INDEPENDENT ORBITER ASSESSMENT

ASSESSMENT
OF THE
MANNED MANEUVERING
UNIT

19 FEBRUARY 1988

MCDONNELL DOUGLAS ASTRONAUTICS COMPANY
HOUSTON DIVISION

SPACE TRANSPORTATION SYSTEM ENGINEERING AND OPERATIONS SUPPORT

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INDEPENDENT ORBITER ASSESSMENT
ASSESMENT OF THE MANNED MANEUVERING UNIT

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1.0 EXECUTIVE SUMMARY

The McDonnell Douglas Astronautics Company (MDAC) was selected in June 1986 to perform an Independent Orbiter Assessment (IOA) of the Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL). Direction was given by the STS Orbiter and GFE Projects Office to perform the hardware analysis using the instructions and ground rules defined in NSTS 22206, Instructions for Preparation of FMEA and CIL, 10 October 1986.

The IOA effort first completed an analysis (Reference 6) of the Manned Maneuvering Unit (MMU) hardware, generating draft failure modes and potential critical items. To preserve independence, this analysis was accomplished without reliance upon the results contain within the NASA FMEA/CIL documentation. The IOA results were then compared to the proposed Martin Marietta FMEA/CIL Post 51-L updates (Reference 7). A discussion of each discrepancy from the comparison is provided through additional analysis as required. However, due to the cancellation of the Martin Marietta FMEA/CIL task, and subsequent cancellation of the IOA FMEA/CIL task, the resolution of these discrepancies were not attempted. These discrepancies were flagged as issues, and recommendations were made based on the FMEA data available at the time. This report documents the results of this comparison for the Orbiter MMU hardware.

The IOA product for the MMU analysis consisted of 204 failure mode "worksheets" that resulted in 95 potential critical items being identified. Comparison was made to the NASA baseline (as of January 5, 1987) which consisted of 179 FMEAs and 110 CIL items. The comparison determined if there were any results which had been found by the IOA but were not in the NASA baseline. This comparison produced agreement on all but 121 FMEAs which caused differences in 92 CIL items. Figure 1 presents a comparison of the proposed Post 51-L NASA baseline, with the IOA recommended baseline, and any issues.

The issues arose due to differences between the NASA and IOA FMEA/CIL preparation instructions.

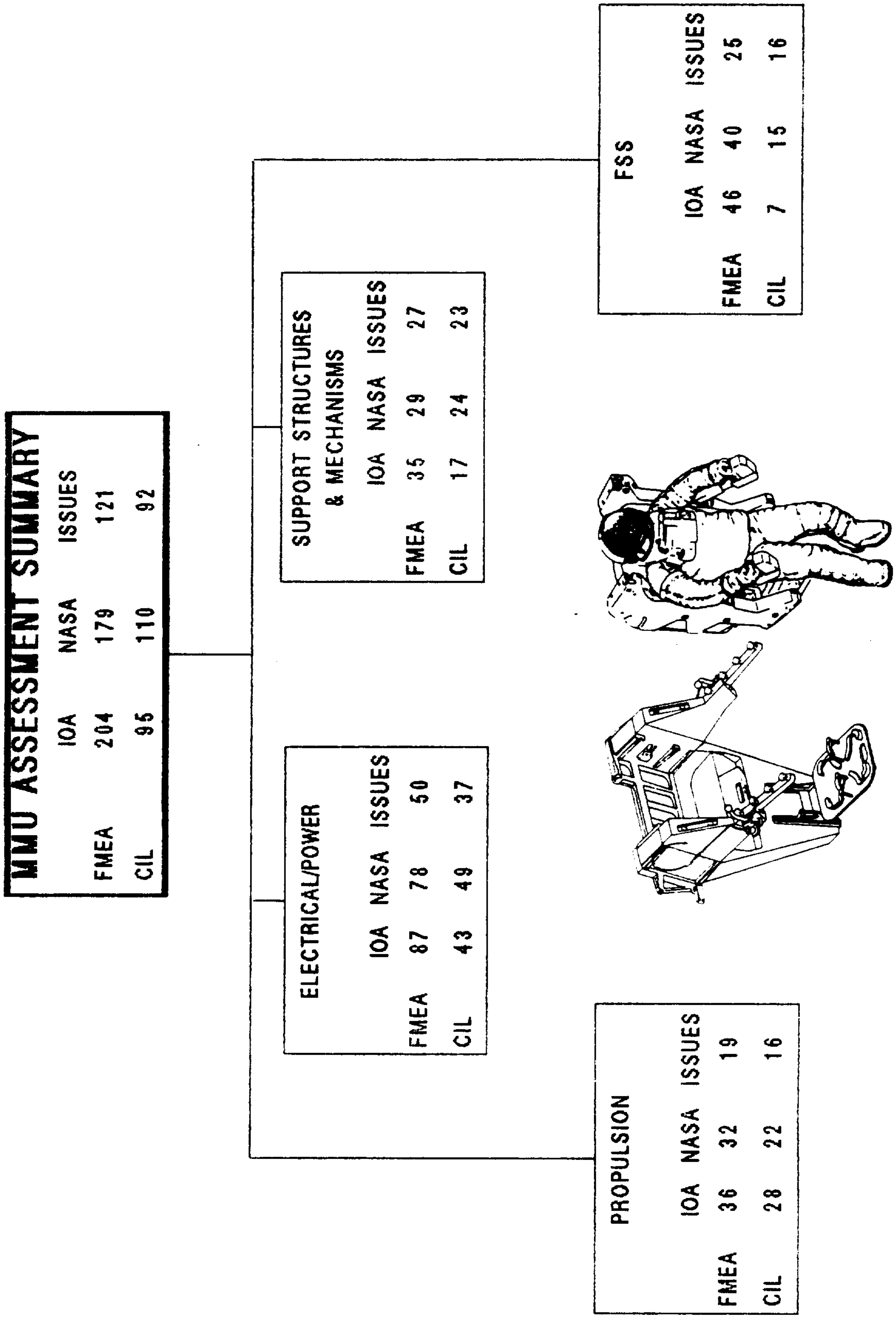

Figure 1 - MMU FMEA/CIL ASSESSMENT

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 and Government Furnished Equipment (GFE) FMEA/CIL for completeness and technical accuracy.

2.2 Scope

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

2.3 Analysis Approach

The independent analysis approach is a top-down analysis utilizing as-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 MMU Ground Rules and Assumptions

Due to the unique functions performed by the MMU, the IOA project determined it necessary to establish groundrules and assumptions applicable solely to the MMU (reference Appendix B). These ground rules and assumptions, in addition to those established project wide (also provided in Appendix B), are intended to both complement and supplement those defined in NSTS 22206. Additionally, they ensure that the IOA MMU analysis is capable of being understood by personnel who did not directly participate in the analysis.

3.0 SYSTEM DESCRIPTION

3.1 Design and Function

The MMU, reference Figure 2, is a modular, self-contained, propulsive backpack designed to attach to the Extravehicular Mobility Unit (EMU) and to be donned and doffed by one unassisted crewmember. When used, the MMU increases the Orbiter crew's Extravehicular Activity (EVA) mobility by extending the range of their activities from the payload bay to other portions of the spacecraft, to appendages of payloads protruding from the cargo bay, or to other spacecraft entirely. When not in use, the MMU is stowed in the forward payload bay on the Flight Support Station (FSS), reference Figure 3. Two MMUs are typically flown on each Orbiter mission.

The IOA analysis has defined the MMU as being comprised of a propulsion subsystem, electrical/power subsystem, support structures and mechanisms, and the FSS. These subsystems and hardware can operate singly or in an integrated manner to perform four primary functions: propulsion, control, system maintenance and stowage, and crewmember restraint/fit.

1. Propulsion Subsystem - Two independent, identical subsystems are each capable of providing the translational and rotational forces necessary for propulsion. Inert GN2 propellant is stored in two pressure vessels. Activation of a motor-driven isolation valve (open) allows GN2 to flow to a pressure regulator and then to the thruster manifolds which consist of four 3-thruster (triad) assemblies for each of the two subsystems. Based on hand-controller and gyro inputs, electrical power to the thruster solenoid valves result in expansion of the nitrogen gas through a nozzle to produce propulsion. The two systems are isolated but can be interconnected through hand-actuated toggle valves. Quick-disconnect valves provide GN2 recharge capability for the pressure vessels when the MMU is stowed in the FSS. Figure 4 is a schematic of the propulsion subsystem.

2. Electrical/Power Subsystem - Encompasses the control electronics and the power storage and distribution within the MMU. Figure 5 presents an overview of this subsystem.

   The maneuvering control comprises three main elements - two hand controllers and the Control Electronics Assembly (CEA). These operate together to provide signals to the propulsion system for rotational or translational motion. The Rotational Hand Controller (RHC) furnishes switching logic that converts rotary motions of the handle to rotational commands. The RHC also supplies control for the attitude hold function. The Translational Hand Controller (THC) provides switching logic that converts the motions of the handle in three axes to translational commands. The THC also controls the propellant isolation valve.

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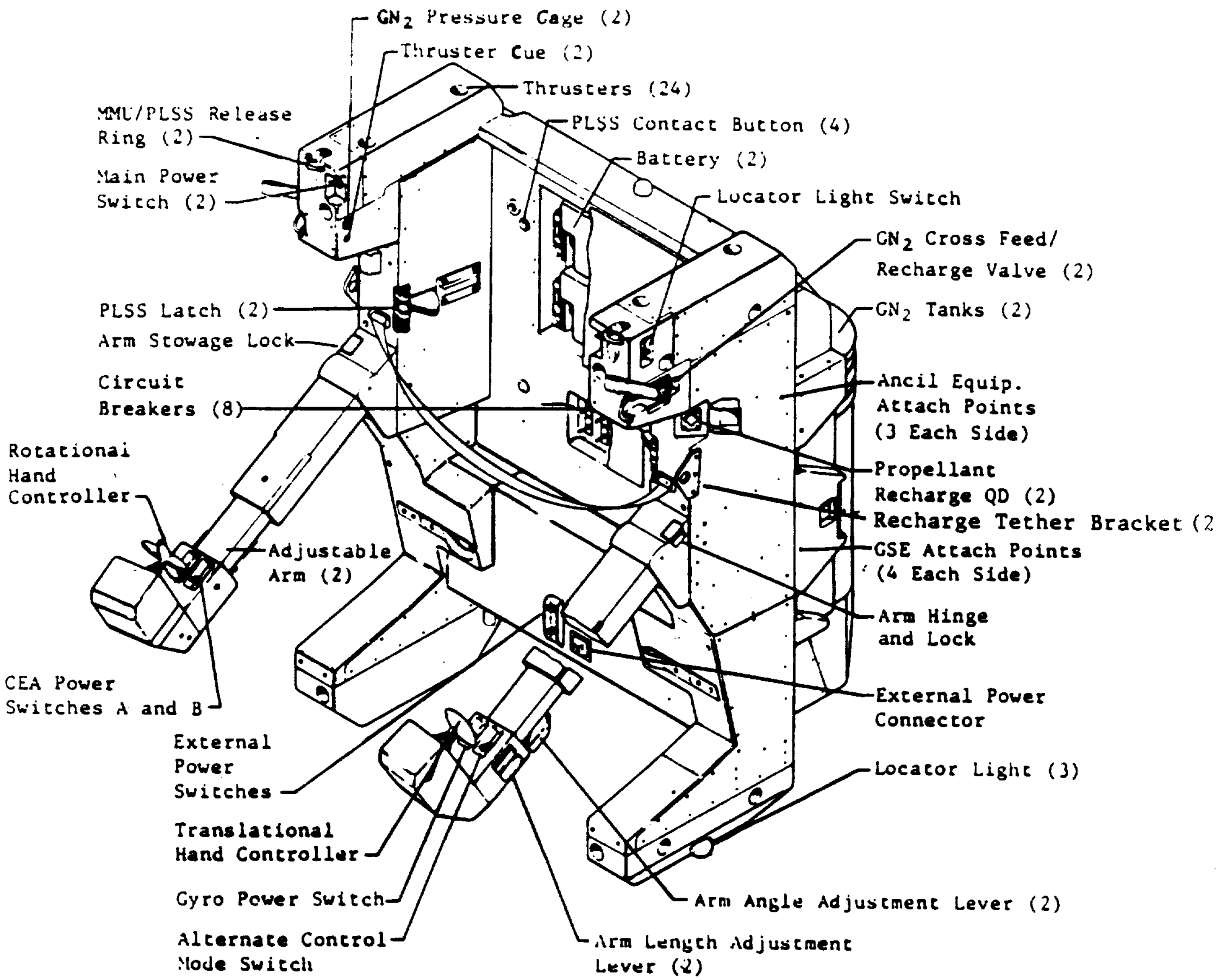

Figure 2 - MANNED MANEUVERING UNIT (MMU)

