INDEPENDENT ORBITER ASSESSMENT

ANALYSIS
OF THE
CREW
EQUIPMENT
SUBSYSTEM

2 NOVEMBER 1987
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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, Change 2, 6 April 1987. 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 corresponding to the Orbiter crew equipment hardware.

The analysis was performed on only a subset of the crew equipment. This subset was agreed upon during negotiation between MDAC and the STS Orbiter and GFE Projects Offices. The subset includes crew equipment which meets the following criteria: (1) normally manifested on every flight; (2) has received final design approval; and (3) is covered by a NASA FMEA/CIL.

The IOA analysis process utilized available crew equipment hardware drawings and schematics for defining hardware assemblies, components, and hardware items. A complete list of reference documents and drawings can be found in Section 5.0. Each level of hardware was evaluated and analyzed for possible failure modes and effects. Criticality was assigned based upon the severity of the effect for each failure mode.

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

<table>
<thead>
<tr>
<th>Summary of CREW EQUIPMENT Failure Modes By Criticality (HW/F)</th>
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<tr>
<td>Criticality:</td>
</tr>
<tr>
<td>Number:</td>
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</table>

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 CREW EQUIPMENT Potential Critical Items (HW/F)

<table>
<thead>
<tr>
<th>Criticality:</th>
<th>1/1</th>
<th>2/1R</th>
<th>2/2</th>
<th>3/1R</th>
<th>3/2R</th>
<th>TOTAL</th>
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<tr>
<td>Number:</td>
<td>33</td>
<td>42</td>
<td>1</td>
<td>2</td>
<td>0</td>
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Of the 352 failure modes analyzed, 78 were determined to be PCIs.
**CREW EQUIPMENT OVERVIEW ANALYSIS SUMMARY**

<table>
<thead>
<tr>
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<th>CRIT.</th>
<th>#FM</th>
<th>#PCI</th>
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<tr>
<td>1/1</td>
<td>33</td>
<td>33</td>
<td>19</td>
</tr>
<tr>
<td>2/1R</td>
<td>42</td>
<td>42</td>
<td>67</td>
</tr>
<tr>
<td>2/2</td>
<td>1</td>
<td>1</td>
<td>190</td>
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</table>

**Figure 1:** Crew Equipment Overview Analysis Summary

- **EVA EQUIP.**
  - CRIT. #FM #PCI
    - 1/1 0 0
    - 2/1R 0 0
    - 2/2 0 0
    - 3/1R 0 0
    - 3/2R 40 0
    - 3/3 23 0

- **EVA TETHERS**
  - CRIT. #FM #PCI
    - 1/1 12 12
    - 2/1R 4 4
    - 2/2 1 1
    - 3/1R 1 0
    - 3/2R 2 0
    - 3/3 11 0

- **EVA TOOLS**
  - CRIT. #FM #PCI
    - 1/1 21 21
    - 2/1R 37 37
    - 2/2 0 0
    - 3/1R 3 2
    - 3/2R 4 0
    - 3/3 23 0

- **IVA TOOLS**
  - CRIT. #FM #PCI
    - 1/1 0 0
    - 2/1R 1 1
    - 2/2 0 0
    - 3/1R 10 0
    - 3/2R 21 0
    - 3/3 86 0

- **FOOD ASSY.**
  - CRIT. #FM #PCI
    - 1/1 0 0
    - 2/1R 0 0
    - 2/2 0 0
    - 3/1R 0 0
    - 3/2R 21 0
    - 3/3 86 0

- **ORBITER HW.**
  - CRIT. #FM #PCI
    - 1/1 0 0
    - 2/1R 0 0
    - 2/2 0 0
    - 3/1R 5 0
    - 3/2R 0 0
    - 3/3 37 0
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 breakdown the respective subsystem into components and low-level hardware items. Each hardware item is evaluated for failure mode, effects, and criticality. These data are documented in the respective subsystem analysis report, and are used to assess the NASA and Prime Contractor FMEA/CIL reevaluation results. The IOA analysis approach is summarized in the following Steps 1.0 through 3.0. Step 4.0 summarizes the assessment of the NASA and Prime Contractor FMEAs/CILs that is 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 Crew Equipment Ground Rules and Assumptions

The crew equipment ground rules and assumptions used in the IOA are defined in Appendix B. The subsystem specific ground rules were defined to provide necessary additions and clarifications to the ground rules and assumptions contained in NSTS 22206.
3.0 SUBSYSTEM DESCRIPTIONS

3.1 Design and Function

The crew equipment items examined during the Independent Orbiter Assessment project comprise a subset of the total list of crew equipment. The items were chosen through MDAC/NASA negotiation and meet the following criteria: (1) normally manifested on every flight; (2) in a final approved design configuration; (3) have a NASA performed FMEA/CIL.

Once the total list of crew equipment items was determined, a logical grouping of the items was made. These groupings are based on usage or location during usage. The overall distribution of the crew equipment is shown in Figure 2. Detailed system breakdowns are included in the following sections.

3.1.1 EVA EQUIPMENT

EMU Scissors

The EMU scissors are modified stainless steel surgical scissors used to cut thermal blankets, wires, tethers, etc. They are stowed in a pocket on the right leg of the lower torso and are tethered in place. Once removed from the EMU pocket they are extremely difficult for the EMU crewmember to replace.

The EMU scissors are shown in Figure 3.

Figure 3: EMU Scissors
Figure 2: Crew Equipment Distribution
EMU LIGHT ASSEMBLY

The Extravehicular Mobility Unit (EMU) light assembly provides a crewmember with portable lighting during an EVA task. These lights are useful in providing illumination during the 45 minutes of darkness of each orbit. The assembly contains two independent lamp modules connected by a cross member as shown in Figure 4.

Each side contains a battery module, two lamps, a switch, and a sequencing circuit (powered by four small watch-sized batteries). The EMU lights attach to the helmet with simple latches. On the EMU lights, each lamp module has a left-right swing angle of 85 degrees (5 degrees towards the helmet and 80 degrees away from the helmet) and an up-down swing angle of 60 degrees (30 degrees up and 30 degrees down). The switch and sequencing circuit provide one-hand operation of the lamp module. Repeatedly depressing the switch sequences the upper lamp on, the lower lamp on, both lamps on, both lamps off. Battery thermal constraints limit dual lamp operation to short periods of time.

Two EMU light battery modules are required to supply the power for the EMU lights (one per side). Each EMU light battery module provides 5 watts to power two bulbs on one side of the EMU light assembly for 3 hours or 2.5 watts to power one bulb on one side for 6 hours. A built-in fuse protects against inadvertent shorting of the contacts. Twelve EMU light batteries are stored on-board for each flight. Each battery module is replaced prior to each EVA.
The Operational Bioinstrumentation System (OBS) provides an amplified electrocardiogram analog signal from crewmembers aboard the Orbiter to the Orbiter avionics multiplexer/demultiplexer where it is converted from analog to digital data. It is then transmitted to the ground in real time or stored on tape for dump or postflight return. The major components of the OBS are a biomed belt with signal conditioner, electrode harness, cables and electrode donning kit as shown in Figure 5.

Use of the OBS is limited to extravehicular activity unless intravehicular activity use is requested by the Flight Surgeon. In case of illness, the Flight Surgeon may request that the OBS be donned for a period of time. In this event, the OBS will be donned and the data will be transmitted in real time or recorded and dumped in near-real time. A spare OBS including an Orbiter panel cable is always flown in the medical kit locker.
EVA PORTABLE FOOT RESTRAINT

The portable foot restraint (PFR) is a working platform which restrains the crewmember during the performance of EVA tasks. The platform consists of a system of toe guides and heel clips which interface with the EMU boots. The PFR is shown in Figure 6. A two-axis (roll and pitch) gimbal system with lock knobs is provided for adjustment and positioning. A probe enables the PFR assembly to interface with the worksite at the PFR socket, where yaw adjustment is available.

The PFR was originally designed to provide Space Shuttle EVA crewmembers with a contingency restraint system for performing EVA work tasks and door latch repairs on or about the forward and aft bulkhead and along the centerline door latches of the payload bay. As EVA operations increased in frequency, new applications for its use were identified and improvements were made in the design to minimize set-up and adjustment times as well as to increase the operational work load limits from 25 to 100 pounds. Spring-loaded lock knobs have been incorporated to prevent inadvertent unlocking of the gimbal system.

Figure 6: Portable Foot Restraint
3.1.2 EVA TETHERS

EVA SLIDEWIRE ASSEMBLY

The EVA slidewire assembly consists of a Kevlar rope attached to support structures at the forward and aft ends of the payload bay doors. See Figure 7. There are slidewire assemblies on both the port and starboard sides of the Orbiter.

![Figure 7: EVA Slidewire](image)

The purpose of the slidewire assembly is to provide a method of connecting an EVA crewmember to the Orbiter, for safety considerations, but still allow freedom of movement throughout the payload bay. To accomplish this purpose, the slidewire is equipped with "slides" which are attached to the rope. The EVA crewman attaches a tether hook, usually one end of the 35-foot waist tether, to the slide which then moves back and forth along the slidewire. This allows the crewman to maneuver around the payload bay, but still remain attached to the Orbiter structure.

The slidewire assembly support structure consists of a yoke, a link, a support, and various fastenings designed to equalize the loads. In the event of a jam in the support mechanism, a quick disconnect pin provides a method of releasing the structure and releasing the jam.

End fittings attach the slidewire to the support structure. The slides are prevented from contacting these end fittings by means of stops which are permanently mounted on the slidewire.

35-FOOT SAFETY TETHER

The 35-foot safety tether connects the crewmember to a slide wire along the cargo bay sill longeron during EVA. The tether consists of a reel case with an integral D-ring, a take-up reel, a 35-foot cable, and a locking hook as shown in Figure 8. A selector on the reel case can be set to lock the take-up reel or to unlock it to allow the tether to reel out and retract. The locking hook on the tether incorporates a lock-lock feature to prevent accidental opening.
Figure 8: 35-Foot Safety Tether

For launch and entry, the port and starboard safety tethers are stowed in a cloth-covered stowage container which is secured to the bulkhead above the airlock in the cargo bay. While still in the airlock, after opening the airlock hatch, a crewmember attaches a waist tether to the D-ring of the 35-foot safety tether. The other end of the waist tether is hooked to a ring on the EMU waist bearing.

A series of straps, clips, and a small capstan secures the 35-foot tether between the slidewire and airlock during launch and entry. The tether is secured near handrails to allow the crewmember to unstow it while moving to the work area and to restow it while returning to the airlock after finishing the extravehicular task.

WAIST TETHER

The waist tether consists of a strip of Nomex webbing material with an aluminum EVA hook on each end (one hook is larger than the other). See Figure 9. The fully extended tether is approximately 44 inches long including the hooks. The tether incorporates a load-limiting feature which allows no more than 75 pounds to be imparted to the EMU until full extension of the tether occurs. If this load is exceeded, the tether will break and the shock will be absorbed by the additional segment of webbing which allows the tether to accept loads of up to 585 pounds.
Waist tethers are used to attach the crewmember to a worksite or to tether an otherwise unrestrained tool to the crewmember. The large hook is attached to handrails, and the small hook is attached to an EMU waist tether ring. Opening of an EVA hook requires that push-to-open buttons on each side of the hook be depressed simultaneously while the hook is squeezed. The hook will spring closed as soon as it is released. The small hook opens 3/4-inch and the large hook opens 1-inch. Two waist tethers are normally attached to each EMU.

3.1.3 EVA TOOLS

TUBE CUTTER

The tube cutter consists of spring-loaded retention rollers, a cutting wheel mounted on a slide, a small ratchet handle that moves the slide, and a large ratchet handle which turns the cutting mechanism around the tube being cut as shown in Figure 10. The tube cutter is designed to cut the Inconel 718 drive tubes which open and close the payload bay doors. The tool is preset to cut tubes with 1/2 to 3/4-inch diameters but can be readjusted to cut 3/4 to 1-inch diameter tubes by flipping the slide 180 degrees and moving the cutter blade to the second screw hole.
During use the tool is pushed on the tube to be cut and is held in place by the retention rollers. The cutting wheel (mounted on a slide) is ratcheted down with the small ratchet handle until it contacts the tube. The large ratchet handle is then used to rotate the entire tube cutter around the tube. The cutting wheel is then tightened, as required, to provide the cutting action. Only a minimal force is required by the operator to cut the drive tube.

**CENTERLINE LATCH BYPASS TOOL**

The centerline latch bypass tool consists of spring-loaded and fixed-load pickup points, a reversible ratchet with stowable handle, and release triggers which have a safety to prevent accidental release. See Figure 11.

![Centerline Latch Bypass Tool](image)

**Figure 11: Centerline Latch Bypass Tool**

The centerline latch tool is used to bypass a failed cargo bay door centerline latch. The tool is designed to exactly duplicate the nominal latch loads on the latch hook and roller. The frame of the tool fits over the latch hook pivot. With the frame held firmly in place, the tool latch is released, which in turn captures the latch roller. The tool handle is rotated to an upright position, and the drive is ratcheted to a hard stop, loading the tool and securing the latch.

**THREE-POINT LATCH TOOL**

The three-point latch tool consists of one spring-loaded and two fixed-load pickup points, a reversible ratchet with stowable handle, two installation handles, and a latch, Figure 12. The tool duplicates the loading on a latch roller produced by a latch hook in nominal condition, transferring loads to the hook pivot, the locking bellcrank, and the latch roller, which secures the forward and aft payload bulkhead latches.
The three-point latch tool is a Shuttle-unique device designed to substitute for the payload bay door forward and aft bulkhead latches if a failure occurs in one of these latches. The tool cannot be installed on a bulkhead latch that has failed with the hook open less than 37 degrees due to interference with the latch hook. Detachable installation handles allow installation of the tool on either side of the bulkhead.

**EVA WINCH AND MOUNTING ASSEMBLY**

The EVA winch consists of a Kevlar rope, a rope housing, a reel, a stowable ratchet handle, and a mounting adapter. A rope guide with rollers to prevent fraying is mounted on the housing. The ratchet lever is used to select reverse, neutral, and engage positions, while the control handle selects ratchet in, ratchet out, reel out, or gear release positions. The winch has 24 feet of 3/8-inch diameter Kevlar rope with a hook attached to the end.

The winch is used to close the payload bay doors manually in the event the door drive system fails. One winch is mounted on each of the forward and aft cargo bay bulkheads. After all apparent obstructions to door movement have been removed and any necessary disconnect and/or cutting operations have been completed, the crewmember routes the rope over the number 4 hook roller and attaches the rope hook to the number 4 latch bellcrank at the top of the door. A load of 600 pounds can be applied on the rope by placing the control to "ratchet in", engaging, and cranking the ratchet handle.

The EVA winch and mounting assembly are shown in Figure 13.
RMS EVA WINCH ADAPTER ASSEMBLY

The remote manipulator system (RMS) EVA winch adapter assembly is comprised of a rope spool with handle, spool bracket, rope guide and rollers, and cam cleats as shown in Figure 14. The RMS winch adapter assembly holds 65 feet of 3/8-inch diameter rope. The rope has a 7 3/4-inch hook on the end, with a spring clip for secure attachment.

The RMS EVA winch adapter assembly is used in conjunction with the snatch blocks in the event of RMS joint failure. The rope is routed through the snatch blocks and attached to the handrail on the tip of the RMS. The crewmember then backdrives the RMS into
the stowed position using the RMS EVA winch adapter assembly. The spool bracket and the rope spool both have handles. Two cam cleats on the rope reel clamp down on the rope to prevent it from being pulled off the reel.

**PAYLOAD RETENTION DEVICE**

The Payload Retention Device (PRD) is used as a contingency tiedown for payloads that cannot be properly restowed in their launch positions for reentry. It consists of a Kevlar webbing strap with French hooks on the ends and a stainless steel and aluminum ratchet mechanism for tightening as shown in Figure 15.

![Figure 15: Payload Retention Device](image)

The PRD can be attached with French hooks to tether points in the cargo bay, on the equipment to be secured, or to another PRD. After both ends of the PRD are hooked in place, the crewmember pulls the handle to operate the ratchet, tightening the strap until the payload is secure. The ratchet mechanism reels in the strap at a sufficiently slow rate that the article being secured repositions itself, thereby preventing inadvertent damage. The PRD does not allow a controlled release of tension; it is intended only as a tiedown device.

As of this writing, the PRD has not been certified for tie-down of payloads during re-entry. The device has been certified only to load levels which permit RMS retention.
**EVA CABLE CUTTER**

The cable cutter is a standard cutter modified for EVA use. It is equipped with large handles to fit the EVA glove. The tool handles are covered with Velcro and a tether point is provided. When fully open, the cutter jaw opening measures 5/16-inch wide and 5/16-inch deep. See Figure 16.

![Figure 16: EVA Cable Cutter](image)

The cable cutter is initially operated with two hands in order to close the cutting jaws and capture the cable. After capture, the handles may then be operated with one hand to cut the cable.

**SNATCH BLOCK ASSEMBLY**

The snatch block is a common marine device modified for EVA use. It is used with a 3/8-inch diameter rope. The snatch block hook has a snap lock to provide a more secure attachment. The hook has an opening of 3/4-inch and is attached by a swivel shaft allowing 360 degrees rotation. See Figure 17.

![Figure 17: Snatch Block Assembly](image)
The snatch block is used to route the cargo bay winch line to support payload tasks. In the event of an RMS failure, it can be used with the RMS EVA winch adapter assembly to backdrive the RMS to a stowed position. Additionally, if a failure should occur in the Airborne Support Equipment (ASE) drive system, the snatch block can be used to stow and/or deploy the Inertial Upper Stage (IUS).

3.1.4 IVA TOOLS

TURNBUCKLE

The turnbuckle consists of three adjustable length links joined by pin and hole connections as shown in Figure 18. After being placed in position between the mid-deck lockers the crewman can manually adjust the threaded lengthening knobs to provide a snug fit.

![Figure 18: Turnbuckle](image)

The turnbuckle is designed to maintain the positions of the mid-deck stowage lockers after (a maximum of) three lockers have been removed. Mid-deck lockers are normally removed to gain access to the forward avionics bay for a variety of in-flight maintenance tasks, including GPC changeout.
LOCKER REMOVAL TOOL

The locker removal tool is a combination ratchet/torque wrench with an extension terminating in a hex drive head as shown in Figure 19. Two locker tools are flown as a part of the IVA tool kit. The extension portion of the tool is designed to fit through the installation/removal tool guides at the four corners of the middeck lockers so that the hex head drive can make contact with the four structural attach fasteners at the rear of the lockers. The ratchet portion of the tool is then used to either loosen or tighten these fasteners so that the locker can either be removed or reinstalled.

Figure 19: Locker Removal Tool

IFM BREAKOUT BOX

The IFM breakout box is designed to provide 1.5 - 28 V dc variable power to support any contingency procedure which may occur during on orbit operations and require electrical power. A standard orbiter power cord connects the breakout box with one of the shuttle utility power panels to provide the 28 V dc input. See Figure 20.

Figure 20: IFM Breakout Box
There are three power output connections on the IFM breakout box. One is an outlet for another standard power cord at 28 V dc and is used when two IFM breakout boxes are required to complete a contingency procedure.

The "B" outlet is also 28 V dc but allows the choice and connection of one of four wire gauges (12, 16, 20, or 22). The choice of wire gauge will be dictated by the requirements of the particular piece of equipment under repair. The wires used to connect the IFM breakout box to the equipment being powered are found in the IFM pin kit. In addition to the pre-made pin/wire combinations, the kit provides the capability for the crew to manufacture any other required options on orbit.

The "A" outlet provides the choice of wire gauges plus the selection of either 28 V dc or a variable voltage between 1.5 and 28 V dc. This selection is made by means of a selection switch. If the variable voltage is required, a multimeter (also carried on board) is connected to the test ports of the IFM breakout box and the potentiometer (built into the IFM breakout box) is used to set the desired voltage level. Note: All power outlets of the breakout box may be used simultaneously.

There are a number of safety options built into the IFM breakout box. In addition to the selection switch position, the active options on the breakout box are displayed by means of LEDs directly above the operational options. Built-in fuses protect the circuit from over-current conditions. Temperature sensing/display strips are mounted on all sides of the breakout box for crew safety purposes.

3.1.5 FOOD ASSEMBLIES

GALLEY ASSEMBLY

The galley is used by crewmembers during meal preparation. The galley consists of an inlet water supply system, a water dispensing mechanism, a water heater, and an oven. Space on the galley is also allocated for storage and dispensing of items such as trays, silverware, condiments, and vitamins.

The water system consists of an inlet side which feeds water directly into the water heater and into the water dispensing system. The water heater has a twelve pound capacity and is located under the galley. Six heaters provide the heat to control the water temperature between 165 and 185 degrees F. Whenever hot water is dispensed, or the water drops below a given temperature, a recirculation pump will start to run so that the water will be heated in an efficient manner.
The galley has an electronic water dispensing system which allows the crewmember to select the amount of water to be fed through the needle. This amount can vary from 0.5 to 8.0 ounces in 0.5 ounce increments. In case of a failure of the electronic system, the galley is equipped with a water bypass system.

The galley oven consists of a set of heaters and three circulating fans to control the temperature and heat the food. The bottom of the oven depends upon this method of convective heating, while the top portion of the oven places the food packets into direct contact with the heaters and relies upon conductive heating.

The galley is shown in Figure 21.

![Figure 21: Galley](image)

**OPERATIONAL WATER DISPENSER**

The Operational Water Dispenser Assembly (OWDA) is a compact system that provides the crew with ambient and chilled water sources for food rehydration, drinking, and hygiene purposes by interfacing with the Orbiter ambient and chilled potable water systems whenever the galley is not flown.

The major component of interest in the OWDA is the rehydration unit which is an electronic system for dispensing 2, 3, 4, and 8 ounces of water into the operational food and beverage containers requiring hydration. The water is introduced via a replaceable needle with two spare needles being flown.
Water dispensing is performed by a pressure regulator/solenoid valve arrangement. Inlet water with a nominal system pressure range of 12.0 to 22.0 psi is reduced to a constant pressure of 12.0 psi by the regulator. Downstream of the solenoid valve, an electronic controller governs the time of flow. This timed shut-off after constant flow translates to specific water quantities for accurate rehydration.

Additional components of interest include: (1) the power switch (the OWDA requires 28 V dc power); (2) the quantity select rotary switch and fill initiation switch combination; (3) a bypass fill valve to be used in case of a failure in (2); (4) various water lines; (5) a microbial check valve to prevent back contamination; and (6) a water selection switch for selecting either ambient or chilled water.

Additionally, the OWDA provides personal hygiene water. The water dispenser provides ambient water through a quick disconnect (QD) on its left side. The crewmember obtains water from this QD by attaching a 12-foot flex hose with a mating QD. On the opposite end of the flex hose is a valve and nozzle.

The OWDA is shown in Figure 22.
CONTINGENCY WATER DISPENSER

The contingency water dispenser is an extremely simple valve/needle combination which connects directly into the orbiter potable water supply and is used in the event of an OWDA or galley failure. See Figure 23.

![Contingency Water Dispenser Assembly](image)

Figure 23: Contingency Water Dispenser Assembly

3.1.6 ORBITER HARDWARE

PASSENGER SEATS AND RESTRAINTS

The passenger seats and restraints are under redesign due to the requirement for a crew escape system. The final approved design configuration is anticipated mid to late September. These items cannot be examined by the IOA contractor until this data has been received.

SLEEP STATIONS AND RESTRAINTS

The four-tier bunk sleep station consists of four sleep stations in which the crewmembers enter sleep restraints that are similar to the sleeping bags, except that the restraints are fastened to rigid pallets. The sleep stations provide for light and sound attenuation and privacy by means of end/slide panels and sliding doors made of machined aluminum and Kevlar materials. The sliding doors allow ingress/egress into the sleep stations. The panels/door and support for the bottom station are removable for under-floor stowage access. To gain access to floor compartment Volume E, the crewmember needs to remove the bottom sleep station side panel and door. The door is physically attached to the side panel structure.

Lights are provided at the head of each sleep station. Ventilating air enters through a grille at the foot of each station into the Orbiter cabin. An adjustable air diffuser will permit a ventilation airflow of up to 20 cubic feet per minute.

The sleep stations and restraints are shown in Figure 24.
Figure 24: Sleep Stations and Restraints
SIDE HATCH SAFETY LOCK

The side hatch safety lock consists of two aluminum clamps held together with a steel cap and pip pin. The safety lock protects the side hatch lock lever from becoming inadvertently unlocked while the vehicle is on-orbit. The aluminum clamps are placed on each side of the crank handle. The steel cap is placed on the clamps such that the pip pin may be placed through the clamps and cap. The side hatch safety lock is removed by reversing the procedure. The safety lock is installed during the orbital phase of the mission and removed during deorbit procedures.

The side hatch safety lock is shown in Figure 25.

![Figure 25: Side Hatch Safety Lock](image)

LOCKERS

Modular lockers provide the middeck stowage space. Each modular locker provides 2 cubic feet of stowage volume. The lockers are locked to the avionics bay by four attach fasteners and can be removed in flight by the use of an extension drive and ratchet assembly.

The lockers have hinged doors with two magnetic on-orbit latches and two captive wingnut locks for securing the doors during launch and entry/landing. The doors have a friction hinge for zero-g positioning. The door can be opened a full 180 degrees. When 90 degrees open, the door's inner surface is flush with the bottom of the lockers.

The lockers are configured with a standard hole pattern for attaching straps and brackets to restrain stowed equipment. Three standard sizes of reusable trays are available. To hold the stowed items, foam inserts are available. An avionics bay closeout panel is used for structural continuity when modular lockers are not flown. As many as 42 modular lockers can be flown.

A typical locker is shown in Figure 26.
TREADMILL

The treadmill consists of a conveyor running track contained in a metal housing. The treadmill base has quick disconnect attachment fittings that fit onto the mid-deck floor deck studs. The running track itself is coupled to a rapid onset braking system which is regulated by a speed control knob. When the preset speed is attained, the rapid onset braking system applies increased drag to the running track and consequently limits the speed of the runner.

To exercise in zero-g, a restraint system is used to apply near one-g forces to the body. Four force cords are routed near the four corners of the treadmill to restrain the body to the running track. The force cords are routed through a series of pulley wheels to provide a more constant force delivered to the body. The force cords attach to the slip buckles which are attached to the adjustment straps on a waistbelt.

The treadmill and the associated restraint cords are shown in Figure 27.
Figure 27: Treadmill
COAS ASSEMBLY

The COAS is a collimator device similar to an aircraft gunsight. It consists of a lamp with an intensity control, reticle, barrel-shaped housing, mount, combiner assembly, and a power cable.

The COAS is designed for use in the right-hand overhead window and in the left-hand forward window. The overhead window position is the primary use location and the forward window position is the secondary location. The COAS is installed in the primary position and in the secondary position by using a mounting bracket which is locked in position by two COAS thumbscrews. In the forward position a forward mounting adapter is installed prior to COAS installation. This adapter is locked into position with a single thumbscrew. The COAS is utilized in the right-hand overhead window to provide range and range rate for rendezvous/docking, for IMU backup alignment, and Z-axis sighting. In the left-hand forward window the COAS is used for stationkeeping/tracking, miscellaneous Orbiter alignment tasks, and as a backup location for IMU alignment. The COAS provides the crewman a fixed line-of-sight attitude reference image that appears to be the same distance away as the target. This image is boresighted (by means of a sight mount) parallel to the X-axis (centerline of the Orbiter).

The COAS and the associated brackets are shown in Figure 28.
Figure 28: COAS

Filter

Coas with filter

Coas bulb change out

Coas intensity control

Bulb housing assembly

Coas with aperture stop

Original page

Black and white photograph
3.2 Locations And Interfaces

The crew equipment items are located in both the crew compartment and the payload bay. Refer to the preceding descriptions for details.

3.3 Hierarchy

The overall hierarchy for crew equipment is shown in Figure 29. Detailed breakdowns are presented in Figures 30 through 39.
Figure 29: Crew Equipment Hierarchy
Figure 30: EMU Light Assembly Hierarchy
Figure 31: EVA Tether Hierarchy
Figure 32: Payload Bay Door Tools Hierarchy
Figure 33: PSA Tool Hierarchy
Figure 34: RMS Tool Hierarchy
37
Figure 35: IFM Breakout Box Hierarchy
Figure 36: Galley Hierarchy
Figure 37: OWDA Hierarchy
Figure 38: Orbiter Hardware Hierarchy

41
Figure 39: COAS Hierarchy
4.0 ANALYSIS RESULTS - CREW EQUIPMENT

The crew equipment analysis identified 352 failure modes and 78 potential critical items. The failure modes are divided into categories in Table I and the PCIs are presented in Table II.

<table>
<thead>
<tr>
<th>TABLE I: Summary of CREW EQUIPMENT Failure Modes and Criticalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criticality</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>EVA Equipment</td>
</tr>
<tr>
<td>EVA Tethers</td>
</tr>
<tr>
<td>EVA Tools</td>
</tr>
<tr>
<td>IVA Tools</td>
</tr>
<tr>
<td>Food</td>
</tr>
<tr>
<td>Assemblies</td>
</tr>
<tr>
<td>Orbiter</td>
</tr>
<tr>
<td>Hardware</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Each major category is discussed in the following sections. Additionally, a comprehensive listing of the items and associated failure modes are presented at the beginning of Appendix C and the list of potential critical items is given in Appendix D.

4.1 Analysis Results - EVA Equipment

The EVA Equipment Analysis identified 63 failure modes. The number of failure modes for the individual items of equipment is given in Table III.


<table>
<thead>
<tr>
<th>TABLE III: Summary of EVA Equipment Failure Modes and Criticalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>--------------------------------------</td>
</tr>
<tr>
<td>EVA Scissors</td>
</tr>
<tr>
<td>EMU Light</td>
</tr>
<tr>
<td>Assembly</td>
</tr>
<tr>
<td>OBS</td>
</tr>
<tr>
<td>PFR</td>
</tr>
<tr>
<td>TOTALS</td>
</tr>
</tbody>
</table>

Of the 63 failure modes, none was judged to be a potential critical item.

4.2 Analysis Results - EVA Tethers

The EVA tether analysis identified 31 failure modes, which are divided among the individual items in Table IV. Of the 31 failure modes, 17 were determined to be potential critical items, as shown on Table V. Of these 17 PCIs, 12 had a 1/1 criticality. The 1/1 criticalities were assigned mainly to failures resulting in an unrestrained, or untethered crewman. All 17 PCIs are listed in Appendix D.

<table>
<thead>
<tr>
<th>TABLE IV: Summary of EVA Tether Failure Modes and Criticalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>--------------------------------------</td>
</tr>
<tr>
<td>EVA Slidewire</td>
</tr>
<tr>
<td>ERCM Tether</td>
</tr>
<tr>
<td>Waist Tether</td>
</tr>
<tr>
<td>TOTALS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE V: Summary of EVA Tether Potential Critical Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>EVA Slidewire</td>
</tr>
<tr>
<td>ERCM Tether</td>
</tr>
<tr>
<td>Waist Tether</td>
</tr>
<tr>
<td>TOTALS</td>
</tr>
</tbody>
</table>
4.3 Analysis Results - EVA Tools

The EVA tools analysis identified 88 failure modes, which are divided among the EVA tools as given in Table VI. Of the 88 failure modes, 60 were judged to be potential critical items with 21 having 1/1 criticalities. These high criticalities are due mainly to the designed use of the tools for contingency payload bay operations. The PCIs are divided into categories in Table VII and listed in Appendix D.

<table>
<thead>
<tr>
<th>TABLE VI: Summary of EVA Tool Failure Modes and Criticalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Tube Cutter</td>
</tr>
<tr>
<td>Centerline</td>
</tr>
<tr>
<td>Latch Bypass</td>
</tr>
<tr>
<td>Tool</td>
</tr>
<tr>
<td>3 Point Latch</td>
</tr>
<tr>
<td>Tool</td>
</tr>
<tr>
<td>EVA Winch &amp;</td>
</tr>
<tr>
<td>Mount Asm.</td>
</tr>
<tr>
<td>EVA Winch</td>
</tr>
<tr>
<td>Adapter</td>
</tr>
<tr>
<td>PRD</td>
</tr>
<tr>
<td>EVA Cable</td>
</tr>
<tr>
<td>Cutter</td>
</tr>
<tr>
<td>Snatch Block</td>
</tr>
<tr>
<td>Assembly</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>
### TABLE VII: Summary of EVA Tool Potential Critical Items

<table>
<thead>
<tr>
<th>Item</th>
<th>1/1</th>
<th>2/1R</th>
<th>2/2</th>
<th>3/1R</th>
<th>3/2R</th>
<th>3/3</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tube Cutter Centerline Latch</td>
<td></td>
<td>9</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>3 Point Latch</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EVA Winch &amp; Mount</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>EVA Winch Adapter</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRD</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>EVA Cable Cutter Snatch Block</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>21</td>
<td>37</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

#### 4.4 Analysis Results - IVA Tools

The IVA tools analysis identified 21 failure modes. Of the 21, only one, a failure of the locker removal tool, was judged to be a potential critical item. The failure modes are distributed among the three categories in Table VIII.

### TABLE VIII: Summary of IVA Tool Failure Modes and Criticalities

<table>
<thead>
<tr>
<th>Item</th>
<th>1/1</th>
<th>2/1R</th>
<th>2/2</th>
<th>3/1R</th>
<th>3/2R</th>
<th>3/3</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnbuckle Locker Removal Tool</td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>IFM Breakout Box</td>
<td>10</td>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>TOTALS</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>21</td>
</tr>
</tbody>
</table>
4.5 Analysis Results - Food Assemblies

The analysis of the food assemblies identified 107 failure modes, none of which was found to be a potential critical item. The failure modes are distributed between the three items of equipment in Table IX.