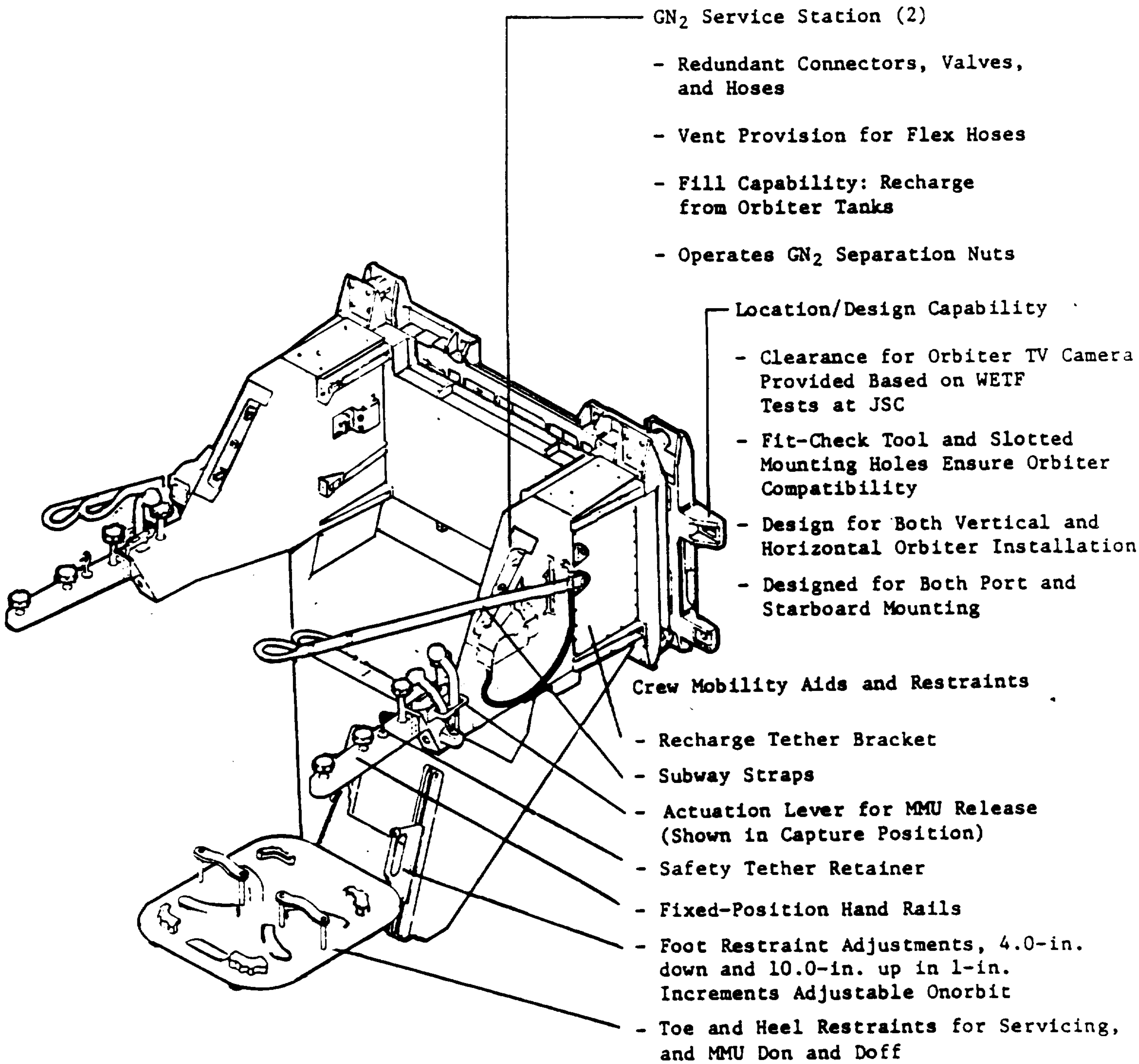

Figure 3 - FLIGHT SUPPORT STATION

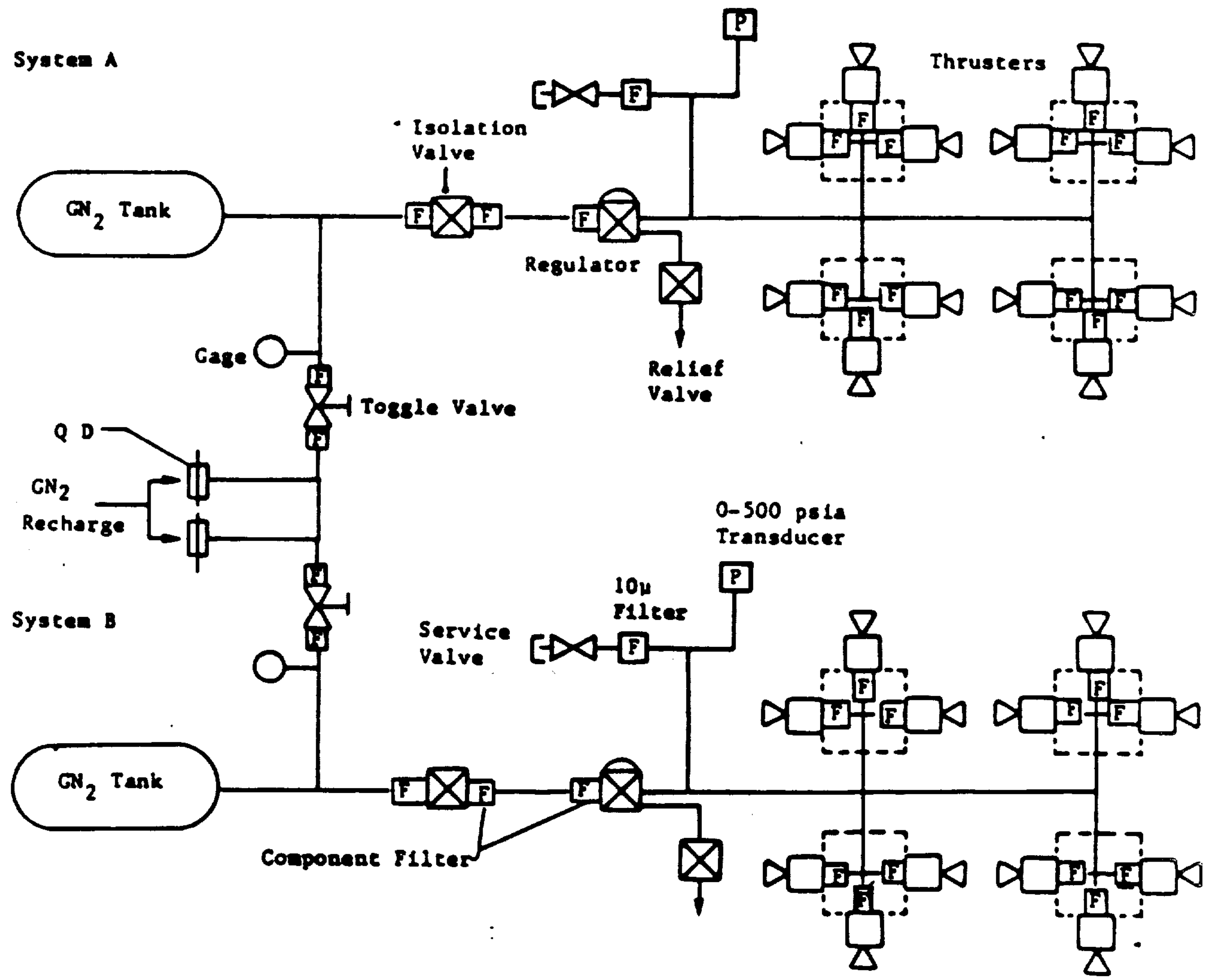

Figure 4 - PROPULSION SUBSYSTEM SCHEMATIC

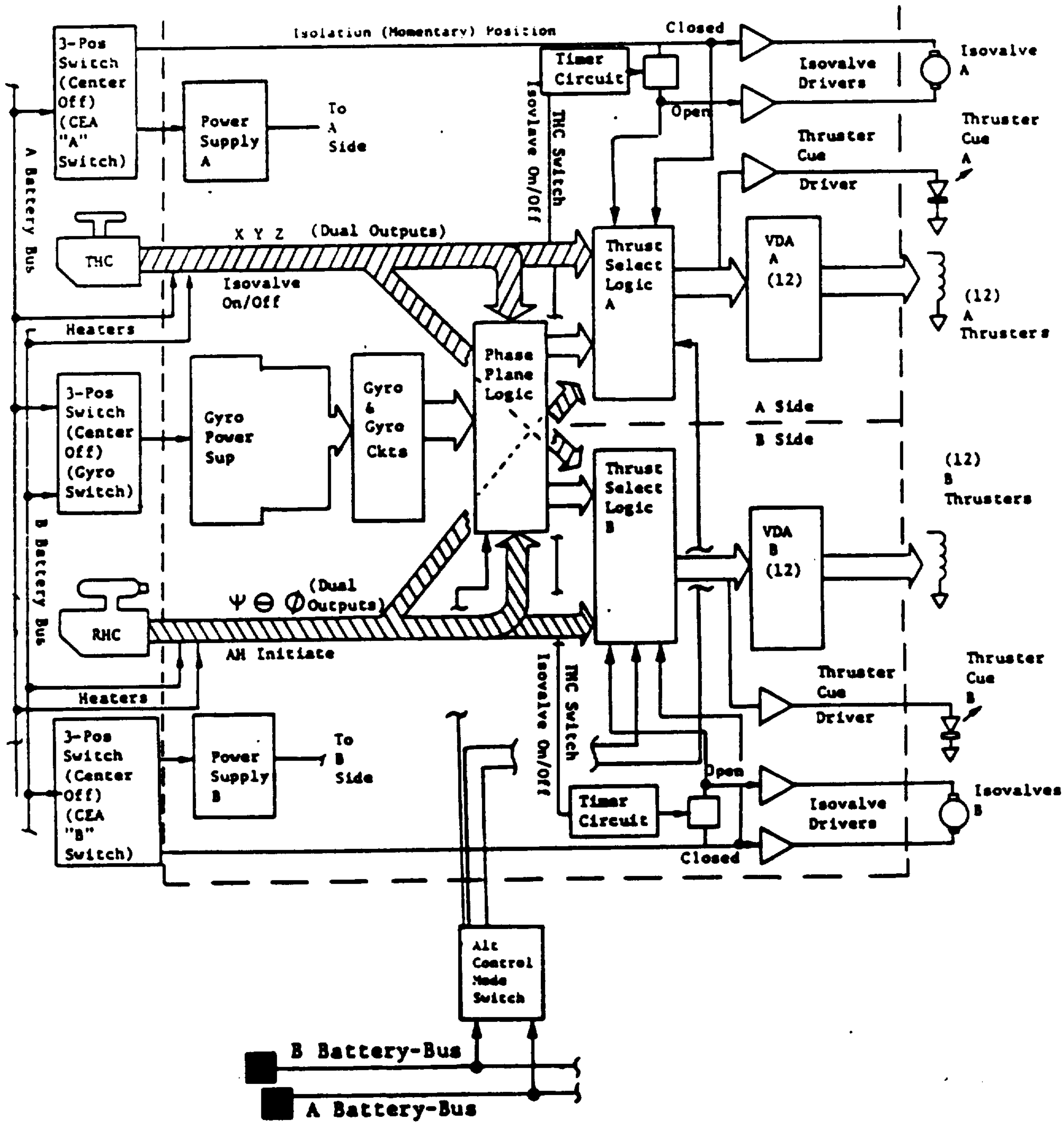

Figure 5 - ELECTRICAL/POWER SUBSYSTEM OVERVIEW

The CEA contains circuitry to operate the thruster valves of the propulsion system, and circuitry to respond to hand-controller commands for translational and rotational control. Gyro circuitry provides attitude and rate information. Phase-plane circuitry furnishes inputs for the thruster select logic for the automatic attitude hold mode of operation.

The thruster select logic uses either or both redundant thruster sets to convert manual and/or attitude hold commands to thrust commands. Valve drive amplifiers amplify the thruster valve signals to levels required for valve operation. Isolation valves, when open, allow GN_2 to flow from the pressure vessels to the pressure regulators.

Thruster cue lights allow a visible indication of thruster commands and isolation valve operation.

The power comprises two silver-zinc batteries and two separate power distribution systems that include the circuit breakers, switches, and relays required for MMU operation. Power conditioners in the CEA, fed from the batteries, supply power to the CEA and hand controllers. Locator lights provide visible indication of the location of the EVA crewmember to an observing crewmember inside the Orbiter. The locator lights consist of a converter assembly and three light assemblies. The batteries also furnish heater power for the propulsion heaters and hand controller case heaters. Heaters are required for both orbital storage and EVA operations. During EVA, skin temperatures can be as low as -120 degrees F, whereas most components must be above -60 degrees F for operation.

3. <u>Support Structures and Mechanisms</u> - The basic MMU structure consists of two side towers connected by the center structure and two arms. The towers support the thrusters and provide mounting for the MMU/FSS retention latches and the propulsion subsystem Quick Disconnects (QDs). The center structure supports the two batteries, eight circuit breakers, the CEA, two pressure vessels, and propulsion equipment. Also supported are the external power connector, and thermal cover, and the thermal covers for the batteries.

   In conjunction with the towers, the center structure supports the retention system for the EMU. This EMU/MMU retention system consists of two independent manually activated latches, guide ramps, and back-support points. The arms can be pivoted and extended for flight or located in the stowed position.

4. Flight Support Station (FSS) - The FSS, reference Figure 3, provides MMU stowage, GN2 pressure vessel recharge, and stowage heaters for the MMU on the port or starboard side of the Orbiter near the EVA airlock and hatch.

The FSS structure comprises the side arms, foot restraints, and the Orbiter mounting structure. A locking handle and butterfly latch are provided for flight docking, capture, and release of the MMU. The foot restraints are adjustable on orbit to accommodate the full range of astronaut anthropometry. Shock mounts (vibration isolators) are provided to attenuate the Orbiter launch environment. The MMU is secured in the FSS during launch with four capture bolts and Gas Actuated Nuts (GANs) installed in the MMU. On astronaut operation, the nuts will actuate and MMU bolts release, allowing FSS egress. For contingency operations, the nuts can be manually engaged or disengaged.

The pneumatic portion of the FSS consists of a dual Orbiter interface which routes GN2 to redundant charging systems, either one of which can recharge the MMU propulsion system. Each charging system contains a charging valve, vent valve, flex hose, and one-half of the QD. GN2 can also be supplied to the GANs used for MMU-to-FSS launch attachment.

FSS heaters are supplied 28-Vdc power from the Orbiter through two independent power buses. Breakers in the Orbiter cabin furnish circuit protection. Five temperature sensors are provided for crew temperature monitoring of the MMU during orbital storage.

3.2 Interfaces and Locations

Interfaces occur between the MMU (including the FSS) and other Space Transportation System (STS) Orbiter elements in three specific areas. First, the MMU itself interfaces with the FSS. Second, structural, mechanical, electrical, and nitrogen recharge interfaces exist between the Orbiter and the FSS. Third, mechanical and man/machine interfaces exist between the crew-member in the EMU and the MMU.

When not in use the MMU is stowed in the front of the payload bay of the Orbiter on the FSS. Due to this location the MMU is continually exposed to the space environment when in orbit. The EMU to MMU interfaces are depicted in Figure 6. The MMU to FSS interfaces envelopes in the payload bay are depicted in Figures 7 and 8.

3.3 Hierarchy

Figures 9 through 13 illustrate the hierarchical relationships between the MMU, subsystems, and components employed for the enclosed IOA analysis.

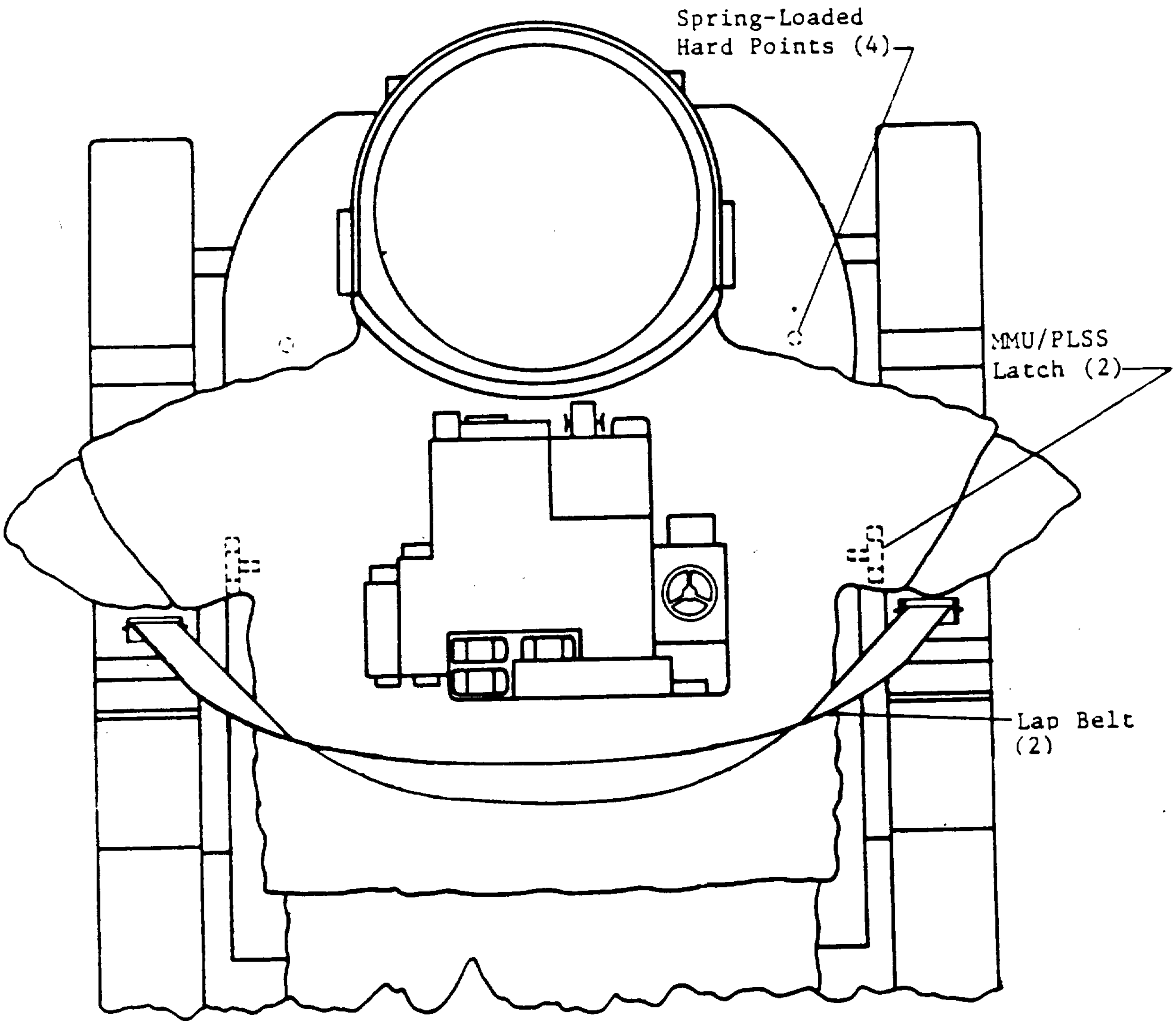

Figure 6 - MMU-EMU INTERFACES

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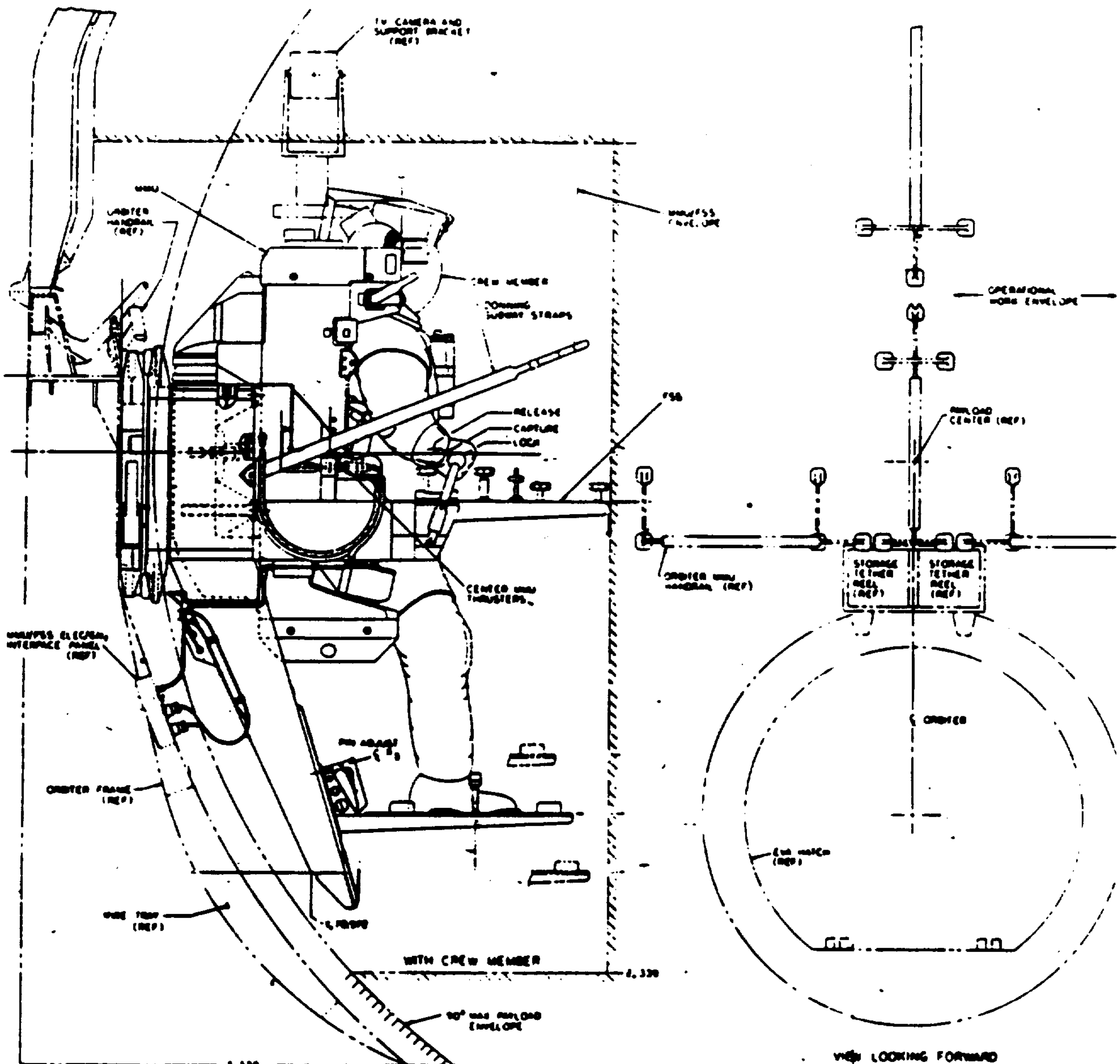

Figure 7 - MMU-FSS ENVELOPE - PORT SIDE

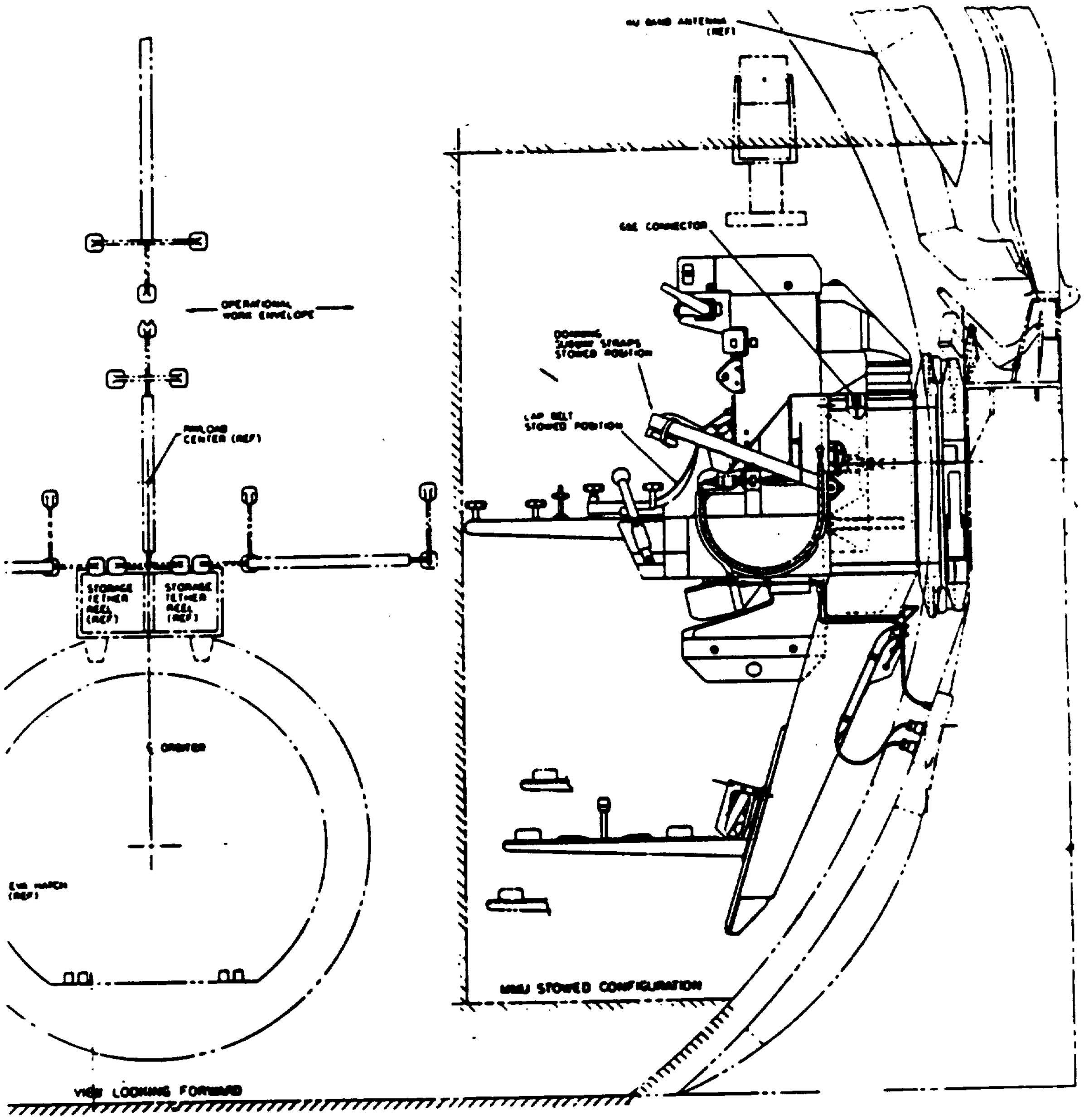

Figure 8 - MMU-FSS ENVELOPE - STARBOARD SIDE

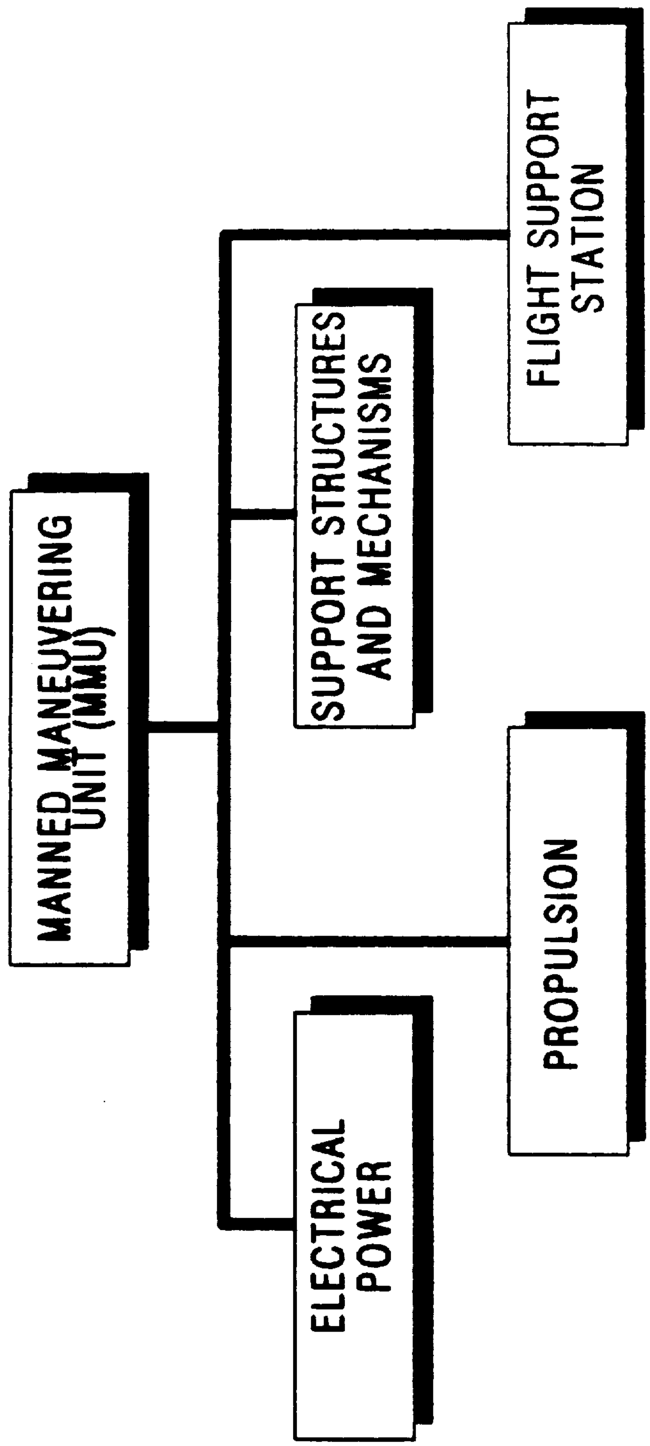

Figure 9 - MMU - TOP LEVEL HIERARCHY

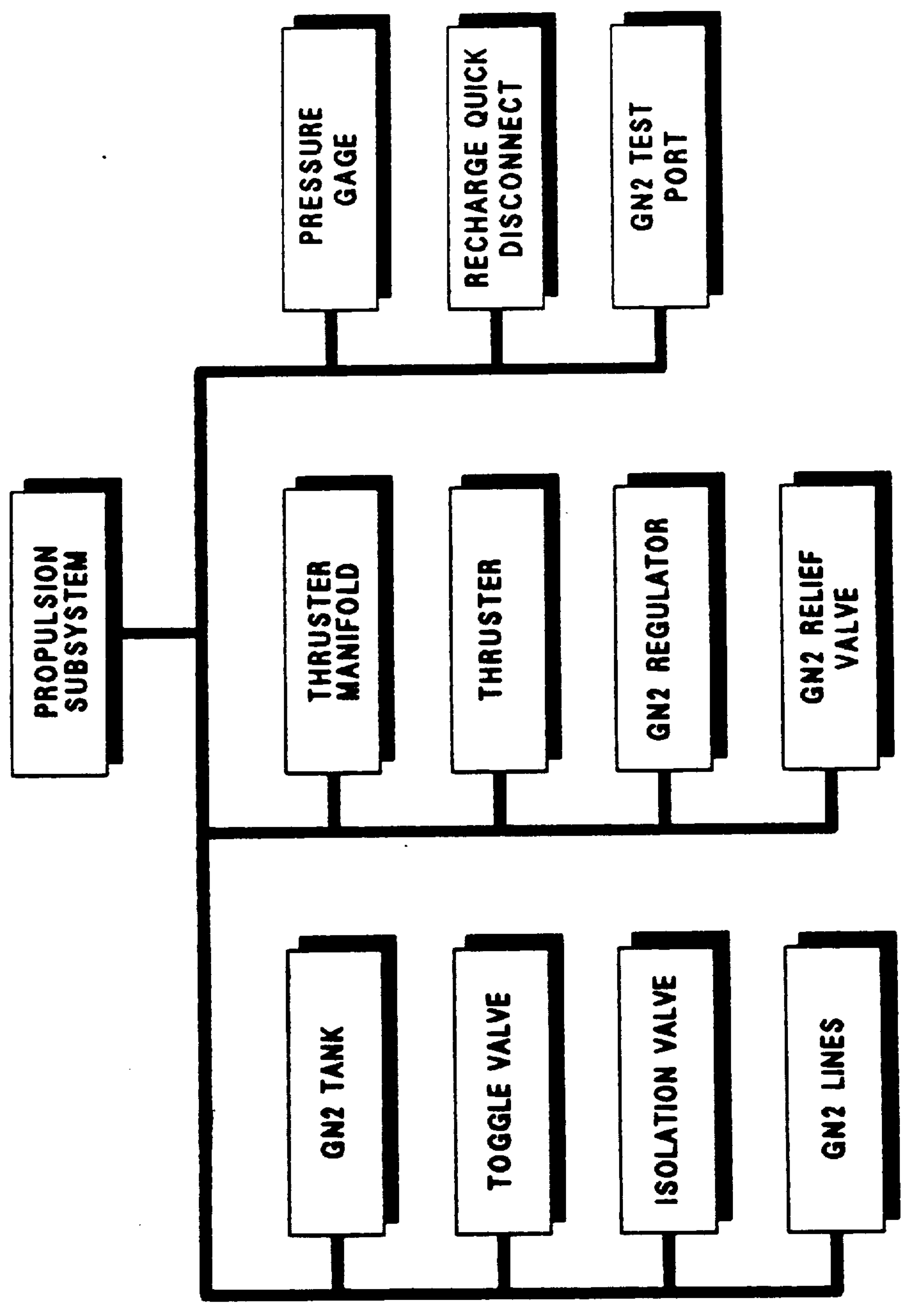

Figure 10 - PROPULSION SUBSYSTEM HIERARCHY

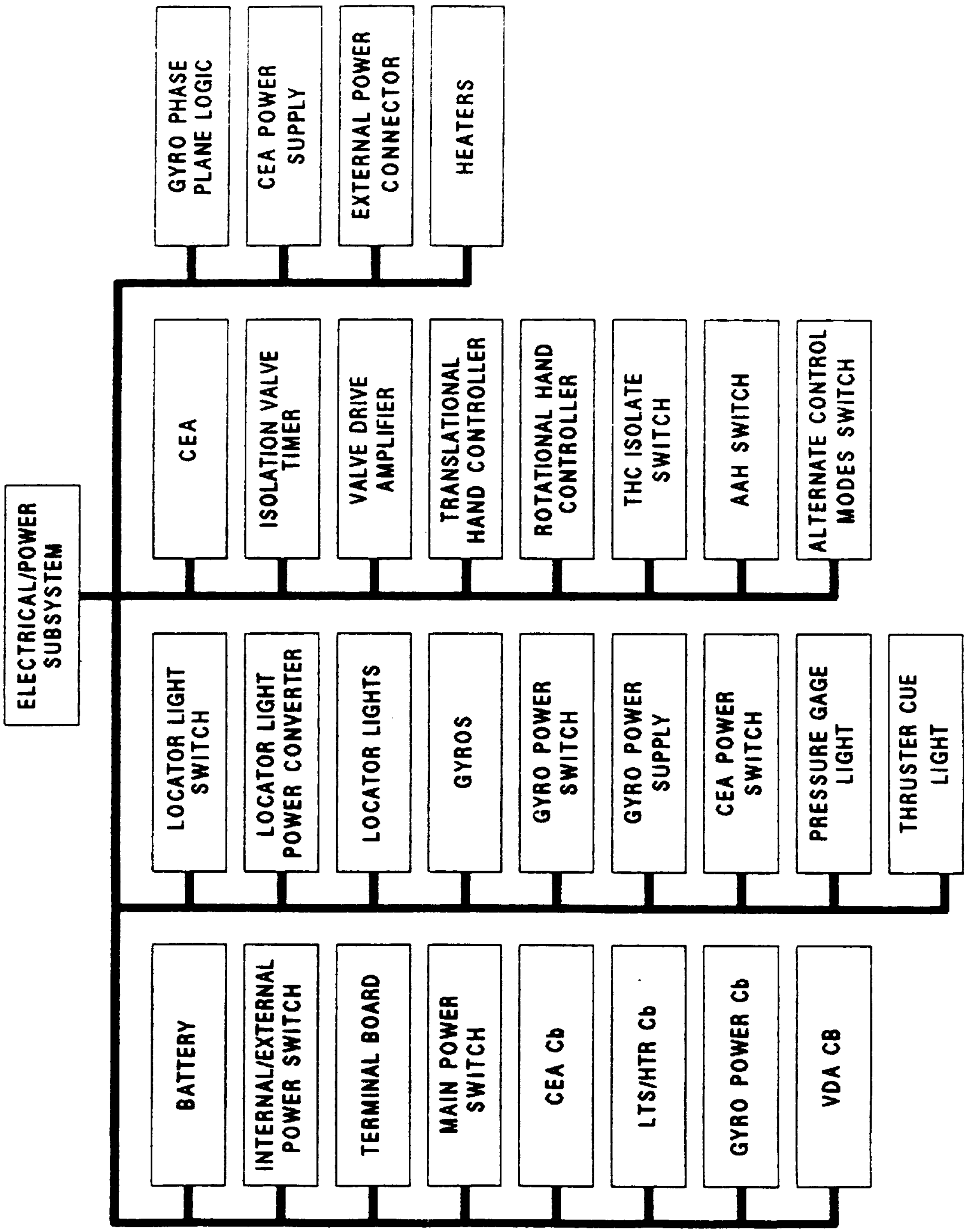

Figure 11 - ELECTRICAL/POWER SUBSYSTEM HIERARCHY

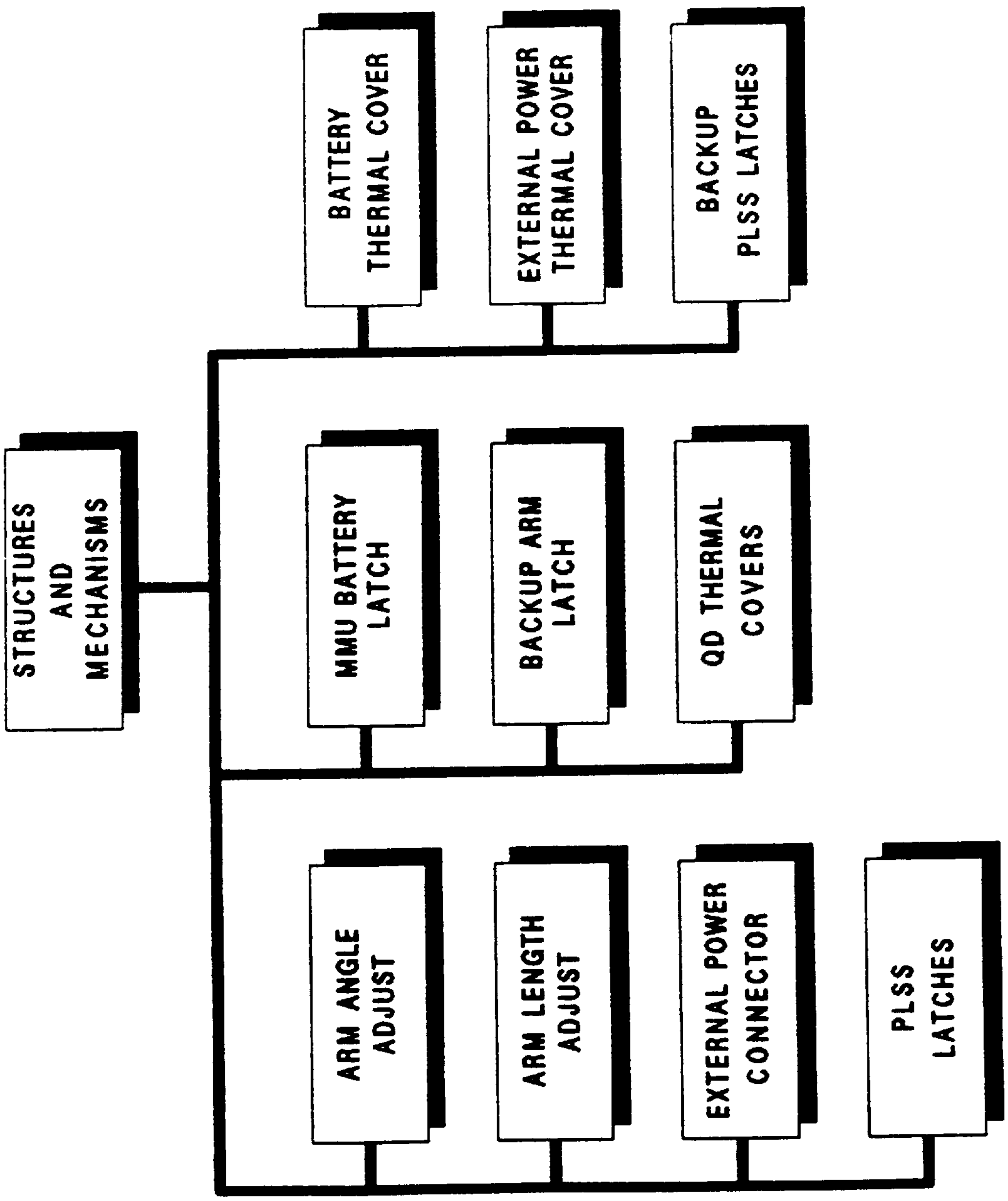

Figure 12 - HIERARCHY OF SUPPORT STRUCTURES AND MECHANISMS

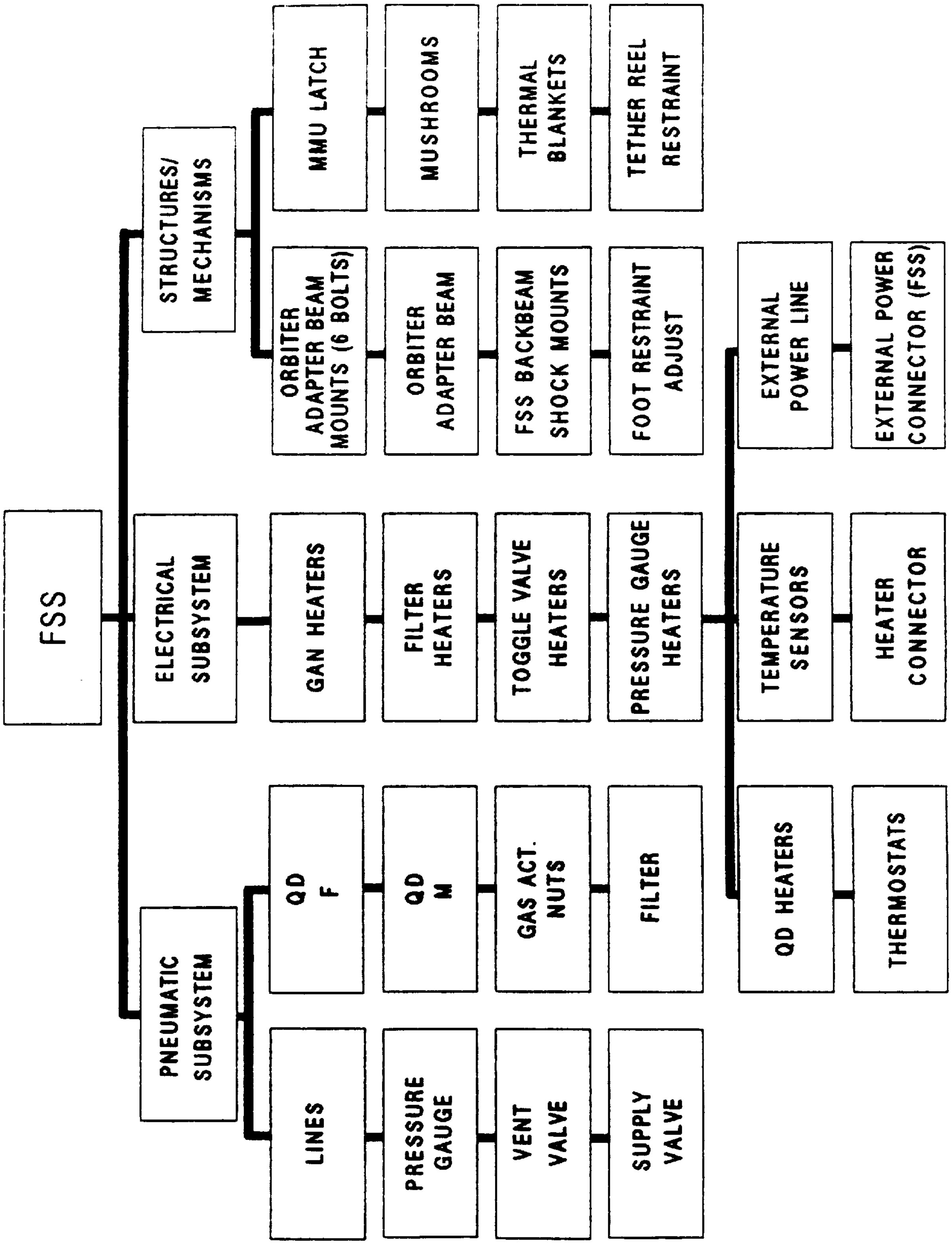

Figure 13 - FSS HIERARCHY

4.0 ASSESSMENT RESULTS

The MMU assessment was done based on the FMEA/CIL data received from Martin Marietta dated January 5, 1987 (Reference 7). Subsequent to the receipt of these data, a meeting was held on April 14, 1987 with Ms. Susan Goudy of the Martin Marietta Corporation and some of the significant issues were discussed. Resolution of these issues remained for a later date, and was not pursued after the cancellation of the Martin Marietta FMEA/CIL task by NASA. In this report, an attempt has been made to compare the IOA analysis results (Reference 6) to those of Reference 7, and bring the assessment process up to date with change 2 of NSTS-22206. Some of the significant issues identified are summarized below:

- The Martin Marietta analysis format lacked a comprehensive definition of the flight phases, screens, and the item(s) under study. All the flight phases were not always analyzed for prep, ops, and post ops for each failure mode. The screens A and B were not specifically designated per NSTS-22206. IOA had to interpret their status based on very limited information provided. The screen C was not addressed, and it was therefore left blank throughout the assessment.

  The Martin Marietta analysis did not address a specific hardware item in some cases, but used an assembly instead. This made it very difficult to investigate failure modes and effects of a particular item and its impact on the overall system.

- The MMU PREP and POST-OPS definitions were not too clear and it was consequently difficult to match their criticalities. IOA considered every MMU activity to begin with PRE-OPS activities and end with POST-OPS activities prior to the start of the next MMU OPS. The Martin Marietta definition seems to suggest that the PREP activities start with the first MMU PRE-OPS and stop after the last MMU OPS activity. The period after the last planned MMU OPS will then be POST-OPS.

- There were a number of issues related to the treatment of the multi-position switches. The Martin Marietta used a more broad and general failure mode approach, such as open or closed. IOA considered and investigated the failure of single contact positions for open and closed and assigned the worst case criticality. Multi-position switches to fail open or closed were in general considered to be unreasonable.

- Electrical items, such as diodes, resistors, relays, etc., associated with an LRU circuit were not studied by Martin Marietta. IOA provided analysis for these items to be incorporated into the final FMEA/CIL study.

The IOA analysis of the MMU hardware initially generated 136 failure mode worksheets and identified 69 Potential Critical Items (PCIs) before starting the assessment process. In order to facilitate comparison, 57 additional failure mode analysis worksheets were generated. These analysis results were compared to the proposed NASA Post 51-L baseline of 179 FMEAs and 110 CIL items, which was generated using the NSTS-22206 FMEA/CIL instructions. Upon completion of the assessment, 121 of the 204 FMEAs remained as issues to be resolved. The explanations for these issues are provided on individual assessment sheets in Apendix C.

Appendix D highlights the NASA Critical Items and corresponding IOA worksheet ID. Appendix E contains the IOA additional analysis worksheets supplementing previous analysis. Appendix F provides a cross reference between the NASA FMEA and corresponding IOA worksheet(s). IOA recommendations are also summarized.

Table I presents a summary of the FMEA and IOA criticalities and the associated issue counts.

Table I Summary of IOA FMEA Assessment Issues

Component	NASA	IOA	Issues
Propulsion	32	36	19
Electrical/ Power	78	87	50
Structures and Mechanism	29	35	27
FSS	40	46	25
TOTAL	179	204	121

Table II presents a summary of the CIL assessment issues that exist for each component.

Table II Summary of IOA CIL Assessment Issues			
Component	NASA	IOA	Issues
Propulsion	22	28	16
Electrical/ Power	49	43	37
Structures and Mechanism	24	17	23
FSS	15	7	16
TOTAL	110	95	92

Table III presents a breakdown of the IOA recommended failure criticalities for the Post 51-L FMEA baseline.

TABLE III Summary of IOA Recommended Failure Criticalities							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
Propulsion	1	23	2	-	8	2	36
Electrical/ Power	9	26	8	6	17	21	87
Structures and Mechanism	-	3	12	-	10	10	35
FSS	-	-	5	2	27	12	46
TOTAL	10	52	27	8	62	45	204

Of the failure modes analyzed, ninety-five were determined to be critical items, distributed throughout MMU as shown in Table IV.

TABLE IV Summary of IOA Recommended Critical Items							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
Propulsion	1	23	2	-	2	-	28
Electrical/ Power	9	26	8	-	-	-	43
Structures and Mechanism	-	3	12	-	2	-	17
FSS	-	-	5	-	2	-	7
TOTAL	10	52	27	-	6	-	95

The scheme for assigning IOA assessment (Appendix C) and analysis (Appendix E) worksheet numbers is shown in Table V.

Table V IOA Worksheet Numbers	
Component	IOA ID Number
Propulsion	MMU-100 to 127, 106A, 106B, 106C, 125A, 1001X, 1031X, 1051X, 1141X, 1191X, 1211X, 1212X, 1251X, 1252X, 1253X.
Electrical/ Power	MMU-128 to 188, 130A, 131A, 134A, 135A, 144A, 145A, 146A, 151A, 152A, 153A, 154A, 157A, 169A, 171A, 174A, 177A, 178A, 179A, 185A, 1281X, 1681X, 1701X to 1704X, 1721X to 1724X, 1731X, 1861X, 1862X, 4015X.