<table>
<thead>
<tr>
<th>TABLE IX: Summary of Food Assembly Failure Modes and Criticalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Galley</td>
</tr>
<tr>
<td>OWDA</td>
</tr>
<tr>
<td>CWDA</td>
</tr>
<tr>
<td>TOTALS</td>
</tr>
</tbody>
</table>

4.6 Analysis Results - Orbiter Hardware

Analysis of the orbiter hardware identified 42 failure modes, none of which was found to be a potential critical item. The failure modes are distributed among the five items of equipment in Table X.

<table>
<thead>
<tr>
<th>TABLE X: Summary of Orbiter Hardware Failure Modes and Criticalities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Sleep Station/Restraints</td>
</tr>
<tr>
<td>Side Hatch</td>
</tr>
<tr>
<td>Safety Lock</td>
</tr>
<tr>
<td>Locker</td>
</tr>
<tr>
<td>Treadmill</td>
</tr>
<tr>
<td>COAS</td>
</tr>
<tr>
<td>TOTALS</td>
</tr>
</tbody>
</table>
5.0 REFERENCES

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

1. NSTS 22206 Instructions for preparation of Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL), Change No. 2, 4-6-87.
2. V602-660302 EO A-09, Turnbuckle, 4-23-85.
4. 10131-10031, Treadmill Exerciser Assembly, 9-25-84.
7. V620-660720 EO B-02, COAS Forward Bracket, 7-26-85.
8. SED 48101600 Rev A, Operational Water Dispenser Assembly, 2-10-83.
9. V602-660604 EO B-17, Locker Assembly, 11-8-84.
10. SED 48101607 Rev A, Contingency Water Dispenser Assembly, 8-18-82.
11. SED 33102357 Rev A DCN 8-5-82, Snatch Block Assembly, 8-5-82.
12. 10159-20076, EVA Scissors Assembly, 5-9-83.
15. SED33101621 DCN 1/25/83, Centerline Latch Tool Assembly, 1-25-83.
16. SED 33101327 Rev C, Three Point Latch Tool Assembly, 5-5-84.
17. SED 33101570, EVA Winch and Mount Assembly, 2-16-80.
18. 10163-10063, Payload Retention Device, 1-12-82.
19. 10134-20001, In-Flight Maintenance Breakout Box, 4-2-85.
20. V617-544702, EVA Operational Slidewire System Link 7-8-82.
22. V617-544701, EVA Operational Slidewire System Yoke, 7-7-82.
23. V617-544720, EO B-01 EVA Operational Slidewire, 7-22-85
24. 10161-10061, EMU Lights Assembly, 5-2-81.
25. 10161-60029, EMU Light Sequencer Mark IV Schematic, 11-29-83.
26. 10161-20033, Gimbal Assembly: EMU Lights Assembly, 4-29-81.
28. SED 42100961, Operational Bioinstrumentation System EVA Cable Assembly, 10-10-84.
29. 10162-10062 EO 101-374, Extended Range Crew Member Safety Tether Assembly, 8-30-85.
30. 10151-20040, Waist Tether Assembly, 1-23-80.
32. 10155-20003, Portable Foot Restraint Boom Assembly, 11-1-82.
33. 10155-20004, Portable Foot Restraint Centerline Clamp Assembly, 3-7-85.
34. 10155-10035, Portable Foot Restraint Articulating Socket Assembly, 5-7-82.
35. V601-669100 Rev B, Sleep Station Restraint Assembly, 2-14-84.
36. JSC 20466, EVA Catalog Tools and Equipment, 11-4-85.
38. SSSH 9.5, Crew Optical Alignment Sight Assembly, 10-18-83.
39. JSC-20365, Food System and Dining Workbook.
40. JSC-17321, FDF: IFM Checklist.
41. EVA Prep/Post 2102 Training Workbook.

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APPENDIX A
ACRONYMS

AOA - Abort-Once-Around
ASE - Aerospace Support Equipment
ATO - Abort-To-Orbit
C&W - Caution and Warning
CIL - Critical Items List
COAS - Crew Optical Alignment Sight
CWDA - Contingency Water Dispenser Assembly
dc - Direct Current
EMU - Extravehicular Mobility Unit
ERCM - Extended Range Crew Member
EVA - Extravehicular Activity
F - Fahrenheit
F - Functional
FMEA - Failure Modes and Effects Analysis
FSSR - Flight Systems Software Requirements
GFE - Government Furnished Equipment
GPC - General Purpose Computer
HW - Hardware
IFM - In-Flight Maintenance
IMU - Inertial Measurement Unit
IOA - Independent Orbiter Assessment
IUS - Inertial Upper Stage
IVA - Intravehicular Activity
JSC - Johnson Space Center
LED - Light Emitting Diode
MDAC - McDonnell Douglas Astronautics Company
NA - Not Applicable
NSTS - National Space Transportation System
OBS - Operational Bioinstrumentation System
OWDA - Operational Water Dispenser Assembly
PCI - Potential Critical Item
PFR - Portable Foot Restraint
PHS - Personal Hygiene Station
PLBD - Payload Bay Door
PRCBD - Program Requirements Control Board Directive
PRD - Payload Retention Device
PSA - Provision Stowage Assembly
psi - Pounds per Square Inch
QD - Quick Disconnect
RHS - Rehydration Station
RMS - Remote Manipulator System
RTLS - Return-to-Launch Site
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<tr>
<td>SFOM</td>
<td>Shuttle Flight Operations Manual</td>
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APPENDIX B

DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

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

Definitions contained in NSTS 22206, Instructions For Preparation of FMEA/CIL, 10 October 1986, change 2, 6 April 1987, 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)

ONORBIR 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
B.2 IOA Project Level Ground Rules and Assumptions

The philosophy embodied in NSTS 22206, Instructions for Preparation of FMEA/CIL, 10 October 1986, change 2, 6 April 1987 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.
B.3 Crew Equipment Specific Ground Rules and Assumptions

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

1. Waist tether is used to fasten a crewmember to either a workstation or to the ERCM safety tether. It is not used to restrain tools.

   RATIONALE: Worst case possibility.

2. The Operational Bioinstrumentation System (OBS) will be considered as a non-mandatory item for EVA operations. Failure of the OBS while monitoring an IVA crewmember can require the Flight Surgeon to terminate the mission. Thus, IVA usage is more critical.

   RATIONALE: IVA crewmembers are hooked to the OBS only at the request of the Flight Surgeon. If a crewmember's health cannot be monitored, the Flight Surgeon has the option of terminating the mission.

3. Crew actions, planned and unplanned, are considered viable alternatives for overcoming failures and reducing criticalities.

   RATIONALE: Crew equipment is designed to permit this capability.

4. "Normally expected environmental conditions" precludes the existence of contamination in all water lines.

   RATIONALE: Interpretation and application of redundancy screen C.

5. Lockers are assumed to contain emergency, lifesaving, or IFM critical equipment.

   RATIONALE: Worst case possibility.

6. Crew equipment failures discovered prior to launch will be corrected prelaunch.

   RATIONALE: Interpretation of flight rules.

7. RMS jettison is considered unlike redundancy to RMS stowing.

   RATIONALE: Definition of redundancy.
8. The EMU lights are not designated as mandatory items during EVA.

RATIONALE: Definition of mandatory versus non-mandatory requirements.

9. The failure of an EVA tether such that the crewmember is unrestrained will be assigned a "1/1" criticality.

RATIONALE: Worst case possibility

10. Certain galley and OWDA failures can result in free water in the cabin. It is not a part of this task to identify the hazards that free water can pose to other on-board systems.

RATIONALE: This should be addressed by a "hazard analysis".

11. Complete loss of the galley will not terminate a mission as long as alternate water sources are available.

RATIONALE: The FDF contains procedures to bypass the galley for water if required. Other galley functions are not required for completion of mission.
APPENDIX C
ANALYSIS WORKSHEETS AND SUMMARY TABLES

C-1
This section contains the IOA analysis worksheets employed during the analysis of the Crew Equipment subsystem. The information on these worksheets is intentionally similar to the FMEA's written by Rockwell and the NASA. Each of these sheets identifies the item being analyzed, and parent assembly, as well as the function. For each failure mode, the possible causes are outlined, and the assessed hardware and functional criticality for each mission phase is listed, as described in the Rockwell Desk Instructions 100-2G. 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
3 = Non loss of life or vehicle or mission

Functional Criticalities :
1R = Redundant identical hardware components or redundant functional paths all of which, if failed, could cause loss of life or vehicle.
2R = Redundant identical hardware components or redundant functional paths 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
4 = Do Not Know

Redundancy Screens B and C :
P = Passed Screen
F = Failed Screen
NA = Not Applicable

Preceding the analysis worksheets are summary tables containing a listing of all identified failures and associated criticalities. These summary tables can be used as a quick reference to identify the desired failure number, then the analysis worksheet can be referenced for more complete information.
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### EVA Tethers Analysis Worksheets Summary

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- EVA SLIDEWIRE ASSEMBLY-STOP
- EVA SLIDEWIRE-END FITTINGS
- EVA SLIDEWIRE ASSEMBLY-COTTR PIN
- EVA SLIDEWIRE ASSEMBLY-QD PIN
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(*) Potential Critical Items.

C-5
# EVA Tools Analysis Worksheets Summary

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- OWDA HDLG CLPS
- OWDA POWER CON
- OWDA POWER CON
- OWDA FLEX LINE
- OWDA FLEX LINE
- OWDA FLEX LINE
- CONTINGENCY WATER DISPENSER
- CONTINGENCY WATER DISPENSER
- CONTINGENCY WATER DISPENSER
- CONTINGENCY WATER DISPENSER

(*) Potential Critical Items.
## ORBITER HARDWARE ANALYSIS WORKSHEETS SUMMARY

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(*) Potential Critical Items.
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1100

ITEM: EVA SCISSORS - SPRING
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SCISSORS
3) SPRING

CRITICALITIES

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

LOCATION: AIRLOCK
PART NUMBER: 10159-20001-02

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
SPRING BREAKS. ONE PAIR OF SCISSORS FLOWN FOR EACH PRIME EMU.
SCISSORS CAN STILL FUNCTION WITH BROKEN SPRING. OTHER REDUNDANT
EVA/IVA HARDWARE ITEMS AVAILABLE TO ACCOMPLISH SAME TASK.

REFERENCES: JSC-20466, EVA PREP/POST 2102 TRAINING BOOK

REPORT DATE 10/23/87  C-13
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 1101  ABORT: /NA

ITEM: EVA SCISSORS - BLADE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SCISSORS
3) BLADE

CRITICALITIES

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LOCATION: AIRLOCK
PART NUMBER: 10159-20001-02

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
BLADE BREAKS. ONE PAIR OF SCISSORS FLOWN FOR EACH PRIME EMU. OTHER EVA/IVA REDUNDANT HARDWARE ITEMS AVAILABLE TO ACCOMPLISH THE SAME TASK.

REFERENCES: JSC-20466, EVA PREP/POST 2102 TRAINING BOOK

REPORT DATE 10/23/87  C-14
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1102

ITEM: EVA SCISSORS - BLADES
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SCISSORS
3) BLADES

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LOCATION: AIRLOCK
PART NUMBER: 10159-20001-02

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, OVERLOAD, THERMAL SHOCK
EFFECTS/RATIONALE:
BLADES HAVE TROUBLE CLOSING. ONE PAIR OF SCISSORS FLOWN FOR EACH PRIME EMU. OTHER EVA/IVA REDUNDANT HARDWARE ITEMS AVAILABLE TO ACCOMPLISH THE SAME TASK.

REFERENCES: JSC-20466, EVA PREP/POST 2102 TRAINING BOOK

REPORT DATE 10/23/87 C-15
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1103

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

ITEM: EVA SCISSORS LOCKING BAR
FAILURE MODE: FAILS TO REMAIN CLOSED

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SCISSORS
3) LOCKING BAR
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: AIRLOCK
PART NUMBER: 10159-20001-02

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
LOCKING BAR BREAKS. ONE PAIR OF SCISSORS FLOWN FOR EACH PRIME EMU. WORST CASE: EVA SCISSORS CANNOT BE STOWED AFTER USE.

REFERENCES: JSC-20466, EVA PREP/POST 2102 TRAINING BOOK

REPORT DATE 10/23/87 C-16
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1104

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

ITEM: EVA SCISSORS HINGE PIN
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SCISSORS
3) HINGE PINS
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LOCATION: AIRLOCK
PART NUMBER: 10159-20001-02

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HINGE PIN JOINING BLADES BREAKS. ONE PAIR OF SCISSORS FLOWN FOR EACH EMU. OTHER EVA/IVA REDUNDANT HARDWARE ITEMS AVAILABLE TO ACCOMPLISH SAME TASK.

REFERENCES: JSC-20466, EVA PREP/POST 2102 TRAINING BOOK

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1200

ITEM: EMU LIGHT ASSEMBLY - SEQUENCING CIRCUIT BATTERY
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) SEQUENCER CIRCUIT
4) BATTERY
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: BATTERY FOR 10161-60029

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:
THE SEQUENCER CIRCUIT FOR THE EMU LIGHT ASSEMBLY IS POWERED BY ITS OWN WATCH SIZE BATTERY. FAILURE OF THIS BATTERY CAUSES A FAILURE OF THE SEQUENCER CIRCUIT AND HENCE A FAILURE OF THE LIGHT ASSEMBLY ON THE AFFECTED SIDE. THE CREWMEMBER WILL STILL HAVE THE LIGHTS ON THE OPPOSITE SIDE OF THE ASSEMBLY.

REFERENCES: 10161-10061, 10161-60029

REPORT DATE 10/23/87  C-18
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1201

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

ITEM: EMU LIGHT ASSEMBLY - SEQUENCING CIRCUIT THERMOSTAT
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) SEQUENCER CIRCUIT
4) THERMOSTAT

CRITICALITIES
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AOA: /NA
DEORBIT: /NA ATO: /NA
LANDING/SAFING: /NA

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

LOCATION: PAYLOAD BAY
PART NUMBER: THERMOSTAT FOR 10161-60029

CAUSES: CONTAMINATION, OVERLOAD, VIBRATION

EFFECTS/RATIONALE:
THE SEQUENCING CIRCUIT CONTROLS THE LIGHT SELECTION FOR THE EMU LIGHT ASSEMBLY. THE THERMOSTAT PROTECTS AGAINST CASES WHERE TWO LIGHTS ARE LEFT ON FOR PERIODS OF TIME LONGER THAN THE DESIGN LIMITS. THE LIGHTS CAN STILL BE TURNED OFF BY THE SWITCH.

REFERENCES: 10161-10061, 10161-60029

REPORT DATE 10/23/87 C-19
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1202

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

ITEM: EMU LIGHT ASSEMBLY - SEQUENCING CIRCUIT THERMOSTAT
FAILURE MODE: FAILS OPEN

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) SEQUENCER CIRCUIT
4) THERMOSTAT
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: THERMOSTAT FOR 10161-60029

CAUSES: CONTAMINATION, OVERLOAD, VIBRATION

EFFECTS/RATIONALE:
A FAILURE OF THE THERMOSTAT IN AN OPEN CONFIGURATION MEANS THE SEQUENCING CIRCUIT WILL NO LONGER OPERATE. THE LIGHTS ON THE UNAFFECTED SIDE OF THE ASSEMBLY WILL STILL BE AVAILABLE TO THE EVA CREWMEMBER.

REFERENCES: 10161-10061, 10161-60029

REPORT DATE 10/23/87 C-20
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1203

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

ITEM: EMU LIGHT ASSEMBLY - SEQUENCING CIRCUIT SWITCH
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) SEQUENCER CIRCUIT
4) SWITCH
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SWITCH FOR 10161-60029

CAUSES: CONTAMINATION, OVERLOAD

EFFECTS/RATIONALE:
THE SEQUENCING CIRCUIT SWITCH ALLOWS THE EVA CREWMEMBER TO SELECT WHICH LIGHTS ARE LIT ON EACH SIDE OF THE HELMET. FAILURE OF THE SWITCH MEANS THAT INCORRECT LIGHTS ARE LIT OR THAT NO LIGHTS ARE LIT. THE OPPOSITE SIDE LIGHTS WILL STILL BE AVAILABLE TO THE EVA CREWMEMBER.

REFERENCES: 10161-10061, 10161-60029

REPORT DATE 10/23/87 C-21
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1204

ITEM: EMU LIGHT ASSEMBLY - SEQUENCING CIRCUIT
FAILURE MODE: FAILS TO OPERATE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) SEQUENCER CIRCUIT

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10161-60029

CAUSES: MECHANICAL SHOCK, THERMAL SHOCK, VIBRATION

EFFECTS/RATIONALE:
TOTAL FAILURE OF THE SEQUENCER CIRCUIT MEANS THE EMU LIGHTS ON ONE SIDE OF THE HELMET ARE NO LONGER AVAILABLE TO THE EVA CREWMEMBER. THE LIGHTS ON THE OPPOSITE SIDE ARE STILL AVAILABLE AS ARE ALTERNATE SOURCES OF LIGHTING. IF THE SWITCH FAILS SUCH BOTH LIGHTS ARE ON, THEN THE THERMOSTAT WILL PROTECT AGAINST POSSIBLE THERMAL OVERLOAD.

REFERENCES: 10161-10061, 10161-60029

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1205
ITEM: EMU LIGHT ASSEMBLY - BULB
FAILURE MODE: BURNS OUT
LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) BULB

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: BULBS FOR 10161-10061

CAUSES: OVERLOAD

EFFECTS/RATIONALE:
A FAILURE OF ONE EMU LIGHT ASSEMBLY BULB STILL LEAVES THREE BULBS ON THE ASSEMBLY AS OPERATIONAL, AS WELL AS ADDITIONAL SOURCES OF LIGHTING.

REFERENCES: 10161-10061

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 1206  ABORT: /NA

ITEM: EMU LIGHT ASSEMBLY-GIMBAL
FAILURE MODE: PHYSICAL BINDING

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) GIMBAL
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10161-20033

CAUSES: CONTAMINATION, MECHANICAL SHOCK, PIECE-PART FAILURE

EFFECTS/RATIONALE:
FAILURE OF THE GIMBAL ASSEMBLY MEANS THAT THE EMU LIGHTS ON ONE SIDE OF THE HELMET WILL BE FROZEN IN ONE CONFIGURATION. THE LIGHTS ON THE OPPOSITE SIDE OF THE HELMET WILL STILL BE POSITIONABLE.

REFERENCES: 10161-10061, 10161-20033

REPORT DATE 10/23/87  C-24
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1207

ITEM: EMU LIGHT ASSEMBLY-GIMBAL
FAILURE MODE: ERRATIC OPERATION

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) GIMBAL
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10161-20033

CAUSES: CONTAMINATION, MECHANICAL SHOCK, PIECE-PART FAILURE

EFFECTS/RATIONALE:
FAILURE OF THE GIMBAL IN A "FREE" POSITION MEANS THAT THE EMU LIGHTS ON THE AFFECTED SIDE OF THE HELMET CANNOT BE POSITIONED AS DESIRED. THE LIGHTS ON THE AFFECTED SIDE CAN STILL BE POSITIONED.

REFERENCES: 10161-10061, 10161-20033

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1208

ITEM: EMU LIGHT ASSEMBLY-GIMBAL
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) GIMBAL

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10161-20033

CAUSES: MECHANICAL SHOCK, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A STRUCTURAL FAILURE OF THE GIMBAL MEANS THAT PART OF THE EMU LIGHT ASSEMBLY (THE PART WITH THE BULBS) WILL NO LONGER BE ATTACHED TO THE REST OF ASSEMBLY. THE FAILURE COULD EXPOSE WIRES THAT NORMALLY RUN FROM THE BULBS TO THE BATTERY. THE COMPLETE ASSEMBLY WOULD BE UNUSABLE AFTER SUCH A FAILURE.

REFERENCES: 10161-10061, 10161-20033

REPORT DATE 10/23/87 C-26
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1209

ITEM: EMU LIGHT ASSEMBLY-HELMET LATCH
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: S.K. SINCLAIR   SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) HELMET LATCH
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10161-10061

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
FAILURE OF THE HELMET LATCH TO CLOSE MEANS THE EMU LIGHT ASSEMBLY CANNOT BE ATTACHED TO THE HELMET. THE FLIGHT SPECIFIC GROUNDRULES STATE THAT THE EMU LIGHTS ARE NOT MANDATORY EVA ITEMS.

REFERENCES: 10161-10061

REPORT DATE 10/23/87  C-27
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87

SUBSYSTEM: CREW EQUIPMENT

MDAC ID: 1210

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

ITEM: EMU LIGHT ASSEMBLY-HELMET LATCH

FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: S.K. SINCLAIR

SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) HELMET LATCH

CRITICALITIES

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

LOCATION: CREW COMPARTMENT

PART NUMBER: 10161-10061

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
FAILURE OF THE HELMET LATCH TO OPEN MEANS THE EMU LIGHT ASSEMBLY CANNOT BE RELEASED FROM THE HELMET. CURRENT RULES CALL FOR THE LIGHTS TO BE REMOVED DURING ENTRY FOR CRASH LOAD RESTRICTIONS. THERE IS NO AFFECT ON CREW SAFETY OR MISSION DURATION.

REFERENCES: 10161-10061

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1211

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

ITEM: EMU LIGHT ASSEMBLY-CROSS MEMBER
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) CROSS MEMBER
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10161-10061

CAUSES: MECHANICAL SHOCK, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A STRUCTURAL FAILURE OF THE EMU LIGHT ASSEMBLY CROSS MEMBER MEANS THE LIGHT ASSEMBLY CANNOT BE ATTACHED TO THE HELMET. ALTERNATE SOURCES OF LIGHTING ARE STILL AVAILABLE.

REFERENCES: 10161-10061

REPORT DATE 10/23/87 C-29
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1212

ITEM: EMU LIGHT ASSEMBLY-BATTERY
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) BATTERY
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10161-20001

CAUSES: ELECTRICAL DISCHARGE

EFFECTS/RATIONALE:
IF THE EMU LIGHT ASSEMBLY BATTERY FAILS, THEN POWER WILL NO LONGER BE AVAILABLE TO THE LIGHTS ON ONE SIDE OF THE ASSEMBLY.
SPARE BATTERIES ARE CARRIED ON BOARD AND THE FAILED BATTERY CAN BE CHANGED AT THE END OF THE EVA.

REFERENCES: 10161-10061, 10161-20001

REPORT DATE  10/23/87  C-30
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1213

ITEM: EMU LIGHT ASSEMBLY BATTERY-INTERNAL FUSE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: S.K. SINCLAIR
LEAD SUBSYS: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) BATTERY
4) INTERNAL FUSE

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10161-20001

CAUSES: MECHANICAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
IF THE INTERNAL FUSE IN THE BATTERY OPENS, THEN THE BATTERY WILL
NO LONGER BE OPERATIONAL AND THE LIGHTS ON THE AFFECTED SIDE WILL
FAIL OFF. SPARE BATTERIES ARE CARRIED ON BOARD AND THE FAILED
BATTERY WILL BE CHANGED AT THE COMPLETION OF THE EVA.

REFERENCES: 10161-10061, 10161-20001

REPORT DATE 10/23/87 C-31
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/15/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1214

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 3/3
ABORT: /NA

ITEM: EMU LIGHT ASSEMBLY - BATTERY CONTACTS
FAILURE MODE: ERRATIC OPERATION

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EMU LIGHT ASSEMBLY
3) BATTERY CONTACTS

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10161-10061

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
ERRATIC OPERATION FROM THE BATTERY CONTACTS MEAN THE EMU LIGHTS MAY BE FLICKERING ON/OFF. WORST CASE WOULD BE SUFFICIENT CONTAMINATION SUCH THAT THE LIGHTS FAIL COMPLETELY OFF.

REFERENCES: 10161-10061, 10161-20001

REPORT DATE 10/23/87 C-32
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  7/17/87
SUBSYSTEM:  CREW EQUIPMENT
MDAC ID:  1300

ITEM:  OBS - SIGNAL CONDITIONER
FAILURE MODE:  ERRONEOUS OUTPUT

LEAD ANALYST:  S.K. SINCLAIR  SUBSYS LEAD:  S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1)  CREW EQUIPMENT
2)  OPERATIONAL BIOINSTRUMENTATION SYSTEM
3)  SIGNAL CONDITIONER

CRITICALITIES

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LOCATION:  CREW COMPARTMENT
PART NUMBER:  TBD

CAUSES:  ELECTROMAGNETIC FIELDS

EFFECTS/RATIONALE:
ERRONEOUS OUTPUT FROM THE OBS SIGNAL CONDITIONER MEANS THAT INCORRECT DATA WILL BE RECEIVED AND RECORDED. A SECOND OBS IS FLOWN IN THE EMERGENCY MEDICAL LOCKER.

REFERENCES:  JSC-12770

REPORT DATE  10/23/87  C-33
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/17/87
HIGHEST CRITICALITY FLIGHT: 3/2R
HDW/FUNC ABORT: /NA

SUBSYSTEM: CREW EQUIPMENT ITEM: OBS - SIGNAL CONDITIONER - BATTERY
MDAC ID: 1301 FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: S.K. SINCLAIR SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) SIGNAL CONDITIONER
4) BATTERY
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LOCATION: CREW COMPARTMENT

PART NUMBER:

CAUSES: OVERLOAD, ELECTRICAL DISCHARGE

EFFECTS/RATIONALE:
IF THE BATTERY OF THE OBS SIGNAL CONDITIONER FAILS, THE SIGNAL CONDITIONER AND HENCE THE OBS WILL NO LONGER BE OPERATIONAL. SPARE BATTERIES AND A SECOND OBS ARE FLOWN.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-34
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/17/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1302

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

ITEM: OBS - SIGNAL CONDITIONER - ON/OFF SWITCH
FAILURE MODE: FAILS TO SWITCH

LEAD ANALYST: S.K. SINCLAIR      SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) SIGNAL CONDITIONER
4) ON/OFF SWITCH
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LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: MECHANICAL SHOCK, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
The on/off switch is built into the OBS and is automatically activated when the IVA biomed cable is attached. A failure such that the switch fails in the ON position means the IVA cable cannot be attached. A failure of the switch in the OFF position means the signal conditioner is no longer operational and should be exchanged for the spare signal conditioner or the spare OBS.

REFERENCES: JSC-12770

REPORT DATE 10/23/87
C-35
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
MDAC ID: 1303

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

ITEM: OBS - SIGNAL CONDITIONER - GAIN
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: S.K. SINCLAIR        SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) SIGNAL CONDITIONER
4) VARIABLE GAIN

CRITICALITIES

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LOCATION: CREW COMPARTMENT

CAUSES: MECHANICAL SHOCK, VIBRATION

EFFECTS/RATIONALE:
THE VARIABLE GAIN FUNCTION IS PRE-SET BEFORE LAUNCH. AN EXTERNAL FORCE WHICH CAUSES THE GAIN TO BE CHANGED WILL RESULT IN INCORRECT LEVELS BEING REFLECTED IN THE OUTPUT.

REFERENCES: JSC-12770
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 1304  ABORT: /NA

ITEM: OBS - SIGNAL CONDITIONER - INPUT PORT
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) SIGNAL CONDITIONER
4) INPUT PORT
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LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
THE INPUT PORT OF THE SIGNAL CONDITIONER IS THE CONNECTION POINT FOR THE ELECTRODE HARNESS. A DESTRUCTION OF ONE OR MORE PINS OR A DISRUPTION OF THE PIN CONFIGURATION WOULD PREVENT THE HARNESS FROM BEING CONNECTED TO THE SIGNAL CONDITIONER AND HENCE THE OBS FROM SERVICING ITS FUNCTION. A SECOND OBS IS CARRIED IN THE MEDICAL LOCKER.

REFERENCES: JSC-12770

REPORT DATE 10/23/87  C-37
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET  

DATE: 7/20/87  
SUBSYSTEM: CREW EQUIPMENT  
MDAC ID: 1305  

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

ITEM: OBS - SIGNAL CONDITIONER - OUTPUT PORT  
FAILURE MODE: STRUCTURAL FAILURE  

LEAD ANALYST: S.K. SINCLAIR  
SUBSYS LEAD: S.K. SINCLAIR  

BREAKDOWN HIERARCHY:  
1) CREW EQUIPMENT  
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM  
3) SIGNAL CONDITIONER  
4) OUTPUT PORT  
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CRITICALITIES  

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LOCATION: CREW COMPARTMENT  
PART NUMBER:  

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE  

EFFECTS/RATIONALE:  
The output port of the OBS signal conditioner is the connection point for either the IVA or EVA Biomed cables. A destruction of one or more pins or a disruption of the pin configuration means the Biomed cables cannot be attached and the OBS cannot perform its primary function. A second OBS is carried in the medical locker.  

REFERENCES: JSC-12770  

REPORT DATE 10/23/87  
C-38
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1306

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

ITEM: OBS - SIGNAL CONDITIONER - ESP
FAILURE MODE: ERRATIC OPERATION

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) SIGNAL CONDITIONER
4) ELECTRO SHOCK PROTECTION SYSTEM
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LOCATION: CREW COMPARTMENT
PART NUMBER:
CAUSES: ELECTROMAGNETIC FIELDS, VIBRATION
EFFECTS/RATIONALE:
The electro shock protection circuit is a part of the OBS signal conditioner circuitry. Failure of the circuit will mean a failure of the signal conditioner and hence a failure of the OBS. A second OBS is carried in the medical locker.

REFERENCES: JSC-12770

REPORT DATE 10/23/87

C-39
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1307

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

ITEM: OBS - BIOMED BELT
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) BIOMED BELT
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
FAILURE OF THE BIOMED BELT WILL HAVE NO AFFECT ON FUTURE OPERATIONS. ALTERNATE ARRANGEMENTS CAN BE MADE OR CREW INGENUITY CAN COMPENSATE FOR THE FAILED BIOMED BELT.

REFERENCES: JSC-12770

REPORT DATE 10/23/87  C-40
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1308

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

ITEM: OBS - ELECTRODE HARNESS WIRES
FAILURE MODE: BROKEN WIRE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) ELECTRODE HARNESS
4) WIRES
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LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A FAILURE WITHIN THE ELECTRODE HARNESS WIRING MEANS THE OBS WILL NO LONGER BE CAPABLE OF PERFORMING ITS PRIMARY FUNCTION. A SECOND OBS IS CARRIED IN THE MEDICAL LOCKER.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-41
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1309

ITEM: OBS - ELECTRODES
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
LEAD: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) ELECTRODE HARNESS
4) ELECTRODES
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LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A failure of the electrodes, either from the wire connection point, or at the attach mechanism will mean a complete failure of the OBS. A second OBS is carried in the medical locker.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-42
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1310

ITEM: OBS - ELECTRODE HARNESS
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) ELECTRODE HARNESS
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LOCATION: CREW COMPARTMENT

PART NUMBER:

CAUSES: SHORTED

EFFECTS/RATIONALE:
A FAILURE WITHIN THE ELECTRODE HARNESS WHICH CAUSES A LOSS OF OUTPUT WILL MEAN THE OBS IS NO LONGER OPERATIONAL. A SECOND OBS IS CARRIED IN THE MEDICAL LOCKER.

REFERENCES: JSC-12770

REPORT DATE 10/23/87  C-43
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1311

ITEM: OBS - ELECTRODE HARNESS - PIN CONNECTOR/PINS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) ELECTRODE HARNESS
4) PIN CONNECTOR
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CRITICALITIES

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LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
THE ELECTRODE HARNESS PIN CONNECTOR IS THE MEANS BY WHICH THE HARNESS IS CONNECTED TO THE OBS SIGNAL CONDITIONER. A DESTRUCTION OF THE PINS OR A DISTORTION OF THE PIN CONFIGURATION MEANS THE SIGNAL WILL NOT GET TO THE SIGNAL CONDITIONER AND THE OBS IS NOT OPERATIONAL. A SECOND OBS IS CARRIED IN THE MEDICAL LOCKER.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-44
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1312

ITEM: OBS - EVA BIOMED CABLE
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: S.K. SINCLAIR  
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) EVA BIOMED CABLE

CRITICALITIES

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

LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A FAILURE OF THE EVA BIOMED CABLE MEANS THE OBS WILL BE NON-OPERATIONAL. DURING EVA, THE OBS IS DETERMINED TO BE A NON-MANDATORY REQUIREMENT AND THEREFORE, LOSS OF THE EVA BIOMED CABLE WILL NOT MEAN THE TERMINATION OF A MISSION.

REFERENCES: JSC-12770, SED42100961

REPORT DATE 10/23/87  C-45
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1313

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

ITEM: OBS - EVA BIOMED CABLE - PINS/PIN CONNECTOR
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR

SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) EVA BIOMED CABLE
4) PINS

CRITICALITIES

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

LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
A DESTRUCTION OF THE PINS OR A DISTORTION OF THE PIN CONFIGURATION AT EITHER END OF THE EVA BIOMED CABLE MEANS THE CABLE WILL NOT WORK. THE OBS IS NOT A MANDATORY REQUIREMENT DURING EVA OPERATIONS.

REFERENCES: JSC-12770, SED42100961

REPORT DATE 10/23/87 C-46
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1314

ITEM: OBS - IVA BIOMED CABLE
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) IVA BIOMED CABLE
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LOCATION: CREW COMPARTMENT

PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE, LOSS OF INPUT

EFFECTS/RATIONALE:
A FAILURE OF THE IVA BIOMED CABLE MEANS THE SIGNAL WILL NO LONGER GET FROM THE SIGNAL CONDITIONER TO THE ORBITER BIOMED CABLE. A SECOND OBS AND IVA BIOMED CABLE ARE CARRIED IN THE MEDICAL LOCKER.

REFERENCES: JSC-12770

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1315

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

ITEM: OBS - IVA BIOMED CABLE - PINS/PIN CONNECTOR
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) IVA BIOMED CABLE
4) PINS
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CRITICALITIES

FLIGHT PHASE HDW/FUNC ABORT HDW/FUNC
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LIFTOFF: /NA TAL: /NA
ONORBIT: 3/2R AOA: /NA
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LANDING/SAFING: /NA


LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
A DESTRUCTION OF THE PINS OR A DISTORTION OF THE PIN CONFIGURATION AT EITHER END OF THE IVA BIOMED CABLE MEANS THE CABLE WILL NO LONGER WORK. A SECOND OBS AND IVA BIOMED CABLE ARE CARRIED IN THE MEDICAL LOCKER.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-48
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1316

ITEM: BIOMED CHANNEL SWITCH
FAILURE MODE: MECHANICALLY JAMS IN ONE POSITION

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) BIOMED CHANNEL SWITCH

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LOCATION: PANEL R10
PART NUMBER:

CAUSES: MECHANICAL SHOCK, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A MECHANICAL JAM OF ONE OF THE BIOMED CHANNEL SWITCHES IN A SINGLE POSITION MEANS THAT THE OBS IS ONLY OPERATIONAL WHEN IT IS HOOKED TO THAT POSITION. THERE IS A SECOND BIOMED CHANNEL SWITCH WHICH IS AVAILABLE FOR SELECTING THE REMAINING OBS INTERFACE LOCATIONS.

REFERENCES: JSC-12770
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87

SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1317

HIGHEST CRITICALITY
HDW/ FUNC

FLIGHT: 3/3
ABORT: /NA

ITEM: BIOMED CHANNEL SWITCH
FAILURE MODE: ONE POSITION PERMANENTLY SELECTED

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) BIOMED CHANNEL SWITCH
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: PANEL R10

CAUSES: CONTAMINATION

EFFECTS/ RATIONALE:
CONTAMINATION CAUSES ONE POSITION ON THE BIOMED CHANNEL SWITCH TO BE PERMANENTLY SELECTED. THIS CAUSES NO PERCEivable PROBLEM SINCE THE SELECTION OF ONE POSITION DOES NOT PRECLUDE THE USE OF THE REMAINING SWITCH POSITIONS.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-50
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87      HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT    FLIGHT: 3/2R
MDAC ID: 1318      ABORT: /NA

ITEM: BIOMED PANEL CABLE
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: S.K. SINCLAIR      SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) BIOMED PANEL CABLE
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LOCATION: PANEL R10
PART NUMBER:

CAUSES: MECHANICAL SHOCK, PIECE-PART FAILURE, ELECTROMAGNETIC FIELDS

EFFECTS/RATIONALE:
THE BIOMED PANEL CABLE GOES BETWEEN THE IVA BIOMED CABLE AND THE BIOMED INTERFACE PANELS. A LOSS OF OUTPUT FROM THIS CABLE MEANS THE OBS WILL BE CONSIDERED NON-OPERATIONAL. ADDITIONAL PANEL CABLES ARE AVAILABLE FOR USE.

REFERENCES: JSC-12770

REPORT DATE 10/23/87  C-51
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1319

ITEM: BIOMED PANEL CABLE - PINS/PIN CONNECTOR
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) BIOMED PANEL CABLE
4) PINS
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LOCATION: PANEL R10
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A DESTRUCTION OF THE PINS OR A DISTORTION OF THE PIN
CONFIGURATION AT EITHER END OF THE BIOMED PANEL CABLE MEANS THE
CABLE WILL BE NO LONGER OPERATIONAL. SPARE CABLES ARE CARRIED
ONBOARD.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-52
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/20/87

SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1320

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

ITEM: BIOMED PANEL CABLE - SHUTTLE INTERFACES
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL BIOINSTRUMENTATION SYSTEM
3) BIOMED PANEL CABLE
4) SHUTTLE INTERFACES
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LOCATION: PANELS A15, A11, M062M

PART NUMBER: PNL.

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
The SHUTTLE INTERFACES PROVIDE THE PLACES WHERE THE BIOMED PANEL CABLE IS PLUGGED INTO. FAILURE OF THESE INTERFACES MEANS THE OBS DATA WILL NOT REACH THE DOWNLINK. THIS, IN TURN, MEANS THE OBS MUST BE CONSIDERED NON-OPERATIONAL. MORE THAN ONE "PLUG-IN" SLOT IS AVAILABLE.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-53
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1400

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

ITEM: PORTABLE FOOT RESTRAINT PLATFORM ASSEMBLY
ADJUSTMENT KNOB
FAILURE MODE: FAILS TO TIGHTEN/LOOSEN

LEAD ANALYST: H. SAXON SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) PLATFORM ASSEMBLY
4) ADJUSTMENT KNOB
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LOCATION: PAYLOAD BAY
PART NUMBER: 10159-10034-02

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
KNOB FAILS TO TIGHTEN/LOOSEN DUE TO: 1) BROKEN KNOB, 2) STRIPPED THREADS, OR 3) CONTAMINATED THREADS. IF PLATFORM CANNOT BE ADJUSTED, THE CREWMEMBER MAY EXPERIENCE DIFFICULTY IN PERFORMING EVA TASK, WHICH COULD ULTIMATELY MEAN AN OMITTED OR INCOMPLETE EVA TASK. THE SECOND PFR COULD BE USED AS REQUIRED.

REFERENCES: JSC-20466, 10159-10034

REPORT DATE 10/23/87 C-54
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1401

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

ITEM: PORTABLE FOOT RESTRAINT PLATFORM ASSEMBLY LOCKING PLATES
FAILURE MODE: LOCKING PLATES SLIP

LEAD ANALYST: H. SAXON
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RERAINT
3) PLATFORM ASSEMBLY
4) LOCKING PLATES
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LOCATION: PAYLOAD BAY
PART NUMBER: 10159-10034-02

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
The locking plates may slip because the serrations are contaminated or galled. Failure of the locking plates to hold means that the platform cannot be adjusted. A crewmember may experience difficulty in performing EVA task, which could result in EVA task being omitted or not completed. The second PFR could be used as required.

REFERENCES: JSC-20466, 10159-10034

REPORT DATE 10/23/87

C-55
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/09/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 1402  ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT PLATFORM ASSEMBLY TOE BAR
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) PLATFORM ASSEMBLY
4) TOE BAR

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10159-10034-02

CAUSES: STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE OF A TOE BAR REDUCES THE CREWMEMBER'S CONSTRAINTS. THE CREWMEMBER CAN STILL PERFORM TASKS, BUT NOT AS EFFECTIVELY.

REFERENCES: JSC-20466, 10159-10034

REPORT DATE 10/23/87  C-56
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/09/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 1403  ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT PLATFORM ASSEMBLY HEEL LOCK
FAILURE MODE: FAILS TO HOLD BOOT HEEL

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) PLATFORM ASSEMBLY
4) HEEL LOCK
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LOCATION: PAYLOAD BAY
PART NUMBER: 10159-10034-02

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CREWMEMBER MAY NOT BE ABLE TO PERFORM EVA TASK AS EFFICIENTLY.
THE HEEL LOCK MAY BE REPAIRED OR THE SECOND PFR MAY BE USED.

REFERENCES: JSC-20466, 10159-10034

REPORT DATE 10/23/87  C-57
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/09/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1404
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT PLATFORM ASSEMBLY HEEL LOCK
FAILURE MODE: FAILS TO RELEASE BOOT HEEL

LEAD ANALYST: H. SAXON
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) PLATFORM ASSEMBLY
4) HEEL LOCK
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LOCATION: PAYLOAD BAY
PART NUMBER: 10159-10034-02

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CREWMEMBER FREES BOOT FROM PFR PLATFORM EITHER WITH TOOLS OR WITH HELP FROM OTHER CREWMEMBER.

REFERENCES: JSC-20466, 10159-10034

REPORT DATE 10/23/87 C-58
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/09/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 1410  ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT TELESCOPING BOOM ASSEMBLY
INBOARD CLAMP
FAILURE MODE: FAILS TO TIGHTEN/LOOSEN

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) TELESCOPING BOOM ASSEMBLY
4) INBOARD CLAMP
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LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20003-01

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
KNOB FAILS TO TIGHTEN/LOOSEN DUE TO: 1) BROKEN KNOB, 2) STRIPPED THREADS, OR 3) CONTAMINATED THREADS. CREWMEMBER WILL BE UNABLE TO ATTACH OR REMOVE BOOM ASSEMBLY FROM BULKHEAD HANDRAILS.

REFERENCES: JSC-20466, 10155-20003
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/09/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT FLIGHT: 3/2R
MDAC ID: 1411 ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT TELESCOPING BOOM ASSEMBLY
OUTBOARD CLAMP
FAILURE MODE: FAILS TO TIGHTEN/LOOSEN

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) TELESCOPING BOOM ASSEMBLY
4) OUTBOARD CLAMP
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LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20003-01

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
KNOB FAILS TO TIGHTEN/LOOSEN DUE TO: 1) BROKEN KNOB, 2) STRIPPED THREADS, OR 3) CONTAMINATED THREADS. CREWMEMBER WILL BE UNABLE TO ATTACH OR REMOVE BOOM ASSEMBLY FROM BULKHEAD HANDRAILS.

REFERENCES: JSC-20466, 10155-20003

REPORT DATE  10/23/87  C-60
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/10/87

SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1412

HIGHEST CRITICALITY: HDW/FUNC

FLIGHT: 3/2R
ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT TELESCOPING BOOM ASSEMBLY

FAILURE MODE: FAILS TO TIGHTEN/LOOSEN

LEAD ANALYST: H. SAXON
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) TELESCOPING BOOM ASSEMBLY
4) PLATFORM CLAMP

H. SAXON

CRITICALITIES

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REPEAT PHASE HDW/FUNC ABORT HDW/FUNC


LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20003-01

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CLAMPS FAILS TO TIGHTEN/LOOSEN DUE TO: 1) BROKEN KNOB, 2) STRIPPED THREADS, OR 3) CONTAMINATED THREADS. THE CLAMP CANNOT BE MOVED OR SECURED TO THE BOOM ASSEMBLY.

REFERENCES: JSC-20466, 10155-20003

REPORT DATE 10/23/87 C-61
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1413

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

ITEM: PORTABLE FOOT RESTRAINT TELESCOPING BOOM ASSEMBLY
PLATFORM CLAMP
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) TELESCOPING BOOM ASSEMBLY
4) PLATFORM CLAMP
5) EYE BOLT

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20003-01

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
FAILURE OF THE EYE BOLT ALLOWS THE PLATFORM ASSEMBLY TO SEPARATE FROM THE BOOM ASSEMBLY. OTHER CLAMPS OR THE OTHER PFR COULD BE USED AS NEEDED.

REFERENCES: JSC-20466, 10155-20003

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/10/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 1414  ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT TELESCOPING BOOM ASSEMBLY
QUICK RELEASE PIN
FAILURE MODE: CANNOT INSERT PIN

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) TELESCOPING BOOM ASSEMBLY
4) QUICK RELEASE PIN

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LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20003-01

CAUSES: CONTAMINATION, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
QUICK RELEASE PIN CANNOT BE INSERTED TO ATTACH THE PLATFORM ASSEMBLY AND THE BOOM ASSEMBLY. OTHER CLAMPS OR THE OTHER PFR COULD BE USED AS NEEDED.

REFERENCES: JSC-20466, 10155-20003

REPORT DATE 10/23/87  C-63
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1415

ITEM: PORTABLE FOOT RESTRAINT TELESCOPING BOOM ASSEMBLY
QUICK RELEASE PIN
FAILURE MODE: CANNOT REMOVE PIN

LEAD ANALYST: H. SAXON SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) TELESCOPING BOOM ASSEMBLY
4) QUICK RELEASE PIN
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LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20003-01

CAUSES: CONTAMINATION, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
QUICK RELEASE PIN CANNOT BE REMOVED. PLATFORM ASSEMBLY CANNOT BE DETACHED FROM THE BOOM ASSEMBLY.

REFERENCES: JSC-20466, 10155-20003

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/10/87

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 3/2R
ABORT: /NA

SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1416

ITEM: PORTABLE FOOT RESTRAINT TELESCOPING BOOM ASSEMBLY
INNER AND OUTER TUBES
FAILURE MODE: CANNOT EXTEND/RETRACT TUBES

LEAD ANALYST: H. SAXON
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) TELESCOPING BOOM ASSEMBLY
4) INNER AND OUTER TUBES

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LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20003-01

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
IF THE BOOM DOES NOT TELESCOPE, I.E. THE TUBES DO NOT EXTEND OR RETRACT, THE PLATFORM CANNOT BE POSITIONED AS REQUIRED. OTHER CLAMPS OR THE OTHER PFR MAY BE USED.

REFERENCES: JSC-20466, 10155-20003

REPORT DATE 10/23/87 C-65
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/10/87

SUBSYSTEM: CREW EQUIPMENT

MDAC ID: 1417

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT TELESCOPING BOOM ASSEMBLY
TORQUE LIMITER

FAILURE MODE: UNDER LIMITS TORQUE

LEAD ANALYST: H. SAXON

SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:

1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) TELESCOPING BOOM ASSEMBLY
4) TORQUE LIMITER

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LOCATION: PAYLOAD BAY

PART NUMBER: 10155-20003-01

CAUSES: MISHANDLING/ABUSE, MISADJUSTMENT

EFFECTS/RATIONALE:

THE TORQUE LIMITER PREVENTS THE BOOM ASSEMBLY BEING SECURED IN PLACE. THE PLATFORM ASSEMBLY WILL NOT REMAIN AS POSITIONED. OTHER CLAMPS OR THE SECOND PFR ARE AVAILABLE.

REFERENCES: JSC-20466, 10155-20003

REPORT DATE 10/23/87 C-66
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/10/87  HIGHEST CRITICALITY  HDW/FUNC  FLIGHT: 3/2R  ABORT: /NA
SUBSYSTEM: CREW EQUIPMENT  MDAC ID: 1418

ITEM: PORTABLE FOOT RESTRAINT TELESCOPING BOOM ASSEMBLY
FAILURE MODE: OVER LIMITS TORQUE

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) TELESCOPING BOOM ASSEMBLY
4) TORQUE LIMITER
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LOCATION:  PAYLOAD BAY
PART NUMBER:  10155-20003-01

CAUSES:  CONTAMINATION, MISHANDLING/ABUSE, MISADJUSTMENT

EFFECTS/RATIONALE:
TORQUE LIMITER PERMITS EXCESSIVE TORQUE. HANDRAILS OR BULKHEAD COULD BE DAMAGED. OTHER CLAMPS OR THE SECOND PFR ARE AVAILABLE.

REFERENCES:  JSC-20466, 10155-20003

REPORT DATE 10/23/87  C-67
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/10/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 1420  ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT CENTERLINE CLAMP ASSEMBLY
QUICK RELEASE PIN
FAILURE MODE: CANNOT INSERT PIN

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) CENTERLINE CLAMP ASSEMBLY
4) QUICK RELEASE PIN
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CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20004-04

CAUSES: CONTAMINATION, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
PLATFORM ASSEMBLY CANNOT BE SECURED IN THE CENTERLINE CLAMP. OTHER CLAMPS OR THE OTHER PFR ARE AVAILABLE.

REFERENCES: JSC-20466, 10155-20004

REPORT DATE 10/23/87  C-68
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1421

HDW/FUNC

FLIGHT: 3/2R
ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT CENTERLINE CLAMP ASSEMBLY
QUICK RELEASE PIN
FAILURE MODE: CANNOT REMOVE PIN

LEAD ANALYST: H. SAXON
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) CENTERLINE CLAMP ASSEMBLY
4) QUICK RELEASE PIN

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LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20004-04

CAUSES: CONTAMINATION, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
QUICK RELEASE PIN CANNOT BE REMOVED. PLATFORM ASSEMBLY CANNOT BE DETACHED FROM THE CENTERLINE CLAMP.

REFERENCES: JSC-20466, 10155-20004

REPORT DATE 10/23/87 C-69
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/10/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 1422  ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT CENTERLINE CLAMP ASSEMBLY
ALIGNMENT TABS
FAILURE MODE: MISADJUSTMENT

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) CENTERLINE CLAMP ASSEMBLY
4) ALIGNMENT TABS
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20004-04

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ALIGNMENT TABS FAIL TO ALIGN CENTERLINE CLAMP ONTO CENTERLINE LATCH SUCH THAT CAPTURE JAWS ARE NOT POSITIONED FOR FASTENING. ALIGNMENT MAY BE PERFORMED VISUALLY.

REFERENCES: JSC-20466, 10155-20004

REPORT DATE 10/23/87  C-70
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/13/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1423

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

ITEM: PORTABLE FOOT RESTRRAINT CENTERLINE CLAMP ASSEMBLY
FAILURE MODE: FAILS TO REMAIN CLOSED

LEAD ANALYST: H. Saxon
SUBSYS LEAD: S.K. Sinclair

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) CENTERLINE CLAMP ASSEMBLY
4) CAPTURE JAWS
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LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20004-04

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
PLATFORM ASSEMBLY COULD SLIP OR SEPARATE FROM THE CENTERLINE CLAMP. OTHER CLAMPS AND THE SECOND PFR ARE AVAILABLE.

REFERENCES: JSC-20466, 10155-20004

REPORT DATE 10/23/87 C-71
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/13/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT FLIGHT: 3/2R
MDAC ID: 1424 ABORT: /NA

ITEM: PORTABLE FOOT RERAINT CENTERLINE CLAMP ASSEMBLY
CLAMP KNOB
FAILURE MODE: FAILS TO TIGHTEN/LOOSEN

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RERAINT
3) CENTERLINE CLAMP ASSEMBLY
4) CLAMP KNOB
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LOCATION: PAYLOAD BAY
PART NUMBER: 10155-20004-04

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
KNOB FAILS TO TIGHTEN/LOOSEN DUE TO: 1) BROKEN KNOB, 2) STRIPPED
THREADS, OR 3) CONTAMINATED THREADS. UNABLE TO ATTACH/REMOVE THE
CENTERLINE CLAMP FROM THE CENTERLINE LATCH.

REFERENCES: JSC-20466, 10155-20004

REPORT DATE 10/23/87  C-72
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/13/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1430

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

ITEM: PORTABLE FOOT RESTRAINT ARTICULATING SOCKET ASSEMBLY ADJUSTMENT KNOB
FAILURE MODE: FAILS TO TIGHTEN/LOOSEN

LEAD ANALYST: H. SAXON
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) ARTICULATING SOCKET ASSEMBLY
4) ADJUSTMENT KNOB

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LOCATION: PAYLOAD BAY
PART NUMBER: 10159-10035

CAUSES: CONTAMINATION, MIS Handling/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
KNOB FAILS TO TIGHTEN/LOOSEN DUE TO: 1) BROKEN KNOB, 2) STRIPPED THREADS, 3) CONTAMINATED THREADS. THE SOCKET ASSEMBLY NOT ADJUSTED AND THE PLATFORM ASSEMBLY NOT POSITIONED AS REQUIRED.

REFERENCES: JSC-20466, 10155-10035

REPORT DATE 10/23/87 C-73
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/13/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 1431

ITEM: PORTABLE FOOT RESTRAINT ARTICULATING SOCKET ASSEMBLY LOCKING PLATES
FAILURE MODE: LOCKING PLATES SLIP

LEAD ANALYST: H. SAXON       SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) ARTICULATING SOCKET ASSEMBLY
4) LOCKING PLATES
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LOCATION: PAYLOAD BAY
PART NUMBER: 10159-10035

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
SOCKET ASSEMBLY CANNOT BE SECURED IN THE DESIRED POSITION.

REFERENCES: JSC-20466, 10155-10035

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/13/87
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT FLIGHT: 3/2R
MDAC ID: 1432 ABORT: /NA

ITEM: PORTABLE FOOT RESTRAINT ARTICULATING SOCKET ASSEMBLY QUICK RELEASE PIN
FAILURE MODE: CANNOT INSERT PIN

LEAD ANALYST: H. SAXON         SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PORTABLE FOOT RESTRAINT
3) ARTICULATING SOCKET ASSEMBLY
4) QUICK RELEASE PIN
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LOCATION: PAYLOAD BAY
PART NUMBER: 10159-10035

CAUSES: CONTAMINATION, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
PLATFORM ASSEMBLY CANNOT BE ATTACHED TO THE SOCKET ASSEMBLY.

REFERENCES: JSC-20466, 10155-10035

REPORT DATE 10/23/87 C-75
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2100

ITEM: EVA SLIDEWIRE ASSEMBLY-SLIDE
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SLIDEWIRE
3) SLIDE

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LOCATION: CARGO BAY
PART NUMBER: V617-544722

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
THE SLIDE IS THE PART TO WHICH THE EVA TETHER HOOK IS ATTACHED. IF THE SLIDE PHYSICALLY JAMS IN ONE SPOT THEN THE EVA CREWMAN'S MOBILITY AROUND THE PAYLOAD BAY IS AFFECTED. THIS WOULD RESULT IN THE LOSS OF A PLANNED EVA REQUIRING THE USE OF THE SLIDEWIRE. A CONTINGENCY EVA, SUCH AS CLOSING PAYLOAD DOORS, WOULD BE PERFORMED USING ALTERNATE MEANS OF TETHER.

REFERENCES: V617-544720, M072-544700

REPORT DATE 10/23/87 C-76
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2101

ITEM: EVA SLIDEWIRE ASSEMBLY-SLIDE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SLIDEWIRE
3) SLIDE
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: V617-544702

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A STRUCTURAL FAILURE OF THE SLIDE WHILE AN EVA CREWMAN IS TETHRED IN PLACE WILL RESULT IN THE CREWMAN FLOATING FREE. THE CREWMAN CAN BE "CAPTURED" USING THE ORBITER/ALTERNATE EVA CREWMAN.

REFERENCES: V617-544720, M072-544700

REPORT DATE 10/23/87 C-77
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2102

ITEM: EVA SLIDEWIRE ASSEMBLY-SLIDE
FAILURE MODE: STRUCTURAL FAILURE-CRIMPED

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

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SLIDEWIRE ASSEMBLY
3) SLIDE
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LOCATION: PAYLOAD BAY
PART NUMBER: V617-544702

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
A CRIMP IN THE EVA SLIDEWIRE SLIDE WILL RESULT IN THE EVA CREWMAN NOT BEING ABLE TO USE IT AS A TETHER SPOT. THERE ARE ADDITIONAL SLIDES ON BOTH SIDES OF THE ORBITER WHICH CAN BE USED AS BACKUP. IF NONE OF THE SLIDES WERE AVAILABLE, THEN ANY PLANNED EVA WOULD BE CANCELLED. CONTINGENCY EVAS COULD STILL BE PERFORMED USING ALTERNATE MEANS OF TETHER.

REFERENCES: V617-544720, M072-544700

REPORT DATE: 10/23/87 C-78
ITEM: EVA SLIDEWIRE ASSEMBLY-STOP
FAILURE MODE: BREAKS FREE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SLIDEWIRE ASSEMBLY
3) STOP
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: V617-544723

CAUSES: MECHANICAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
This failure allows the stop/slide combination to strike the slidewire end assemblies plus allow the slides to travel further than designed. It is unlikely that sufficient force will be generated to pull the rope from the end fittings. However, the whip end could be damaged and further EVA activities curtailed.

REFERENCES: V617-544720

REPORT DATE 10/23/87
**INDEPENDENT ORBITER ASSESSMENT**  
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 7/06/87  
**SUBSYSTEM:** CREW EQUIPMENT  
**MDAC ID:** 2104

**ITEM:** EVA SLIDEWIRE-END FITTINGS  
**FAILURE MODE:** STRUCTURAL FAILURE

**LEAD ANALYST:** S.K. SINCLAIR  
**SUBSYS LEAD:** S.K. SINCLAIR

**BREAKDOWN HIERARCHY:**
1) CREW EQUIPMENT  
2) EVA SLIDEWIRE  
3) END FITTING  
4)  
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**CRITICALITIES**

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

**LOCATION:** PAYLOAD BAY  
**PART NUMBER:** V617-544721

**CAUSES:** MECHANICAL SHOCK, MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

**EFFECTS/RATIONALE:**
A STRUCTURAL FAILURE OF THE SLIDEWIRE END FITTING WILL RESULT IN THE SLIDEWIRE BEING FREE AT ONE END. THE SLIDES, WITH THE EVA TETHERS ATTACHED, ARE STILL RESTRAINED BY THE STOP. THEREFORE, THE FIRST FAILURE SHOULD BE A LOSS OF MISSION. THE LOSS OF ALL UNLIKE REDUNDANCY INCLUDING THE STOP CAN RESULT IN AN UNRESTRAINED EVA CREWMAN.

**REFERENCES:** V617-544720, M072-544700

**REPORT DATE** 10/23/87  
**C-80**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2105

ITEM: EVA SLIDEWIRE ASSEMBLY-COTTER PIN
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR 
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SLIDEWIRE
3) COTTER PIN

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: MS24665-153

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
THE COTTER PIN, IN ADDITION TO THE CHEMICAL ADHESIVE, ANCHORS THE KEVLAR ROPE ON THE END FITTING. A FAILURE OF THE COTTER PIN REMOVES ONE LEVEL OF REDUNDANCY IN THE ANCHORING SYSTEM.

REFERENCES: M072-544700

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/06/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/1R
MDAC ID: 2106  ABORT: /NA

ITEM: EVA SLIDEWIRE ASSEMBLY - QUICK DISCONNECT PIN
FAILURE MODE: COMES OUT

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SLIDEWIRE
3) SUPPORT STRUCTURE ASSEMBLY
4) QUICK DISCONNECT PIN
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LOCATION: PAYLOAD BAY
PART NUMBER: ME122-0014-5098

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, VIBRATION

EFFECTS/RATIONALE:
The loss of the quick disconnect pin in the EVA slidewire means unexpected and unanticipated loading on the remainder of the support structure during an EVA. Worst case would result in the support structure contacting the radiator and possible deformation of the payload bay door.

REFERENCES: M072-544700

REPORT DATE 10/23/87  C-82
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/06/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 2/1R
MDAC ID: 2107  ABORT: /NA

ITEM: EVA SLIDEWIRE ASSEMBLY - QUICK DISCONNECT PIN
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SLIDEWIRE
3) SUPPORT STRUCTURE ASSEMBLY
4) QUICK DISCONNECT PIN
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LOCATION: PAYLOAD BAY
PART NUMBER: ME122-0014-5098

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
THE QUICK DISCONNECT PIN APPEARS TO BE USED WHEN THE MECHANISM "JAMS" AND A RELEASE MECHANISM IS REQUIRED. FAILURE OF THE PIN TO RELEASE MEANS THE JAM CANNOT BE CLEARED. THIS PREVENTS THE PAYLOAD BAY DOOR FROM CLOSING. THE PROBLEM CAN BE SOLVED BY REMOVING A BOLT FROM ANOTHER LOCATION IN THE SUPPORT STRUCTURE OR USING THE HACKSAW.

REFERENCES: M072-544700

REPORT DATE 10/23/87  C-83
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2108

ITEM: EVA SLIDEWIRE ASSEMBLY-SUPPORT STRUCTURE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SLIDEWIRE
3) SUPPORT STRUCTURE
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LOCATION: PAYLOAD BAY
PART NUMBER: VARIOUS PIECES INCLUDING V617-544701; V617-544702; V617-544704; V617-544705

CAUSES: MECHANICAL SHOCK, OVERLOAD, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
A FAILURE OF ANY PIECE OF THE SLIDEWIRE SUPPORT STRUCTURE MEANS A LOSS OF EVA CAPABILITY ON THE AFFECTED SIDE OF THE PAYLOAD. IT ALSO OPENS THE POSSIBILITY FOR THE DAMAGED STRUCTURE TO CONTACT THE RADIATOR AND/OR CAUSE DEFORMATION OF THE PAYLOAD BAY DOOR.

REFERENCES: M072-544700

REPORT DATE 10/23/87 C-84
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/06/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 1/1
MDAC ID: 2109  ABORT: /NA

ITEM: EVA SLIDEWIRE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA SLIDEWIRE ASSEMBLY
3) SLIDEWIRE
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: V617-544720

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
IF THE SLIDEWIRE BREAKS WHILE IN USE, THE EVA CREWMAN WILL NO LONGER BE RESTRAINED. THIS WILL REQUIRE ORBITER MANEUVERS TO "CAPTURE" AND RETRIEVE THE CREWMAN.

REFERENCES: M072-544700

REPORT DATE 10/23/87  C-85
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 1/1
MDAC ID: 2200  ABORT: /NA

ITEM: EXTENDED RANGE CREWMEMBER SAFETY TETHER-SMALL HOOK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM TETHER
3) SMALL HOOK
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: ST201-11009

CAUSES: MECHANICAL SHOCK, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A STRUCTURAL FAILURE OF THE SMALL HOOK WILL RESULT IN AN UNRESTRANDED EVA CREWMEMBER.

REFERENCES: 10162-10062

REPORT DATE 10/23/87  C-86
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2201

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

ITEM: EXTENDED RANGE CREWMEMBER SAFETY TETHER—SMALL HOOK
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: S.K. SINCLAIR    SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) SMALL HOOK
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REDUNDANCY SCREENS: A [ ]   B [ ]   C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: ST201-11009

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
FAILURE OF THE TETHER HOOK MEANS THAT THE ERCM SAFETY TETHER CANNOT BE USED. THERE ARE NO SAFETY IMPLICATIONS SINCE THE TETHER IS NOT IN USE WHEN THE FAILURE OCCURS. CREW ACTIONS CAN DEVISE ALTERNATE MEANS OF RESTRAINT IN THE EVENT OF A FAILURE OF THIS TYPE.

REFERENCES: 10162-10062

REPORT DATE 10/23/87  C-87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2202

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

ITEM: EXTENDED RANGE CREWMEMBER SAFETY TETHER-SMALL HOOK
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) SMALL HOOK
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: ST201-11009

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
FAILURE OF THE HOOK IN A CLOSED POSITION WILL MEAN THE TETHER CANNOT BE USED TO RESTRAIN EVA CREWMEN (IF THE TETHER IS NOT IN USE WHEN THE FAILURE OCCURS). IF THE TETHER IS ATTACHED TO THE SLIDE WHEN THE HOOK FAILS CLOSED, IT CANNOT BE RELEASED. CREW ACTIONS CAN PREVENT ANY FURTHER PROBLEMS.

REFERENCES: 10162-10062

REPORT DATE 10/23/87 C-88
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87

SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2203

ITEM: EXTENDED RANGE CREWMEMBER SAFETY TETHER-CABLE
FAILURE MODE: STRUCTURAL FAILURE
LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) CABLE
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10162-20037

CAUSES: MECHANICAL SHOCK, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A STRUCTURAL FAILURE OF THE CABLE WILL MEAN AN UNRESTRAINED,
FREE-FLOATING EVA CREWMEMBER.

REFERENCES: 10162-10062

REPORT DATE 10/23/87

C-89
**INDEPENDENT ORBITER ASSESSMENT**  
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 7/08/87  
**SUBSYSTEM:** CREW EQUIPMENT  
**MDAC ID:** 2204  
**HIGHEST CRITICALITY HDW/FUNC**  
**FLIGHT:** 1/1  
**ABORT:** /NA

**ITEM:** ERCM SAFETY TETHER-CABLE ATTACH POINTS  
**FAILURE MODE:** STRUCTURAL FAILURE

**LEAD ANALYST:** S.K. SINCLAIR  
**SUBSYS LEAD:** S.K. SINCLAIR

**BREAKDOWN HIERARCHY:**

1) CREW EQUIPMENT  
2) ERCM SAFETY TETHER  
3) CABLE  
4) ATTACHMENTS  
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**REDUNDANCY SCREENS:** A [ ]  
**LOCATION:** PAYLOAD BAY  
**PART NUMBER:** 10162-10062  
**CAUSES:** MECHANICAL SHOCK, MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

**EFFECTS/RATIONALE:**
A STRUCTURAL FAILURE OF THE CABLE ATTACH POINTS AT EITHER THE HOOK OR THE REEL ASSEMBLY MEANS A BROKEN CABLE AND AN UNRESTRAINED EVA CREWMEMBER.

**REFERENCES:** 10162-10062

**REPORT DATE** 10/23/87 **C-90**
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET  

DATE: 7/08/87  
SUBSYSTEM: CREW EQUIPMENT  
MDAC ID: 2205  

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

ITEM: EXTENDED RANGE CREWMEMBER SAFETY TETHER-REEL CASE  
FAILURE MODE: STRUCTURAL FAILURE  
LEAD ANALYST: S.K. SINCLAIR  
SUBSYS LEAD: S.K. SINCLAIR  

BREAKDOWN HIERARCHY:  
1) CREW EQUIPMENT  
2) ERCM SAFETY TETHER  
3) REEL CASE HOUSING  

CRITICALITIES  

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

LOCATION: PAYLOAD BAY  
PART NUMBER: 10162-20021; 10162-20022  

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE  

EFFECTS/RATIONALE:  
A STRUCTURAL FAILURE OF THE CABLE TAKE UP REEL HOUSING WILL ALLOW THE CABLE TO COME FREE (NO LONGER ATTACHED TO THE TAKE UP REEL). THIS MEANS THE EVA CREWMEMBER WILL BE UNRESTRAINED. 