Structures and Mechanism	MMU-189 to 207, 192A, 196A, 1891X to 1899X, 4000X, 4001X, 4005X, 4006X, 4012X, 4013X,1981X 4014X.
FSS	MMU-208 to 245, 219A, 2111X, 2141X to 2144X, 2391X, 2392X, 4002X, 4003X, 4004X, 4007X to 4011X.

5.0 REFERENCES

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

1. NSTS 22206, Instructions for Preparation of Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL), 10 October 1986

2. MMU-SE-17-73, Manned Maneuvering Unit, Space Shuttle Program, Operational Data Book, Volume I, Rev. B, July 1985

3. MMU-SE-17-73, Manned Maneuvering Unit, Space Shuttle Program, Operational Data Book, Volume II, October 1984

4. 852MM000019, Propulsion Flow Diagrams, Rev C, 15 April 1986

5. 852CD0000825, Electrical Check Diagram FSS and MMU, 9 September 1986

6. MDAC IOA MMU Working Paper NO.-WP-VA86001-09, 21 November 1986

7. Martin Marietta Informal Data, MMU Failure Modes and Effect Analysis, Rev A., January 1987

APPENDIX A
ACRONYMS

AAH	-	Automatic Attitude Hold
CB	-	Circuit Breaker
CEA	-	Control Electronics Assembly
CIL	-	Critical Items List
EMU	-	Extravehicular Mobility Unit
EVA	-	Extravehicular Activity
F	-	Functional
FMEA	-	Failure Modes and Effects Analysis
FM	-	Failure Mode
FSS	-	Flight Support Station
GAN	-	Gas Actuated Nut
GFE	-	Government Furnished Equipment
GN_2	-	Gaseous Nitrogen
HW	-	Hardware
HC	-	Hand Controller
HUT	-	Hard Upper Torso
IOA	-	Independent Orbiter Assessment
IVA	-	Intravehicular Activity
JSC	-	Johnson Space Center
LED	-	Light Emitting Diode
Lts	-	Lights
MDAC	-	McDonnell Douglas Astronautic Company
MMU	-	Manned Maneuvering Unit
NSTS	-	National Space Transportation System
PCI	-	Potential Critical Item
PLB	-	Payload Bay
PLSS	-	Portable Life-Support System
QD	-	Quick Disconnect
RHC	-	Rotational Hand Controller
Sat Stab	-	Satellite Stabilization
SMM	-	Solar Maximum Mission
SOS	-	Space Operations Simulator
STS	-	Space Transportation System
TCS	-	Thermal Control System
THC	-	Translational Hand Controller
TPAD	-	Trunnion Pin Attach Device
VDA	-	Valve Drive Amplifier

APPENDIX B

DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

APPENDIX B
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.1 Definitions

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

INTACT ABORT DEFINITIONS:

> RTLS - begins at transition to OPS 6 and ends at transition to OPS 9, post-flight
>
> TAL - begins at declaration of the abort and ends at transition to OPS 9, post-flight
>
> AOA - begins at declaration of the abort and ends at transition to OPS 9, post-flight
>
> ATO - begins at declaration of the abort and ends at transition to OPS 9, post-flight

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

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

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

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

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

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

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

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

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

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

OPS - software operational sequence

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

PHASE DEFINITIONS:

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

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

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

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

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

B.2 IOA Project Level Ground Rules and Assumptions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B.3 MMU Ground Rules and Assumptions

1. Loss of the MMU's automatic attitude hold capability will not be considered life or vehicle threatening, or a mission impact.

   Rationale: To date no normal or contingency MMU operation has been identified or envisioned which would require the automatic attitude hold capability.

2. The availability of the Orbiter to perform a rescue of a stranded crewperson will not be considered in determining the criticality of the applicable failure mode.

   Rationale: The IOA project believes such an exclusion is necessary to ensure worst case scenario analysis results in the most appropriate criticality.

3. For all analyses, it is assumed that the MMU may be required for planned or contingency operations anytime up to initiation of the Orbiter deorbit phase.

   Rationale: The above assumption ensures that failures occuring subsequent to a MMU mission are analyzed for their effect on subsequent MMU missions.

4. The following MMU flight phase definitions are applicable for the analyses provided in Appendix C:

   Pre-Ops: The timeframe extending from installation in the Orbiter to removal of the MMU (on-orbit) from the FSS

   Ops: The on-orbit duration of time during which the MMU is manned and not stowed in the FSS

   Post-Ops: Any timeframe subsequent to on-orbit stowage of the MMU and prior to Orbiter mission completion

5. Although two (2) MMUs are flown on each mission, criticality assignment is performed without consideration to the availability of the second MMU.

   Rationale: The assignment of worst case criticality is ensured by this assumption.

APPENDIX C
DETAILED ASSESSMENT

This section contains the IOA assessment worksheets generated during the assessment of this subsystem. The information on these worksheets facilitates the comparison of the NASA FMEA/CIL (Pre and Post 51-L) to the IOA detailed analysis worksheets included in Appendix E. Each of these worksheets identifies the NASA FMEA being assessed, corresponding MDAC Analysis Worksheet ID (Appendix E), hardware item, criticality, redundancy screens, and recommendations. For each failure mode, the highest assessed hardware and functional criticality is compared and discrepancies noted as "N" in the compare row under the column where the discrepancy occurred.