REFERENCES: 10162-10062  

REPORT DATE 10/23/87  
C-91
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2206

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

ITEM: ERCM SAFETY TETHER-CABLE TAKE UP ASSEMBLY
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) CABLE TAKE UP ASSEMBLY

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10162-20025

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
IF THE CABLE TAKE UP ASSEMBLY CEASES TO TURN, THE CABLE LENGTH WILL REMAIN AT THE FAILED POSITION. THERE ARE NO SAFETY IMPLICATIONS, ONLY REDUCED CREWMEMBER MOBILITY.

REFERENCES: 10162-10062

REPORT DATE 10/23/87 C-92
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87  HIGHEST CRITICALITY  HDW/FUNC
  SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
  MDAC ID: 2207  ABORT: /NA

ITEM: ERCM SAFETY TETHER-CABLE TAKE UP ASSEMBLY
FAILURE MODE: FAILS "UNLOCKED"

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) CABLE TAKE UP ASSEMBLY
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10162-20025

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
A FAILURE WITHIN THE CABLE TAKE UP ASSEMBLY SUCH THAT THE TAKE-UP REEL CANNOT BE RESTRAINED MEANS THAT THE CABLE CANNOT BE STOPPED AT A GIVEN LENGTH. THE "UNLOCKED" CONDITION STILL ALLOWS THE TETHER TO REEL OUT AND RETRACT AS REQUIRED.

REFERENCES: 10162-10062

REPORT DATE 10/23/87  C-93
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2208

ITEM: ERCM SAFETY TETHER-CABLE TAKE UP ASSEMBLY
FAILURE MODE: INADVERTENT RELEASE OF BRAKE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) CABLE TAKE UP ASSEMBLY
4) BRAKE
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10162-20025

CAUSES: MECHANICAL SHOCK, PIECE-PART FAILURE

EFFECTS/RATIONALE:
AN INADVERTENT RELEASE OF THE TAKE UP REEL BRAKE WHILE THE TETHER IS IN USE MEANS THAT THE CABLE WILL EXTEND/RETRACT UNEXPECTEDLY. THIS SHOULD NOT CAUSE ANY PROBLEM.

REFERENCES: 10162-10062

REPORT DATE 10/23/87  C-94
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2209

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

ITEM: ERCM SAFETY TETHER-CABLE TAKE UP ASSEMBLY
FAILURE MODE: INADVERTENT OPERATION OF BRAKE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) CABLE TAKE UP ASSEMBLY
4) BRAKE
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10162-20025

CAUSES: MECHANICAL SHOCK

EFFECTS/RATIONALE:
INADVERTENT OPERATION OF THE BRAKE MEANS THE CABLE WILL SUDDENLY BE RESTRAINED. NO SAFETY IMPLICATIONS.

REFERENCES: 10162-10062

REPORT DATE 10/23/87 C-95
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 7/08/87
**SUBSYSTEM:** CREW EQUIPMENT
**MDAC ID:** 2210

**ITEM:** ERCM SAFETY TETHER-LOCK/UNLOCK SELECTOR SWITCH
**FAILURE MODE:** PHYSICAL BINDING/JAMMING IN LOCK POSITION

**LEAD ANALYST:** S.K. SINCLAIR
**SUBSYS LEAD:** S.K. SINCLAIR

**BREAKDOWN HIERARCHY:**
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) LOCK/UNLOCK SELECTOR SWITCH
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**REDUNDANCY SCREENS:** A [ ] B [ ] C [ ]

**LOCATION:** PAYLOAD BAY
**PART NUMBER:** 10151-20034; 10151-20038

**CAUSES:** CONTAMINATION, MECHANICAL SHOCK

**EFFECTS/RATIONALE:**
FAILING THE SELECTOR SWITCH IN THE LOCK POSITION WILL RESULT IN THE CABLE BEING STUCK AT ONE LENGTH. THIS MEANS REDUCED MOBILITY FOR THE EVA CREWMEMBER BUT NO SAFETY IMPLICATIONS.

**REFERENCES:** 10162-10062

**REPORT DATE** 10/23/87 C-96
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 2211  ABORT: /NA

ITEM: ERCM SAFETY TETHER-LOCK/UNLOCK SELECTOR SWITCH
FAILURE MODE: PHYSICAL BINDING/JAMMING IN UNLOCK POSITION

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) LOCK/UNLOCK SELECTOR SWITCH
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10151-20034; 10151-20038

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
FAILURE OF THE SELECTOR SWITCH IN THE UNLOCKED POSITION MEANS THE CABLE WILL RETRACT AND RELEASE WITH THE CREWMAN - IT CANNOT BE LOCKED INTO ONE POSITION. NO SAFETY IMPLICATIONS.

REFERENCES: 10162-10062

REPORT DATE 10/23/87  C-97
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 1/1
MDAC ID: 2212  ABORT: /NA

ITEM: ERCM SAFETY TETHER-"D" RING
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) "D" RING

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10162-10062

CAUSES: OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A STRUCTURAL FAILURE OF THE INTEGRAL "D" RING WILL RESULT IN AN UNRESTRAINED EVA CREWMEMBER.

REFERENCES: 10162-10062

REPORT DATE 10/23/87  C-98
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 2213  ABORT: /NA

ITEM: ERCM SAFETY TETHER-"D" RING
FAILURE MODE: CRIMPING OF "D" RING

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ERCM SAFETY TETHER
3) "D" RING

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10162-10062

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
A "CRIMPING" OF THE INTEGRAL "D" RING MEANS THE WAIST TETHER HOOK CANNOT BE CONNECTED. THE TETHER CANNOT THEN PERFORM ITS FUNCTION BUT THERE ARE NO SAFETY IMPLICATIONS.

REFERENCES: 10162-10062

REPORT DATE 10/23/87  C-99
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87  HIGHEST CRITICALITY  HDW/FUNC
MDAC ID: CREW EQUIPMENT  FLIGHT: 1/1
2300  ABORT: /NA

ITEM: WAIST TETHER-HOOKS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) WAIST TETHER
3) HOOKS
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: LARGE-ST20H1009-04; SMALL-ST20H1009-01

CAUSES: MECHANICAL SHOCK, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A FAILURE OF THE HOOK WHILE IN USE WILL RESULT IN AN UNRESTRAINED EVA CREWMEMBER.

REFERENCES: 10151-20040, JSC-20466

REPORT DATE  10/23/87  C-100
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 2301  ABORT: /NA

ITEM: WAIST TETHER-HOOKS  
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) WAIST TETHER
3) HOOKS
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: LARGE-ST20H1009-04; SMALL-ST20H1009-01

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
A MECHANICAL JAM OF THE HOOK IN THE OPEN POSITION MEANS THE TETHER IS NO LONGER USABLE. NO SAFETY ISSUES INVOLVED SINCE TETHER IS NOT IN OPERATION AT THE TIME THE FAILURE OCCURS.

REFERENCES: 10151-20040, JSC-20466

REPORT DATE 10/23/87  C-101
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2302

ITEM: WAIST TETHER-HOOKS
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) WAIST TETHER
3) HOOKS

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: LARGE-ST20H1009-04; SMALL-ST20H1009-01

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
IF THE HOOKS FAIL CLOSED, THE TETHER CAN NO LONGER BE USED (IF NOT YET IN USE) OR BE RELEASED FROM THE EQUIPMENT IF CURRENTLY IN USE. CREW ACTIONS CAN PROVIDE ALTERNATIVE WORK-AROUNDS.

REFERENCES: 10151-20040, JSC-20466

REPORT DATE 10/23/87 C-102
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2303

HIGHEST CRITICALITY

HDW/FUNC

FLIGHT: 1/1
ABORT: /NA

ITEM: WAIST TETHER-HOOKS
FAILURE MODE: INADVERTENT OPENING

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) WAIST TETHER
3) HOOKS
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: LARGE-ST20H1009-04; SMALL-ST20H1009-01

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
AN INADVERTENT OPENING OF EITHER OF THE HOOKS ON THE WAIST TETHER MEANS AN UNRESTRAINED EVA CREWMEMBER.

REFERENCES: 10151-20040, JSC-20466

REPORT DATE 10/23/87  C-103
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2304

ITEM: WAIST TETHER-NOMEX WEBBING
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) WAIST TETHER
3) NOMEX WEBBING
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: ST13N981

CAUSES: OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
A STRUCTURAL FAILURE OF THE NOMEX WEBBING RESULTS IN AN UNRESTRAINED EVA CREWMEMBER.

REFERENCES: 10151-20040, JSC-20466

REPORT DATE 10/23/87 C-104
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2305

ITEM: WAIST TETHER—NOMEX WEBBING
FAILURE MODE: FAILS TO TEARAWAY AS DESIGNED

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) WAIST TETHER
3) NOMEX WEBBING
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: ST13N981

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
THE NOMEX WEBBING IS DESIGNED TO TEAR INTO ADDITIONAL LENGTHS AS EXCESSIVE LOADS ARE APPLIED. IF THIS FEATURE DOES NOT OPERATE CORRECTLY, THEN EXCESSIVE LOADS CAN BE APPLIED TO THE EMU BEFORE ANTICIPATED.

REFERENCES: 10151-20040, JSC-20466
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 2306

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 1/1
ABORT: /NA

ITEM: WAIST TETHER-NOMEX WEBBING
FAILURE MODE: TEARS AT ATTACH POINTS

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) WAIST TETHER
3) NOMEX WEBBING

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

LOCATION: PAYLOAD BAY
PART NUMBER: ST13N981

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
TEARING OF THE NOMEX WEBBING AT THE ATTACH POINTS TO THE HOOK CAN BE CAUSED BY OVERLOAD, SHARP EDGES ON THE ATTACHMENT, ETC. A COMPLETE TEARING WILL RESULT IN AN UNRESTRAINED EVA CREWMEMBER.

REFERENCES: 10151-20040, JSC-20466

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3100

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

ITEM: TUBE CUTTER CUTTING WHEEL
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) CUTTING WHEEL
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CUTTING WHEEL BREAKS. USED TO CUT DRIVE TUBES ON PLBD.
REDUNDANT ITEMS ARE IVA HACKSAW AND WIRE SAW. LOSS OF ALL
REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE DUE TO
INABILITY TO CLOSE DOORS AND DEORBIT.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87 C-107
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3101

ITEM: TUBE CUTTER CUTTING WHEEL
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) CUTTING WHEEL
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CUTTING WHEEL UNABLE TO ROTATE. USED TO CUT DRIVE TUBES ON PLB. REDUNDANT ITEMS ARE IVA HACKSAW AND WIRE SAW. LOSS OF ALL REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE DUE TO INABILITY TO CLOSE DOORS AND DEORBIT.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87 C-108
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 2/1R
MDAC ID: 3102  ABORT: /NA

ITEM: TUBE CUTTER CUTTING WHEEL SLIDE
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) CUTTING WHEEL SLIDE

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: CONTAMINATION, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CUTTING WHEEL SLIDE (CARRYING CUTTING WHEEL) IS UNABLE TO DESCEND
WHEN SMALL RATCHET HANDLE IS TRIED. USED TO CUT DRIVE TUBES ON
PLBD. IF UNABLE TO CLOSE DOORS THE VEHICLE IS UNABLE TO DEORBIT.
LOSS OF ALL REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87  C-109
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 2/1R
MDAC ID: 3103  ABORT: /NA

ITEM: TUBE CUTTER RATCHET WHEEL (ON SMALL RATCHET)
FAIL mode: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) SMALL RATCHET WHEEL
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: CONTAMINATION, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET WHEEL IN SMALL SCREW RATCHET ASSEMBLY FAILS TO TURN AND CUTTING WHEEL WILL NOT TOUCH TUBE BEING CUT. USED TO CUT DRIVE TUBES ON PLBD. IF UNABLE TO CLOSE DOORS THE VEHICLE IS UNABLE TO DEORBIT. LOSS OF ALL REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87  C-110
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 2/1R
MDAC ID: 3104  ABORT: /NA

ITEM: TUBE CUTTER SMALL RATCHET ASSEMBLY DIRECTION
SELECTION TAB
FAILURE MODE: FAILS TO OPEN/CLOSE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) DIRECTION SELECTION TAB
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LOCATION: PAYLOAD BAY
PART NUMBER: SED3101368

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET ASSEMBLY DIRECTION SELECTION TAB FAILS. UNABLE TO CHANGE
RATCHET DIRECTION. WORST CASE WOULD NOT ALLOW CUTTING WHEEL TO
CONTACT TUBE. USED TO CUT DRIVE TUBES ON PLBD. IF UNABLE TO
CLOSE DOORS THE VEHICLE IS UNABLE TO DEORBIT. LOSS OF ALL
REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87  C-111
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3105

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

ITEM: TUBE CUTTER SMALL RATCHET ASSEMBLY DIRECTION SELECTION TAB
FAILURE MODE: FAILS TO REMAIN OPEN/CLOSE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) DIRECTION SELECTION TAB
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET ASSEMBLY DIRECTION SELECTION TAB FAILS. UNABLE TO ENGAGE RATCHET WHEEL OR UNABLE TO STAY AT SELECTED RATCHET DIRECTION. WORST CASE WOULD NOT ALLOW CUTTING WHEEL TO CONTACT TUBE. USED TO CUT DRIVE TUBES ON PLBD. IF UNABLE TO CLOSE DOORS THE VEHICLE IS UNABLE TO DEORBIT. LOSS OF ALL REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87  C-112
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3106

ITEM: TUBE CUTTER PAWL
FAILURE MODE: FAILS TO ENGAGE NOTCHES

LEAD ANALYST: L. GRAHAM     SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) PAWL
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
PAWL FAILS TO ENGAGE NOTCHES. UNABLE TO ROTATE TUBE CUTTER AROUND TUBE. FAILURE OF FIRST AND SECOND PAWL UNDETECTABLE BY CREWMAN. TOOL STILL FUNCTIONS. FAILURE OF ALL 3 PAWLS RESULT IN LOSS OF TOOL FUNCTION. USED TO CUT DRIVE TUBES ON PLBD. IF UNABLE TO CLOSE DOORS THE VEHICLE IS UNABLE TO DEORBIT. LOSS OF ALL REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87 C-113
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3107

ITEM: TUBE CUTTER PAWL
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) PAWL
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
PAWL BREAKS. UNABLE TO ROTATE TUBE CUTTER AROUND TUBE. FAILURE OF FIRST AND SECOND PAWL UNDETECTABLE BY CREWMAN. TOOL STILL FUNCTIONS. FAILURE OF ALL 3 PAWLS RESULTS IN LOSS OF TOOL FUNCTION. USED TO CUT DRIVE TUBES ON PLBD. IF UNABLE TO CLOSE DOORS THE VEHICLE IS UNABLE TO DEORBIT. LOSS OF ALL REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87  C-114
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 3108  ABORT: /NA

ITEM: TUBE CUTTER SPRING-ASSISTED RETENTION ROLLER (ON ROLLER LINK)
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) SPRING-ASSISTED RETENTION ROLLER
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
RETENTION ROLLER FAILS TO MAINTAIN TENSION ON PIPE BEING CUT.
MOST PROBABLE CAUSE IS FAILURE OF TORSION SPRING(S) OR DOWEL PIN
(ON LINK) BEING PUSHED ON BY TORSION SPRINGS. USED TO HOLD PLBD
DRIVE TUBES DURING CUTTING.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87  C-115
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3109

ITEM: TUBE CUTTER ROLLER LINK
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) ROLLER LINK
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CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROLLER LINK STICKS IN "DOWN" POSITION UNABLE TO SPRING "UP" AND AWAY FROM TUBE BEING CUT. USED TO HOLD PLBD DRIVE TUBES DURING CUTTING. IF UNABLE TO CLOSE DOORS THE VEHICLE IS UNABLE TO DEORBIT. LOSS OF ALL REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87 C-116
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET  

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REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE  10/23/87  C-117
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 2/1R
MDAC ID: 3111  ABORT: /NA

ITEM: TUBE CUTTER LARGE RATCHET HANDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) RATCHET HANDLE

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: MISHANDLING/ABUSE, OVERLOAD, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
HANDLE BREAKS. CREW ACTIONS REDUCE HARDWARE CRITICALITY BY ONE TO A "2". TOOL IS USED TO CUT DRIVE TUBES ON PLBD. IF UNABLE TO CLOSE DOORS THE VEHICLE IS UNABLE TO DEORBIT. LOSS OF ALL REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87  C-118
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3112

ITEM: TUBE CUTTER SMALL RATCHET HANDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) SMALL RATCHET HANDLE
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
SMALL RATCHET HANDLE USED TO SNUG CUTTING WHEEL TO TUBE BREAKS. CREW ACTIONS REDUCE HARDWARE CRITICALITY BY ONE TO A "2". TOOL IS USED TO CUT DRIVE TUBES ON PLBD. IF UNABLE TO CLOSE DOORS THE VEHICLE IS UNABLE TO DEORBIT. LOSS OF ALL REDUNDANCY WILL RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3113

ITEM: TUBE CUTTER SOFT-TIP SET SCREW
FAILURE MODE: FAILS TO CONTACT SHAFT

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TUBE CUTTER
3) SOFT-TIP SET SCREW

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101368

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
SOFT TIP SET SCREW USED TO "SNUG-UP" SLIDE DRIVE SHAFT DOES NOT CONTACT SHAFT. SET SCREW PREVENTS BOTH CUTTING WHEEL SLIDE AND DRIVE SHAFT FROM BACK DRIVING DURING CUTTING WHEEL CONTACT. FAILURE OF SET SCREW SHOULD NOT CAUSE LOSS OF TOOL FUNCTION. BACK DRIVING IS NOT NORMALLY A PROBLEM.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101368

REPORT DATE 10/23/87  C-120
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3200

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

ITEM: CENTERLINE LATCH BYPASS TOOL SAFETY RELEASE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CENTERLINE LATCH BYPASS TOOL
3) SAFETY RELEASE
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101621

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
SAFETY RELEASE IS UNABLE TO MOVE TO ENABLE TRIGGER. TWO TOOLS FLOWN ON EACH FLIGHT. OPERATION OF RATCHET WILL RELEASE LATCH BYPASSING SAFETY RELEASE FAILURE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101621

REPORT DATE 10/23/87 C-121
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3201

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

ITEM: CENTERLINE LATCH BYPASS TOOL LATCH
FAILURE MODE: INADVERTENT OPERATION

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CENTERLINE LATCH BYPASS TOOL
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101621

CAUSES: MISHANDLING/ABUSE

EFFECTS/RATIONALE:
LATCH MAY RELEASE DUE TO MISHANDLING BY CREW. TWO TOOLS FLOWN EACH FLIGHT. CREW CAN MANUALLY RESET TOOL IF ACCIDENTLY TRIGGERED OR MANUALLY HOLD TOOL IN STOWED CONFIGURATION UNTIL PLACED IN CORRECT POSITION/ATTITUDE FOR USE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101621

REPORT DATE 10/23/87 C-122
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/1R
MDAC ID: 3202  ABORT: /NA

ITEM: CENTERLINE LATCH BYPASS TOOL LATCH
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CENTERLINE LATCH BYPASS TOOL
3) LATCH
4)  
5)  
6)  
7)  
8)  
9)  

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101621

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
LATCH FAILS TO OPEN WHEN RELEASED, THEREFORE THE TOOL WILL FAIL TO CAPTURE THE LATCH ROLLER OF THE PAYLOAD BAY DOOR. TWO TOOLS FLOWN ON EACH FLIGHT. FAILURE OF THE SECOND HARDWARE ITEM WOULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101621

REPORT DATE 10/23/87  C-123
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3203

HIGHEST CRITICALITY
FLIGHT: 1/1
ABORT: /NA

ITEM: CENTERLINE LATCH BYPASS TOOL LATCH
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CENTERLINE LATCH BYPASS TOOL
3) LATCH
4) PIVOT PIN
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101621

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
PIVOT PIN (SDD33101625-001 OR SDD33101625-005) FAILS THEREBY BREAKING LATCH. TOOL IS UNABLE TO FUNCTION. LOSS OF VEHICLE OR LIFE POSSIBLE WITH LOSS OF FUNCTION. THERE IS A SECOND TOOL ONBOARD BUT IS NOT REDUNDANT DURING OPERATION.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101621

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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<td>S.K. SINCLAIR</td>
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**BREAKDOWN HIERARCHY:**
1) CREW EQUIPMENT
2) CENTERLINE LATCH BYPASS TOOL
3) RATCHET WHEEL

**CRITICALITIES**

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

**LOCATION:** PAYLOAD BAY
**PART NUMBER:** SED33101621

**CAUSES:** CONTAMINATION, PIECE-PART FAILURE

**EFFECTS/RATIONALE:**
TWO TOOLS FLOWN ON EACH FLIGHT. RATCHET BEING UNABLE TO OPERATE RESULTS IN A TOOL UNABLE TO FUNCTION. LOSS OF VEHICLE POSSIBLE WITH LOSS OF FUNCTION. FAILURE OF FIRST HARDWARE ITEM RESULTS IN LOSS OF LIFE OR VEHICLE SINCE THERE IS NO OPERATIONAL REDUNDANCY FOR THIS TOOL. THIS FAILURE COULD PREVENT USE OF REDUNDANT TOOL.

**REFERENCES:** JSC-12770 SFOM VOL. 15, JSC-20466, SED33101621

**REPORT DATE** 10/23/87  C-125
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3205

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

ITEM: CENTERLINE LATCH BYPASS TOOL RELEASE TRIGGER
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM

SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CENTERLINE LATCH BYPASS TOOL
3) SAFETY RELEASE

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101621

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
RELEASE TRIGGER JAMMED. TWO TOOLS FLOWN ON EACH FLIGHT. OPERATION OF RATCHET WILL FORCE RELEASE OF LATCH THEREBY BYPASSING FAILURE OF RELEASE TRIGGER.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101621

REPORT DATE 10/23/87  C-126
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT FLIGHT: 1/1
MDAC ID: 3206  ABORT: /NA

ITEM: CENTERLINE LATCH BYPASS TOOL RATCHET HANDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CENTERLINE LATCH BYPASS TOOL
3) RATCHET HANDLE
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101621

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET HANDLE BREAKS. TWO TOOLS FLOWN ON EACH FLIGHT. ASSUMING TOOL BREAKS WHILE UNDER TENSION AND AT A POINT ALONG SHAFT HANDLE WHERE EVA TOOLS (PLIERS, ETC.) WOULD NOT BE USEFUL. EVA CREWMAN WOULD BE UNABLE TO REVERSE TOOL. SECOND TOOL COULD NOT BE INSTALLED IF FIRST TOOL CANNOT BE REMOVED.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101621

REPORT DATE 10/23/87  C-127
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:  6/06/87

SUBSYSTEM:  CREW EQUIPMENT

MDAC ID:  3207

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

ITEM:  CENTERLINE LATCH BYPASS TOOL RELEASE CATCH

FAILURE MODE:  STRUCTURAL FAILURE

LEAD ANALYST:  L. GRAHAM
SUBSYS LEAD:  S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CENTERLINE LATCH BYPASS TOOL
3) RELEASE CATCH

CRITICALITIES

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

LOCATION:  PAYLOAD BAY
PART NUMBER:  SED33101628

CAUSES:  PIECE-PART FAILURE

EFFECTS/RATIONALE:
TWO TOOLS FLOWN ON EACH FLIGHT. IF TOOL RELEASE CATCH BREAKS
TOOL LATCH WILL RELEASE (DEPLOY). CREW CAN MANUALLY HOLD TOOL IN
STOWED CONFIGURATION UNTIL PLACED IN CORRECT POSITION/ATTITUDE.

REFERENCES:  JSC-12770 SFOM VOL. 15, JSC-20466, SED33101621

REPORT DATE  10/23/87  C-128
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3208

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/3
ABORT: /NA

ITEM: CENTERLINE LATCH BYPASS TOOL SAFETY RELEASE TAB
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CENTERLINE LATCH BYPASS TOOL
3) SAFETY RELEASE TAB

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101621

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
TWO TOOLS FLOWN ON EACH FLIGHT. WORST CASE WOULD HAVE EVA CREWMAN INADVERTENTLY ACTIVATING LATCH RELEASE. CREWMAN CAN MANUALLY RESET TOOL.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101621

REPORT DATE 10/23/87  C-129
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
MDAC ID: 3300

SUBSYSTEM: CREW EQUIPMENT
HIGHEST CRITICALITY HDW/FUNC: FLIGHT: 1/1
ABORT: /NA

ITEM: 3-POINT LATCH TOOL RATCHET HANDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) 3-POINT LATCH TOOL
3) RATCHET HANDLE
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101327

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET HANDLE BREAKS. TWO TOOLS FLOWN ON EACH FLIGHT. WORST CASE PRECLUDES USE OF EVA TOOLS TO REPAIR/REPLACE HANDLE. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF LATCHING FUNCTION WILL RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101327

REPORT DATE 10/23/87  C-130  

C - 3
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3301

ITEM: 3-POINT LATCH TOOL HOOK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) 3-POINT LATCH TOOL
3) HOOK
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101327

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
HOOK BREAKS. TWO TOOLS FLOWN ON EACH FLIGHT. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. WORST CASE PRECLUDES USE OF EVA TOOLS AND PROCEDURES TO REPAIR/REPLACE HOOK. LOSS OF LATCHING FUNCTION WILL RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101327

REPORT DATE 10/23/87  C-131
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3302

ITEM: 3-POINT LATCH TOOL RATCHET WHEEL SELECTOR TAB
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) 3-POINT LATCH TOOL
3) RATCHET WHEEL SELECTOR TAB
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101327

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET WHEEL DIRECTION SELECTOR TAB CANNOT CHANGE. TWO TOOLS FLOWN ON EACH FLIGHT. WORST CASE PRECLUDES FUNCTIONING OF TOOL. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF LATCHING FUNCTION RESULTS IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101327

REPORT DATE 10/23/87 C-132
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3303

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

ITEM: 3-POINT LATCH TOOL RATCHET WHEEL SELECTOR TAB
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) 3-POINT LATCH TOOL
3) RATCHET WHEEL SELECTOR TAB
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101327

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET WHEEL DIRECTION SELECTOR TAB CANNOT CHANGE. TWO TOOLS FLOWN ON EACH FLIGHT. WORST CASE PRECLUDES FUNCTIONING OF TOOL. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF LATCHING FUNCTION RESULTS IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101327

REPORT DATE 10/23/87 C-133
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3304

ITEM: 3-POINT LATCH TOOL RATCHET WHEEL
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) 3-POINT LATCH TOOL
3) RATCHET WHEEL
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101327

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET WHEEL IS UNABLE TO ROTATE. TWO TOOLS FLOWN ON EACH FLIGHT. WORST CASE PRECLUDES USE OF EVA TOOLS AND PROCEDURES TO REPAIR/REPLACE GEAR. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF LATCHING FUNCTION WILL RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101327

REPORT DATE 10/23/87 C-134
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 3305  ABORT: /NA

ITEM: 3-POINT LATCH TOOL ROLLER SHOE RELEASE HANDLE LATCH
FAILURE MODE: INADVERTENT OPERATION

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) 3-POINT LATCH TOOL
3) ROLLER SHOE RELEASE HANDLE LATCH
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101327

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RELEASE HANDLE LATCH FAILS OR CREWMAN ACCIDENTLY RELEASES ROLLER SHOE BY LIFTING LATCH. TWO TOOLS FLOWN ON EACH FLIGHT. CREWMAN CAN MANUALLY RESET TOOL IF LATCH IS INTACT. IF LATCH HAS BROKEN CREWMAN CAN MANUALLY HOLD AND PLACE TOOL TO THE CORRECT POSITION AND ATTITUDE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101327

REPORT DATE 10/23/87  C-135
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3306

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

ITEM: 3-POINT LATCH TOOL ROLLER SHOE RELEASE HANDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) 3-POINT LATCH TOOL
3) ROLLER SHOE RELEASE HANDLE
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101327

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROLLER SHOE RELEASE HANDLE(S) FAIL. TWO TOOLS FLOWN ON EACH FLIGHT. WORST CASE WOULD PRECLUDE USE OF EVA TOOLS AND PROCEDURES TO REPAIR/REPLACE. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF FUNCTION RESULTS IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101327

REPORT DATE 10/23/87 C-136
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3307

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

ITEM: 3-POINT LATCH TOOL COMPENSATOR ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) 3-POINT LATCH TOOL
3) COMPENSATOR ASSEMBLY

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101327

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
TWO TOOLS FLOWN ON EACH FLIGHT. COMPENSATOR ASSEMBLY FAILS. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF LATCHING FUNCTION WILL RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101327

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3308

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

ITEM: 3-POINT LATCH TOOL ROLLER SHOE ASSEMBLY
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) 3-POINT LATCH TOOL
3) ROLLER SHOE ASSEMBLY

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101327

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
Pivot pin fails. ROLLER SHOE CANNOT STAY DEPLOYED. NO OPERATIONAL REDUNDANCY AVAILABLE FOR THIS TOOL. LOSS OF FUNCTION RESULTS IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101327

REPORT DATE 10/23/87 C-138
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/08/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3400

ITEM: EVA WINCH AND MOUNT ASSEMBLY HOOK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM   SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) HOOK

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
EVA WINCH HOOK BREAKS. LOSS OF ALL FUNCTIONAL REDUNDANCY OF WINCH WOULD CAUSE LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLBD OR RESTOW RMS AND DEORBIT.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87   C-139
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3401

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

ITEM: EVA WINCH AND MOUNT ASSEMBLY RATCHET HANDLE
CONTROL LEVER
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) RATCHET HANDLE CONTROL LEVER
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET HANDLE CONTROL LEVER BREAKS. LOSS OF ALL FUNCTIONAL
REDUNDANCY OF WINCH WOULD CAUSE LOSS OF VEHICLE DUE TO INABILITY
TO CLOSE PLB DOORS AND DEORBIT. CREW HANDLE REPAIR CAN REDUCE
HARDWARE CRITICALITY BY ONE TO A "2".

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87 C-140
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3402

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

ITEM: EVA WINCH AND MOUNT ASSEMBLY RATCHET HANDLE
CONTROL LEVER
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) RATCHET HANDLE CONTROL LEVER
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET HANDLE CONTROL LEVER JAMS/BINDS. LOSS OF ALL FUNCTIONAL REDUNDANCY OF WINCH WOULD CAUSE LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLB DOOR AND DEORBIT.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87 C-141
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: /NA

ITEM: EVA WINCH AND MOUNT ASSEMBLY LARGE CONTROL HANDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) LARGE CONTROL HANDLE
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
LARGE CONTROL HANDLE (REEL SELECTOR) BREAKS. LOSS OF ALL FUNCTIONAL REDUNDANCY OF WINCH WOULD CAUSE LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLB DOORS AND DEORBIT. CREW HANDLE REPAIR CAN REDUCE HARDWARE CRITICALITY BY ONE TO A "2". FAILURE OF REDUNDANT WINCH COULD RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87 C-142
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3404

ITEM: EVA WINCH AND MOUNT ASSEMBLY LARGE CONTROL HANDLE
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) LARGE CONTROL HANDLE

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
LARGE CONTROL HANDLE (REEL SELECTOR) JAMS/BINDS. LOSS OF ALL FUNCTIONAL REDUNDANCY WOULD CAUSE LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLB DOORS AND DEORBIT. CREW HANDLE REPAIR CAN REDUCE HARDWARE CRITICALITY BY ONE TO A "2". FAILURE OF REDUNDANT WINCH COULD RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87  C-143
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 2/1R
MDAC ID: 3405  ABORT: /NA

ITEM: EVA WINCH AND MOUNT RATCHET HANDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) RATCHET HANDLE
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
RATCHET HANDLE BREAKS. LOSS OF ALL FUNCTIONAL REDUNDANCY WOULD CAUSE LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLB DOORS AND DEORBIT. CREW HANDLE REPAIR CAN REDUCE HARDWARE CRITICALITY BY ONE TO A "2". FAILURE OF REDUNDANT WINCH COULD RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87  C-144
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3406

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

ITEM: EVA WINCH AND MOUNT ASSEMBLY ROPE
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM        SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) ROPE

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROPE JAMS/BINDS. LOSS OF ALL FUNCTIONAL REDUNDANCY WOULD CAUSE
LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLB DOORS AND DEORBIT.
CREW ACTIONS REDUCE HARDWARE CRITICALITY BY ONE TO A "2".
FAILURE OF REDUNDANT WINCH COULD RESULT IN LOSS OF LIFE OR
VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87 C-145
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3407

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 2/1R
ABORT: /NA

ITEM: EVA WINCH AND MOUNT ASSEMBLY ROPE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) ROPE
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROPE BREAKS. LOSS OF ALL FUNCTIONAL REDUNDANCY WOULD CAUSE LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLB DOORS AND DEORBIT. CREW ACTIONS REDUCE HARDWARE CRITICALITY BY ONE TO A "2". FAILURE OF REDUNDANT WINCH COULD RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87 C-146
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3408

ITEM: EVA WINCH AND MOUNT ASSEMBLY TORQUE LIMITER
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) TORQUE LIMITER

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

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
TORQUE LIMITER FAILS TO SLIP. LOSS OF TORQUE LIMITER SHOULD NOT
PRECLUDE WINCH OPERATION. LIMITER IS USED TO AVOID OVERLOAD
CAUSED (MOST PROBABLY) BY OBSTRUCTION.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87  C-147
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 2/1R
MDAC ID: 3409  ABORT: /NA

ITEM: EVA WINCH AND MOUNT ASSEMBLY RATCHET WHEEL
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) RATCHET WHEEL

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET WHEEL JAMS/BINDS. LOSS OF ALL FUNCTIONAL REDUNDANCY
WOULD CAUSE LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLB DOORS
AND DEORBIT. CREW ACTIONS REDUCE HARDWARE CRITICALITY BY ONE TO
A "2". FAILURE OF REDUNDANT WINCH COULD RESULT IN LOSS OF
LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87  C-148
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3410

HIGHEST CRITICALITY

ITEM: EVA WINCH AND MOUNT ASSEMBLY ROPE ROLLER
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) ROPE ROLLER
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROPE ROLLER(S) BREAK. EVA WINCH SHOULD STILL BE ABLE TO FUNCTION.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87  C-149
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3411

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

ITEM: EVA WINCH AND MOUNT ASSEMBLY ROPE ROLLER
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM     SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) ROPE ROLLER

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROPE ROLLER(S) JAM/BIND. EVA WINCH SHOULD STILL BE ABLE TO FUNCTION.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87     C-150
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3412

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

ITEM: EVA WINCH AND MOUNT ASSEMBLY HANDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) HANDLE
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HOLDING HANDLE FOR EVA CREWMAN BREAKS. HANDLE BREAKAGE DOES NOT PREVENT OPERATION OF EVA WINCH. EVA CREWMAN CAN HOLD HANDRAIL WHILE OPERATING WINCH.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87  C-151
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/09/87       HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT    FLIGHT: 2/1R
MDAC ID: 3413      ABORT: /NA

ITEM: EVA WINCH AND MOUNT ASSEMBLY MOUNTING PLATE ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM    SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) MOUNTING PLATE ASSEMBLY
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
MOUNTING PLATE ASSEMBLY SEPARATES FROM EVA WINCH ASSEMBLY. LOSS OF ALL FUNCTIONAL REDUNDANCY WOULD RESULT IN LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLB DOORS OR RESTOW RMS AND DEORBIT. CREW ACTIONS REDUCE HARDWARE CRITICALITY BY ONE TO A "2". FAILURE OF REDUNDANT WINCH COULD RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87    C-152
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3414

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

ITEM: EVA WINCH AND MOUNT ASSEMBLY GEARS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM       SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) GEARS

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
TAKE UP GEAR(S) BREAK. LOSS OF ALL FUNCTIONAL REDUNDANCY WOULD
CAUSE LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLB DOORS AND
DEORBIT. CREW ACTIONS REDUCE HARDWARE CRITICALITY BY ONE TO A
"2". FAILURE OF REDUNDANT WINCH COULD RESULT IN LOSS OF LIFE OR
VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87 C-153
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 2/1R
MDAC ID: 3415  ABORT: /NA

ITEM: EVA WINCH AND MOUNT ASSEMBLY GEARS
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) GEARS

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
TAKE UP GEARS BIND/JAM. LOSS OF ALL FUNCTIONAL REDUNDANCY WOULD CAUSE LOSS OF VEHICLE DUE TO INABILITY TO CLOSE PLB DOORS AND DEORBIT. CREW ACTIONS REDUCE HARDWARE CRITICALITY BY ONE TO A "2". FAILURE OF REDUNDANT WINCH COULD RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87  C-154
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3416

ITEM: EVA WINCH AND MOUNT ASSEMBLY PIP PIN
FAILURE MODE: FAILS TO REMAIN ATTACHED

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) PIP PIN
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: CONTAMINATION, PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
PIP PIN MAY WORK LOOSE DURING ATMOSPHERIC MANEUVERS. COULD COME LOOSE AND CAUSE LOSS OF VEHICLE FROM EVA WINCH IMPACTING CABLE BUNDLES, ETC. CREW WOULD HAVE NO KNOWLEDGE OF FAILURE UNTIL VEHICLE WENT OUT OF CONTROL. LOSS OF SECOND PIP PIN COULD RESULT IN CRIT 1 SITUATION THUS A HARDWARE CRIT 2 IS ASSIGNED.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87 C-155
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/20/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT FLIGHT: 2/1R
MDAC ID: 3417 ABORT: /NA

ITEM: EVA WINCH AND MOUNT ASSEMBLY ROPE SPOOL
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH AND MOUNT ASSEMBLY
3) ROPE SPOOL

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33101570

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROPE SPOOL WILL NOT REEL OUT/TAKE IN ROPE. INABILITY OF SPOOL TO
ROTATE AND LET OUT/TAKE UP ROPE WOULD CAUSE LOSS OF TOOL
FUNCTION. POSSIBLE TO USE SECOND EVA WINCH AND MOUNT ASSEMBLY AS
A REDUNDANT ITEM. LOSS OF ALL FUNCTIONAL REDUNDANCY WOULD
RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-12770 SFOM VOL. 15, JSC-20466, SED33101570

REPORT DATE 10/23/87  C-156
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3500

ITEM: EVA WINCH ADAPTER ASSEMBLY ROPE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH ADAPTER ASSEMBLY
3) ROPE

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33102348

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROPE BREAKS. EVA WINCH ADAPTER IS USED AS AN EXTENSION TO THE
EVA WINCH TO RESTOW RMS. ONLY ONE WINCH ADAPTER CARRIED PER
FLIGHT. INABILITY TO STOW OR JETTISON RMS WOULD PREVENT VEHICLE
DEORBIT. MAY BE POSSIBLE TO USE SECOND EVA WINCH AND MOUNT
ASSEMBLY AS REDUNDANT ITEM. LOSS OF ALL REDUNDANCY, LIKE AND
UNLIKE, COULD RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-20466, SED33102348

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3501

ITEM: EVA WINCH ADAPTER ASSEMBLY ROPE
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH ADAPTER ASSEMBLY
3) ROPE

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33102348

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
ROPE JAMS. EVA WINCH ADAPTER IS USED AS AN EXTENSION TO THE EVA WINCH TO RESTOW RMS. ONLY ONE WINCH ADAPTER CARRIED PER FLIGHT. INABILITY TO STOW OR JETTISON RMS WOULD PREVENT VEHICLE DEORBIT. MAY BE POSSIBLE TO USE SECOND EVA WINCH AND MOUNT ASSEMBLY AS REDUNDANT ITEM. LOSS OF ALL REDUNDANCY, LIKE AND UNLIKE, COULD RESULT IN LOSS OF LIFE OR VEHICLE.

REFERENCES: JSC-20466, SED33102348

REPORT DATE 10/23/87  C-158
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3502

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

ITEM: EVA WINCH ADAPTER ASSEMBLY HOOK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM    SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH ADAPTER ASSEMBLY
3) HOOK

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33102348

CAUSES: OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HOOK BREAKS. MAY BE ABLE TO USE SECOND EVA WINCH AND MOUNT ASSEMBLY ALONG WITH FIRST EVA WINCH AND MOUNT ASSEMBLY TO ACCOMPLISH THE SAME FUNCTION AS FIRST EVA WINCH AND MOUNT ASSEMBLY AND EVA WINCH ADAPTER ASSEMBLY. CREW MAY BE ABLE TO TIE ROPE AROUND RMS TO REPLACE FUNCTION OF HOOK. INABILITY TO STOW OR JETTISON RMS WOULD PREVENT VEHICLE DEORBIT.

REFERENCES: JSC-20466, SED33102348

REPORT DATE 10/23/87    C-159
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 3503  ABORT: /NA

ITEM: EVA WINCH ADAPTER ASSEMBLY HOOK LATCH
FAILURE MODE: FAILS TO OPEN/CLOSE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH ADAPTER ASSEMBLY
3) HOOK LATCH

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33102348

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HOOK LATCH JAMS OPEN OR CLOSED. EVA CREWMAN CAN BEND LATCH CLOSED OR OPEN (AS NEEDED) TO ALLOW EVA WINCH ADAPTER TO FUNCTION CORRECTLY. CREWMAN CAN ALSO TIE ROPE AROUND RMS TO AVOID USING HOOK AND FAILED LATCH.

REFERENCES: JSC-20466, SED33102348

REPORT DATE 10/23/87  C-160
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3504
MDAC ID: 3504

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

ITEM: EVA WINCH ADAPTER ASSEMBLY ROPE CAM CLEAT
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH ADAPTER ASSEMBLY
3) ROPE CAM CLEAT
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CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33102348

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CAM CLEAT BREAKS. ROPE CAN BE HELD IN PLACE BY ACTION OF ONE CAM CLEAT. LOSS OF TOOL FUNCTION MAY PREVENT STOWAGE OF FAILED RMS THUS RESULTING IN LOSS OF LIFE AND VEHICLE. EVA CREW ACTIONS MAY BE ABLE TO REPAIR TOOL.

REFERENCES: JSC-20466, SED33102348

REPORT DATE 10/23/87 C-161
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3505

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 2/1R
ABORT: /NA

ITEM: EVA WINCH ADAPTER ASSEMBLY ROPE CAM CLEAT
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH ADAPTER ASSEMBLY
3) ROPE CAM CLEAT

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33102348

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CAM CLEATS JAM. ROPE CAN BE HELD IN PLACE BY ACTION OF ONE CAM CLEAT. LOSS OF TOOL FUNCTION MAY PREVENT STOWAGE OF FAILED RMS THUS RESULTING IN LOSS OF LIFE OR VEHICLE. EVA CREW MAY BE ABLE TO REPAIR TOOL.

REFERENCES: JSC-20466, SED33102348

REPORT DATE 10/23/87 C-162
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

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**ITEM:** EVA WINCH ADAPTER ASSEMBLY ROPE GUIDE PLATE

**FAILURE MODE:** STRUCTURAL FAILURE

**LEAD ANALYST:** L. GRAHAM  
**SUBSYS LEAD:** S.K. SINCLAIR

**BREAKDOWN HIERARCHY:**
1) CREW EQUIPMENT  
2) EVA WINCH ADAPTER ASSEMBLY  
3) ROPE GUIDE PLATE

**CRITICALITIES**

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

**LOCATION:** PAYLOAD BAY  
**PART NUMBER:** SED33102348

**CAUSES:** STRUCTURAL FAILURE

**EFFECTS/RATIONALE:**
ROPE GUIDE PLATE FAILS AND SEPARATES FROM SPOOL. WHEN ROPE IS UNDER TENSION GUIDE PLATE MAY STRUCTURALLY FAIL THUS PREVENTING TOOL FROM FUNCTIONING. EVA WINCH LATCH ATTACHES TO GUIDE PLATE. LOSS OF TOOL FUNCTION PREVENTS RESTOWING OF DISABLED RMS. INABILITY TO CLOSE PLBD CAN RESULT IN LOSS OF LIFE AND VEHICLE. MAY BE ABLE TO USE SECOND EVA WINCH AND MOUNT ASSEMBLY TO REPLACE FUNCTION. CREW ACTIONS COULD REDUCE HARDWARE CRITICALITY BY ONE TO A "2".

**REFERENCES:** JSC-20466, SED33102348

**REPORT DATE** 10/23/87  
**C-163**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3507

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: EVA WINCH ADAPTER ASSEMBLY ROPE ROLLER
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH ADAPTER ASSEMBLY
3) ROPE ROLLER
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33102348

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROLLER BREAKS. WINCH ADAPTER ASSEMBLY (RMS ROPE REEL) CAN STILL FUNCTION.

REFERENCES: JSC-20466, SED33102348

REPORT DATE 10/23/87  C-164
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3508

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| LEAD ANALYST: L. GRAHAM | SUBSYS LEAD: S.K. SINCLAIR |

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH ADAPTER ASSEMBLY
3) ROPE ROLLER
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33102348

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
ROPE ROLLER FAILS TO TURN. WINCH ADAPTER ASSEMBLY (RMS ROPE REEL) CAN STILL FUNCTION.

REFERENCES: JSC-20466, SED33102348

REPORT DATE 10/23/87 C-165
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/06/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3509

ITEM: EVA WINCH ADAPTER ASSEMBLY ROPE SPOOL
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA WINCH ADAPTER ASSEMBLY
3) ROPE SPOOL
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33102348

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROPE SPOOL WILL NOT REEL OUT/IN ROPE. INABILITY OF SPOOL TO ROTATE AND LET OUT/TAKE UP ROPE WOULD CAUSE LOSS OF TOOL FUNCTION. MAY BE POSSIBLE TO USE SECOND EVA WINCH AND MOUNT ASSEMBLY AS REDUNDANT ITEM. LOSS OF ALL REDUNDANCY WOULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, SED33102348

REPORT DATE 10/23/87 C-166
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3600
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R
ABORT: /NA

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY RATCHET HANDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) RATCHET HANDLE

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HANDLE BREAKS. TWO DEVICES FLOWN ON EACH FLIGHT. LOSS OF TOOL
FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE. CREW ACTIONS
CAN REDUCE HARDWARE CRITICALITY BY ONE TO A "2".

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87  C-167
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3601
MDAC ID:
HIGHEST CRITICALITY
HDW/FUNC
FLIGHT:
ABORT:
1/1
/NA

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY HOOK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) HOOK
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HOOK(S) BREAKS. TWO DEVICES FLOWN ON EACH FLIGHT. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87 C-168
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3602

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

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY HOOK LATCH
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM     SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) HOOK LATCH

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HOOK LATCH BREAKS. TWO DEVICES FLOWN ON EACH FLIGHT. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE. CREW ACTIONS CAN REDUCE HARDWARE CRITICALITY BY ONE TO A "2".

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87 C-169
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3603

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY HOOK LATCH
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: L. GRAHAM     SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) HOOK LATCH
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CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HOOK LATCH FAILS TO CLOSE. TWO DEVICES FLOWN ON EACH FLIGHT.
LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.
CREW ACTIONS CAN REDUCE HARDWARE CRITICALITY BY ONE TO A "2".

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87  C-170
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 1/1
MDAC ID: 3604  ABORT: /NA

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY RATCHET GEAR
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) RATCHET GEAR

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET GEAR BINDS/JAMS. TWO DEVICES FLOWN ON EACH FLIGHT. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87  C-171
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 1/1
MDAC ID: 3605  ABORT: /NA

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY RATCHET GEAR
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) RATCHET GEAR
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET GEAR BREAKS. TWO DEVICES FLOWN ON EACH FLIGHT. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87  C-172
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3606

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

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY KEVLAR WEB STRAP
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM            SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) KEVLAR WEB STRAP
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
KEVLAR WEB STRAP BREAKS. TWO DEVICES FLOWN ON EACH FLIGHT. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87 C-173
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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**BREAKDOWN HIERARCHY:**
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) REACTION HANDLE ASSEMBLY
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**CRITICALITIES**

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**REdundancy Screens:** A [ ] B [ ] C [ ]

**LOCATION:** PAYLOAD BAY
**PART NUMBER:** 10163-10063-03

**CAUSES:** MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

**EFFECTS/RATIONALE:**
REACTION HANDLE ASSEMBLY BREAKS. TWO DEVICES FLOWN ON EACH FLIGHT. LOSS OF REACTION HANDLE WILL NOT CAUSE LOSS OF TOOL FUNCTION.

**REFERENCES:** JSC-20466, 10163-10063

**REPORT DATE** 10/23/87 C-174
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3608

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

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY RATCHET SHAFT PIN
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) RATCHET SHAFT PIN
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LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET SHAFT PIN BREAKS. TWO DEVICES FLOWN ON EACH FLIGHT. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87  C-175
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3609
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY WEB ROLLER ASSEMBLY
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) WEB ROLLER ASSEMBLY
4) .....

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROLLER GUIDE ASSEMBLY FOR KEVLAR WEB STRAP BINDS/JAMS. CAN STILL FUNCTION TO TIE DOWN RMS.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87 C-176
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3610

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

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY WEB ROLLER
ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM          SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) WEB ROLLER ASSEMBLY
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REDUNDANCY SCREENS:  A [  ]  B [  ]  C [  ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROLLER GUIDE ASSEMBLY FOR KEVLAR WEB STRAP BREAKS. CAN STILL FUNCTION TO TIE DOWN RMS.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87  C-177
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3611

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY SPRING STORAGE REEL

FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) SPRING STORAGE REEL
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CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
SPRING STORAGE REEL BINDS/JAMS. TWO DEVICES FLOWN ON EACH FLIGHT. LOSS OF SPRING STORAGE REEL COULD RESULT IN LOSS OF TOOL FUNCTION. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF MISSION. IF NEITHER TOOL IS EFFECTIVE AS A TIEDOWN - THE DEVICE BEING RESTRAINED MAY HAVE TO BE JETTISONED PRIOR TO REENTRY.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87 C-178
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3612

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY RATCHET LATCH
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) RATCHET LATCH

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET LATCH BREAKS. TWO DEVICES FLOWN ON EACH FLIGHT. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87 C-179
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3613
HIGHEST CRITICALITY HDW/FNC
FLIGHT: 1/1
ABORT: /NA

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY RATCHET LATCH
FAILURE MODE: FAILS TO CONTACT RATCHET WHEEL

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) RATCHET LATCH
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET LATCH FAILS TO CONTACT GEAR. TWO DEVICES FLOWN ON EACH FLIGHT. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87 C-180
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT FLIGHT: 1/1
MDAC ID: 3614 ABORT: /NA

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY RATCHET ASSEMBLY RELEASE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) RATCHET ASSEMBLY RELEASE
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONAL:
RATCHET ASSEMBLY RELEASE IS UNABLE TO CLOSE (ENGAGE RATCHET WHEEL). TWO DEVICES FLOWN ON EACH FLIGHT. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87 C-181
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3615

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

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY RATCHET ASSEMBLY RELEASE
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) RATCHET ASSEMBLY RELEASE

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

LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
RATCHET ASSEMBLY RELEASE BINDS/JAMS. TWO DEVICES FLOWN ON EACH FLIGHT. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87 C-182
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/10/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3616

ITEM: PAYLOAD RETENTION DEVICE ASSEMBLY HOOK/WEB CONNECT PIN
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) PAYLOAD RETENTION DEVICE ASSEMBLY
3) LATCH/WEB CONNECT PIN

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LOCATION: PAYLOAD BAY
PART NUMBER: 10163-10063-03

CAUSES: OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HOOK/WEB CONNECT PIN BREAKS. PAYLOAD RETENTION DEVICE LOSES FUNCTION. NO OPERATIONAL REDUNDANCY FOR THIS TOOL. LOSS OF TOOL FUNCTION COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-20466, 10163-10063

REPORT DATE 10/23/87 C-183
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/14/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3700

ITEM: EVA CABLE CUTTER
FAILURE MODE: FAILS TO OPEN/CLOSE, PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA CABLE CUTTER
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LOCATION: PAYLOAD BAY
PART NUMBER: SED39117075-301

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
CUTTERS JAM AND CREWMEN IS UNABLE TO OPEN/CLOSE (AS NEEDED TO COMPLETE THE MISSION). BACKUP TOOL IS DIAGONAL CUTTER (WHICH IS NORMALLY MANIFESTED).

REFERENCES: JSC-20466

REPORT DATE 10/23/87 C-184
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/14/87  HIGHEST CRITICALITY  FLIGHT: 3/2R
SUBSYSTEM: CREW EQUIPMENT  HDW/FUNC  ABORT: /NA
MDAC ID: 3701

ITEM: EVA CABLE CUTTER
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA CABLE CUTTER
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LOCATION: PAYLOAD BAY
PART NUMBER: SED39117075-301

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HANDLE BREAKS THEREBY RENDERING CREWMAN UNABLE TO COMPLETE ORBITER MISSION. BACKUP TOOL IS DIAGONAL CUTTER (WHICH IS NORMALLY MANIFESTED).

REFERENCES: JSC-20466

REPORT DATE 10/23/87  C-185
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/14/87

SUBSYSTEM: CREW EQUIPMENT

MDAC ID: 3702

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ABORT: /NA

ITEM: EVA CABLE CUTTER

FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM

SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) EVA CABLE CUTTER
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LOCATION: PAYLOAD BAY

PART NUMBER: SEC39117075-301

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
JAWS DEFORMED, UNABLE TO CUT CABLE. BACKUP TOOL IS DIAGONAL CUTTER (WHICH IS NORMALLY MANIFESTED).

REFERENCES: JSC-20466

REPORT DATE 10/23/87 C-186
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3800

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

ITEM: SNATCH BLOCK ASSEMBLY HOOK LATCH
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SNATCH BLOCK ASSEMBLY
3) HOOK LATCH

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33102357

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
NORMALLY MANIFESTED ON EVERY FLIGHT. TWO SNATCH BLOCKS CARRIED ON EACH FLIGHT. FAILURE OF BOTH PRIMARY AND REDUNDANT BLOCK MAY CAUSE LOSS OF LIFE/VEHICLE WHEN BEING USED TO STOW FAILED RMS OR RESTOW IUS TILT CRADLE. FAILURE TO OPEN LATCH WOULD PREVENT SNATCH BLOCK BEING ATTACHED TO ORBITER OR AEROSPACE SUPPORT EQUIPMENT ON-ORBIT.

REFERENCES: JSC-20466, SED33102357

REPORT DATE 10/23/87 C-187
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3801

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

ITEM: SNATCH BLOCK ASSEMBLY HOOK SWIVEL
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SNATCH BLOCK ASSEMBLY
3) HOOK SWIVEL
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33102357

CAUSES: CONTAMINATION, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
FAILURE OF SWIVEL COULD PREVENT SUCCESSFUL OPERATION OF SNATCH BLOCK. TWO SNATCH BLOCKS FLOWN ON EACH FLIGHT.

REFERENCES: JSC-20466, SED33102357

REPORT DATE 10/23/87  C-188
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3802

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

ITEM: SNATCH BLOCK ASSEMBLY RIGHT SPRING PLUNGER
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SNATCH BLOCK ASSEMBLY
3) RIGHT SPRING PLUNGER
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: PAYLOAD BAY
PART NUMBER: SED33102357

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
SPRING PLUNGER BALL FAILS TO TRAVEL UP/DOWN THUS PREVENTING UPPER RIGHT CHEEK BLOCK FROM CONTACTING HOOK/LATCH ASSEMBLY. TWO SPRING PLUNGERS USED ON RIGHT SIDE, ANY ONE OF WHICH WILL PROVIDE SUFFICIENT PUSHING FORCE ON CHEEK BLOCK. SHOULD NOT RELEASE HOOK/LATCH ASSEMBLY DUE TO TENSION ON DEVICE.

REFERENCES: JSC-20466, SED33102357

REPORT DATE 10/23/87  C-189
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87    HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT    FLIGHT: 3/3
MDAC ID: 3803    ABORT: /NA

ITEM: SNATCH BLOCK ASSEMBLY LEFT SPRING PLUNGER
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM    SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SNATCH BLOCK ASSEMBLY
3) LEFT SPRING PLUNGER
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CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33102357

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
SPRING PLUNGER FAILS TO TRAVEL UP/DOWN THUS PREVENTING LEFT CHECK BLOCK FROM PUSHING AGAINST HOOK/LATCH ASSEMBLY. SHOULD NOT RELEASE DUE TO TENSION ON DEVICE. TWO SPRING PLUNGERS USED ON LEFT SIDE, ANY ONE OF WHICH WOULD PROVIDE SUFFICIENT PUSHING FORCE ON CHEEK BLOCK.

REFERENCES: JSC-20466, SED33102357

REPORT DATE 10/23/87 C-190
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3804

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: SNATCH BLOCK ASSEMBLY PULL WIRE BALL END
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SNATCH BLOCK ASSEMBLY
3) PULL WIRE BALL END

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33102357

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
BALL COMES OFF ALLOWING EVA PULL WIRE TO DRIFT OUT AND AWAY (LOST). EVA CREWMAN CAN STILL OPERATE RELEASE BLOCK BY MANUALLY PULLING ON "EARS" OF LATCH RELEASE BLOCK. TWO SNATCH BLOCKS FLOWN ON EACH FLIGHT.

REFERENCES: JSC-20466, SED33102357

REPORT DATE 10/23/87 C-191
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3805

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

ITEM: SNATCH BLOCK ASSEMBLY HOOK ASSEMBLY LATCH BLOCK
FAILURE MODE: FAILS TO REMAIN CLOSED

LEAD ANALYST: L. GRAHAM   SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SNATCH BLOCK ASSEMBLY
3) HOOK ASSEMBLY LATCH BLOCK

CRITICALITIES

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LOCATION: PAYLOAD BAY
PART NUMBER: SED33102357

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
TWO SNATCH BLOCKS FLOWN ON EACH FLIGHT. IF LATCH BLOCK FAILS TO
STAY CLOSED THE HOOK/LATCH ASSEMBLY COULD COME LOOSE, THEREBY
RELEASING ROPE DURING CRIT 1 EVA ACTIVITIES.

REFERENCES: JSC-20466, SED33102357

REPORT DATE 10/23/87   C-192
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87

SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3806

ITEM: SNATCH BLOCK ASSEMBLY PULLEY WHEEL
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SNATCH BLOCK ASSEMBLY
3) PULLEY WHEEL

CRITICALITIES

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

LOCATION: PAYLOAD BAY
PART NUMBER: SED33102357

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
ROPE CAN STILL TRAVEL OVER JAMMED PULLEY WHEEL THUS ALLOWING SNATCH BLOCK ASSEMBLY TO CONTINUE TO FUNCTION. ROPE MAY, HOWEVER, SUFFER SUFFICIENT WEAR TO PRECLUDE REPEATED USE. TWO SNATCH BLOCK ASSEMBLIES FLOWN ON EACH FLIGHT.

REFERENCES: JSC-20466, SED33102357

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 3807

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

ITEM: SNATCH BLOCK ASSEMBLY HOOK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SNATCH BLOCK ASSEMBLY
3) HOOK
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LOCATION: PAYLOAD BAY
PART NUMBER: SED33102357

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HOOK BREAKS. UNABLE TO ATTACH SNATCH BLOCK TO ORBITER OR
AEROSPACE SUPPORT EQUIPMENT ON-ORBIT. TWO SNATCH BLOCKS FLOWN ON
EACH FLIGHT.

REFERENCES: JSC-20466, SED33102357

REPORT DATE 10/23/87 C-194
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/05/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4100

ITEM: TURNBUCKLE
FAILURE MODE: QUICK RELEASE PIN FAILS, UNABLE TO ATTACH TO ORBITER STRUCTURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TURNBUCKLE
3) QUICK RELEASE PIN
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: CREW MODULE
PART NUMBER: V602-660302

CAUSES: WEAR, MISHANDLING BY CREWMAN

EFFECTS/RATIONALE:
CREWMEN CAN BEND PIN PRONGS BACK. ALSO, CREWMAN CAN DEVELOP ALTERNATIVE METHODS TO MAINTAIN STRUCTURAL INTEGRITY DURING FORWARD AVIONICS BAY REPAIR TASKS. THREE TURNBUCKLES FLOWN ON EACH FLIGHT.

REFERENCES: JSC-12770 VOL. 12, V602-660302

REPORT DATE 10/23/87  C-195
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/05/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4101

ITEM: TURNBUCKLE
FAILURE MODE: HINGES FAIL TO MAINTAIN POSITION WHEN TURNBUCKLE SET IN PLACE DUE TO STRIPPED THREADS

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TURNBUCKLE
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CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: V602-660302

CAUSES: WEAR, MISHANDLING BY CREW

EFFECTS/RATIONALE:
CREWMAN CAN TAPE HINGES IN PLACE TO MAINTAIN POSITIONING. ALSO CREWMAN CAN DEVELOP ALTERNATIVE METHODS TO MAINTAIN STRUCTURAL INTEGRITY DURING FORWARD AVIONICS BAY REPAIR TASKS. THREE TURNBUCKLES FLOWN ON EACH FLIGHT.

REFERENCES: JSC-12770 VOL. 12, V602-660302

REPORT DATE 10/23/87  C-196
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/05/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4200

ITEM: LOCKER REMOVAL TOOL
FAILURE MODE: HEX HEAD IS ROUNDED OFF, UNABLE TO ENGAGE LOCKER HOLDERS TO REMOVE LOCKERS.

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) LOCKER REMOVAL TOOL

CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: V625-650899

CAUSES: CREW MISHANDLING, WEAR
EFFECTS/RATIONALE:
IF CREW IS UNABLE TO REMOVE LOCKERS FOR ACCESS TO FORWARD AVIONICS BAY, LOSS OF CREW/VEHICLE MAY RESULT. MORE THAN ONE REMOVAL TOOL CARRIED ON EACH FLIGHT.

REFERENCES: JSC-12770 VOL. 12, V625-650899

REPORT DATE 10/23/87 C-197
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4300

ITEM: IFM BREAKOUT BOX INPUT POWER CONNECTOR
FAILURE MODE: SHORTED

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) INPUT POWER CONNECTOR

CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
INPUT POWER CONNECTOR SHORTS. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. CREW CAN ALSO PERFORM AN IN-FLIGHT REPAIR ON BROKEN INPUT CONNECTOR. CREW ACTIONS CAN THEREBY REDUCE HARDWARE CRITICALITY ONE LEVEL TO "3". BOX SUPPLIES POWER FOR VARIOUS CONTINGENCY SITUATIONS THAT COULD CAUSE LOSS OF LIFE AND VEHICLE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87 C-198
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4301

ITEM: IFM BREAKOUT BOX INPUT POWER CONNECTOR
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) INPUT POWER CONNECTOR

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LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
INPUT POWER CONNECTOR HAS AN OPEN CIRCUIT. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. CREW CAN ALSO PERFORM AN IN-FLIGHT REPAIR ON BROKEN INPUT CONNECTION. CREW ACTIONS CAN THEREBY REDUCE HARDWARE CRITICALITY ONE LEVEL TO "3". BREAKOUT BOX SUPPLIES POWER FOR VARIOUS CONTINGENCY SITUATIONS THAT COULD CAUSE LOSS OF LIFE AND VEHICLE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87 C-199
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4302
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: IFM BREAKOUT BOX AUXILIARY ON/OFF SWITCH (SW1)
FAILURE MODE: SHORTED

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) AUXILIARY ON/OFF SWITCH (SW1)
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: CONTAMINATION, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
SW1 SHORTS. TWO BREAKOUT BOXES FLOWN ON EACH FLIGHT. SWITCH ONLY PROVIDES POWER TO OUTPUT POWER CONNECTOR. OUTPUT CONNECTOR IS INTENDED TO BE USED AS POWER SOURCE FOR SECOND IFM BREAKOUT BOX USE. CURRENT IFM PROCEDURES NO LONGER REQUIRE USE OF 2 BREAKOUT BOXES SIMULTANEOUSLY.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87 C-200
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4303

ITEM: IFM BREAKOUT BOX AUXILIARY ON/OFF SWITCH (SW1)
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) AUXILIARY ON/OFF SWITCH (SW1)

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
SW1 HAS AN OPEN CIRCUIT. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. SWITCH ONLY PROVIDES POWER TO OUTPUT POWER CONNECTOR. OUTPUT CONNECTOR IS INTENDED TO BE USED AS POWER SOURCE FOR SECOND IFM BREAKOUT BOX USE. CURRENT IFM PROCEDURES NO LONGER REQUIRE USE OF 2 BREAKOUT BOXES SIMULTANEOUSLY.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4304

ITEM: IFM BREAKOUT BOX OUTPUT POWER CONNECTOR
FAILURE MODE: SHORTED

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREACKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) OUTPUT POWER CONNECTOR
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CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
OUTPUT POWER CONNECTOR SHORTS. TWO BREAKOUT BOXES FLOWN ON EACH FLIGHT. OUTPUT CONNECTOR IS INTENDED TO BE USED AS POWER SOURCE FOR SECOND IFM BREAKOUT BOX USE. CURRENT IFM PROCEDURES NO LONGER REQUIRE USE OF 2 BREAKOUT BOXES SIMULTANEOUSLY.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87  C-202
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87

SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4305

ITEM: IFM BREAKOUT BOX OUTPUT POWER CONNECTOR
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) OUTPUT POWER CONNECTOR
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
OUTPUT POWER CONNECTOR HAS OPEN CIRCUIT. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. OUTPUT CONNECTOR IS INTENDED TO BE USED AS POWER SOURCE FOR SECOND IFM BREAKOUT BOX USE. CURRENT IFM PROCEDURES NO LONGER REQUIRE USE OF 2 BREAKOUT BOXES SIMULTANEOUSLY.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87 C-203
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4306

ITEM: IFM BREAKOUT BOX FUSE
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: L. GRAHAM    SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) FUSE
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CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
FUSE OPENS. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. SPARE FUSE CARRIED IN PIN KIT. CREW REPAIRS CAN REDUCE HARDWARE CRITICALITY TO "3". BOX SUPPLIES POWER FOR VARIOUS CONTINGENCY SITUATIONS THAT COULD CAUSE LOSS OF LIFE AND VEHICLE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87    C-204
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4307

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

ITEM: IFM BREAKOUT BOX FUSE HOLDER
FAILURE MODE: INADVERTENT OPERATION, CAP COMES LOOSE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) FUSE HOLDER
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LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
FUSE HOLDER CAP COMES LOOSE AND FUSE LEAVES BOX DURING CONTINGENCY OPERATION. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. WORST CASE WOULD PRECLUDE REATTACHMENT OF FUSE HOLDER CAP. CREW CAN USE SECOND BREAKOUT BOX OR TAPE BROKEN CAP INTO POSITION. CREW ACTION CAN REDUCE HARDWARE CRITICALITY BY ONE TO A "3". LOSS OF FUSE COULD RESULT IN LOSS OF BREAKOUT BOX FUNCTION. LOSS OF ALL REDUNDANCY COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87 C-205
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87          HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT            FLIGHT: 3/3
MDAC ID: 4308              ABORT: /NA