LEGEND FOR IOA ASSESSMENT WORKSHEETS

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

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

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

NASA Data :
- Baseline = NASA FMEA/CIL
- New = Baseline with Proposed Post 51-L Changes

CIL Item :
- X = Included in CIL

Compare Row :
- N = Non compare for that column (deviation)

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-100
NASA FMEA #: 1.1.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 100
ITEM: GN2 TANK

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-102
NASA FMEA #: 1.5.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 102
ITEM: TOGGLE VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[F]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, HOWEVER, THIS FAILURE COULD NOT BE DETECTED DURING FLIGHT UNTIL THE TIME WHEN ONE TANK IS TO BE ISOLATED, OR A RECHARGE IS ATTEMPTED AFTER EVA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-103
NASA FMEA #: 1.5.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 103
ITEM: TOGGLE VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL CLOSED. IOA AGREES WITH THE FMEA, BUT THE SCREENS SHOULD BE LEFT BLANK.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-104
NASA FMEA #: 1.4.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 104
ITEM: ISOLATION VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[F]	[ ]	[X] *
IOA	[2 /2]	[P]	[F]	[P]	[X]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[2 /2]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
VALVE FAILED OPEN IS NOMINAL OPERATING POSITION. HOWEVER, IT WILL RESULT IN LOSS OF CAPABILITY TO ISOLATE THE GN2 TANK FROM THRUSTERS IN THE EVENT OF A DOWNSTREAM LEAK. LOSS OF FUNCTIONAL REDUNDANCY DOES NOT RESULT IN LOSS OF LIFE AS INDICATED BY THE FMEA. IOA CONSIDERS EVA LOST WITH THIS HARDWARE CRITICALITY, SINCE THIS FAILURE ALONE MAY BE ONE STEP AWAY FROM LOSS OF LIFE (EVA CREW BEING STRANDED WITH THIS FAILURE AND A LEAK) - CANCEL THE EVA AND RETURN TO ORBITER.
AN ITEM OF MAJOR CONCERN IS THAT THIS FAILURE WILL NOT BE DETECTED UNTIL A SUBSEQUENT FAILURE WHICH REQUIRES ISOLATING THE TANK FROM THE THRUSTERS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-105
NASA FMEA #: 1.4.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 105
ITEM: ISOLATION VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[F]	[F]	[X]
COMPARE	[/]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA CRITICALITY. HOWEVER THIS FAILURE WILL NOT BE DETECTED UNTIL THRUSTERS ARE TO BE FIRED, AND THEN THE EVA CREWPERSON COULD NOT DISTINGUISH THIS FAILURE FROM A SIMILAR FAILURE FROM REGULATORS, OR THRUSTERS SOLENOID VALVES.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-106
NASA FMEA #: 1.7.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 106
ITEM: GN2 LINES (ISOL VLV - REGULATOR)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LEAK. THE FMEA CRITICALITY ASSUMES POSSIBLE LOSS OF LIFE DUE TO SHARPNEL AFTER LINE RUPTURE. IOA FEELS THAT FAILURE MODE "RUPTURE" IN THE LINE TO BE NON-CREDIBLE FAILURE. THEREFORE ANY EXTERNAL LEAKAGE WILL FORCE CLOSING THE ISOLATION VALVE, THUS LOSS OF A SYSTEM (MISSION IMPACT). AND WITH LOSS OF BOTH SYSTEMS (TWO LINES LEAK) DURING OPS, THE CREWPERSON IS SUBJECT TO BEING STRANDED-POSSIBLE LOSS OF LIFE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-106A
NASA FMEA #: 1.7.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 106
ITEM: GN2 LINES (REG-THRUSTERS)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[2 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LEAK. THE FMEA CRITICALITY ASSUMES POSSIBLE LOSS OF LIFE DUE TO SHARPNEL AFTER LINE RUPTURE. IOA FEELS THAT FAILURE MODE "RUPTURE" IN THE LINE TO BE NON-CREDIBLE FAILURE. THEREFORE ANY EXTERNAL LEAKAGE WILL FORCE CLOSING THE ISOLATION VALVE, THUS LOSS OF A SYSTEM (MISSION IMPACT). AND WITH LOSS OF BOTH SYSTEMS (TWO LINES LEAK) DURING OPS, THE CREWPERSON IS SUBJECT TO BEING STRANDED-POSSIBLE LOSS OF LIFE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-106B
NASA FMEA #: 1.7.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 106
ITEM: GN2 LINES (XFEED VLV - XFEED VLV)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[P]	[P]	[ ]	[X] *
IOA	[3 /3]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LEAK. A LEAK IN THIS AREA (BETWEEN XFEED VALVES) HAS NO IMMEDIATE EFFECT SINCE THE TANKS ARE CHARGED PRELAUNCH, AND THE XFEED VALVES REMAIN CLOSED THROUGHOUT PRE-OPS AND OPS. HOWEVER, DURING POST-OPS RECHARGE CAPABILITY WILL BE LOST IN SUBSEQUENT EVA/MMU ACTIVITIES. ALSO IT WILL CREATE CONDIJTION FOR A POTENTIAL LOSS OF LIFE IF ONE/TWO OR XFEED VALVES WERE TO FAIL OPEN DURING OPS THIS FAILURE IS NOT DETECTED DURING PRE-OPS AND OPS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-106C
NASA FMEA #: 1.7.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 106
ITEM: GN2 LINES (TANK-ISOL VLV)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[2 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LEAK. LOSS OF GN2 RESULTING IN LOSS OF A SYSTEM. LOSS OF BOTH SYSTEMS (REDUNDANCY FAILURE) DURINGS OPS COULD BE CATASTROPHIC.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-110
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 110
ITEM: THRUSTER MANIFOLD

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LEAK.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-111
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 111
ITEM: THRUSTER MANIFOLD

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
CONSTRICTION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-112
NASA FMEA #: 1.6.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 112
ITEM: THRUSTER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-113
NASA FMEA #: 1.6.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 113
ITEM: THRUSTER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL CLOSED. LOSS OF CONTROL, SAT STAT, AND AAH RESULTING IN MISSION IMPACT OR EVA LOSS. FUNCTIONAL LOSS WILL LEAVE THE EVA CREWPERSON STRANDED DURING OPS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-114
NASA FMEA #: 1.6.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 114
ITEM: THRUSTER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, BASED ON THE EXPLANATION GIVEN IN MMU-113.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-116
NASA FMEA #: 1.2.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 116
ITEM: GN2 REGULATOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA. HOWEVER, THIS FAILURE DURING PRE-OPS AND POST-OPS WILL NOT BE DETECTED, AND DURING OPS PHASE IT CANNOT BE DISTINGUISHED FROM A SIMILAR FAILURE FROM OTHER VALVES IN THE LINE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-117
NASA FMEA #: 1.2.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 117
ITEM: GN2 REGULATOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-119
NASA FMEA #: 1.2.6

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 119
ITEM: GN2 REGULATOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[2 /2]	[P]	[F]	[P]	[X]
COMPARE	[N /N]	[ ]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LOSS OF PRESSURE REGULATION WITH VERY LOW TOLERANCE. FUNCTIONAL LOSS DURING OPS MAY LEAVE THE CREW STRANDED - POTENTIAL LOSS OF LIFE. THE FAILURE MODE MAY BE MORE APPROPRIATELY CALLED OUT OF TOLERANCE (HIGH/LOW RESPONSE) - SEE MMU-1191.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-120
NASA FMEA #: 1.2.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 120
ITEM: GN2 RELIEF VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA. IOA WITHDRAWS THE CAUSES OF THE FAILURE AND ACCEPTS THE FMEA CAUSES.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-121
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 121
ITEM: GN2 RELIEF VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM	
NASA	[/]	[ ]	[ ]	[ ]	[ ]	*
IOA	[3 /1R]	[P]	[P]	[P]	[ ]	
COMPARE	[N /N]	[N]	[N]	[N]	[ ]	

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[F]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL CLOSED. THE RELIEF VALVE FAILED CLOSED DOES NOT POSE ANY IMMEDIATE PROBLEM. HOWEVER, THE VENT CAPABILITY IS LOST AND NOT AVAILABLE WHEN NEEDED AFTER A SUBSEQUENT FAILURE, LIKE REGULATOR FAILED OPEN. KNOWING THIS SCENARIO, THIS FAILURE WILL THEREFORE CREATE A CONDITION THAT IS NOT ADVISABLE TO CONTINUE THE MISSION, BECAUSE THIS FAILURE PLUS REGULATOR FAILED OPEN COULD BE CATASTROPHIC DURING OPS PHASE. THIS FAILURE IS FURTHER COMPLICATED BY THE FACT THAT IT IS NOT READILY DETECTABLE UNTIL A SUBSEQUENT FAILURE (REG FAILED OPEN).

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-122
NASA FMEA #: 1.8.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 122
ITEM: PRESSURE GAGE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-123
NASA FMEA #: 1.8.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 123
ITEM: PRESSURE GAGE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[F]	[P]	[ ]
COMPARE	[/]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LOSS OF ACCURATE GN2 PRESSURE INDICATION - EVA CREW PERSON WILL NOT KNOW QUANTITY OF PROPELLANT REMAINING TO SUCCESSFULLY CONTINUE EVA. EVA CREW PERSON MUST RELY ON OTHER GAGE OR GROUND INSTRUCTION. ANOMALY IN THE TWO GAGE READINGS WILL INDICATE AN ERROR.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-124
NASA FMEA #: 1.8.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 124
ITEM: PRESSURE GAGE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[F]	[P]	[ ]
COMPARE	[/]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LOSS OF ACCURATE GN2 PRESSURE INDICATION - EVA CREW PERSON WILL NOT KNOW QUANTITY OF PROPELLANT REMAINING TO SUCCESSFULLY CONTINUE EVA. EVA CREW PERSON MUST RELY ON OTHER GAGE OR GROUND INSTRUCTION. ANOMALY IN THE TWO GAGE READINGS WILL INDICATE AN ERROR.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-125
NASA FMEA #: 1.3.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 125
ITEM: RECHARGE QUICK DISCONNECT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[F]	[P]	[X]
COMPARE	[/]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN/LEAK. NO IMPACT SINCE THE XFEED VALVES ARE CLOSED, AND FURTHERMORE, THE QD's HAVE CAP's INSTALLED AFTER DISCONNECT FROM THE FSS. DURING PRE/POST-OPS, NO IMPACT IS SEEN SINCE THE TANKS CAN BE RECHARGED AND ISOLATED BY THE XFEED VALVES.
THIS FAILURE WILL NOT BE READILY DETECTED. THE FMEA SEEMS TO BE IN CONFLICT/INCONSISTENT WHEN COMPARED TO 1.3.5.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-125A
NASA FMEA #: 1.3.6

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 125
ITEM: RECHARGE QUICK DISCONNECT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[2 /2]	[P]	[F]	[P]	[X]
COMPARE	[N /N]	[ ]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN/LEAK. NO IMPACT SINCE THE XFEED VALVES ARE CLOSED, AND FURTHERMORE, THE QD's HAVE CAP's INSTALLED AFTER DISCONNECT FROM THE FSS. DURING PRE/POST-OPS, NO IMPACT IS SEEN SINCE THE TANKS CAN BE RECHARGED AND ISOLATED BY THE XFEED VALVES.
THIS FAILURE WILL NOT BE READILY DETECTED. THE FMEA SEEMS TO BE IN CONFLICT/INCONSISTENT WHEN COMPARED TO 1.3.5.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-126
NASA FMEA #: 1.3.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 126
ITEM: RECHARGE QUICK DISCONNECT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, WITH THE EXCEPTION THAT RECHARGE CAPABILITY/ACTIVITY IS PART OF THE POST-OPS PHASE AND NOT PREP AS INDICATED BY THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-127
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 127
ITEM: GN2 TEST PORT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-128
NASA FMEA #: 3.11.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 128
ITEM: BATTERY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-129
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 129
ITEM: INTERNAL/EXTERNAL POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-130
NASA FMEA #: 3.14.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 130
ITEM: INTERNAL/EXTERNAL POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
NO EFFECT DURING MMU OPS SINCE THIS IS NORMAL POSITION. DURING THE FIRST PRE AND POST-OPS IT WILL RESULT IN LOSS OF DIRECT ORBITER POWER TO STORAGE HEATERS. IOA CONSIDERED THIS TO RESULT IN LOSS OF CEA/BATTERY DUE TO COLD/UNDER TEMPERATURE CEA LIMIT VIOLATION - THUS LOSS OF ONE SYSTEM. HOWEVER, IOA ALSO RECOGNIZES THAT A POSSIBILITY EXISTS TO PROVIDE POWER TO THE STORAGE HEATERS BY TURNING THE MAIN POWER SWITCH ON WHILE RECHARGING THE BATTERY - THIS OPERATION COULD BE MONITORED IN THE AIRLOCK, BUT THE EFFECT OF 28V POWER TO OTHER ELECTRICAL COMPONENT IS NOT INVESTIGATED. FINALLY, THIS FAILURE HAS NO EFFECT (3/3) ON MISSIONS WITH ONLY ONE MMU ACTIVITY, AND WILL BE LOSS OF MISSION FOR MULTIPLE MMU OPS AS SHOWN ABOVE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-130A
NASA FMEA #: 3.14.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 130
ITEM: INTERNAL/EXTERNAL POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FAILURE MODE, ELECTRICALLY FAILS IN INT POSITION, AS STATED BY THE FMEA, IS NOT CREDIBLE. THE SWITCH IS A MULTI-POSITION/CONTACT SWITCH AND IT WILL BE ONLY APPROPRIATE TO CONSIDER "A SINGLE CONTACT OPEN" - IN THIS CASE, THE WORST SINGLE CONTACT OPEN IS FOR EXTERNAL POWER TO THE STORAGE HEATERS DURING PRE/POST OPS ACTIVITY, OR MAIN POWER CONTACT OPEN (PINS 5-6) DURING OPS ACTIVITY. EITHER ONE OF THESE FAILURES, CONSIDERED SEPARATELY, WILL RESULT IN LOSS OF A SYSTEM, THUS EVA TERMINATION AS EXPLAINED BY MMU-130. SEE ALSO MMU-131A FOR A SINGLE CONTACT CLOSED FAILURE MODES. THOSE ANALYSIS MAY HAVE TO BE RE-WRITTEN TO CLARIFY THE FAILURE MODES.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-131
NASA FMEA #: 3.14.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 131
ITEM: INTERNAL/EXTERNAL POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
NO EFFECT DURING PRE/POST OPS ACTIVITY SINCE THAT IS ITS NOMINAL POSITION. DURING OPS AND WITH INADVERTENT SWITCHING TO EXT POSITION (OTHERWISE IT IS NOT APPLICABLE), BATTERY POWER WILL BE DENIED TO ONE SYSTEM - LOSS OF A SYSTEM. MISSIONS WITH SAT-STAT REQUIREMENT CAN NOT BE MET. FUNCTIONAL LOSS MAY STRAND THE CREW WITH NO THRUSTER POWER TO RETURN TO ORBITER.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-131A
NASA FMEA #: 3.14.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 131
ITEM: INTERNAL/EXTERNAL POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS FMEA FAILURE MODE WAS CONSIDERED NON-CREDIBLE, SINCE THE SWITCH IS A MULTI POSITION/CONTACT SWITCH. IT WILL BE MORE APPROPRIATE TO FAIL CLOSED THE SWITCH IN ONE SINGLE CONTACT AT THE TIME. ANY SINGLE CONTACT CLOSED FROM EXT/INT PINS HAS NO EFFECT WHEN THE SWITCH IS AT EXT/INT POSITION ACCORDINGLY - NOMINAL POSITION. A SINGLE CONTACT CLOSED ON EXT PINS WHEN THE SWITCH IS IN INT HAS NO EFFECT ALSO SINCE THE MMU IS DURING OPS AND SEPARATED FROM ORBITER POWER. ON THE OTHER HAND, A SINGLE CONTACT CLOSED FROM INT PINS WHEN THE SWITCH IS IN EXT POSITION WILL HAVE A POSSIBILITY OF DRAINING POWER FROM ORBITER AND THE BATTERIES IF THE MAIN POWER SWITCH REMAINS ON. THIS CASE WAS REJECTED SINCE DURING EXT POWER NOMINAL CREW ACTION WILL TURN OFF BATTERY POWER.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-132
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 132
ITEM: TERMINAL BOARD

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-133
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 133
ITEM: TERMINAL BOARD

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-134
NASA FMEA #: 3.13.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 134
ITEM: MAIN POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[2 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FMEA CONSIDERED THIS FAILURE DURING PREP ONLY WHEN THE BATTERY POWER IS TURNED OFF (SWITCH OFF). HOWEVER, DURING OPS PERIOD, THE INADVERTENT SWITCHING ACTION TO OFF POSITION MUST BE CONSIDERED DUE TO SHOCK OR VIBRATION. THIS LATER CASE MAY BE ANALYZED BY A SEPARATE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-134A
NASA FMEA #: 3.13.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 134
ITEM: MAIN POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS FAILURE SHOULD ONLY CONSIDER A SINGLE CONTACT OPEN OR CLOSED AT A TIME. A COMPLETE LOSS OF POWER REQUIRES BOTH CONTACTS TO BE OPEN - NON-CREDIBLE. THIS ANALYSIS IS DONE FOR A SINGLE CONTACT OPEN - SEE ALSO MMU-135A FOR A SINGLE CONTACT CLOSED.
LOSS OF BATTERY RECHARGE CAPABILITY DURING PRE/POST OPS, OTHERWISE NO EFFECT SINCE THE BATTERY POWER CAN BE MAINTAINED THROUGH A REDUNDANT CONTACT ON THE SWITCH. LOSS OF RECHARGE CAPABILITY WILL PRECLUDE SUBSEQUENT EVA/MMU ACTIVITIES.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-135
NASA FMEA #: 3.13.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 135
ITEM: MAIN POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-135A
NASA FMEA #: 3.13.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 135
ITEM: MAIN POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[1 /1]	[ ]	[ ]	[ ]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS FAILURE DURING THE FIRST PRE-OPS WILL APPLY A 28V POWER TO THE BATTERY. THIS MAY RESULT IN BATTERY EXPLOSION CAUSING A POTENTIAL FOR LOSS OF LIFE/VEHICLE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-136
NASA FMEA #: 3.9.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 136
ITEM: LTS/HTR.cb

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-137
NASA FMEA #: 3.9.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 137
ITEM: LTS/HTR.Cb