ITEM: IFM BREAKOUT BOX AWG OUTPUT SELECT SWITCH (SW3)
FAILURE MODE: SHORTED

LEAD ANALYST: L. GRAHAM       SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) AWG OUTPUT SELECT SWITCH (SW3)
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: CONTAMINATION, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
SW3 SHORTS. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. SWITCH SHORTS (28 V) TO ONE OF FOUR SETS OF AWG PIN HOLES. CREW IS UNABLE TO TURN SWITCH OFF OR SET TO ANOTHER PIN HOLE SET. CREW CAN OVERCOME FUNCTION OF BROKEN SWITCH BY USING ORBITER-SIDE POWER OUTLET SWITCH.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX electrical schematic

REPORT DATE 10/23/87  C-206
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4309
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/1R
ABORT: /NA

ITEM: IFM BREAKOUT BOX AWG OUTPUT SELECT SWITCH (SW3)
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) AWG OUTPUT SELECT SWITCH (SW3)
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LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
SW3 HAS OPEN CIRCUIT OR SHORT CIRCUIT TO "OFF" SETTING. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. CREW CAN USE VARIABLE POWER CIRCUIT (LIGHTING) SET TO 28 V, TO OVERCOME LOSS OF SWITCH FUNCTION. CREW CAN ALSO USE SECOND BREAKOUT BOX AS REPLACEMENT. AS A LAST RESORT CREW CAN PERFORM IFM ON BREAKOUT BOX. LOSS OF ALL REDUNDANCY COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4310

ITEM: IFM BREAKOUT BOX PIN CONNECTION OUTLET
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) PIN CONNECTION OUTLET
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LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: CONTAMINATION, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
12 HOLE PIN CONNECTION OUTLET HAS NO ELECTRICAL OUTPUT DUE TO CONTAMINATED (PLUGGED) HOLES OR BROKEN CONNECTION. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. CREW COULD USE OTHER PIN CONNECTION OUTLET ON SAME BOX (ASSUMING 28V NEEDED) OR USE SECOND BREAKOUT BOX. CREW CAN ALSO PERFORM IFM ON BREAKOUT BOX TO REPAIR PIN CONNECTION OUTLET. LOSS OF ALL REDUNDANCY COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87 C-208
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4311

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

ITEM: IFM BREAKOUT BOX PIN/WIRE HOLDING BRACKET
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) PIN/WIRE HOLDING BRACKET
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
PIN/WIRE HOLDING BRACKET BINDS/JAMS. UNABLE TO BE ADJUSTED TO HOLD PIN/WIRE STRUCTURE IN PLACE IN THE PIN CONNECTION OUTLET. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. NOT REALLY NEEDED SINCE PIN AND HOLE HAVE A POSITIVE SNUG FIT. CREW CAN ALSO USE TAPE TO HOLD PIN IN PLACE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/1R
MDAC ID: 4312  ABORT: /NA

ITEM: IFM BREAKOUT BOX VARIABLE VOLTAGE POWER SUPPLY
FAILURE MODE: SHORTED

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) VARIABLE VOLTAGE POWER SUPPLY
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LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: CONTAMINATION, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
VARIABLE VOLTAGE POWER SUPPLY SHORTS. TWO IFM BOXES FLOWN ON EACH FLIGHT. CREW CAN USE SECOND BREAKOUT BOX FOR REPLACEMENT OF VARIABLE VOLTAGE POWER SUPPLY FUNCTION. CREW CAN USE PIN KIT AND VARIABLE LIGHTING RHEOSTAT AS ANOTHER REPLACEMENT. THIS CREW ACTION REDUCES HARDWARE CRITICALITY BY ONE TO A "3". LOSS OF ALL REDUNDANCY COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE  10/23/87 C-210
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4313

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

ITEM: IFM BREAKOUT BOX VARIABLE VOLTAGE POWER SUPPLY
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) VARIABLE VOLTAGE POWER SUPPLY

CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
VARIABLE VOLTAGE POWER SUPPLY HAS AN OPEN CIRCUIT. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. CREW CAN USE SECOND BREAKOUT BOX FOR REPLACEMENT OF VARIABLE VOLTAGE POWER SUPPLY FUNCTION. CREW CAN USE PIN KIT AND VARIABLE LIGHTING RHEOSTAT AS REPLACEMENT. THIS CREW ACTION REDUCES HARDWARE CRITICALITY BY ONE TO A "3". LOSS OF ALL REDUNDANCY COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87  C-211
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT    FLIGHT: 3/3
MDAC ID: 4314     ABORT: /NA

ITEM: IFM BREAKOUT BOX 28 V/VARIABLE SWITCH (SW2)
FAILURE MODE: SHORTED

LEAD ANALYST: L. GRAHAM     SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) 28 V/VARIABLE SWITCH (SW2)
4)
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: CONTAMINATION, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
SW2 SHORTS. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. UNABLE TO OPEN SWITCH AND TURN POWER OFF. CREW CAN USE ORBITER-SIDE POWER OUTLET SWITCH TO OVERCOME LOSS OF SWITCH FUNCTION.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87 C-212
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4315

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

ITEM: IFM BREAKOUT BOX 28 V/VARIABLE SWITCH (SW2)
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) 28 V/VARIABLE SWITCH (SW2)
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LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
SW2 HAS AN OPEN CIRCUIT. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. CREW CAN USE SECOND BREAKOUT BOX AS REPLACEMENT OR PERFORM IFM TO REPAIR BROKEN SWITCH. CREW CAN ALSO USE PIN KIT AND VARIABLE LIGHTING RHEOSTAT AS REPLACEMENT. THIS CREW ACTION REDUCES CRITICALITY BY ONE TO A "3". LOSS OF ALL REDUNDANCY COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87  C-213
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 4316

ITEM: IFM BREAKOUT BOX AWG OUTPUT SELECT SWITCH (SW4)
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) AWG OUTPUT SELECT SWITCH (SW4)

CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: 10134-20001

CAUSES: PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
SW4 HAS AN OPEN CIRCUIT OR SHORTS IN "OFF" POSITION. TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. CREW CAN USE SECOND BREAKOUT BOX OR PERFORM IFM ON BROKEN BREAKOUT BOX. CREW CAN ALSO USE PIN KIT AND VARIABLE LIGHTING RHEOSTAT FOR REPLACEMENT FUNCTION. CREW ACTIONS REDUCE HARDWARE CRITICALITY BY ONE TO "3". LOSS OF ALL REDUNDANCY COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87 C-214
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/04/87  HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/3  ABORT: /NA
SUBSYSTEM: CREW EQUIPMENT  MDAC ID: 4317

ITEM: IFM BREAKOUT BOX AWG OUTPUT SELECT SWITCH (SW4)
FAILURE MODE: SHORTED

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) IFM BREAKOUT BOX
3) OUTPUT SELECT SWITCH (SW4)

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

LOCATION: CREW MODULE  PART NUMBER: 10134-20001

CAUSES: CONTAMINATION, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
TWO IFM BREAKOUT BOXES FLOWN ON EACH FLIGHT. SWITCH SHORTS TO ONE OF FOUR AWG PIN SETS. UNABLE TO SWITCH TO DIFFERENT AWG SETTING. CREW CAN USE SW2 OR ORBITER-SIDE POWER OUTLET SWITCH TO TURN POWER OFF. CREW CAN USE SECOND BREAKOUT BOX OR PIN KIT TO PROVIDE REPLACEMENT FUNCTION FOR DIFFERENT AWG SETTING.

REFERENCES: 10134-20001, JSC-17321, IFM BREAKOUT BOX ELECTRICAL SCHEMATIC

REPORT DATE 10/23/87  C-215
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5101

ITEM: GALLEY WATER HEATER CIRCUIT BREAKER
FAILURE MODE: FAILS OPEN

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) WATER HEATER
4) CIRCUIT BREAKER
5) 
6) 
7) 
8) 
9) 

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

LOCATION: PANEL ML86B
PART NUMBER: CB24

CAUSES: OVERLOAD

EFFECTS/RATIONALE:
FAILING THE WATER HEATER CIRCUIT BREAKER OPEN WILL ELIMINATE FIVE OF THE SIX WATER HEATERS. ONE HEATER IS NOT SUFFICIENT TO HEAT THE WATER TO REQUIRED TEMPERATURE. WORST CASE WOULD MEAN ALTERNATE MEANS OF HEATING BEVERAGES WOULD HAVE TO BE FOUND AND THAT IT MAY TAKE LONGER TO HEAT OTHER FOOD IN THE OVEN (ASSUMING REHYDRATION WITH AMBIENT WATER).

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-216
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5102

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

ITEM: GALLEY DC POWER BUS B SWITCH
FAILURE MODE: FAILS "OFF"

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) DC POWER BUS B SWITCH
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
FAILING THE GALLEY POWER BUS SWITCH "OFF" WILL RESULT IN THE LOSS OF FIVE OF THE SIX WATER HEATERS. ONE HEATER IS NOT SUFFICIENT TO HEAT THE WATER TO THE REQUIRED TEMPERATURES. WORST CASE WOULD REQUIRE ALTERNATE MEANS OF HEATING BEVERAGES. ALSO, HEATING FOOD IN THE OVEN MIGHT TAKE LONGER DUE TO REHYDRATION WITH AMBIENT AS OPPOSED TO HEATED WATER.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-217
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87

SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5103

HIGHEST CRITICALITY

ITEM: GALLEY DC POWER BUS B SWITCH
FAILURE MODE: FAILS "ON"

LEAD ANALYST: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) DC POWER BUS B SWITCH
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
FAILING THE HEATER SWITCH "ON" MEANS THAT WATER WILL ALWAYS BE HEATING. ASSUMING THAT THE THERMOSTATS AND RECIRCULATION PUMP CONTINUE TO WORK PROPERLY, THE FAILURE SHOULD HAVE NO EFFECT ON THE OPERATION OF THE GALLEY.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-218
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5104

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 3/3
ABORT: /NA

ITEM: GALLEY DC POWER BUS B SWITCH
FAILURE MODE: PARTIAL OUTPUT

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) DC POWER BUS B SWITCH

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
CONTAMINATION OF THE SWITCH MEANS THAT A SUBSET OF THE WATER HEATERS WILL ALWAYS BE ON OR ALWAYS OFF (DEPENDING UPON THE CONTAMINATION PATTERN AND SWITCH POSITION). SINCE TOTAL FAILURE OF THE SWITCH DOES NOT PRESENT CRITICAL FAILURES, A PARTIAL FAILURE OF THE SWITCH IS ALSO NOT CRITICAL.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87   C-219
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5105

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

ITEM: POTABLE WATER HEATER TELEMETRY
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) WATER HEATER STATUS

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

LOCATION: GALLEY
PART NUMBER: V62S0706E

CAUSES: ELECTROMAGNETIC FIELDS

EFFECTS/RATIONALE:
ERRONEOUS OUTPUT ON THE TELEMETRY MEANS AN INCORRECT STATUS WILL BE REFLECTED. IT HAS NO AFFECT ON ACTUAL OPERATIONS.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-220
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5106

ITEM: RECIRCULATION PUMP
FAILURE MODE: FAILS TO START

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) HOT WATER SYSTEM
4) RECIRCULATION PUMP

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

LOCATION: GALLEY
PART NUMBER: P1

CAUSES: CONTAMINATION, LOSS OF INPUT

EFFECTS/RATIONALE:
THE RECIRCULATION PUMP IS A PART OF THE WATER HEATING SYSTEM
MIXING HOT AND COLD WATER TO ENSURE EVEN AND EFFICIENT HEATING.
FAILURE OF THE PUMP TO START MEANS THE WATER WILL NOT BE HEATED
AND ALTERNATE METHODS OF HEATING BEVERAGES/REHYDRATABLE FOOD
MUST BE FOUND. ALSO, THERE MAY NOT BE ENOUGH PRESSURE TO
DISPENSE HOT WATER TO THE REHYDRATION STATION.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE: 10/23/87
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87  
SUBSYSTEM: CREW EQUIPMENT  
MDAC ID: 5107  

ITEM: RECURRENT PUMP  
FAILURE MODE: FAILS TO STOP  

LEAD ANALYST: S.K. SINCLAIR  
SUBSYS LEAD: S.K. SINCLAIR  

BREAKDOWN HIERARCHY:  
1) CREW EQUIPMENT  
2) GALLEY  
3) HOT WATER SYSTEM  
4) RECURRENT PUMP  

CRITICALITIES  

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

LOCATION: GALLEY  
PART NUMBER: P1

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:  
THE RECURRENT PUMP IS DESIGNED TO OPERATE WHEN THE WATER TEMPERATURE IS BETWEEN 145 DEGREES AND 165 DEGREES F, AND AS HOT WATER IS DISPENSED. THE PUMP REMAINS RUNNING AT OTHER THAN DESIRED TEMPERATURES, AN INCREASE IN HEATER DUTY CYCLES COULD OCCUR.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87  
C-222
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5108

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

ITEM: RECIRCULATION THERMOSTAT
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) HOT WATER SYSTEM
4) RECIRCULATION PUMP
5) THERMOSTAT
6) 
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8) 
9) 

CRITICALITIES

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REdundancy SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
FAILURE OF THE RECIRCULATION PUMP THERMOSTAT TO OPEN WILL CAUSE THE RECIRCULATION PUMP TO CONTINUE RUNNING AT HIGHER THAN DESIRED TEMPERATURE. THIS WILL RESULT IN INEFFECTIVE HEATING OF THE WATER AND INCREASED HEATER DUTY CYCLES.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-223
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5109

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

ITEM: RECIRCULATION THERMOSTAT
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) HOT WATER SYSTEM
4) RECIRCULATION PUMP
5) THERMOSTAT
6)
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8)
9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC ABORT HDW/FUNC
Prelaunch: /NA RTLS: /NA
Liftoff: /NA TAL: /NA
Onorbit: 3/3 AOA: /NA
Deorbit: /NA ATO: /NA
Landing/Safing: /NA

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL, LOSS OF INPUT

EFFECTS/RATIONALE:
FAILURE OF THE RECIRCULATION PUMP THERMOSTAT TO CLOSE MEANS THE PUMP WILL NOT TURN ON TO RECIRCULATE WATER. THIS MEANS THE WATER HEATING CANNOT BE GUARANTEED AND ALTERNATE METHODS MUST BE USED.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-224
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 5110  ABORT: /NA

ITEM: HOT WATER TANK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) HOT WATER SYSTEM
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CRITICALITIES

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LOCATION: GALLEY
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
STRUCTURAL FAILURE OF THE HOT WATER TANK WILL RESULT IN FREE WATER IN THE CABIN AND ONLY CHILLED WATER REMAINING THRU THE GALLEY. WATER CAN BE OBTAINED THRU THE EMERGENCY WATER DISPENSER ASSEMBLY. THE MISSION CAN BE AFFECTED IF REDUNDANT MEANS OF CONTAINING WATER (i.e. SHUT OFF VALVES) FAIL. WITH THE ADDITION OF THE ACCUMULATOR THIS FAILURE IS UNLIKELY.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87  C-225
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5111

ITEM: WATER TANK HEATERS
FAILURE MODE: FAIL OFF

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) HOT WATER SYSTEM
4) HEATER

CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: PIECE-PART FAILURE, LOSS OF INPUT

EFFECTS/RATIONALE:
LOSS OF THE WATER TANK HEATERS MEANS THAT ALTERNATE MEANS OF HEATING BEVERAGES/REHYDRATABLE FOOD MUST BE FOUND.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-226
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5112

ITEM: WATER TANK HEATERS
FAILURE MODE: FAIL ON

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) HOT WATER SYSTEM
4) HEATER
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CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: ERRONEOUS INPUT, LOSS OF INPUT

EFFECTS/RATIONALE:
FAILING ALL THE WATER TANK HEATERS "ON" WILL RESULT IN CONTINUOUS HEAT BEING APPLIED TO THE WATER/TANK AND POSSIBLE OVERPRESSURIZATION OF THE TANK. IF JUST ONE HEATER FAILS "ON", THE REQUIRED CYCLING OF THE HEATERS CAN BE ACCOMPLISHED BY THE REMAINING HEATERS. THE ADDITION OF THE ACCUMULATOR WILL PREVENT DAMAGE IN THE CASE OF OVERPRESSURIZATION.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87  C-227
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87

SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5113

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: WATER TANK HEATER THERMOSTAT
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) HOT WATER SYSTEM
4) HEATER
5) THERMOSTAT

CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
FAILURE OF THE THERMOSTAT TO OPEN WILL HAVE THE SAME EFFECT AS A HEATER FAILING ON. EACH HEATER HAS TWO REDUNDANT THERMOSTATS SO THAT BOTH THERMOSTATS MUST FAIL TO OPEN FOR THE HEATER TO REMAIN ON. A SERIES OF TWELVE THERMOSTATS MUST FAIL TO HAVE ALL SIX HEATERS REMAINING ON.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-228
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5114

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

ITEM: WATER TANK HEATER THERMOSTAT
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) HOT WATER SYSTEM
4) HEATER
5) THERMOSTAT
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CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
A THERMOSTAT FAILING TO CLOSE WILL HAVE THE SAME EFFECT AS A HEATER FAILING OFF.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-229
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

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**BREAKDOWN HIERARCHY:**
1) CREW EQUIPMENT
2) GALLEY
3) HOT WATER TEMPERATURE GAUGE
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**CRITICALITIES**

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

**LOCATION:**  
GALLEY

**PART NUMBER:**

**CAUSES:**  
CONTAMINATION

**EFFECTS/RATIONALE:**

ERRONEOUS DISPLAY OF THE WATER TEMPERATURE MEANS THE CREW WILL THINK THE HOT WATER IS A DIFFERENT TEMPERATURE THAN IT ACTUALLY IS. ALL OPERATIONS WILL CONTINUE AND THE ACTUAL WATER TEMPERATURE CAN BE DETERMINED BY SAMPLING THE WATER OUTLET.

**REFERENCES:**  
JSC-12770, SSSH 6.6

**REPORT DATE**  
10/23/87  
C-230
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5116

ITEM: GALLEY OVEN CIRCUIT BREAKER
FAILURE MODE: FAILS OPEN

LEAD ANALYST: S.K. SINCLAIR

SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) CIRCUIT BREAKER

CRITICALITIES

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

LOCATION: PANEL ML86B
PART NUMBER: CB20

CAUSES:

EFFECTS/RATIONALE:
The GALLEY OVEN CIRCUIT BREAKER PROVIDES POWER TO THE OVEN HEATERS AND TO THE GALLEY CONTROL ELECTRONICS. ALL FUNCTIONS OF THE GALLEY ARE LOST DUE TO THE ELECTRONICS FAILURE. WATER WILL STILL BE AVAILABLE THRU THE CONTINGENCY WATER DISPENSER.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5117

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

ITEM: GALLEY DC POWER BUS A SWITCH
FAILURE MODE: FAILS "OFF"

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) DC POWER BUS A SWITCH

CRITICALITIES

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RTLS: /NA
TAL: /NA
AOA: /NA
ATO: /NA

RELANDING/SAFING: /NA

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
JAMMING THE GALLEY POWER BUS IN THE "OFF" POSITION WILL PREVENT POWER FROM REACHING THE OVEN HEATERS AND THE GALLEY CONTROL ELECTRONICS. THE CONTROL ELECTRONICS ELIMINATE ALL GALLEY FUNCTIONS - LEAVING WATER TO BE OBTAINED THROUGH THE CWDA.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-232
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/04/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5118

ITEM: GALLEY DC POWER BUS A SWITCH
FAILURE MODE: FAILS "ON"

LEAD ANALYST: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) DC POWER BUS A SWITCH
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY

PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
FAILING THE SWITCH "ON" SIMPLY MEANS POWER WILL CONTINUOUSLY BE APPLIED TO THE OVEN HEATERS AND CONTROL. THE THERMOSTATS SHOULD CONTINUE TO CYCLE TO MAINTAIN TEMPERATURE CONTROL.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-233
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5119  ABORT: /NA

ITEM: GALLEY DC POWER BUS A SWITCH
FAILURE MODE: PARTIAL OUTPUT

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) DC POWER BUS A SWITCH
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9) CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
SINCE THERE ARE 3 SETS OF CONTACTS, THIS FAILURE COULD HAVE VARYING RESULTS. IT COULD MEAN LOSS OF POWER TO:
1) ONE OF SIX HEATERS IN THE WATER HEATER WHICH WOULD NOT ADVERSELY EFFECT NORMAL OPERATIONS, HOWEVER WOULD INDICATE LOSS OF POWER TO THE GALLEY VIA TELEMETRY,
2) TO THE HEATER COILS, WHICH WOULD ELIMINATE THE USE OF THE OVEN,
3) TO THE CONTROL ELECTRONICS WHICH WOULD ELIMINATE USE OF THE ENTIRE GALLEY. WATER WOULD STILL BE AVAILABLE TO THE CREW.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87  C-234
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5120

ITEM: FOOD OVEN TELEMETRY
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) FOOD OVEN STATUS
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CRITICALITIES

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

LOCATION:
PART NUMBER: V62S0702E

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
WILL GIVE AN INCORRECT INDICATION OF WHETHER THE OVEN IS "ON" BUT WILL HAVE NO EFFECT ON THE ACTUAL OPERATION.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87  C-235
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5121

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

ITEM: GALLEY FAN CIRCUIT BREAKERS
FAILURE MODE: FAIL OPEN

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) FAN
4) CIRCUIT BREAKERS
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CRITICALITIES

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

LOCATION: PANEL MA73C
PART NUMBER: PHASE A - CB26; PHASE B - CB27; PHASE C - CB28

CAUSES: OVERLOAD

EFFECTS/RATIONALE:
THIS FAILURE WOULD RESULT IN LOSS OF THE FANS WHICH CIRCULATE AIR
IN THE OVEN FOR EVEN HEATING. OVEN PERFORMANCE WOULD BE DEGRADED
AND COULD EFFECTIVELY ELIMINATE THE USE OF THE OVEN FOR
CONVECTIVE HEATING.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-236
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
HIGHEST CRITICALITY: FLIGHT: 3/3
SUBSYSTEM: CREW EQUIPMENT ABORT: /NA
MDAC ID: 5122

ITEM: GALLEY OVEN FAN SWITCH
FAILURE MODE: FAILS "ON"

LEAD ANALYST: B. RICHARD SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN FAN SWITCH

CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
THIS FAILURE WOULD RESULT IN LOSS OF THE FANS WHICH CIRCULATE AIR IN THE OVEN FOR EVEN HEATING. OVEN PERFORMANCE WOULD BE DEGRADED. THIS FAILURE COULD EFFECTIVELY ELIMINATE THE USE OF THE OVEN FOR CONVECTION HEATING.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-237
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5123

ITEM: GALLEY OVEN FAN SWITCH
FAILURE MODE: FAILS "ON"

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN FAN SWITCH
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
THIS FAILURE WOULD RESULT IN CONTINUOUS OPERATION OF THE FANS.
THIS WOULD HAVE NO ADVERSE EFFECT ON THE OPERATION OF THE OVEN.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-238
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5124

ITEM: OVEN FAN - MOTOR
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) FAN MOTOR
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
LOSS OF ONE OF 3 FANS WOULD HAVE MINIMAL EFFECT ON THE PERFORMANCE OF THE OVEN.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87  C-239
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5125

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

ITEM: OVEN FAN - MOTOR
FAILURE MODE: OPEN (ELECTRICAL)

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) FAN MOTOR
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY OVEN

CAUSES: MECHANICAL SHOCK

EFFECTS/RATIONALE:
THIS WOULD RESULT IN LOSS OF ONE OF 3 FANS. THIS WOULD HAVE A MINIMAL EFFECT ON THE PERFORMANCE OF THE OVEN.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87  C-240
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5126  ABORT: /NA

ITEM: OVEN FAN - MOTOR
FAILURE MODE: SHORTED

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) FAN MOTOR
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:
CAUSES: CONTAMINATION, MISHANDLING/ABUSE
EFFECTS/RATIONALE:
THIS WILL RESULT IN IMMEDIATE LOSS OF 1 OF 3 OVEN FANS, AND WILL PROBABLY TRIP THE BREAKERS WHICH WILL SHUT DOWN THE OTHER 2 FANS RESULTING IN LOSS OF CONVECTION HEATING IN THE OVEN.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87  C-241
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5127  ABORT: /NA

ITEM: OVEN FAN  HDW/FUNC
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) FAN
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
LOSS OF ONE OF 3 FANS WILL HAVE MINIMAL EFFECT ON THE PERFORMANCE OF THE OVEN.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87  C-242
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5128

ITEM: OVEN THERMOSTAT
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) THERMOSTAT
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THERE ARE REDUNDANT THERMOSTATS IN EACH OF THE 4 HEATING ELEMENTS IN THE OVEN. FAILURE OF ONE WILL NOT EFFECT THE PERFORMANCE OF THE OVEN.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-243
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5129

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

ITEM: OVEN THERMOSTAT
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) THERMOSTAT
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REdundancy Screens: A [ ] B [ ] C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL, LOSS OF INPUT

EFFECTS/RATIONALE:
THIS FAILURE WILL RESULT IN LOSS OF 1 OF 4 HEATING ELEMENTS IN THE OVEN. THIS WILL INCREASE THE DUTY CYCLES OF THE OTHER 3 ELEMENTS AND COULD RESULT IN MORE TIME REQUIRED TO HEAT FOOD.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-244
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT             FLIGHT: 3/3
MDAC ID: 5130                             ABORT: /NA

ITEM: OVEN HEATER
FAILURE MODE: FAILS OFF

LEAD ANALYST: B. RICHARD              SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) HEATER
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REDUNDANCY SCREENS: A [ ]   B [ ]   C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
LOSS OF A SINGLE HEATING ELEMENT WILL RESULT IN LESS EFFICIENT OVEN PERFORMANCE AND INCREASED DUTY CYCLE OF OTHER 3 ELEMENTS. LOSS OF ALL HEATING ELEMENTS ELIMINATES USE OF THE OVEN FOR HEATING FOOD.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87          C-245
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5131  ABORT: 3/3

ITEM: OVEN DOOR LAUNCH/ENTRY RESTRAINING STRAP
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN DOOR
4) LAUNCH/ENTRY RESTRAINING STRAP
5)
6)
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CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE OF THE LAUNCH/ENTRY RESTRAINING STRAP CAN RESULT IN THE OVEN DOOR SWINGING OPEN DURING LAUNCH AND POSSIBLE DAMAGE TO THE DOOR. IF THE DAMAGE IS SEVERE ENOUGH, IT WILL ADVERSELY EFFECT THE PERFORMANCE OF THE OVEN. THE CREW CAN SECURE THE DOOR FOR REENTRY WITH TAPE.

REFERENCES: JSC-12770

REPORT DATE 10/23/87  C-246
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5132

ITEM: OVEN DOOR
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN DOOR
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
EXTENT OF DAMAGE WILL DETERMINE THE EFFECT ON THE PERFORMANCE OF THE OVEN. IF THE DOOR CANNOT BE USED AT ALL IT WILL ELIMINATE THE USE OF THE OVEN FOR HEATING FOOD.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-247
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5133

HIGHEST CRITICALITY
HDW/FUNC

FLIGHT: 3/3
ABORT: /NA

ITEM: OVEN DOOR
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN DOOR
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
IF THE DOOR CANNOT BE CLOSED IT WILL ELIMINATE USE OF THE OVEN FOR HEATING FOOD.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87 C-248
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5134

ITEM: OVEN DOOR LATCH
FAILURE MODE: FAILS TO RELEASE

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN DOOR
4) LATCH
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REDUNDANCY SCREENS: A[ ] B[ ] C[ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HAND TOOLS ON-BOARD CAN BE USED TO FORCE THE SPRING LATCHES OPEN IF THE LATCH PUSH MECHANISM FAILS.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-249
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5135

ITEM: OVEN DOOR LATCH
FAILURE MODE: FAILS TO LATCH

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN DOOR
4) LATCH
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY OVEN

CAUSES: PIECE-PART FAILURE

EFFECTS/RATIONALE:
DOOR CAN BE TAPED SHUT IF LATCH WILL NOT WORK.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-250
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5136

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

ITEM: OVEN DOOR TRACK
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN DOOR
4) DOOR TRACK
5) 6) 7) 8) 9)

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

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
IF DOOR CANNOT BE STORED IN TRACK IT WILL HAVE LITTLE EFFECT AS LONG AS THE DOOR CAN BE OPENED. IF FAILURE PREVENTS THE DOOR FROM BEING USED TO CLOSE THE OVEN IT WILL ELIMINATE THE USE OF THE OVEN.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-251
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5137

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: OVEN DOOR TRACK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN DOOR
4) DOOR TRACK
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
THE TRACK IS NOT NECESSARY TO THE OPERATION OF THE OVEN, HOWEVER IF IT PREVENTS THE DOOR FROM BEING USED TO CLOSE THE OVEN, IT WILL ELIMINATE THE USE OF THE OVEN.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-252
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5138

ITEM: OVEN GASKET
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) GASKET
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
THIS FAILURE WILL PREVENT THE OVEN DOOR FROM SEALING AND REDUCE THE PERFORMANCE OF THE OVEN. IT WILL TAKE LONGER TO HEAT FOOD.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-253
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5139

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

ITEM: OVEN SHELF ASSEMBLY - UPPER RACK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) UPPER RACK SHELF ASSEMBLY

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

LOCATION: GALLEY OVEN

PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
DAMAGE TO THIS RACK CAN EFFECT THE PLACEMENT OF FOOD PACKETS IN THE OVEN AND RESTRICT CIRCULATION. THIS COULD CAUSE UNEVEN HEATING OF THE FOOD.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-254
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5140  ABORT: /NA

ITEM: LOWER SHELF ASSEMBLY
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) LOWER SHELF ASSEMBLY
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
DAMAGE TO THE SHELF CAN EFFECT PLACEMENT OF PACKETS IN THE OVEN
AND RESTRICT CIRCULATION. THIS CAN CAUSE UNEVEN HEATING OF THE FOOD.

REFERENCES: JSC-12770

REPORT DATE 10/23/87  C-255
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5141

ITEM: LOWER TRACKS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) LOWER TRACKS
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
DAMAGE TO THE RACK CAN EFFECT PLACEMENT OF THE FOOD PACKETS IN THE OVEN AND RESTRICT CIRCULATION. THIS CAN CAUSE UNEVEN HEATING OF THE FOOD.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-256
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5142

ITEM: OVEN SCREEN
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) SCREEN
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LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: CONTAMINATION, PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
DEBRIS FILTER PROTECTS THE REST OF OVEN IN CASE OF PACKAGE BREAKAGE. RESTRICTED CIRCULATION WILL CAUSE UNEVEN HEATING OF FOOD. THIS PROBLEM CAN BE FIXED BY CLEANING THE SCREEN.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-257
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5143

ITEM: OVEN SCREEN
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) SCREEN
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CRITICALITIES
FLIGHT PHASE HDW/FUNC ABORT HDW/FUNC
PRELAUNCH: /NA RTLS: /NA
LIFTOFF: /NA TAL: /NA
ONORBIT: 3/3 AOA: /NA
DEORBIT: /NA ATO: /NA
LANDING/SAFING: /NA

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

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
SEVERELY BENT SCREEN COULD IMPINGE ON ONE OR MORE FANS WHICH WOULD LIMIT AIR CIRCULATION IN THE OVEN. A LARGE HOLE IN THE SCREEN WOULD PERMIT ANY CONTAMINANTS TO CIRCULATE IN THE OVEN AND POSSIBLY DAMAGE THE FANS.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-258
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5144

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

ITEM: SPRING LOADED PLATE
FAILURE MODE: FAILS MID-TRAVEL

LEAD ANALYST: B. RICHARD SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) SPRING LOADED PLATE(S)
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CRITICALITIES

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

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE OF SPRING LOADED PLATE WOULD MEAN PARTIAL LOSS OF CONDUCTIVE HEATING FOR HEATING FOOD IN THE OVEN. THERE ARE 4 SPRING LOADED PLATES. REHYDRATED FOODS COULD STILL BE HEATED WITH CONVECTIVE HEAT IN THE LOWER RACK.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-259
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5145

ITEM: OVEN SPRING CLIP
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) SPRING PLATE
5) RETAINING CLIP

CRITICALITIES

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

LOCATION: GALLEY OVEN

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
FAILURE OF THE RETAINING CLIP WILL HAVE NO ADVERSE EFFECT ON THE PERFORMANCE OF THE OVEN, EVEN THOUGH IT MIGHT MAKE IT MORE DIFFICULT FOR THE CREW TO LOAD FOOD POUCHES ONTO THE SPRING PLATES.

REFERENCES: JSC-12770

REPORT DATE 10/23/87  C-260
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5146  ABORT: /NA

ITEM: OVEN FINNED PLATE HEAT SINK
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) OVEN
4) FINNED PLATE HEAT SINK
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY OVEN
PART NUMBER:

CAUSES: MECHANICAL SHOCK, PIECE-PART FAILURE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
BLOCKS AIR FLOW - CONVECTIVE HEATING OF FOOD IN OVEN IS REDUCED - IT WILL TAKE LONGER TO HEAT FOOD.

REFERENCES: JSC-12770

REPORT DATE 10/23/87 C-261
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5147  ABORT: /NA

ITEM: GALLEY CONTROL ELECTRONICS
FAILURE MODE: ERRONEOUS OUTPUT

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) RHS
4) CONTROL ELECTRONICS
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER:  

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
COULD RESULT IN INCORRECT VOLUME OF WATER BEING DISPENSED AT
REHYDRATION STATION OR PHS; OR COMPLETE LOSS OF GALLEY WATER
SYSTEM. WATER WOULD STILL BE AVAILABLE TO CREW THRU THE
AUXILIARY PORT.

REFERENCES: JSC-12770, SSSH 6.6

REPORT DATE 10/23/87  C-262
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5148

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

ITEM: WATER QUANTITY SELECTOR SWITCH
FAILURE MODE: JAMS IN ONE POSITION

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) WATER QUANTITY SELECTOR SWITCH
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER:
CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
THIS FAILURE MEANS THAT THE CREW WILL NOT BE ABLE TO SELECT THE AMOUNT OF WATER TO BE DISPENSED, AND WILL HAVE TO SETTLE FOR THE AMOUNT INDICATED BY THE SELECTOR. THIS MAY AFFECT THE CONSISTENCY OR TASTE OF THE FOOD.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-263
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5149  ABORT: /NA

ITEM: WATER QUANTITY SELECTOR SWITCH
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) WATER QUANTITY SELECTOR SWITCH
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, LOSS OF INPUT

EFFECTS/RATIONALE:
THIS FAILURE WILL ELIMINATE AN ACCURATE MEASURE OF WATER TO THE REHYDRATION STATION FOR ADDING WATER TO FOOD PACKAGES. ALTERNATE METHODS WILL HAVE TO BE USED.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-264
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5150

ITEM: WATER QUANTITY SELECTOR SWITCH
FAILURE MODE: MULTIPLE OUTPUTS

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) WATER QUANTITY SELECTOR SWITCH

CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THIS FAILURE MEANS AN INCORRECT VOLUME OF WATER MAY BE ADDED TO FOOD WHICH WILL EFFECT ITS CONSISTENCY AND TASTE. WORST CASE - TOO MUCH WATER MAY BE ADDED TO PACKAGE RESULTING IN WATER LEAKAGE.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5151

ITEM: REHYDRATION PUMP
FAILURE MODE: FAILS "ON"

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) REHYDRATION STATION PUMP (P2)

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

LOCATION: GALLEY
PART NUMBER: P2

CAUSES: CONTAMINATION, ERRONEOUS INPUT

EFFECTS/RATIONALE:
CONTINUOUS RUNNING OF THE PUMP SHOULD NOT EFFECT THE OPERATION OF THE REHYDRATION STATION, HOWEVER IT MAY SHORTEN THE LIFE OF THE PUMP. THIS PUMP IS NOW USED TO RECIRCULATE COLD WATER BACK TO AMBIENT - IF THE COLD WATER CONTINUES TO CIRCULATE, IT COULD EFFECT THE EFFICIENCY OF THE HEATING COILS IN THE HOT WATER LOOP SINCE THEY WILL HAVE TO HEAT COLD WATER INSTEAD OF AMBIENT.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-266
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5152  ABORT: /NA

ITEM: REHYDRATION PUMP  HDW/FUNC
FAILURE MODE: FAILS "OFF"

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) REHYDRATION STATION PUMP
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER: P2

CAUSES: OVERLOAD, LOSS OF INPUT

EFFECTS/RATIONALE:
WITH THE PUMP OFF THERE MAY NOT BE ADEQUATE PRESSURE IN THE LINE TO PROPERLY REHYDRATE THE FOOD PACKAGES WITH COLD WATER. HOT WATER WILL STILL BE AVAILABLE TO REHYDRATE THE FOOD. ALSO, COLD WATER WILL NOT BE RECIRCULATED, SO THE COLD WATER LOOP WILL WARM UP.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-267
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5153  ABORT: /NA

ITEM: RHS LEVER ARM CONTROL
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) RHS
4) LEVER ARM CONTROL
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
ACTIVATES INTERLOCK SWITCH. SWITCH MUST ALSO BE OPENED BETWEEN EACH SUCCESSIVE WATER DISPENSING. IF FAILURE PREVENTS SWITCH FROM CYCLING, THE REHYDRATION STATION WILL NOT DISPENSE WATER. ALTERNATE MEANS WILL HAVE TO BE USED TO REHYDRATE FOOD.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-268
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5154  ABORT: /NA

ITEM: RHS LEVER ARM CONTROL
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) RHS
4) LEVER ARM CONTROL
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]
LOCATION: GALLEY
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
THIS FAILURE WILL PREVENT ACTIVATION OF THE INTERLOCK SWITCH AND THE HYDRATION STATION WILL NOT DISPENSE WATER. ALTERNATE MEANS WILL HAVE TO BE USED TO REHYDRATE FOOD.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-269
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY
SUBSYSTEM: CREW EQUIPMENT  HDW/FUNC
MDAC ID: 5155  FLIGHT: 3/3
ABORT: /NA

ITEM: REHYDRATION STATION SWITCH
FAILURE MODE: FAILS OPEN

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) REHYDRATION SYSTEM
4) INTERLOCK SWITCH

CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THE REHYDRATION SWITCH IS AN INTEGRAL INTERLOCK SWITCH WHICH CLOSSES WHEN THE FOOD PACKET IS CORRECTLY INSERTED. IF IT DOES NOT CYCLE TO "CLOSED" AND BACK TO "OPEN" WATER WILL NOT BE DISPENSED. ALTERNATE MEANS WILL BE REQUIRED TO REHYDRATE FOOD.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-270
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5156

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

ITEM: REHYDRATION STATION SWITCH
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EP&DC
3) REHYDRATION SYSTEM
4) INTERLOCK SWITCH
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THE REHYDRATION STATION WILL NOT DISPENSE WATER IF THIS SWITCH IS CLOSED. ALTERNATE MEANS WILL HAVE TO BE USED TO REHYDRATE FOOD.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-271
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5157

ITEM: COLD WATER FILL PUSH BUTTON SWITCH
FAILURE MODE: FAILS OPEN

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) COLD WATER FILL SYSTEM
4) PUSH BUTTON SWITCH
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, MECHANICAL SHOCK, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
IF THIS SWITCH FAILS OPEN, THE REHYDRATION STATION CANNOT DISPENSE COLD WATER. HOT WATER WILL NOT BE EFFECTED.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-272
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5158

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

ITEM: COLD WATER FILL PUSH BUTTON SWITCH
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: B. RICHARD SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) COLD WATER FILL SYSTEM
4) PUSH BUTTON SWITCH

CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
IF THIS SWITCH FAILS CLOSED, THE SOLENOID VALVE ON THE CHILLED WATER WILL REMAIN OPEN ALL THE TIME. THE CREW WILL NOT BE ABLE TO REGULATE THE WATER TEMPERATURE AT THE REHYDRATION STATION.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-273
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5159

ITEM: COLD WATER FILL SWITCH - LIGHT
FAILURE MODE: FAILS ON

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) COLD WATER FILL SYSTEM
4) INDICATOR LIGHT
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THIS FAILURE WILL HAVE NO EFFECT ON THE ACTUAL PERFORMANCE OF THE SYSTEM, HOWEVER IT WILL INCORRECTLY INDICATE THAT THE COLD WATER VALVE IS STUCK OPEN.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-274
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5160

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

ITEM: COLD WATER FILL SWITCH - LIGHT
FAILURE MODE: FAILS OFF

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EP&D&C
3) COLD WATER FILL SYSTEM
4) INDICATOR LIGHT
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: PIECE-PART

EFFECTS/RATIONALE:
THIS FAILURE WILL HAVE NO EFFECT ON THE ACTUAL PERFORMANCE OF THE SYSTEM, HOWEVER, IT WILL INCORRECTLY INDICATE THAT COLD WATER IS NOT AVAILABLE AT THE REHYDRATION STATION.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-275
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5161  ABORT: /NA

ITEM: RHS CHILLED WATER FEED SOLENOID/VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) RHS WATER SUPPLY SYSTEM
4) CHILLED WATER FEED SOLENOID/VALVE
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER: SV4

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
COLD WATER WILL NOT BE AVAILABLE AT THE REHYDRATION STATION.
THIS WILL HAVE NO EFFECT ON THE HOT WATER.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-276
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5162

ITEM: RHS CHILLED WATER FEED SOLENOID/VALVE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: B. RICHARD SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) RHS WATER SUPPLY SYSTEM
4) CHILLED WATER FEED SOLENOID/VALVE
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CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER: SV4

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THIS FAILURE MEANS THAT CHILLED WATER CANNOT BE ELIMINATED FROM THE DISPENSER AT THE REHYDRATION STATION. THE CREW CAN STILL SELECT HOT WATER, BUT WILL GET A MIXTURE.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-277
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5163

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

ITEM: RHS OUTLET SOLENOID VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: B. RICHARD      SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) RHS WATER SUPPLY
4) OUTLET SOLENOID/VALVE
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REDUNDANCY SCREENS: A [ ]   B [ ]   C [ ]

LOCATION: GALLEY
PART NUMBER: SV3

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
THIS FAILURE WILL PREVENT HOT WATER FROM BEING DISPENSED AT THE REHYDRATION STATION. COLD WATER WILL STILL BE AVAILABLE.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87    C-278
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5164

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

ITEM: RHS OUTLET SOLENOID VALVE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) RHS WATER SUPPLY
4) OUTLET SOLENOID/VALVE

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

LOCATION: GALLEY
PART NUMBER: SV3

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THIS FAILURE COULD RESULT IN SOME LEAKAGE. HOWEVER, THE WATER CAN BE SHUT OFF UPSTREAM USING THE HOT WATER SOLENOID VALVE AND THE COLD WATER SOLENOID VALVE.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-279
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5165

ITEM: RHS BYPASS SOLENOID VALVE
FAILURE MODE: Fails to open

LEAD ANALYST: B. Richard
SUBSYS LEAD: S.K. Sinclair

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) RHS WATER SUPPLY
4) BYPASS SOLENOID VALVE
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9)

REDUNDANCY SCREENS: A [ ] B [ ] C [ ]
LOCATION: GALLEY
PART NUMBER: SV2

CAUSES: Contamination

EFFECTS/RATIONALE:
Will not be able to supply water by bypassing the electronic filling mechanism. If the electronic mechanism has also failed, an alternate method of rehydrating food will be required.

REFERENCES: JSC 12770, SSSH 6.6

CRITICALITIES

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REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-280
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5166

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

ITEM: RHS BYPASS SOLENOID VALVE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) RHS WATER SUPPLY
4) BYPASS SOLENOID VALVE
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY
PART NUMBER: SV2

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
WATER WILL CONTINUOUSLY BY-PASS THE ELECTRONIC FILLING MECHANISM AND WATER HEATER. THIS WILL AFFECT THE TEMPERATURE OF THE HOT WATER BEING DISPENSED.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-281
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5167  ABORT: /NA

ITEM: HOT WATER FILL PUSH BUTTON SWITCH
FAILURE MODE: FAILS OPEN

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) HOT WATER FILL SWITCH
4) GALLEY EPD&C
5) AUDIO SPACE SYSTEM
6) AUDIO SPACE SYSTEM
7) GALLEY EPD&C
8) GALLEY EPD&C
9) GALLEY EPD&C

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, MECHANICAL SHOCK, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
IF THIS SWITCH FAILS OPEN, THE REHYDRATION STATION CANNOT
DISPENSE HOT WATER. THE COLD WATER WILL NOT BE EFFECTED.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-282
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT
FLIGHT: 3/3
MDAC ID: 5168
ABORT: /NA

ITEM: HOT WATER FILL PUSH BUTTON SWITCH
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) HOT WATER FILL SWITCH
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REDUNDANCY SCREENS: A [ ]   B [ ]   C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION, MECHANICAL SHOCK

EFFECTS/RATIONALE:
IF THIS SWITCH FAILS CLOSED, THE HOT WATER SOLENOID VALVE WILL REMAIN OPEN CONTINUOUSLY. THE HOT WATER LOOP WILL HAVE TO BE CLOSED TO PREVENT LEAKAGE. COLD WATER WILL STILL BE AVAILABLE AT THE REHYDRATION STATION.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-283
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5169  ABORT: /NA

ITEM: HOT WATER FILL SWITCH - LIGHT
FAILURE MODE: FAILS ON

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) HOT WATER FILL SYSTEM
4) INDICATOR LIGHT
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THIS FAILURE WILL HAVE NO EFFECT ON THE ACTUAL PERFORMANCE OF THE SYSTEM, HOWEVER, IT WILL INCORRECTLY INDICATE THAT THE HOT WATER VALVE IS STUCK OPEN.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-284
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5170

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

ITEM: HOT WATER FILL SWITCH - LIGHT
FAILURE MODE: FAILS OFF

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) HOT WATER FILL SYSTEM
4) INDICATOR LIGHT
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY

PART NUMBER:

CAUSES: PIECE-PART STRUCTURAL, BURNS OUT

EFFECTS/RATIONALE:
THIS FAILURE WILL HAVE NO EFFECT ON THE ACTUAL PERFORMANCE OF THE SYSTEM, HOWEVER, IT WILL INCORRECTLY INDICATE THAT HOT WATER IS NOT AVAILABLE AT THE REHYDRATION STATION.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-285
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5171

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

ITEM: COLD WATER RECIRCULATION SOLENOID/VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: B. RICHARD SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY EPD&C
3) RHS WATER SUPPLY
4) HOT WATER FEED SOLENOID/VALVE

CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER: SV1

CAUSES: CONTAMINATION, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
COLD WATER WILL NOT BE RECIRCULATED WHICH WILL ALLOW THE WATER IN THE LINE TO WARM UP BETWEEN DISPENSING CYCLES.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-286
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5172

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

ITEM: COLD WATER RECIRCULATION SOLENOID/VALVE
FAILURE MODE: FAILS OPEN

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) RHS WATER SUPPLY
4) HOT WATER FEED SOLENOID/VALVE
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: GALLEY
PART NUMBER: SV1

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THIS MEANS THAT COLD WATER WILL BE CONTINUOUSLY RECYCLED.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5173

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

ITEM: RHS NEEDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) REHYDRATION SYSTEM
4) NEEDLE
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REDUNDANCY SCREENS: A [ ]   B [ ]   C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
PLUGGED NEEDLE WILL PREVENT DISPENSING WATER AT THE REHYDRATION STATION. SPARE NEEDLES ARE ALWAYS FLOWN AND EASILY CHANGED OUT BY CREWMEN.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-288
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5174

ITEM: RHS CUP RETAINER
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) RHS
4) CUP RETAINER

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
IF THE CUP RETAINER IS DAMAGED SO THAT FOOD PACKAGES CANNOT BE INSTALLED IN IT, THE REHYDRATION STATION WILL BE UNUSABLE AND ALTERNATE METHODS OF REHYDRATING FOOD WILL HAVE TO BE USED.

REFERENCES: JSC 12770, SSSH 6.6
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5175

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

ITEM: RHS CUP RETAINER PARALLEL RODS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) RHS
4) CUP RETAINER
5) PARALLEL RODS

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LOCATION: GALLEY
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
THIS FAILURE WOULD HAVE LITTLE EFFECT ON THE ACTUAL OPERATION OF THE REHYDRATION STATION, HOWEVER IT WOULD MAKE IT MORE DIFFICULT FOR CREWMEN TO ALIGN THE FOOD PACKAGES WITH THE REHYDRATION NEEDLE.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87
C-290
**INDEPENDENT ORBITER ASSESSMENT**
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 8/24/87  
**SUBSYSTEM:** CREW EQUIPMENT  
**MDAC ID:** 5176

**ITEM:** RHS CUP RETAINER PARALLEL RODS  
**FAILURE MODE:** PHYSICAL BINDING/JAMMING

**LEAD ANALYST:** B. RICHARD  
**SUBSYS LEAD:** S.K. SINCLAIR

**BREAKDOWN HIERARCHY:**
1) CREW EQUIPMENT  
2) GALLEY  
3) RHS  
4) CUP RETAINER  
5) PARALLEL RODS  
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**REDUNDANCY SCREENS:** A [ ]  B [ ]  C [ ]

**LOCATION:** GALLEY  
**PART NUMBER:**

**CAUSES:** MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART STRUCTURAL

**EFFECTS/RATIONALE:**
THIS FAILURE COULD PREVENT INSERTION OF THE NEEDLE INTO THE FOOD PACKAGES RENDERING THE REHYDRATION STATION UNUSABLE. ALTERNATE METHODS OF REHYDRATION WOULD HAVE TO BE USED.

**REFERENCES:** JSC 12770, SSSH 6.6
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

| DATE:     | 8/24/87 |
| SUBSYSTEM: | CREW EQUIPMENT |
| MDAC ID:  | 5177 |

| ITEM:     | RHS "TRANSPARENT CHAMBER" |
| FAILURE MODE: | STRUCTURAL FAILURE |

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) RHS
4) TRANSPARENT CHAMBER
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION:

PART NUMBER:

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
A CRACKED CHAMBER COULD ALLOW SOME WATER LEAKAGE IF FREE WATER RESULTS FROM THE REHYDRATION PROCEDURE.

REFERENCES: JSC 12770

REPORT DATE  10/23/87  C-292
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5178

ITEM: INLET WATER CONNECTIONS
FAILURE MODE: RESTRICTED FLOW
LEAD ANALYST: B. RICHARD
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) WATER SUPPLY
4) CONNECTIONS
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THIS FAILURE COULD RESULT IN INADEQUATE WATER SUPPLY TO THE GALLEY. IF THE CHILLED WATER CONNECTOR WAS PLUGGED, THERE WOULD BE NO COLD WATER.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87

C-293
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5179

ITEM: INLET WATER CONNECTIONS
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) WATER SUPPLY
4) INLET CONNECTIONS
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LOCATION: GALLEY
PART NUMBER:

CAUSES: MECHANICAL SHOCK, PIECE-PART

EFFECTS/RATIONALE:
WATER LEAKAGE AT THE CONNECTION OF THE GALLEY TO THE WATER SUPPLY LINES WILL RESULT IN FREE WATER IN THE CABIN. THE WATER CAN BE SHUT-OFF UPSTREAM OF THE CONNECTIONS, BUT IT WILL MEAN NO WATER WILL BE AVAILABLE TO THE GALLEY. IF ALTERNATE WATER SUPPLIES ARE NOT AVAILABLE TO THE CREW, THE MISSION MAY HAVE TO BE TERMINATED.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87 C-294
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5180

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

ITEM: MANUAL SHUT OFF VALVE
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) WATER SUPPLY
4) MANUAL SHUT OFF VALVE
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LOCATION: GALLEY
PART NUMBER: M_3

CAUSES: CONTAMINATION, MECHANICAL SHOCK, PIECE-PART STRUCTURAL

EFFECTS/RATIONALE:
THIS VALVE SHUTS OFF AMBIENT WATER TO THE GALLEY IF THE GALLEY WATER SYSTEM LEAKS HOT WATER ON ORBIT. IF THE VALVE CANNOT BE CLOSED THE SYSTEM WILL CONTINUE TO LEAK UNTIL THE SUPPLY IS CLOSED UPSTREAM OF THE GALLEY. IF LEAKAGE IS SEVERE IT COULD EFFECT THE LENGTH OF THE MISSION.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-295
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 8/24/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5181  ABORT: /NA

ITEM: AUXILIARY PORT - POTABLE WATER
FAILURE MODE: RESTRICTED FLOW

LEAD ANALYST: B. RICHARD  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) GALLEY
3) WATER SUPPLY
4) AUXILIARY PORT
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CRITICALITIES

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

LOCATION: GALLEY
PART NUMBER:

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THIS FAILURE WILL PREVENT USE OF THE AUXILIARY PORT FOR POTABLE WATER. OTHER MEANS WILL HAVE TO BE USED.

REFERENCES: JSC 12770, SSSH 6.6

REPORT DATE 10/23/87  C-296
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/28/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5300

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

ITEM: OPERATIONAL WATER DISPENSER QUICK DISCONNECTS
FAILURE MODE: FAILS TO REMAIN CLOSED

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) QUICK DISCONNECT CONNECTIONS
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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
IF EITHER QUICK DISCONNECT FAILS (ON AMBIENT OR CHILLED WATER INPUTS) THE CREWMAN CAN DISCONNECT THAT LINE AND USE THE OTHER FOR REHYDRATION USES, ETC. IF THE PERSONAL HYGIENE CONTROL VALVE DISCONNECT FAILS, IFM PROCEDURES WILL RESOLVE THE PROBLEM. AS A LAST RESORT THE CONTINGENCY WATER DISPENSER CAN BE USED.
MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87
C-297
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 5301  ABORT: /NA

ITEM: OPERATIONAL WATER DISPENSER QUICK DISCONNECTS
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) QUICK DISCONNECT CONNECTIONS
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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
IF EITHER QUICK DISCONNECT FAILS (ON AMBIENT OR CHILLED WATER INPUTS) THE CREWMAN CAN DISCONNECT THAT LINE AND USE THE OTHER FOR REHYDRATION USES, ETC. IF THE PERSONAL HYGIENE CONTROL VALVE DISCONNECT FAILS, IFM PROCEDURES WILL RESOLVE THE PROBLEM. AS A LAST RESORT THE CONTINGENCY WATER DISPENSER CAN BE USED. MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-298
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/17/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5302

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

ITEM: WATER VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) AMBIENT/CHILLED/OFF WATER VALVE

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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE,
PIECE-PART FAILURE

EFFECTS/RATIONALE:
FAILURE OF VALVE TO MOVE FROM "OFF" POSITION WOULD NOT PRECLUDE
USE OF PERSONAL HYGIENE VALVE OR CONTINGENCY WATER DISPENSER.
MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-299
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5303

ITEM: OPERATIONAL WATER DISPENSER AMBIENT/CHILLED/OFF WATER VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) AMBIENT/CHILLED/OFF WATER VALVE
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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE: MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY. CREW IFM PROCEDURES WOULD BE USED TO REPAIR LEAKING COMPONENT/CONNECTION. EXTERNAL LEAKAGE WOULD BE CONTAINED IN WATER DISPENSER ASSEMBLY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-300
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5304

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

ITEM: WATER VALVE
FAILURE MODE: OPERATIONAL WATER DISPENSER AMBIENT/CHILLED/OFF
PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM    SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) AMBIENT/CHILLED/OFF WATER VALVE
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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE: FAILURE OF VALVE TO MOVE FROM AMBIENT TO CHILLED (OR VICE VERSA) WOULD STILL ALLOW USE OF THE OPERATIONAL WATER DISPENSER, PERSONAL HYGIENE VALVE, OR CONTINGENCY WATER DISPENSER. MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-301
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/17/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5305

ITEM: OPERATIONAL WATER DISPENSER PRESSURE REGULATOR
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) PRESSURE REGULATOR
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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MECHANICAL SHOCK, PIECE-PART FAILURE

EFFECTS/RATIONALE:
FAILURE TO ALLOW WATER TO REACH END OF DISPENSER FOR NEEDLE VALVE DISPENSING. CREWMAN CAN STILL OBTAIN WATER THROUGH USE OF BYPASS VALVE, CONTINGENCY WATER DISPENSER, OR PERSONAL HYGIENE VALVE. MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-302
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5306

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

ITEM: OPERATIONAL WATER DISPENSER PRESSURE REGULATOR
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) PRESSURE REGULATOR
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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MECHANICAL SHOCK, PIECE-PART FAILURE

EFFECTS/RATIONALE:
POSSIBLE INABILITY TO MAINTAIN CONSTANT WATER PRESSURE AT REHYDRATION NEEDLE. CREW IFM PROCEDURES WOULD BE USED TO REPAIR LEAKING COMPONENT/CONNECTION. EXTERNAL LEAKAGE WOULD BE CONTAINED IN WATER DISPENSER ASSEMBLY. MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-303
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5307

ITEM: OPERATIONAL WATER DISPENSER BYPASS VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) BYPASS VALVE

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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
BYPASS VALVE IS A CONTINGENCY DEVICE ON WATER DISPENSER. MISSION BORT NEEDED FOR LOSS OF ALL REDUNDANCY. CONTINGENCY WATER DISPENSER STILL AVAILABLE.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-304
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5308

ITEM: OPERATIONAL WATER DISPENSER BYPASS VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) BYPASS VALVE

CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
BYPASS VALVE IS A CONTINGENCY DEVICE ON WATER DISPENSER. CREW IFM PROCEDURES WOULD BE USED TO REPAIR LEAKING COMPONENT/CONNECTION. EXTERNAL LEAKAGE WOULD BE CONTAINED IN WATER DISPENSER ASSEMBLY. MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-305
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 5309  ABORT: /NA

ITEM: OPERATIONAL WATER DISPENSER SOLENOID VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) SOLENOID VALVE
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CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MECHANICAL SHOCK, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
BYPASS VALVE CAN STILL BE USED TO SUPPLY WATER TO THE REHYDRATION NEEDLE. CONTINGENCY WATER DISPENSER ALSO AVAILABLE. MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87  C-306
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5310
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R
ABORT: /NA

ITEM: OPERATIONAL WATER DISPENSER SOLENOID VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) SOLENOID VALVE
4) 5) 6) 7) 8) 9)

CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: MECHANICAL SHOCK, PIECE-PART FAILURE, VIBRATION
EFFECTS/RATIONALE:
CREW IFM PROCEDURES WOULD BE USED TO REPAIR LEAKING COMPONENT/CONNECTION. EXTERNAL LEAKAGE WOULD BE CONTAINED IN WATER DISPENSER ASSEMBLY. BYPASS VALVE CAN STILL BE USED TO SUPPLY WATER TO THE REHYDRATION NEEDLE. MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-307
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/01/87

SUBSYSTEM: CREW EQUIPMENT

MDAC ID: 5311

HIGHEST CRITICALITY HDW/FUNC

ITEM: OPERATIONAL WATER DISPENSER ROTARY SELECTION

SWITCH

FAILURE MODE: FAILS TO SWITCH

LEAD ANALYST: L. GRAHAM

SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:

1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) ROTARY SELECTION SWITCH

CRITICALITIES

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LOCATION: CREW MODULE

PART NUMBER: SED48101600

CAUSES: CONTAMINATION, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:

IF SWITCH FAILS OFF (SOLENOID DISPENSING VALVE CLOSED) NO WATER WILL PASS THROUGH. CREW WILL HAVE TO USE BYPASS VALVE. IF SWITCH STICKS AT A GIVEN SETTING, CREW CAN STILL USE IT BY MANUAL TIMING FLOW (1 oz./SECOND). CONTINGENCY WATER DISPENSER ASSEMBLY STILL AVAILABLE. MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87  C-308
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5312

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

ITEM: OPERATIONAL WATER DISPENSER REHYDRATION NEEDLE
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) REHYDRATION NEEDLE
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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE
EFFECTS/RATIONALE:
REPLACEMENT REHYDRATION NEEDLE FLOWN. CONTINGENCY WATER DISPENSER ALSO FLOWN ON EVERY MISSION. MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-309
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5313
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: OPERATIONAL WATER DISPENSER MICROBIAL CHECK VALVE
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) MICROBIAL CHECK VALVE

CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
WILL NOT RESULT IN LOSS OF MISSION OR LOSS OF FUNCTION. USED TO PREVENT BACTERIAL CONTAMINATION FROM BOTH ORBITER SUPPLY-SIDE AND BACKFLOW FROM PERSONAL HYGIENE VALVE. ORBITER SUPPLY-SIDE HAS MICROBIAL CHECK VALVE.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-310
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5314

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

ITEM: OPERATIONAL WATER DISPENSER MICROBIAL CHECK VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: L. GRAHAM        SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) MICROBIAL CHECK VALVE
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: MECHANICAL SHOCK, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
LOSS OF FUNCTION PREVENTS USE OF PERSONAL HYGIENE VALVE (USED TO WASH HANDS, FACE, ETC.). SHOULD NOT CAUSE LOSS OF MISSION. CREW IFM ACTIONS ABLE TO REPAIR VALVE.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87       C-311
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5315

ITEM: OPERATIONAL WATER DISPENSER MICROBIAL CHECK VALVE
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) MICROBIAL CHECK VALVE

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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
IODINE BEADS MAY FAIL THUS ALLOWING BACKFLOW OF CONTAMINATION WATER (FROM PERSONAL HYGIENE VALVE). ORBITER SUPPLY SIDE HAS MICROBIAL CHECK VALVE. MISSION ABORT NEEDED FOR LOSS OF POTABLE WATER SUPPLY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-312
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5316

ITEM: OPERATIONAL WATER DISPENSER PERSONAL HYGIENE VALVE
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) HYGIENE VALVE
4) 6) 7) 8) 9)

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

LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
LOSS OF PERSONAL HYGIENE VALVE HARDWARE WILL NOT RESULT IN LOSS OF MISSION. CREW IFM AND ACTIONS WILL REDUCE AMOUNT OF WATER SPILLAGE.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87  C-313
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5317

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

ITEM: OPERATIONAL WATER DISPENSER PERSONAL HYGIENE VALVE
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) HYGIENE VALVE
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
LOSS OF PERSONAL HYGIENE VALVE HARDWARE WILL NOT RESULT IN LOSS OF MISSION. LOSS OF ALL FUNCTIONAL REDUNDANCY WILL NOT RESULT IN LOSS OF MISSION.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87  C-314
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5318  ABORT: /NA

ITEM: OPERATIONAL WATER DISPENSER PERSONAL HYGIENE VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) HYGIENE VALVE
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
FAILURE OF HARDWARE ITEM WILL NOT CAUSE LOSS OF MISSION. CREW IFM PROCEDURES WILL REPAIR LEAK. CREW CAN USE REHYDRATION NEEDLE AS WATER SOURCE FOR PERSONAL HYGIENE. LOSS OF ALL REDUNDANCY FOR THIS FUNCTION (PERSONAL HYGIENE) WILL NOT CAUSE LOSS OF MISSION.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87  C-315
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 5319  ABORT: /NA

ITEM: OPERATIONAL WATER DISPENSER HOLDING CLIPS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) HOLDING CLIPS
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
WATER DISPENSER STOWED DURING ASCENT AND DESCENT. IF HOLDING CLIPS FAIL WHILE ON-ORBIT WATER DISPENSER WILL SIMPLY FLOAT AROUND. ANY 1 OF 4 HOLDING CLIPS WILL HOLD DISPENSER IN PLACE.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87  C-316
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5320

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

ITEM: OPERATIONAL WATER DISPENSER INPUT POWER CONNECTOR
FAILURE MODE: OPEN, SHORTED

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) INPUT POWER CONNECTOR

CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
EITHER OPEN OR SHORT WILL CAUSE CONTROLLER TO STOP FUNCTIONING.
CREW IFM CAN REPAIR PHYSICAL DAMAGE (PIN KIT, PLIERS, ETC.). NO
REDUNDANCY FOR POWER INPUT. CONTINGENCY DISPENSER AND PERSONAL
HYGIENE VALVE CAN STILL BE USED DESPITE LOSS OF CONTROLLER.

REFERENCES: JSC-12770, JSC-20466, SED33102348
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5321

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R,
ABORT: /NA

ITEM: OPERATIONAL WATER DISPENSER FLEX LINE
FAILURE MODE: STRUCTURAL FAILURE (RUPTURE)

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) FLEX WATER LINE
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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CREW CAN "SWITCH-OUT" FAILED FLEX LINE WITH OTHER FLEX LINES.
MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87 C-318
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 5322  ABORT: /NA

ITEM: OPERATIONAL WATER DISPENSER FLEX LINES
FAILURE MODE: FAILS TO REMAIN OPEN

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) OPERATIONAL WATER DISPENSER
3) FLEXIBLE WATER LINES

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LOCATION: CREW MODULE
PART NUMBER: SED48101600

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
CREW CAN PERFORM IFM TO REPAIR LINES. MULTIPLE REDUNDANT LINES AVAILABLE FOR SWITCHING OUT. MISSION ABORT NEEDED FOR LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-12770 SFOM VOL. 12, JSC-20365, SED48101600

REPORT DATE 10/23/87  C-319
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/2R
MDAC ID: 5400  ABORT: /NA

ITEM: CONTINGENCY WATER DISPENSER
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYT: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CONTINGENCY WATER DISPENSER
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LOCATION: CREW MODULE
PART NUMBER: SED48101607

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CREW CAN PERFORM IFM TO REPAIR THIS DISPENSER, THEREBY REDUCING
HARDWARE CRITICALITY. MISSION ABORT MUST OCCUR UPON LOSS OF ALL
REDUNDANCY.

REFERENCES: JSC-20365, SED48101607

REPORT DATE 10/23/87  C-320
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 5401

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

ITEM: CONTINGENCY WATER DISPENSER
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM        SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CONTINGENCY WATER DISPENSER
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LOCATION: CREW MODULE
PART NUMBER: SED48101607

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
CREW CAN PERFORM IFM TO REPAIR THIS DISPENSER, THEREBY REDUCING HARDWARE CRITICALITY. MISSION ABORT MUST OCCUR UPON LOSS OF ALL REDUNDANCY.

REFERENCES: JSC-20365, SED48101607

REPORT DATE 10/23/87  C-321
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 6/03/87  
SUBSYSTEM: CREW EQUIPMENT  
MDAC ID: 5402

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

ITEM: CONTINGENCY WATER DISPENSER
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) CONTINGENCY WATER DISPENSER
3) REHYDRATION NEEDLE
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: CREW MODULE
PART NUMBER: SED48101607

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
REHYDRATION NEEDLE BREAKS. CAN STILL DISPENSE WATER.