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FMEA AND ORIGINAL IOA STUDY ASSUMED THAT A FAILURE (OVER CURRENT) HAS ALREADY OCCURED AND THE CB HAS ALSO FAILED CLOSED. THIS SCENARIO IS MULTIPLE FAILURE CASE FOR WHICH THE FAILURES SHOULD BE STUDIED SEPARATELY.
THE CB FAILED CLOSED HAS NO CONSEQUENTIAL EFFECT, AND NOT DETECTABLE UNLESS ANOTHER FAILURE OCCURS. AT ANY RATE, POWER TO THE LIGHTS/HEATERS CAN ALSO BE CUT OFF BY EXT/INT SWITCH AND/OR MAIN POWER SWITCH TO COMPENSATE FOR THE BREAKERS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-138
NASA FMEA #: 3.8.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 138
ITEM: CEA CIRCUIT BREAKER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-139
NASA FMEA #: 3.8.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 139
ITEM: CEA CIRCUIT BREAKER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FMEA AND ORIGINAL IOA STUDY ASSUMED A FAILURE ALREADY IN PROGRESS WHICH DRAWS OVERCURRENT AND THE CB HAS FAILED CLOSED. THIS IS MULTIPLE FAILURE SCENARIO AND INCONSISTENT WITH THE FMEA PROCEDURE. THIS FAILURE POSES NO MAJOR PROBLEM EXCEPT FOR LOSS OF ABILITY TO DENY POWER TO THE CEA. HOWEVER, THE POWER MAY BE DENIED BY CEA OR MAIN POWER SWITCH IF NEEDED. THIS FAILURE IS NOT DETECTABLE UNTIL AN OVERCURRENT FAILURE OCCURS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-140
NASA FMEA #: 3.10.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 140
ITEM: GYRO PWR cb

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-141
NASA FMEA #: 3.10.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 141
ITEM: GYRO PWR cb

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FMEA AND ORIGINAL IOA STUDY ASSUMED A FAILURE ALREADY IN PROGRESS WHICH DREW OVERCURRENT WHILE THE CB HAD FAILED CLOSED. THIS SCENARIO IS MULTIPLE FAILURE CASE AND SHOULD NOT BE CONSIDERED. THIS CB FAILED CLOSED HAS NO EFFECT SINCE IT HAS FAILED IN ITS NOMINAL POSITION. THE FAILURE WILL HOWEVER DENY CAPABILITY TO OPEN THE CIRCUIT, BUT THIS COULD BE MANUALLY DONE BY GYRO POWER SWITCH OR MAIN POWER SWITCH.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-142
NASA FMEA #: 3.7.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 142
ITEM: VDA cb

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-143
NASA FMEA #: 3.7.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 143
ITEM: VDA cb

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FMEA AND ORIGINAL IOA STUDY ASSUMED A FAILURE ALREADY IN PROGRESS WHICH DRAWS OVERCURRENT WHILE THE CB HAS FAILED CLOSED. THIS CASE IS MULTIPLE FAILURE SCENARIO AND SHOULD NOT DRIVE THE CRITICALITY. THE CB FAILURE ALONE IS ONE STEP AWAY FROM THIS SCENARIO WHICH IS CONSIDERED LOSS OF MISSION. THIS FAILURE POSES NO IMMEDIATE THREAT SINCE THE CB HAS FAILED IN ITS NOMINAL POSITION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-144
NASA FMEA #: 3.17.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 144
ITEM: LOCATOR LIGHT SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[F]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, BUT THE SCREENS DO NOT APPLY - SHOULD BE LEFT BLANK.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-144A
NASA FMEA #: 3.17.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 144
ITEM: LOCATOR LIGHT SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[F]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA CRIT WITH THE FOLLOWING TWO COMMENTS: 1) SCREENS DO NOT APPLY - SHOULD BE LEFT BLANK 2) THE FAILURE MODE SHOULD ADDRESS ANY SINGLE CONTACT FAILED IN EITHER OPEN OR CLOSED POSITION. THIS FAILURE SEEMS TO BE A SINGLE CONTACT OPEN - SEE ALSO MMU-145A FOR A SINGLE CONTACT CLOSED.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-145
NASA FMEA #: 3.17.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 145
ITEM: LOCATOR LIGHT SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, BUT THE SCREENS SHOULD BE LEFT BLANK.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-145A
NASA FMEA #: 3.17.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 145
ITEM: LOCATOR LIGHT SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, BUT THE SCREENS SHOULD BE LEFT BLANK. ALSO THE FAILURE MODE IS MORE APPROPRIATELY DEFINED AS A SINGLE CONTACT CLOSED FOR THIS CASE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-146
NASA FMEA #: 3.17.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 146
ITEM: LOCATOR LIGHT SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[NA]	[NA]	[NA]	[ ]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, BUT THE SCREENS SHOULD BE LEFT BLANK.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-146A
NASA FMEA #: 3.17.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 146
ITEM: LOCATOR LIGHT SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[NA]	[NA]	[NA]	[ ]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, BUT THE SCREENS SHOULD BE LEFT BLANK. ALSO, THE FAILURE MODE IS MORE APPROPRIATELY STATED AS A SINGLE CONTACT CLOSED.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-147
NASA FMEA #: 3.18.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 147
ITEM: LOCATOR LIGHT POWER CONVERTER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, BUT THE SCREENS SHOULD BE LEFT BLANK.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-148
NASA FMEA #: 3.19.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 148
ITEM: LIGHT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, BUT THE SCREENS SHOULD BE LEFT BLANK.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-149
NASA FMEA #: 3.16.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 149
ITEM: GYRO POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[NA]	[NA]	[NA]	[ ]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA RECOMMENDS THE ABOVE CRITICALITY BASED ON THE FMEA EXPLANATION GIVEN FOR THE GYROS CIRCUIT BREAKER 3.10.2, THAT IS:
- COMPLETE LOSS OF GYROS WILL ALSO NEGATE THE FUNCTION OF AAH & ALT ATTITUDE CONTROL SWITCHES WHICH IS NECESSARY FOR SOME MISSIONS.
- CREW MAY MAINTAIN ALTITUDE MANUALLY AS A BACK-UP REDUNDANCY TO AUTOMATIC CONTROL.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-150
NASA FMEA #: 3.16.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 150
ITEM: GYRO POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[NA]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, BUT THE SCREENS SHOULD BE LEFT BLANK.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-151
NASA FMEA #: 3.3.6

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 151
ITEM: GYRO POWER SUPPLY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[NA]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS FAILURE WILL PREVENT AAH OPERATION, BUT, MANUAL ATTITUDE CONTROL IS AVAILABLE THROUGH RHC TO COMPENSATE FOR THE LOSS. HOWEVER, SOME MISSIONS (SOLAR MAX) WILL REQUIRE AAH OPERATION IN CONJUNCTION WITH THE ALT CONTROL SWITCH. LOSS OF THIS FUNCTION AND RHC WILL PRECLUDE Y,R,P SEQUENCE, THUS LOSS OF MISSION AND RETURN TO THE ORBITER - SEE ALSO 3.10.2 FOR FURTHER EXPLANATION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-151A
NASA FMEA #: 3.3.7

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 151
ITEM: GYRO POWER SUPPLY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[NA]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS FAILURE WILL PREVENT AAH OPERATION, BUT, MANUAL ATTITUDE CONTROL IS AVAILABLE THROUGH RHC TO COMPENSATE FOR THE LOSS. HOWEVER, SOME MISSIONS (SOLAR MAX) WILL REQUIRE AAH OPERATION IN CONJUNCTION WITH THE ALT CONTROL SWITCH. LOSS OF THIS FUNCTION AND RHC WILL PRECLUDE Y,R,P SEQUENCE, THUS LOSS OF MISSION AND RETURN TO THE ORBITER - SEE ALSO 3.10.2 FOR FURTHER EXPLANATION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-152
NASA FMEA #: 3.12.5

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 152
ITEM: CEA POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM	
NASA	[2 /1R]	[P]	[P]	[ ]	[X]	*
IOA	[2 /1R]	[P]	[P]	[P]	[X]	
COMPARE	[/]	[ ]	[ ]	[N]	[ ]	

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA ACCEPTS THE PREP CRITICALITY AND REJECTS THIS FAILURE MODE FOR THE FLIGHT PHASE DUE TO FOLLOWING REMARKS: 1) THE FAILURE MODE "MECHANICALLY JAMS IN ISO" IS NOT REALISTIC BECAUSE THE SWITCH IS PLACED IN "ON" POSITION THROUGHOUT THE FLIGHT PHASE, AND NO MORE CREW ACTION IS ANTICIPATED/REQUIRED, 2) THE FMEA ASSUMES A FAILURE ALREADY IN PROGRESS WHICH WOULD WARRANT SWITCHING ACTION FROM "ON" TO "ISO", AND THEN JAMMING IN "ISO" POSITION. THIS IS MULTIPLE FAILURE SCENARIO, AND INCONSISTENT WITH THE NSTS-22206 GROUND RULES, 3) AN INADVERTENT OPERATION DOES NOT APPLY EITHER BECAUSE IN ORDER TO ARRIVE AT A 2/1R CRIT, THE SWITCH MUST GO THROUGH TWO FAILURES: A. INADVERTENT OPERATION FROM "ON" TO "ISO", B. "ISO" POSITION JAMMED RIGHT AFTER INADVERTENT OPERATION WHICH WOULD PREVENT THE EVA CREW FROM REACTIVATING/SWITCHING BACK TO "ON" POSITION. THEREFORE, FLIGHT CRITICALITY IS NOT APPLICABLE, AND PREP CRIT IS ACCEPTED WHICH WOULD PREVENT FLIGHT PHASE MMU OPS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-152A
NASA FMEA #: 3.12.6

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 152
ITEM: CEA POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, BUT THE FAILURE MODE SHOULD BE STUDIED FOR A SINGLE CONTACT OPEN AND CLOSED. THIS FMEA SEEM TO BE A SINGLE CONTACT CLOSED IN ISO PINS DUE TO CONTAMINATION/CORROSION. HOWEVER, THE POSSIBILITY OF THE SWITCH BEING IN "ON" POSITION (DURING FLIGHT) AND HAVING A SHORT ACROSS "ISO" OR "OFF" POSITIONS SHOULD BE INVESTIGATED ESPECIALLY IN REGARD TO THE ISOLATION VALVE POSITION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-153
NASA FMEA #: 3.12.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 153
ITEM: CEA POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /3]	[P]	[P]	[F]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FAILURE OF THIS SWITCH (MECHANICALLY JAMMED IN "ON" POSITION) POSES NO IMMEDIATE PROBLEM SINCE IT FAILED IN NORMAL OPERATING POSITION. HOWEVER, IT WILL DENY CAPABILITY FOR CLOSING A SYSTEM CEA DUE TO A FAILURE - THIS ACTION CAN BE COMPENSATED FOR, THROUGH MAIN POWER SWITCH OR THE THC HANDLE (SHUTS OFF BOTH ISO VALVE, TURN OFF MAIN POWER SWITCHES, REACTIVATES THE GOOD MAIN POWER SWITCH) AND RETURN TO ORBITER.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-153A
NASA FMEA #: 3.12.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 153
ITEM: CEA POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /3]	[P]	[P]	[F]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FAILURE (ELECTRONICALLY FAILS "ON") IS MORE APPROPRIATELY IDENTIFIED AS A SINGLE CONTACT OPEN FOR EITHER "ISO" OR "OFF" POSITIONS. THE INABILITY TO TURN OFF A CEA WILL HAVE THE SAME EFFECT AS THE SWITCH FAILED MECHANICALLY IN "ON" POSITION - MMU-153.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-154
NASA FMEA #: 3.12.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 154
ITEM: CEA POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA ACCEPTS THE PREP PHASE CRITICALITY, BUT REJECTS THE OPS/FLT PHASE CRITICALITY BASED ON THE EXPLANATION GIVEN FOR MMU-152.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-154A
NASA FMEA #: 3.12.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 154
ITEM: CEA POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA ACCEPTS THE CRITICALITY, BUT SUGGEST THAT THE FAILURE MODE BE IDENTIFIED AS A SINGLE CONTACT CLOSED (IN THIS FMEA, PINS "OFF"). HOWEVER, DURING OPS WHEN THE SWITCH IS ON, AND THE "OFF" PINS ARE CLOSED - THE FAILURE MUST BE INVESTIGATED.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-155
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 155
ITEM: CEA POWER SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS FAILURE MODE IS SAME AS EITHER "FAILED IN ON" OR "FAILED IN OFF" AS STUDIED BY MMU-153 AND MMU-154 RESPECTIVELY. THIS ANALYSIS MAY BE WITHDRAWN.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-156
NASA FMEA #: 3.21.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 156
ITEM: PRESSURE GAGE LIGHT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA AGREES WITH THE FMEA, SINCE THE TOTAL LOSS OF PRESSURE GAGES WILL RESULT IN LOSS OF CREWPERSON ABILITY TO DETECT GN2 LEVEL AND GN2 LEAK; WHICH MAY JEPARDIZE THE CREWPERSON'S SAFETY. THEREFORE, IOA AGREES TO CANCEL THE MMU AFTER FUNCTIONAL LOSS AND RETURN TO THE ORBITER. HOWEVER, IOA RECOGNIZES THAT THIS DECISION WILL BE MOST LIKELY MADE REAL TIME DEPENDENT UPON THE CIRCUMSTANCES.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-157
NASA FMEA #: 3.3.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 157
ITEM: THRUSTER CUE LT.

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH FMEA, BUT THE SCREEN SHOULD BE LEFT BLANK. SEE ALSO MMU-157A (3.20.1).

ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-157A
NASA FMEA #: 3.20.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 157
ITEM: THRUSTER CUE LT.

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA, BUT THE SCREEN SHOULD BE LEFT BLANK. ALSO SEE MMU-157 (3.3.4).

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-158
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 158
ITEM: CONTROL ELECTRONICS ASSEMBLY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-159
NASA FMEA #: 3.3.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 159
ITEM: CONTROL ELECTRONICS ASSEMBLY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA, HOWEVER, EACH PIECE OF ELECTRONIC EQUIPMENT IN THE CEA SHOULD BE STUDIED SEPARATELY AND ITS FAILURE MODE(S) INVESTIGATED.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-160
NASA FMEA #: 3.3.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 160
ITEM: CONTROL ELECTRONICS ASSEMBLY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE ERRATIC RESPONSE FROM THE THRUSTERS MAY FORCE THE EVA CREWPERSON TO SHUTDOWN A SYSTEM IN ORDER TO MAINTAIN ATTITUDE CONTROL. LOSS OF BOTH SIDES UNDER SEVER ERRATIC RESPONSE MAY LEAVE THE EVA CREWPERSON STRANDED. SEE ALSO NOTE MMU-159.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-161
NASA FMEA #: 3.3.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 161
ITEM: CONTROL ELECTRONICS ASSEMBLY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE ERRATIC RESPONSE FROM THE THRUSTERS MAY FORCE THE EVA CREWPERSON TO SHUTDOWN A SYSTEM IN ORDER TO MAINTAIN ATTITUDE CONTROL. LOSS OF BOTH SIDES UNDER SEVER ERRATIC RESPONSE MAY LEAVE THE EVA CREWPERSON STRANDED. SEE ALSO NOTE MMU-159.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-162
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 162
ITEM: ISOLATION VALVE TIMER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /2]	[P]	[F]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /2]	[ ]	[ ]	[ ]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-163
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 163
ITEM: ISOLATION VALVE TIMER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /2]	[P]	[F]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[ ]	[ ]	[ ]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-164
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 164
ITEM: ISOLATION VALVE TIMER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[F]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[F]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
CONTINUOUS SIGNAL TO THE ISOLATION VALVE MOTOR TO CLOSE THE VALVE MAY BURN THE MOTOR AND DRAIN THE BATTERY.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-166
NASA FMEA #: 3.3.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 166
ITEM: VALVE DRIVER AMPLIFIER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[F]	[ ]	[X] *
IOA	[2 /1R]	[P]	[F]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA - SEE ALSO REMARKS FOR MMU-159.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-167
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 167
ITEM: VALVE DRIVER AMPLIFIER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL ON

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-168
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 168
ITEM: VALVE DRIVER AMPLIFIER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
NOISY
THIS ANALYSIS MAY BE WITHDRAWN.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-169
NASA FMEA #: 3.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 169
ITEM: TRANSLATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[P]	[P]	[ ]	[X] *
IOA	[1 /1]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL ON 1-3 AXES

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-169A
NASA FMEA #: 3.2.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 169
ITEM: TRANSLATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[1 /1]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[1 /1]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL ON 1-3 AXES

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-170
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 170
ITEM: TRANSLATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[1 /1]	[P]	[NA]	[NA]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS ASSESSMENT AND CORRESPONDING WORKSHEETS ARE VOIDED. THEY ARE SUPERCEEDED BY ITEMS MMU 1701X, 1702X, 1703X, AND 1704X.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-171
NASA FMEA #: 3.1.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 171
ITEM: ROTATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[P]	[P]	[ ]	[X] *
IOA	[1 /1]	[P]	[NA]	[NA]	[X]
COMPARE	[/]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL ON (1-3 AXES)