REFERENCES: JSC-20365, SED48101607

REPORT DATE 10/23/87  C-322
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/13/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 6100  ABORT: /NA

ITEM: SLEEPING BAG - ADJUSTABLE STRAPS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEP RESTRAINTS
3) ADJUSTABLE STRAPS

CRITICALITIES

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

LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
THE ADJUSTABLE STRAPS ON THE SLEEPING RESTRAINT HOLD THE SLEEPING BAG IN PLACE ON THE LOCKERS. FAILURE OF ANY STRAP MEANS THE BAG WILL NOT BE AS SECURELY RESTRANDED AS INTENDED BUT NO SAFETY IMPLICATIONS.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87  C-323
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/13/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 6101  ABORT: /NA

ITEM: SLEEPING BAG - HELICAL SPRING
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEP RESTRAINTS
3) ADJUSTABLE STRAPS
4) HELICAL SPRING
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REDUNDANCY SCREENS:  A [ ]  B [ ]  C [ ]

LOCATION: CREW COMPARTMENT
PART NUMBER: E0360-055-30005

CAUSES: MECHANICAL SHOCK, PIECE-PART FAILURE

EFFECTS/RATIONALE:
THE HELICAL SPRING IS ONE COMPONENT OF THE ADJUSTABLE STRAPS. FAILURE OF THE SPRING MEANS SIMPLY THAT THE SLEEPING BAG WILL NOT BE AS SECURELY FASTENED AS INTENDED BUT NO SAFETY IMPLICATIONS.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87  C-324
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/14/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 6102  ABORT: /NA

ITEM: SLEEPING BAG - CLOTH TUNNEL
FAILURE MODE: STRUCTURAL FAILURE TEARS

LEAD ANALYST: S.K. SINCLAIR  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEP RESTRAINTS
3) ADJUSTABLE STRAPS
4) HELICAL SPRING
5) CLOTH TUNNEL
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW COMPARTMENT
PART NUMBER:
CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE: THE CLOTH TUNNEL SURROUNDS THE HELICAL SPRING ON THE SLEEPING BAG ADJUSTED STRAP. A RIP IN THE CLOTH TUNNEL WILL HAVE NO AFFECT.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87 C-325
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/14/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6103

ITEM: SLEEPING BAG - SPRING CLIP
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEP RESTRAINTS
3) ADJUSTABLE STRAPS
4) SPRING CLIP
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW COMPARTMENT
PART NUMBER: NF 12480

CAUSES: MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
A FAILURE OF THE SPRING CLIP TO OPEN MEANS THAT THE PIP PIN CANNOT BE ATTACHED AND THE SLEEPING BAG SECURELY POSITIONED. NO EFFECT ON FUTURE OPERATIONS.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87 C-326
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/14/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6104

ITEM: SLEEPING BAG - SPRING CLIP
FAILURE MODE: FAILS TO REMAIN CLOSED

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEP RESTRAINTS
3) ADJUSTABLE STRAPS
4) SPRING CLIP

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

LOCATION: CREW COMPARTMENT
PART NUMBER: NF 12480

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE, VIBRATION

EFFECTS/RATIONALE:
THE SPRING CLIP COMING OPEN MEANS THE SLEEPING BAG WILL NOT BE AS
SECURELY RESTRAINED AS DESIGNED. NO AFFECT ON FUTURE OPERATIONS.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87  C-327
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/14/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6105

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

ITEM: SLEEPING BAG - PIP PIN
FAILURE MODE: PULLS OUT

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEP RESTRAINTS
3) ADJUSTABLE STRAPS
4) PIP PINS
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CRITICALITIES

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A [ ] B [ ] C [ ]

LOCATION: CREW COMPARTMENT
PART NUMBER: TBD

CAUSES: MECHANICAL SHOCK, OVERLOAD

EFFECTS/RATIONALE:
THE PIP PIN PULLING OUT OF THE MIDDECK LOCKER WALL MEANS THE SLEEPING BAG WILL NOT BE AS FULLY RESTRAINED AS DESIGNED. NO IMPACT ON FUTURE OPERATIONS.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87 C-328
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/14/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6106

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

ITEM: SLEEPING BAG – MOUNTING LOCATION
FAILURE MODE: FAILS TO HOLD PIP PIN

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEP BAG
3) PIP PIN MOUNTING LOCATION
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CRITICALITIES

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

LOCATION: CREW COMPARTMENT
PART NUMBER: TBD

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
THE PIP PIN MOUNTS THE SLEEPING BAG ON THE MODULAR MIDDECK LOCKERS. CONTAMINATION IN THE MOUNTING SPOTS MEANS THE SLEEPING BAG CANNOT BE PLACED IN ITS DESIGNATED LOCATION AND AN ALTERNATE LOCATION MUST BE FOUND. NO IMPACT ON FUTURE OPERATIONS.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/14/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6107

ITEM: SLEEPING BAG RESTRAINTS - BUCKLE FLAP
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEP RESTRAINTS
3) BUCKLE FLAP

CRITICALITIES

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

LOCATION: CREW COMPARTMENT
PART NUMBER: TBD

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
THE BUCKLE FLAP HOLDS THE RESTRAINTS ON THE PAD. A FAILURE OF THE FLAP MEANS THE RESTRAINTS MAY NOT OPERATE COMPLETELY AS DESIGNED BUT NO IMPACT ON FUTURE OPERATIONS.

REFERENCES: JSC 12770, V601-669100
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/14/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6108

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: ATTACHMENT ZIPPER(S)
FAILURE MODE: BREAKS

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEPING BAG
3) ATTACHMENT ZIPPERS
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW COMPARTMENT
PART NUMBER: TBD

CAUSES: MISHANDLING/ABUSE

EFFECTS/RATIONALE:
A BREAK IN THE ZIPPER THAT ATTACHES THE SLEEPING BAG TO THE NOMEX PAD MEANS THE TWO ITEMS WILL BE SEPARATED. ALTERNATE MEANS OF SECURING THE BAG TO THE PAD CAN BE DEVISED; OR THE SLEEPING BAG CAN BE USED ALONE WITHOUT THE NOMEX PAD.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87 C-331
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/14/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6109

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

ITEM: CLOSURE ZIPPER
FAILURE MODE: BREAKS

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEPING BAG
3) CLOSURE ZIPPER
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW COMPARTMENT
PART NUMBER: TBD

CAUSES: MISHANDLING/ABUSE

EFFECTS/RATIONALE:
IF THE SLEEPING BAG CLOSURE ZIPPER BREAKS, THE CREWMEMBER WILL NO LONGER BE RESTRAINED IN THE BAG. ALTERNATE PLACES FOR SLEEPING ARE AVAILABLE. THE FAILURE SHOULD NOT PRESENT ANY PROBLEMS.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87 C-332
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/14/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6110

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

ITEM: BODY RESTRAINTS
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: S.K. SINCLAIR
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) SLEEP RESTRAINTS
3) BODY RESTRAINTS
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: MISHANDLING/ABUSE, STRUCTURAL FAILURE

EFFECTS/RATIONALE:
RESTRAINT CAN BE REPAIRED BY TAPE OR OTHER EQUIPMENT AS AVAILABLE.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87 C-333
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/22/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6111
HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/3
ABORT: /NA

ITEM: FOUR-TIER SLEEP STATION SLIDING DOOR
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: H. SAXON
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) FOUR-TIER SLEEP STATIONS
3) SLIDING DOOR

CRITICALITIES

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

LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
DOOR FAILS TO SLIDE OPEN OR CLOSED. IFM TOOLS MAY BE USED TO FREE THE DOOR.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87  C-334
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/22/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6112

ITEM: FOUR-TIER SLEEP STATION CAPTIVE WING NUT FASTENER
FAILURE MODE: FAILS TO TIGHTEN/LOOSEN

LEAD ANALYST: H. SAXON         SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) FOUR-TIER SLEEP STATIONS
3) CAPTIVE WING NUT FASTENER
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
WING NUT FASTENERS SECURE THE PANELS COVERING FLOOR COMPARTMENT VOLUME E, FLOOR COMPARTMENT F, AND THE WET TRASH COMPARTMENT. IFM TOOLS MAY BE USED TO REMOVE OR REPLACE WING NUT FASTENERS.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87   C-335
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/22/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6113

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

ITEM: FOUR-TIER SLEEP STATION AIR DIFFUSER
FAILURE MODE: FAILS TO START/STOP

LEAD ANALYST: H. SAXON
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) FOUR-TIER SLEEP STATIONS
3) AIR DIFFUSER

CRITICALITIES

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

LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: LOSS OF INPUT

EFFECTS/RATIONALE:
AIR DIFFUSER IN A SLEEP STATION COULD FAIL TO START OR FAIL TO STOP. AIR CIRCULATION WOULD BE REDUCED, BUT IS NOT LIFE OR MISSION THREATENING.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87 C-336
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/22/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6114

ITEM: FOUR-TIER SLEEP STATION LIGHT
FAILURE MODE: FAILS TO TURN ON/OFF

LEAD ANALYST: H. SAXON
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) FOUR-TIER SLEEP STATIONS
3) LIGHT
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: CREW COMPARTMENT
PART NUMBER:

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
LIGHT IN SLEEP STATION FAILS TO TURN ON/OFF. THIS IS NO THREAT TO MISSION OR LIFE.

REFERENCES: JSC 12770, V601-669100

REPORT DATE 10/23/87  C-337
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/28/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6200

ITEM: ORBITER SIDE HATCH SAFETY LOCK PIP PIN
FAILURE MODE: CANNOT INSERT PIN

LEAD ANALYST: H. SAXON
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ORBITER SIDE HATCH SAFETY LOCK
3) PIP PIN
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LOCATION: CREW COMPARTMENT
PART NUMBER: SED33103383

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
SAFETY LOCK CANNOT BE INSTALLED. THE SIDE HATCH COULD BE ACCIDENTALLY OPENED WHICH COULD RESULT IN POSSIBLE LOSS OF CREW. ANOTHER PIP PIN COULD BE USED OR THE SAFETY LOCK COULD BE SECURED BY OTHER TOOLS OR TAPE.

REFERENCES: SED33103383

REPORT DATE 10/23/87 C-338
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 7/28/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6201

ITEM: ORBITER SIDE HATCH SAFETY LOCK PIP PIN
FAILURE MODE: CANNOT REMOVE PIN

LEAD ANALYST: H. SAXON  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) ORBITER SIDE HATCH SAFETY LOCK
3) PIP PIN
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LOCATION: CREW COMPARTMENT
PART NUMBER: SED33103383

CAUSES: CONTAMINATION, MISHANLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
THE SAFETY LOCK CANNOT BE REMOVED AND THE HATCH CANNOT BE OPENED.
THE PIP PIN MAY BE REMOVED BY CUTTING.

REFERENCES: SED33103383

REPORT DATE 10/23/87
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/29/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6300

ITEM: MIDDECK STOWAGE LOCKER DOOR
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) MIDDECK STOWAGE LOCKER
3) LOCKER DOOR
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CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: V602-660604

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE,
PIECE-PART FAILURE, PRESSURE

EFFECTS/RATIONALE:
IFM PROCEDURES DETAIL USING IFM PRY BAR OR ESCAPE PRY BAR (WHICH
IS NOT STORED IN LOCKER) TO OPEN STUCK DOOR. FAILURE TO OPEN ON-
ORBIT IS DUE TO SHIFTING OF ORBITER MOUNTING STRUCTURE. FAILURE
TO OPEN DURING PRELAUNCH PHASE IS NO PROBLEM SINCE LOCKER
CHANGEOUT WOULD OCCUR BEFORE LAUNCH IF DOOR FAILED TO OPEN.
ASSUMING LOCKER CONTENTS CONTAIN EMERGENCY EQUIPMENT, LOSS OF ALL
REDUNDANCY COULD RESULT IN LOSS OF LIFE AND VEHICLE.

REFERENCES: JSC-17321, V602-660604

REPORT DATE 10/23/87  C-340
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/29/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6301

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

ITEM: MIDDECK STOWAGE LOCKER DOOR
FAILURE MODE: FAILS TO CLOSE

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) MIDDECK STOWAGE LOCKER
3) LOCKER DOOR
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW MODULE
PART NUMBER: V602-660604

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE, PIECE-PART FAILURE, PRESSURE

EFFECTS/RATIONALE:
IFM PROCEDURES DETAILS TWO METHODS TO FORCE CLOSURE OF MIDDECK LOCKER DOORS. CAN ALSO TAPE DOORS CLOSED. FAILURE TO CLOSE WHILE ON-ORBIT DUE TO SHIFTING OF ORBITER MOUNTING STRUCTURE. FAILURE TO CLOSE DURING PRELAUNCH PHASE IS NO PROBLEM SINCE LOCKER CHANGEOUT WOULD OCCUR BEFORE LAUNCH IF DOOR FAILED TO CLOSE.

REFERENCES: JSC-17321, V602-660604

REPORT DATE 10/23/87 C-341
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/29/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 6302  ABORT: /NA

ITEM: MIDDECK STOWAGE LOCKER DOOR HINGE PIN
FAIL URE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) MIDDECK STOWAGE LOCKER
3) LOCKER DOOR HINGE PIN
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW MODULE
PART NUMBER: V602-660604

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
HINGE PIN FAILS. BROKEN PIN CAN STILL FUNCTION AS HINGE PIN.

REFERENCES: JSC-17321, V602-660604

REPORT DATE 10/23/87  C-342
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/29/87

SUBSYSTEM: CREW EQUIPMENT

MDAC ID: 6303

HIGHEST CRITICALITY HDW/FUNC

ITEM: MIDDECK STOWAGE LOCKER DOOR
FAILURE MODE: FAILS TO REMAIN CLOSED

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) MIDDECK STOWAGE LOCKER
3) DOOR LATCH
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CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: V602-660604

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
LOCKER LATCH FAILS TO CATCH/HOLD. TWO CATCHES ON EACH LOCKER DOOR ANY ONE OF WHICH WOULD PERFORM THE CLOSURE FUNCTION. LOSS OF ALL REDUNDANCY COULD PERMIT DOOR TO OPEN AND CONTENTS BE RELEASED TO CABIN. DURING ASCENT/ENTRY THE CONTENTS COULD INJURE CREWMEMBER AND/OR DAMAGE VEHICLE.

REFERENCES: JSC-17321, V602-660604

REPORT DATE 10/23/87 C-343
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/27/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6400

ITEM: TREADMILL EXERCISER ASSEMBLY
FAILURE MODE: PHYSICAL BINDING/JAMMING

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TREADMILL EXERCISER ASSEMBLY
3) TREADMILL BELT

CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: 10131-10031-02

CAUSES: CONTAMINATION, PIECE-PART FAILURE

EFFECTS/RATIONALE:
TREADMILL BELT WILL STOP ROTATING. CREWMAN MAY STUMBLE BUT
SHOULD NOT BE INJURED SINCE THE HIGHEST SPEED IS NORMALLY A
JOGGING-TYPE PACE. SUDDEN STOP MAY BE CAUSED BY PARTICULATE
CONTAMINATION OR PIECE-PART FAILURE OF RAPID ONSET BRAKING
SYSTEM.

REFERENCES: JSC-12770 SFOM VOL. 12, 10131-10031

REPORT DATE 10/23/87  C-344
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/27/87

HIGHEST CRITICALITY HDW/Func

SUBSYSTEM: CREW EQUIPMENT

MDAC ID: 6401

FLIGHT: 3/3

ABORT: /NA

ITEM: TREADMILL EXERCISER ASSEMBLY BUNGEE FORCE CORD

FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TREADMILL EXERCISER ASSEMBLY
3) BUNGEE FORCE CORD
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CRITICALITIES

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

LOCATION: CREW MODULE

PART NUMBER: 10131-10031

CAUSES: OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
FORCE CORD (OR BUNGEE CORD) FAILS, HOOK ON END OF FORCE CORD FAILS AND DETACHES FROM BUNGEE CLEAT, OR SLIP BUCKLE FAILS.
CREWMAN MAY FLOAT OUT OF RESTRAINING RIG BUT NOT AT SUFFICIENT VELOCITY TO CAUSE INJURY.

REFERENCES: JSC-12770 SFOM VOL. 12, 10131-10031

REPORT DATE 10/23/87 C-345
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/27/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6402

ITEM: TREADMILL EXERCISER ASSEMBLY SHOULDER STRAP
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TREADMILL EXERCISER ASSEMBLY
3) SHOULDER STRAP

CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: 10131-10031

CAUSES: OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
SHOULDER STRAP FAILS, HOOK CONNECTING SHOULDER STRAP TO WAISTBELT FAILS. SHOULDER STRAP MATERIAL MAY TEAR BY OVERLOAD, HOOK MAY FAIL DUE TO PRODUCTION FAILURE. CREWMAN MAY FLOAT OUT OF RESTRAINING RIG BUT NOT AT SUFFICIENT VELOCITY TO CAUSE INJURY.

REFERENCES: JSC-12770 SFOM VOL. 12, 10131-10031

REPORT DATE 10/23/87

C-346
**INDEPENDENT ORBITER ASSESSMENT**

**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

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**LEAD ANALYST:** L. GRAHAM  
**SUBSYS LEAD:** S.K. SINCLAIR

**BREAKDOWN HIERARCHY:**
1) CREW EQUIPMENT
2) TREADMILL EXERCISER ASSEMBLY
3) WAIST BELT
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**REDUNDANCY SCREENS:** A [ ]   B [ ]   C [ ]

**LOCATION:** CREW MODULE

**PART NUMBER:** 10131-10031

**CAUSES:** OVERLOAD, PIECE-PART FAILURE

**EFFECTS/RATIONALE:**
WAIST BELT MATERIAL FAILS, BRASS RING IN WAIST BELT FAILS, RETAINING PIN FAILS, RING TO HOLD SHOULDER STRAP HOOKS FAIL, SLIP BUCKLE FAILS. ANY FAILURE MAY OCCUR DUE TO OVERLOAD OR MATERIAL FAILURE. CREWMAN MAY FLOAT OUT OF RESTRAINING RIG BUT NOT SUFFICIENT VELOCITY TO CAUSE INJURY.

**REFERENCES:** JSC-12770 SFOM VOL. 12, 10131-10031

**REPORT DATE** 10/23/87  C-347
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/27/87  HIGHEST CRITICALITY HDW/FUNC FLIGHT: 3/3
SUBSYSTEM: CREW EQUIPMENT  ABORT: /NA
MDAC ID: 6404

ITEM: TREADMILL EXERCISER ASSEMBLY PHYSIOLOGICAL MONITOR
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TREADMILL EXERCISER ASSEMBLY
3) PHYSIOLOGICAL MONITOR

CRITICALITIES

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REduNDANCY SCREEnS: A [ ]  B [ ]  C [ ]

LOCATION: CREW MODULE
PART NUMBER: 10131-10031

CAUSES: CONTAMINATION, MECHANICAL SHOCK, MISHANDLING/ABUSE

EFFECTS/RATIONALE:
PHYSIOLOGICAL MONITOR FAILS. REDUCES EFFECTIVENESS OF TREADMILL BUT DOES NOT AFFECT CREW, VEHICLE, OR MISSION STATUS.

REFERENCES: JSC-12770 SFOM VOL. 12, 10131-10031

REPORT DATE 10/23/87  C-348
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/27/87
MDAC ID: 6405

SUBSYSTEM: CREW EQUIPMENT

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: TREADMILL EXERCISER ASSEMBLY HANDLE ASSEMBLY

FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TREADMILL EXERCISER ASSEMBLY
3) HANDLE ASSEMBLY

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

LOCATION: CREW MODULE
PART NUMBER: 10131-10031

CAUSES: MISHANDLING/ABUSE, OVERLOAD, PIECE-PART FAILURE

EFFECTS/RATIONALE:
TREADMILL EXERCISER HANDLE ASSEMBLY FAILS. FAILURE WILL REDUCE USEFULNESS OF TREADMILL. CREWMAN USING TREADMILL DURING FAILURE WILL NOT BE INJURED.

REFERENCES: JSC-12770 SFOM VOL. 12, 10131-10031

REPORT DATE 10/23/87 C-349
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/27/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 6406  ABORT: /NA

ITEM: TREADMILL EXERCISE ASSEMBLY INFRARED SENSOR
FAILURE MODE: LOSS OF OUTPUT

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TREADMILL EXERCISER ASSEMBLY
3) INFRARED SENSOR
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: CREW MODULE
PART NUMBER: 10131-10031

CAUSES: MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
INFRARED SENSOR FAILS OFF, SENSOR CABLE FAILS. PHYSIOLOGICAL
MONITOR EFFECTIVENESS REDUCED. LOSS OF SENSOR AND/OR OUTPUT WILL
NOT AFFECT CREW, VEHICLE, OR MISSION STATUS.

REFERENCES: JSC-12770 SFOM VOL. 12, 10131-10031

REPORT DATE 10/23/87  C-350
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/27/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 6407  ABORT: /NA

ITEM: TREADMILL EXERCISER ASSEMBLY SPEED CONTROL KNOB
FAILURE MODE: STRUCTURAL FAILURE

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TREADMILL EXERCISER ASSEMBLY
3) SPEED CONTROL KNOB
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CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: 10131-10031

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
SPEED CONTROL KNOB FAILS. UNABLE TO ADJUST PRESET BELT SPEED LIMIT. TREADMILL USEFULNESS REDUCED. SHOULD NOT AFFECT CREW, VEHICLE, OR MISSION STATUS.

REFERENCES: JSC-12770 SFOM VOL. 12, 10131-10031

REPORT DATE 10/23/87  C-351
INDEPENDENT ORBITER ASSESSMENT  
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 5/27/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/1R
MDAC ID: 6408  ABORT: 3/1R

ITEM: TREADMILL EXERCISER ASSEMBLY ATTACHMENT FITTINGS
FAILURE MODE: FAILS TO REMAIN CLOSED

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) TREADMILL EXERCISER ASSEMBLY
3) ATTACHMENT FITTINGS

CRITICALITIES

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LOCATION: CREW MODULE
PART NUMBER: 10131-10031

CAUSES: CONTAMINATION, MISHANDLING/ABUSE, PIECE-PART FAILURE

EFFECTS/RATIONALE:
QUICK DISCONNECT ATTACHMENT FITTINGS FAIL TO REMAIN CLOSED OR LOCKED DURING ASCENT/ENTRY. TREADMILL MAY DETACH ITSELF FROM MIDD/DECK FLOOR. CREW AND/OR VEHICLE MAY BE HARMED OR DAMAGED BY TREADMILL DURING ASCENT/ENTRY MANEUVERING.

REFERENCES: JSC-12770 SFOM VOL. 12, 10131-10031

REPORT DATE 10/23/87  C-352
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6500

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) INTENSITY CONTROL/POWER SWITCH
FAILURE MODE: INTENSITY CONTROL/POWER SWITCH FAILS OPEN

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) INTENSITY CONTROL OR POWER SWITCH
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CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: ME446-0045-0001

CAUSES: SHOCK, VIBRATION, WEAR, CONTAMINATION ON ELECTRICAL CONTACTS

EFFECTS/RATIONALE:
LOSS OF POWER TO LAMP RESULTING IN LOSS OF USE OF COAS. LOSS OF COAS MAY RESULT IN DELAY FOR RENDEZVOUS AND LOSS OF BACKUP IMU ALIGNMENT AND VERIFICATION CAPABILITY.

REFERENCES: V620-660810, SSSH 9.5

REPORT DATE 10/23/87  C-353
**INDEPENDENT ORBITER ASSESSMENT**
**ORBITER SUBSYSTEM ANALYSIS WORKSHEET**

**DATE:** 4/13/87  
**SUBSYSTEM:** CREW EQUIPMENT  
**MDAC ID:** 6501

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

**ITEM:** CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) INTENSITY CONTROL  
**FAILURE MODE:** INTENSITY CONTROL FAILS CLOSED

**LEAD ANALYST:** L. GRAHAM  
**SUBSYS LEAD:** S.K. SINCLAIR

**BREAKDOWN HIERARCHY:**
1) CREW EQUIPMENT  
2) COAS  
3) INTENSITY CONTROL  
4)  
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**REDUNDANCY SCREENS:**  
A [ ]  
B [ ]  
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**LOCATION:** CREW MODULE  
**PART NUMBER:** ME446-0045-0001

**CAUSES:** SHOCK, VIBRATION, WEAR, CONTAMINATION ON ELECTRICAL CONTACTS

**EFFECTS/RATIONALE:**
UNABLE TO CONTROL BULB INTENSITY. IF INTENSITY CONTROL FAILS AT LOW INTENSITY COAS MAY BE USELESS DURING SOME RENDEZVOUS SITUATIONS.

**REFERENCES:** V620-660810, SSSH 9.5

**REPORT DATE** 10/23/87  
**C-354**
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6502

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

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) LIGHT BULB
FAILURE MODE: BULB FAILS OFF

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) BULB HOUSING ASSEMBLY
4) LIGHT BULB
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CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: V620-660815-003

CAUSES: BULB BURNS OUT OR FAILS DUE TO SHOCK OR VIBRATION

EFFECTS/RATIONALE:
UNABLE TO USE COAS FOR IMU REALIGNMENT. MAY CAUSE LOSS OF MISSION. HOWEVER, 2 SPARE BULBS ARE FLOWN ON EACH FLIGHT WHICH WOULD ALLOW THE CREWMAN TO REPLACE THE FAILED ONE.

REFERENCES: V620-660810, SSSH 9.5

REPORT DATE 10/23/87 C-355
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6503

HIGHEST CRITICALITY
FLIGHT: 3/3
ABORT: /NA

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) MOUNTING BASE

FAILURE MODE: FAILS TO ALLOW COAS TO ATTACH TO OR DETACH FROM BRACKETS

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) MOUNTING BASE
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CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: V620-660830-001

CAUSES: MISHANDLING BY CREWMAN DAMAGES BASE OR MOUNTING SCREWS ON COAS

EFFECTS/RATIONALE:
UNABLE TO ATTACH OR TO DETACH COAS FROM BRACKETS. UNABLE TO USE COAS DURING IMU REALIGNMENT (IF NECESSARY). CREWMAN CAN USE TAPE TO ATTACH COAS TO BRACKETS THEREBY OVERCOMING FAILURE.

REFERENCES: V620-660730, V620-660720

REPORT DATE 10/23/87 C-356
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6504

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

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) FORWARD ADAPTER BRACKET
FAILURE MODE: FAILS TO ATTACH OR DETACH COAS

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) FORWARD ADAPTER BRACKET
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW MODULE
PART NUMBER: V620-660720

CAUSES: MISHANDLING BY CREWMAN DAMAGES ADAPTER BRACKET OR ATTACHMENT THUMBSCREW ON FORWARD ADAPTER BRACKET.

EFFECTS/RATIONALE:
UNABLE TO ASSIST IN COMPLETE IMU REALIGNMENT. CREWMAN CAN USE TAPE TO ATTACH COAS TO BRACKET THEREBY OVERCOMING FAILURE.

REFERENCES: V620-660720

REPORT DATE 10/23/87 C-357
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87

HIGHEST CRITICALITY HDW/FUNC

SUBSYSTEM: CREW EQUIPMENT

MDAC ID: 6505

ABORT: /NA

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) FORWARD ADAPTER BRACKET

FAILURE MODE: COAS MISALIGNMENT

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) FORWARD ADAPTER BRACKET
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW MODULE
PART NUMBER: V620-660720

CAUSES: ACCIDENTAL CONTACT BY CREWMAN OR CONTACT WITH ANOTHER PIECE OF EQUIPMENT WHILE MOUNTED.

EFFECTS/RATIONALE:
ACCIDENTAL CONTACT MAY MISALIGN THE MOUNTED COAS WHEN IT IS ON THE FORWARD ADAPTER. IF THE MISALIGNMENT IS NOT NOTICED AND CORRECTED IT MAY CAUSE A PROBLEM DURING RENDEZVOUS/DOCKING OR IMU ALIGNMENT. CREWMAN CAN MANUALLY ADJUST COAS DURING SIGHTINGS TO OVERCOME MISALIGNMENT.

REFERENCES: V620-660720

REPORT DATE 10/23/87 C-358
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6506

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

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) AFT MOUNTING BRACKET
FAILURE MODE: FAILS TO ATTACH OR DETACH COAS

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) AFT MOUNTING BRACKET (ATTACHED TO ORBITER)
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REDUNDANCY SCREENS: A [ ] B [ ] C [ ]

LOCATION: CREW MODULE
PART NUMBER: V620-660730

CAUSES: CREWMAN ACCIDENTLY DAMAGES AFT MOUNTING BRACKET PLATE OR THREADED HOLES.

EFFECTS/RATIONALE:
UNABLE TO ATTACH OR DETACH COAS. POSSIBLY UNABLE TO ASSIST IN COMPLETE IMU ALIGNMENT. CREWMAN CAN USE TAPE TO ATTACH COAS TO BRACKET TO OVERCOME FAILURE.

REFERENCES: V620-660730

REPORT DATE 10/23/87 C-359
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT FLIGHT: 3/3
MDAC ID: 6507 ABORT: /NA

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) FORWARD MOUNTING BRACKET
FAILURE MODE: FAILS TO ATTACH OR DETACH COAS

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) FORWARD MOUNTING BRACKET (ATTACHED TO ORBITER)

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

LOCATION: CREW MODULE
PART NUMBER: V620-660720

CAUSES: CREWMAN ACCIDENTLY DAMAGES FORWARD MOUNTING BRACKET PLATE OR THREADED HOLES

EFFECTS/RATIONALE:
UNABLE TO ASSIST IN COMPLETE IMU REALIGNMENT. CREWMAN CAN USE TAPE TO ATTACH COAS TO BRACKET THEREBY OVERCOMING FAILURE.

REFERENCES: V620-660720

REPORT DATE 10/23/87 C-360
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87  HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 6508  ABORT: /NA

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) APERTURE STOP
FAILURE MODE: BROKEN APERTURE STOP

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) BARREL
4) APERTURE STOP
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REDUNDANCY SCREENS: A [ ]  B [ ]  C [ ]

LOCATION: CREW MODULE
PART NUMBER:

CAUSES: MISHANDLING BY CREWMAN, SHOCK, OR VIBRATION

EFFECTS/RATIONALE:
BROKEN STOP ALLOWS AN INCREASED AMOUNT OF SIDE-TO-SIDE HEAD MOVEMENT WHEN OBSERVING THE PROJECTED RETICLE IMAGE. COULD CAUSE CREWMAN TO MISREAD RANGE, RANGE RATE, OR ALIGNMENT DATA. CREWMAN CAN USE TAPE TO REPAIR APERTURE STOP.

REFERENCES: V620-660810, SSSH 9.5

REPORT DATE 10/23/87  C-361
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6509

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

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) APERTURE STOP
FAILURE MODE: BROKEN APERTURE FILTER

LEAD ANALYST: L. GRAHAM SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) COMBINER LENS ASSEMBLY
4) APERTURE FILTER
5)
6)
7)
8)
9)

CRITICALITIES

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

LOCATION: CREW MODULE

PART NUMBER:

CAUSES: MISHANDLING BY CREWMAN, SHOCK, OR VIBRATION

EFFECTS/RATIONALE:
BROKEN FILTER ALLOWS GREATER FLARE WHEN VIEWING THE RETICLE IMAGE ON THE COMBINER LENS DURING FULL SUNLIGHT. POSSIBLE TO RENDER COAS UNUSABLE DURING FULL SUNLIGHT THEREBY CAUSING A DELAY IN RENDEZVOUS.

REFERENCES: V620-660810, SSSH 9.5

REPORT DATE 10/23/87 C-362
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87  HIGHEST CRITICALITY  HDW/FUNC
SUBSYSTEM: CREW EQUIPMENT  FLIGHT: 3/3
MDAC ID: 6510  ABORT: /NA

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) COMBINER LENS ASSEMBLY
FAILURE MODE: COMBINER LENS ASSEMBLY BREAKS

LEAD ANALYST: L. GRAHAM  SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) COMBINER LENS ASSEMBLY
4)
5)
6)
7)
8)
9)

CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER:

CAUSES: MISHANDLING BY CREWMAN, SHOCK, OR VIBRATION

EFFECTS/RATIONALE:
BROKEN COMBINER LENS ASSEMBLY MAY RENDER COAS UNUSABLE DURING COMPLETE IMU REALIGNMENT. CREWMAN CAN USE TAPE TO REPAIR COMBINER LENS ASSEMBLY.

REFERENCES: V620-660810, SSSH 9.5

REPORT DATE 10/23/87  C-363
INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 4/13/87
SUBSYSTEM: CREW EQUIPMENT
MDAC ID: 6511

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

ITEM: CREWMAN OPTICAL ALIGNMENT SIGHT (COAS) BARREL LOCK
FAILURE MODE: BARREL LOCK FAILS IN ONE POSITION

LEAD ANALYST: L. GRAHAM
SUBSYS LEAD: S.K. SINCLAIR

BREAKDOWN HIERARCHY:
1) CREW EQUIPMENT
2) COAS
3) BARREL
4) BARREL LOCK
5)
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9)

CRITICALITIES

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

LOCATION: CREW MODULE
PART NUMBER: V620-660825-003

CAUSES: SHOCK, VIBRATION, MISHANDLING BY CREWMAN

EFFECTS/RATIONALE:
COAS BARREL WILL BE UNABLE TO ROTATE REQUIRED 10 DEGREES FOR
SHIFTING FROM OVERHEAD WINDOW OPERATIONS TO FORWARD WINDOW
OPERATIONS OR VICE VERSA. THIS WILL RENDER THE COAS UNUSABLE FOR
IMU ALIGNMENT, EXCEPT AT THE SOLE WINDOW OF THE COAS SETTING.
CREWMAN CAN MANUALLY CORRECT FOR THE BARREL MISALIGNMENT.

REFERENCES: V620-660810, SSSH 9.5

REPORT DATE 10/23/87  C-364
APPENDIX D
POTENTIAL CRITICAL ITEMS
## APPENDIX D
POTENTIAL CRITICAL ITEMS

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To be initiated by the responsible NASA Project Officer, Technical Monitor, or other appropriate NASA official for all presentations, reports, papers, and proceedings that contain scientific and technical information. Explanations are on the back of this form and are presented in greater detail in NHB 2200.2, "NASA Scientific and Technical Information Handbook."

I. DOCUMENT/PROJECT IDENTIFICATION (information contained on report documentation page should not be repeated except title, date and contract number)

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<td>Author(s)</td>
<td>NASA Scientific and Technical Division</td>
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