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-171A
NASA FMEA #: 3.1.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 171
ITEM: ROTATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[1 /1]	[P]	[NA]	[NA]	[X]
COMPARE	[N /N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[1 /1]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL ON (1-3 AXES). FAILURE CANNOT BE ISOLATED. ABORT REQUIRED. RESCUE REQUIRED. CREW PERSON STRANDED.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-172
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 172
ITEM: ROTATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[1 /1]	[P]	[NA]	[NA]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OFF (1-3 AXES). THIS ASSESSMENT AND CORRESPONDING ANALYSIS WORKSHEETS ARE VOIDED. THEY ARE REPLACED WITH ITEMS MMU-1721X, 1722X, 1723X, AND 1724X.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-173
NASA FMEA #: 3.2.7

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 173
ITEM: THC ISOLATE SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[1 /1]	[P]	[NA]	[NA]	[X]
COMPARE	[N /N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IF THE FAILURE IS ELECTRICAL, ISO SWITCH HAS ONE BACKUP IN THE ALTERNATE SYSTEM. IF THE FUNCTION IS LOST, THE ISO VALVES ARE CLOSED. THE PILOT IS STRANDED WITH NO PROPULSIVE POWER. IOA ACCEPTS THE CRITICALITY.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-174
NASA FMEA #: 3.2.9

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 174
ITEM: THC ISOLATE SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[NA]	[NA]	[X]
COMPARE	[/N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[1 /1]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE THC ISOLATE SWITCH IS ONLY USED DURING CONTINGENCY SITUATIONS DURING FLIGHT. UNDER THIS SCENARIO, THE PILOT HAS NO OTHER BACKUP TO STOP THE EXISTING PROPULSION/LEAK. ORBITER RESCUE IS NOT CONSIDERED AS CONTINGENCY FOR COMPONENT FAILURE MODE EFFECTS ANALYSIS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-174A
NASA FMEA #: 3.2.10

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 174
ITEM: THC ISOLATE SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[NA]	[NA]	[X]
COMPARE	[/N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[1 /1]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OFF. THE THC ISOLATE SWITCH IS ONLY USED DURING CONTINGENCY SITUATIONS DURING FLIGHT. UNDER THIS SCENARIO, THE PILOT HAS NO OTHER BACKUP TO STOP THE EXISTING PROPULSION/LEAK. OTHER RESCUE IS NOT CONSIDERED AS CONTINGENCY FOR COMPONENT FAILURE MODE EFFECTS ANALYSIS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-175
NASA FMEA #: 3.1.8

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 175
ITEM: AUTOMATIC ATTITUDE HOLD SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[2 /2]	[P]	[F]	[F]	[X]
COMPARE	[N /N]	[ ]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL ON. THERE IS NO MISSION IMPACT. AAH IS ACTIVE WHEN GYRO POWER IS ON. EXCESSIVE USE OF PROPELLANT CAN BE AVOIDED BY TURNING GYRO POWER OFF FOR ROTATIONAL MANEUVERS. IOA ACCEPTS THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-176
NASA FMEA #: 3.1.7

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 176
ITEM: AUTOMATIC ATTITUDE HOLD SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OFF. THE PURPOSE OF THE AUTOMATIC ATTITUDE HOLD IS TO EASE THE PILOT WORKLOAD WHILE SAVING GAS. THIS IS DONE BY AUTOMATICALLY CONTROLLING THE PITCH, YAW, AND ROLL OF THE MMU. THE FAILURE OF THIS ITEM MAY HAVE MISSION IMPACT. THE DEGREE OF SEVERITY HAS TO BE JUDGE REAL TIME DEPENDING ON TIME OF FAILURE, REMAINING MISSION DIFFICULTY, AND AMOUNT OF GAS LEFT IN THE TANKS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-177
NASA FMEA #: 3.15.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 177
ITEM: ALTERNATE CONTROL MODES SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[2 /2]	[P]	[F]	[F]	[X]
COMPARE	[N /N]	[ ]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS FAILURE MODE IS "FAILS IN NORM". THE PILOT WORKLOAD MAY BE INCREASED BY THE INABILITY TO ENGAGE AAH WITH AXIS INHIBIT. IN ADDITION, SATELLITE STABILIZATION CANNOT BE PERFORMED DUE TO THE INABILITY TO ENGAGE THE THRUSTER LOGIC. FURTHER, BOTH OPERATIONS PERFORMED MANUALLY WILL REQUIRE MORE TIME AND GAS. THE COMBINATIONS OF UNCERTANINTIES WILL HAVE TO BE EVALUATED AND A GO/NO GO DECISION MADE REAL TIME.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-177A
NASA FMEA #: 3.15.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 177
ITEM: ALTERNATE CONTROL MODES SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[2 /2]	[P]	[F]	[F]	[X]
COMPARE	[N /N]	[ ]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FAILURE MODE IS "FAILS IN NORM". THE PILOT WORKLOAD MAY BE INCREASED BY THE INABILITY TO ENGAGE AAH WITH AXIS INHIBIT. IN ADDITION, SATELLITE STABILIZATION CANNOT BE PERFORMED DUE TO THE INABILITY TO ENGAGE THE THRUSTER LOGIC. FURTHER, BOTH OPERATIONS PERFORMED MANUALLY WILL REQUIRE MORE TIME AND GAS. THE COMBINATIONS OF UNCERTAINTIES WILL HAVE TO BE EVALUATED AND A GO/NO GO DECISION MADE REAL TIME.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-178
NASA FMEA #: 3.15.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 178
ITEM: ALTERNATE CONTROL MODES SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[F]	[F]	[ ]
COMPARE	[/N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL ON SATELLITE STABILIZER. THIS FAILURE MAY TERMINATE MISSION DUE TO THE PILOT INABILITY TO CONTROL TRANSLATIONS AND THE HIGH RATE OF GAS USED. PILOT'S ACTION IS REQUIRED TO TURN OFF ONE CEA SIDE TO INITIATE BACKUP LOGIC. UNDER THIS MODE, THE AAH DOES NOT OPERATE, WHICH ITSELF IS A MISSION IMPACT DUE TO HIGHER RATE OF GAS USED (SEE MMU-176) AND INABILITY TO USE AXIS INHIBIT. THE MISSION SCENARIO WILL HAVE TO BE EVALUATED AND A GO/NO GO DECISION MADE REAL TIME. IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-178A
NASA FMEA #: 3.15.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 178
ITEM: ALTERNATE CONTROL MODES SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[F]	[F]	[ ]
COMPARE	[/N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL ON SATELLITE STABILIZER. SEE REMARKS FOR MMU-178-IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-179
NASA FMEA #: 3.15.5

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 179
ITEM: ALTERNATE CONTROL MODES SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[F]	[F]	[ ]
COMPARE	[/]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL ON IN "AXIS INHIBIT". THE SYSTEM FAILS TO FLY AAH IN THE SELECTED AXIS AND ENGAGE SATELLITE STABILIZATION WHEN NEEDED. THERE MAY BE MISSION IMPACT DUE TO INCREASED PILOT WORKLOAD, AND USE OF GAS. THE MISSION SCENARIO WILL HAVE TO BE EVALUATED AND A GO/NO GO DECISION MADE REAL TIME.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-179A
NASA FMEA #: 3.15.6

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 179
ITEM: ALTERNATE CONTROL MODES SWITCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[F]	[F]	[ ]
COMPARE	[/]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE SYSTEM FAILS TO FLY AAH IN THE SELECTED AXIS AND ENGAGE SATELLITE STABILIZATION WHEN NEEDED. THERE MAY BE MISSION IMPACT DUE TO INCREASED PILOT WORKLOAD, AND USE OF GAS. THE MISSION SCENARIO WILL HAVE TO BE EVALUATED AND GO/NO GO DECISION MADE REAL TIME.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-180
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 180
ITEM: GYRO PHASE PLANE LOGIC

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[NA]	[NA]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAILS OFF 1-3 CH. AUTOMATIC ATTITUDE HOLD DOES NOT WORK WITHOUT THIS ITEM, SEE MMU-176.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-181
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 181
ITEM: GYRO PHASE PLANE LOGIC

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[NA]	[NA]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
NOISY/FALSE OUTPUTS. THIS FAILURE WILL FORCE THE SHUTDOWN OF AAH, SEE MMU-176.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-182
NASA FMEA #: 3.3.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 182
ITEM: CEA PWR SPLY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-183
NASA FMEA #: 3.4.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 183
ITEM: WIRE HARNESS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
SHORT OR OPEN CIRCUIT.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-184
NASA FMEA #: 3.5.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 184
ITEM: EXTERNAL POWER CONNECTOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[F]	[X]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN, 1 OR MORE PINS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-185
NASA FMEA #: 4.1.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 185
ITEM: HEATERS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[F]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[F]	[X]
COMPARE	[/N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OFF. HEATER FUNCTION IS TO MAINTAIN THE MMU AND FSS STRUCTURE AND COMPONENTS WITHIN AN ACCEPTABLE TEMPERATURE RANGE. FAILURE OF A HEATER WILL BE NOTICED BY THE PILOT DUE TO SLUGGISH PERFORMANCE OR FREEZE UP, WITH EXCEPTION OF THE CIRCUIT BREAKER PANEL, CEA CASE, AND LOCATOR LIGHT CONTROL (FOR THIS REASON SCREEN B IS FAILED). SECOND SYSTEM HEATER FAILURE IS LIFE THREATENING. IOA AGREES WITH FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-185A
NASA FMEA #: 4.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 185
ITEM: HEATERS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[F]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[F]	[X]
COMPARE	[/]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[F]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OFF. HEATER FUNCTION IS TO MAINTAIN THE MMU AND FSS STRUCTURE AND COMPONENTS WITHIN AN ACCEPTABLE TEMPERATURE RANGE. FAILURE OF A HEATER WILL BE NOTICED BY THE PILOT DUE TO SLUGGISH PERFORMANCE OR FREEZE UP, WITH EXCEPTION OF THE CIRCUIT BREAKER PANEL, CEA CASES, AND LOCATOR LIGHT CONTROL (FOR THIS REASON SCREEN B IS FAILED). SECOND SYSTEM HEATER FAILURE IS LIFE THREATENING.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-186
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 186
ITEM: HEATERS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL ON (CEA). THIS FMEA IS VOIDED. THE ITEM FAILED IS THE THERMOSTAT FOR THE CEA HEATERS. THIS ITEM AND FAILURE ARE COVERED WITH FMEA 1861 AND ASSESSMENT WORKSHEET MMU-1861.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-187
NASA FMEA #: 3.3.9

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 187
ITEM: GYROS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[F]	[F]	[ ]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
DRIFT WITH DEGRADED GYRO PERFORMANCE AAH CANNOT OPERATE, SEE MMU-176.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-188
NASA FMEA #: 3.3.8

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 188
ITEM: GYROS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[F]	[F]	[ ]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OFF WITHOUT GYROS AAH DOES NOT OPERATE, SEE MMU-176.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-189
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 189
ITEM: ARM ANGLE ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
ARM DOES NOT LATCH TO FLIGHT POSITION (UNLATCHED, LATCHED STOWED, LATCHED WORKSITE, LATCHED FLIGHT). THIS ASSESSMENT AND FMEA WORKSHEET ASSOCIATED WITH IT (MMU-189 AND 189, RESPECTIVELY) ARE VOIDED AND SUPERCEEDED BY WORKSHEETS 1891X THRU 1899X; AND ASSESSMENTS MMU-1891X THRU 1899X RESPECTIVELY.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-190
NASA FMEA #: 2.1.9

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 190
ITEM: ARM LENGTH ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL UNLATCHED

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-191
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 191
ITEM: ARM LENGTH ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL LATCHED SHORT

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-192
NASA FMEA #: 2.1.7

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 192
ITEM: ARM LENGTH ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
PILOTS INCONVENIENCE, POOR FIT AND DIFFICULT TO OPERATE THE CONTROLS FOR TRANSLATIONS OR ROTATIONS. THE DESIGN IS SUCH THAT, THE SMALLEST PILOT CAN OPERATE A FULLY EXTENDED ARM.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-192A
NASA FMEA #: 2.1.8

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 192
ITEM: ARM LENGTH ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[2 /2]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
PILOTS INCONVENIENCE, POOR FIT AND DIFFICULT TO OPERATE THE CONTROLS FOR TRANSLATIONS OR ROTATIONS. THE DESIGN IS SUCH THAT, THE SMALLEST PILOT CAN OPERATE A FULLY EXTENDED ARM.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-194
NASA FMEA #: 3.6.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 194
ITEM: EXTERNAL POWER CONNECTOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL CONNECTED

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-195
NASA FMEA #: 3.6.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 195
ITEM: EXTERNAL POWER CONNECTOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[F]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL DISCONNECTED

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-196
NASA FMEA #: 2.5.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 196
ITEM: PLSS LATCHES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[F]	[P]	[X]
COMPARE	[/]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-196A
NASA FMEA #: 2.5.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 196
ITEM: PLSS LATCHES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[F]	[P]	[X]
COMPARE	[/N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-197
NASA FMEA #: 2.5.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 197
ITEM: PLSS LATCHES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /2R]	[P]	[F]	[P]	[X]
COMPARE	[N /N]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL CLOSED. ONLY ONE LATCH NEEDS TO OPERATE FOR PLSS RELEASE. IF ALL LATCHES FAIL CLOSED, CREWMEMBER ENTERS AIRLOCK WITH MMU ATTACHED AND SUBSEQUENT MISSIONS ARE IMPACTED.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-198
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 198
ITEM: MMU BATTERY LATCHES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL UNLATCHED. SEE MDAC MMU-1981 FOR ANALYSIS DURING LAUNCH/LANDING. THE LATCH FAILURE ONORBIT (PRE-OPS, OPS, AND POST-OPS) HAS NO MISSION IMPACT.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-199
NASA FMEA #: 2.3.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 199
ITEM: MMU BATTERY LATCHES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL LATCHED. FAILURE SHOULD BE "FAILS TO UNLATCH"

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-200
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 200
ITEM: BACKUP ARM LATCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[ ]	[ ]	[ ]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL LATCHED

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-201
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 201
ITEM: BACKUP ARM LATCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM	
NASA	[/]	[ ]	[ ]	[ ]	[ ]	*
IOA	[2 /2]	[P]	[P]	[P]	[X]	
COMPARE	[N /N]	[N]	[N]	[N]	[N]	

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[ ]	[ ]	[ ]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL UNLATCHED. SCREENS ARE NOT REQUIRED WITH THIS CRITICALITY.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-202
NASA FMEA #: 4.6.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 202
ITEM: QD THERMAL COVERS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-203
NASA FMEA #: 4.6.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 203
ITEM: BATTERY THERMAL COVER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN DURING STOWAGE. SCREENS ARE NOT REQUIRED FOR THE RECOMMENDED CRITICALITY.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-204
NASA FMEA #: 4.6.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 204
ITEM: BATTERY THERMAL COVER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /3]	[P]	[F]	[F]	[ ]
COMPARE	[N /N]	[ ]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN DURING FLIGHT. SCREENS ARE NOT REQUIRED FOR THE RECOMMENDED CRITICALITY.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-205
NASA FMEA #: 4.6.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 205
ITEM: EXT. PWR. THERMAL COVER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /3]	[P]	[P]	[F]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN DURING FLIGHT. SCREENS ARE NOT REQUIRED FOR THE RECOMMENDED CRITICALITY.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-206
NASA FMEA #: 5.4.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 206
ITEM: BACKUP PLSS LATCHES (LAP BELTS)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN DURING FLIGHT

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-207
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 207
ITEM: BACKUP PLSS LATCHES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[ ]	[ ]	[ ]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL CLOSED

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-208
NASA FMEA #: 1.9.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 208
ITEM: GN2 LINES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LEAK. RUPTURE IS NOT A REALISTIC FAILURE FOR THESE LINES. AN EXTERNAL LEAK IN THE FSS LINES MAY LIMIT THE CHARGE OR FAIL TO CHARGE THE MMU TANKS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-210
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 210
ITEM: GN2 LINES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FSS BLOCKED LINES HAS NOT BEEN ASSESSED BY A NASA FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-211
NASA FMEA #: 1.10.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 211
ITEM: PRESSURE GAUGE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FSS PRESSURE GAUGE LEAK WHILE CHARGING THE MMU TANKS WILL FORCE A SWITCH TO THE REDUNDANT SYSTEM. LOSS OF REDUNANCY IS MISSION FAILURE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-212
NASA FMEA #: 1.12.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 212
ITEM: VENT VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
DIFFICULT TO MATE FSS/MMU QD DUE TO HIGH PRESSURE LINE, CREW INCONVENIENCE. IOA AGREES WITH THE FMEA, EXCEPT THAT THE SCREENS DO NOT NEED TO BE SPECIFIED.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-213
NASA FMEA #: 1.12.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 213
ITEM: VENT VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-214
NASA FMEA #: 1.12.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 214
ITEM: VENT VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-215
NASA FMEA #: 1.3.6

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 215
ITEM: QD-HOSE END

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LOSS OF RECHARGE CAPABILITY, LOSS OF MISSION IF REDUNDANT SYSTEM FAILS. IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-216
NASA FMEA #: 1.3.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 216
ITEM: QD-HOSE END

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-217
NASA FMEA #: 1.3.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 217
ITEM: QD-FIXED HALF

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LEAK, FAILED OPEN

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-218
NASA FMEA #: 1.3.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 218
ITEM: QD-FIXED HALF

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-219
NASA FMEA #: 2.6.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 219
ITEM: GAS ACTUATED NUTS (4)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /1R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /1R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-219A
NASA FMEA #: 2.6.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 219
ITEM: GAS ACTUATED NUTS (4)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /1R]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN. THIS FMEA WILL RESULT IN THE SAME EFFEDCT AS 2.6.2, AND THEREFORE TREATED THE SAME WAY.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-220
NASA FMEA #: 2.6.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 220
ITEM: GAS ACTUATED NUTS (4)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[ ]	[X]
COMPARE	[/]	[ ]	[ ]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-221
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 221
ITEM: FILTER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LEAK. FSS FILTER LEAK HAS NOT BEEN ASSESSED BY A NASA FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-222
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 222
ITEM: FILTER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[F]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[F]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FRACTURE. FSS FILTER FRACTURE HAS NOT BEEN ASSESSED BY A NASA FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-223
NASA FMEA #: 4.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 223
ITEM: GAN HEATERS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
OPEN. THE ASTRONAUT, USING A SPECIAL TOOL STOWED ON THE FSS CAN MANUALLY UNBOLT AND REBOLT ALL NUTS AND BOLTS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-224
NASA FMEA #: 4.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 224
ITEM: HEATER FOR FSS RECHARGE SYSTEM PNEUMATIC FILTER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[F]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
WITH THE FSS HEATER FAILED OFF, THE FILTER WILL BECOME EMBRITTLED AND FRACTURE. DEBRIS MAY CAUSE OTHER MALFUNCTIONS DOWNSTREAM. A SIMILAR FAILURE IN THE ALTERNATE SYSTEM WILL CAUSE MISSION TERMINATION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-225
NASA FMEA #: 4.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 225
ITEM: TOGGLE VALVE HEATERS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
OPEN CIRCUIT, SHORT CIRCUIT

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-226
NASA FMEA #: 4.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 226
ITEM: PRESSURE GAUGE HEATERS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN, SHORT CIRCUIT

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-227
NASA FMEA #: 4.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 227
ITEM: QD HEATERS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OFF, OPEN CIRCUIT, SHORT CIRCUIT. FSS QD MAY BE INOPERABLE OR FAIL CAUSING THE LOSS OF ONE RECHARGE SIDE. LOSS OF BOTH SIDES IS LOSS OF MISSION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-228
NASA FMEA #: 4.4.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 228
ITEM: HEATER THERMOSTATS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM	
NASA	[3 /2R]	[P]	[P]	[ ]	[ ]	*
IOA	[3 /2R]	[P]	[P]	[P]	[ ]	
COMPARE	[/]	[ ]	[ ]	[N]	[ ]	

RECOMMENDATIONS: (If different from NASA)

[2 /2]	[ ]	[ ]	[ ]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OPEN. MISSION IS TERMINATED WHEN FLIGHT CRITICAL COMPONENT FAILS. MMU WILL NOT FLY WITHOUT A REDUNDANT SYSTEM AVAILABLE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-229
NASA FMEA #: 4.4.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 229
ITEM: HEATER THERMOSTATS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[F]	[ ]	[X] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[ ]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /2]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL CLOSED. MISSION IS TERMINATE WHEN FLIGHT CRITICAL COMPONENT FAILS. MMU WILL NOT FLY WITHOUT A REDUNDANT SYSTEM AVAILABLE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-230
NASA FMEA #: 4.5.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 230
ITEM: TOGGLE VALVE TEMP. SENSORS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LOSS OF SIGNAL. THE FSS SUPPLY TOGGLE VALVE TEMPERATURE SENSOR IS NOT MISSION ESSENTIAL. THIS FAILURE MODE DOES NOT REQUIRE SCREENS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-231
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 231
ITEM: TOGGLE VALVE TEMP. SENSORS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /3]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL HIGH

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-232
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 232
ITEM: TOGGLE VALVE TEMP. SENSORS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL LOW

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-233
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 233
ITEM: ORBITER POWER CONNECTOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[F]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS ITEM AND FAILURE MODE ARE VOIDED. THIS IS COVERED WITH ITEM MMU-184.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-234
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 234
ITEM: EXTERNAL POWER LINE/CONNECTOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
OPEN CIRCUIT. THIS IOA IS SAME AS MMU-184, AND MAY THEREFORE BE VOIDED.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-235
NASA FMEA #: 2.4.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 235
ITEM: ORBITER ADAPTOR BEAM MOUNTS (6)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /1R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE RECOMMENDATION IS NOT TO CONSIDER THESE FAILURES SINCE THEY ARE NOT WITHIN THE SPECIFICATION OF 22206. THIS ITEM IS PART OF STRUCTURE, AND ITS FAILURE MODE AND CAUSE RELATIONSHIP ARE VERY UNLIKELY.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-237
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 237
ITEM: BACKBEAM SHOCK MOUNTS (4)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE RECOMMENDATION IS NOT TO CONSIDER THESE FAILURES SINCE THEY ARE NOT WITHIN THE SPECIFICATION OF NSTS-22206. THIS ITEM IS PART OF STRUCTURE, AND ITS FAILURE MODE AND CAUSE RELATIONSHIP ARE VERY UNLIKELY. THIS FAILURE MODE MAY BE WITHDRAWN.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-238
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 238
ITEM: FOOT RESTRAINT ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /3]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-239
NASA FMEA #: 2.2.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 239
ITEM: FOOT RESTRAINT ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
JAM LOCKED

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-240
NASA FMEA #: 2.7.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 240
ITEM: MMU LATCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
JAM OPEN. LOSS OF FUNCTION (TO LATCH MMU TO FSS) COULD BE LOSS OF MISSION, IF THE UNIT CANNOT BE RECHARGED. HOWEVER PRIOR TO REENTRY, THE MMU CAN BE STRAPPED DOWN IN THE MIDDECK. IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-241
NASA FMEA #: 2.7.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 241
ITEM: MMU LATCH

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
JAM CLOSED. THE MISSION IS TERMINATED IF REDUNDANT LANYARD ATTACHED TO THE FAILED LATCH DOES NOT BREAK THE SHEAR PIN. IOA AGREES WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-242
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 242
ITEM: MUSHROOM KNOBS (8)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-243
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 243
ITEM: THERMAL BLANKETS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FSS THERMAL BLANKET FAILURE TO COVER SENSITIVE COMPONENT MAY RESULT IN LOSS OF RECHARGE CAPABILITY THUS POSSIBLE LOSS OF MISSION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-244
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 244
ITEM: TETHER REEL RESTRAINT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FRACTURE. THIS MALFUNCTION IS VOIDED SINCE THE ITEM IS CONNECTED TO THE EMU.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-245
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 245
ITEM: TETHER REEL RESTRAINT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS MALFUNCTION IS VOIDED SINCE THE ITEM IS CONNECTED TO THE EMU.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1001X
NASA FMEA #: 1.1.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1001
ITEM: GN2 TANK

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[1 /1]	[ ]	[ ]	[ ]	[X]
COMPARE	[/]	[ ]	[ ]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1031X
NASA FMEA #: 1.5.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1031
ITEM: TOGGLE VALVES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1051X
NASA FMEA #: 1.4.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1051
ITEM: ISOLATION VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1141X
NASA FMEA #: 1.6.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1141
ITEM: THRUSTER TRIAD

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1191X
NASA FMEA #: 1.2.6

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1191
ITEM: REGULATOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
HIGH PRESSURE DOWNSTREAM WILL FORCE THE VENT VALVE OPEN, THUS LOSS OF GN2 OR LOSS OF SIDE. FUNCTIONAL LOSS MAY LEAVE THE CREW PERSON STRANDED.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1211X
NASA FMEA #: 1.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1211
ITEM: GN2 REGULATOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[2 /1R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FMEA FULLY EXPLAINS THE CORRECTIVE ACTION, BUT ASSIGNED THE CRITICALITY INAPPROPRIATELY. THE LOSS OF REGULATOR DOES NOT CAUSE LOSS OF LIFE IMMEDIATELY. ISO VALVE WILL BE SHUTOFF TO STOP THE LEAKAGE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1212X
NASA FMEA #: 1.2.5

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1212
ITEM: GN2 REGULATOR

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1251X
NASA FMEA #: 1.3.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1251
ITEM: QUICK DISCONNECT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FMEA DID NOT CONSIDER THE FACT THAT THE COUPLER ON QD IS SELF SEALING WHICH STOPS LEAKAGE UNDER SUCH A CIRCUMSTANCE. ALSO, RECHARGE ACTIVITY IS ACCOMPLISHED DURING POST-OPS NOT PREP AS INDICATED BY THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1252X
NASA FMEA #: 1.3.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1252
ITEM: QUICK DISCONNECT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA, EXCEPT THAT RECHARGE IS DONE DURING POST-OPS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1253X
NASA FMEA #: 1.3.5

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1253
ITEM: QUICK DISCONNECT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1281X
NASA FMEA #: 3.11.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1281
ITEM: BATTERY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FMEA DOES NOT RECOGNIZE REPLACING THE AFFECTED BATTERY WITH ANOTHER ONE STORED IN ORBITER.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-1681X
NASA FMEA #: 3.3.5

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1681
ITEM: GYRO POWER SUPPLY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LOSS OF GYRO RESULTS IN LOSS OF AAH & ALT CONTROL SWITCH CAPABILITY NEEDED FOR CERTAIN MISSIONS LIKE SOLAR MAX. MANUAL RHC CONTROL IS AVAILABLE AS A BACK-UP TO COMPENSATE FOR THE LOSS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/16/87
ASSESSMENT ID: MMU-1701X
NASA FMEA #: 3.2.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1701
ITEM: TRANSLATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[3 /1R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /1R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA CONSIDERS THE AXES REDUNDANT TO EACH OTHER.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-1702X
NASA FMEA #: 3.2.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1702
ITEM: TRANSLATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[3 /1R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /1R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA CONSIDERS THE AXES REDUNDANT TO EACH OTHER.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-1703X
NASA FMEA #: 3.2.5

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1703
ITEM: TRANSLATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[3 /1R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /1R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA CONSIDERS THE AXES REDUNDANT TO EACH OTHER.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/16/87
ASSESSMENT ID: MMU-1704X
NASA FMEA #: 3.2.6

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1704
ITEM: TRANSLATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAILS OFF IN ALL THREE AXIS. SEE ANALYSIS WORKSHEET.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/16/87
ASSESSMENT ID: MMU-1721X
NASA FMEA #: 3.1.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1721
ITEM: ROTATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /1R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /1R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OFF ONE AXIS. SEE ANALYSIS WORKSHEET 1721.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-1722X
NASA FMEA #: 3.1.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1722
ITEM: ROTATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /1R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /1R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
LOSS OF ROTATION IN ONE AXIS. THE PILOT CAN ROTATE AND TRANSLATE IN OTHER AXES. LOSS OF ALL FUNCTIONS WILL LEAVE THE PILOT STRANDED IF UNABLE TO SIGHT THE ORBITER.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 12/05/86
ASSESSMENT ID: MMU-1723X
NASA FMEA #: 3.1.5

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1723
ITEM: ROTATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[3 /1R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /1R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAIL OFF (1-3 AXES), SEE ALSO MMU-1721A.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/16/87
ASSESSMENT ID: MMU-1724X
NASA FMEA #: 3.1.6

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1724
ITEM: ROTATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[1 /1]	[ ]	[ ]	[ ]	[X]
COMPARE	[N /N]	[N]	[N]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

[1 /1]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
SEE ANALYSIS WORKSHEET 1722.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/16/87
ASSESSMENT ID: MMU-1731X
NASA FMEA #: 3.2.8

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1731
ITEM: TRANSLATIONAL HAND CONTROLLER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[1 /1]	[ ]	[ ]	[ ]	[X]
COMPARE	[/]	[ ]	[ ]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
MECHANICALLY JAMS IN ISO MODE. IF THE FAILURE IS MECHANICAL, BOTH ISO VALVES ARE CLOSED. THE HANDLE CANNOT BE RETURNED TO NORMAL POSITION. PILOT IS STRANDED WITH NO PROPULSIVE POWER.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/19/87
ASSESSMENT ID: MMU-1861X
NASA FMEA #: 4.3.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1861
ITEM: CEA THERMOSTATS (2 SETS)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAILS CLOSE

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 4/14/87
ASSESSMENT ID: MMU-1862X
NASA FMEA #: 4.3.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1862
ITEM: MMU THERMOSTATS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[F]	[ ]	[X] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[/]	[ ]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAILS OPEN

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/19/87
ASSESSMENT ID: MMU-1891X
NASA FMEA #: 2.1.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1891
ITEM: ARM ANGLE ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IF THE ARM JAMS IN THE WORK POSITION, THE PILOT CAN FLY BACK SINCE IT MUST BE SHORTENED BEFORE IT IS PLACED IN THAT POSITION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/19/87
ASSESSMENT ID: MMU-1892X
NASA FMEA #: 2.1.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1892
ITEM: ARM ANGLE ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IF THE ARM JAMS IN THE WORK POSITION, THE PILOT CAN FLY BACK SINCE IT MUST BE SHORTENED BEFORE IT IS PLACED IN THAT POSITION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/19/87
ASSESSMENT ID: MMU-1893X
NASA FMEA #: 2.1.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1893
ITEM: ARM ANGLE ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[ ]	[ ]	[ ]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IF THE ARM FAILS TO LOCK BACK TO FLIGHT POSITION, THE PILOT CAN OPERATE THE MMU FROM THE WORK POSITION SINCE THE ARM MUST BE SHORTENED BEFORE IT IS PLACED IN THE WORK POSITION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/19/87
ASSESSMENT ID: MMU-1894X
NASA FMEA #: 2.1.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1894
ITEM: ARM ANGLE ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[3 /3]	[ ]	[ ]	[ ]	[ ]
COMPARE	[N /N]	[N]	[N]	[ ]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IF THE ARM FAILS TO LOCK BACK TO FLIGHT POSITION, THE PILOT CAN OPERATE THE MMU FROM THE WORK POSITION SINCE THE ARM MUST BE SHORTENED BEFORE IT IS PLACED IN THE WORK POSITION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/19/87
ASSESSMENT ID: MMU-1895X
NASA FMEA #: 2.1.5

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1895
ITEM: ARM ANGLE ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[ ]	[ ]	[ ]	[ ]
COMPARE	[/N]	[N]	[N]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IF THE ARM FAILS TO LOCK BACK TO FLIGHT POSITION, THE PILOT CAN OPERATE THE MMU FROM THE WORK POSITION SINCE THE ARM MUST BE SHORTENED BEFORE IT IS PLACED IN THE WORK POSITION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/19/87
ASSESSMENT ID: MMU-1896X
NASA FMEA #: 2.1.6

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1896
ITEM: ARM ANGLE ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[F]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[F]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FAILURE IS, "INADVERTENTLY UNLOCKS". HOWEVER, THE ARM IS ALSO SECURED WITH A STRAP.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/19/87
ASSESSMENT ID: MMU-1897X
NASA FMEA #: 2.1.10

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1897
ITEM: ARM ANGLE ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IF THE ARM JAMS IN THE WORK POSITION, THE PILOT CAN FLY BACK SINCE IT MUST BE SHORTENED BEFORE IT IS PLACED IN THAT POSITION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/19/87
ASSESSMENT ID: MMU-1898X
NASA FMEA #: 2.1.11

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1898
ITEM: ARM ANGLE ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IF THE ARM JAMS IN THE WORK POSITION, THE PILOT CAN FLY BACK SINCE IT MUST BE SHORTENED BEFORE IT IS PLACED IN THAT POSITION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/19/87
ASSESSMENT ID: MMU-1899X
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1899
ITEM: ARM ANGLE ADJUST

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[2 /1R]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[2 /1R]	[P]	[P]	[P]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
FAILS FROM WORK TO LAUNCH POSITION.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/24/87
ASSESSMENT ID: MMU-1981X
NASA FMEA #: 2.3.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 1981
ITEM: MMU BATTERY LATCHES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[F]	[P]	[X]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[F]	[P]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-2111X
NASA FMEA #: 1.10.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 2111
ITEM: FSS PRESSURE GAUGES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-2141X
NASA FMEA #: 1.13.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 2141
ITEM: FSS SUPPLY VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[ ]	[P]	[ ]	[ ] *
IOA	[/NA]	[ ]	[ ]	[ ]	[ ]
COMPARE	[N /N]	[ ]	[N]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA RECOMMENDS DELETING THIS FAILURE MODE, SINCE THE ITEM STUDIED IS THE FSS SUPPLY VALVE AND THE FAILURE MODE IS FOR THE SUPPLY VALVE CIRCUIT BREAKER. THIS IS NOT CONSISTENT - IT ASSUMES A FAILURE IN ANOTHER SUBSYSTEM. MMU SUPPLY VALVE CB IS STUDIED UNDER ARPCS-230 TO BE 3/2R (P,P,P).

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-2142X
NASA FMEA #: 1.13.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 2142
ITEM: FSS SUPPLY VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA, BUT RECOGNIZES THAT RECHARGING IS DONE DURING POST-OPS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-2143X
NASA FMEA #: 1.13.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 2143
ITEM: FSS SUPPLY VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[2 /2]	[ ]	[ ]	[ ]	[A] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IF A SEVERE LEAKAGE OCCURS THAT CANNOT BE STOPPED BY THE VALVE ITSELF, THEN GN2 FROM ORBITER AND MMU WILL ESCAPE OUTSIDE. RECHARGE CAPABILITY WILL BE LOST FOR THAT MMU. ONLY ONE MMU REMAINING TO ACCOMPLISH THE MISSION, AND THAT IS REAL TIME CALL DEPENDENT UPON THE CIRCUMSTANCE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-2144X
NASA FMEA #: 1.13.4

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 2144
ITEM: FSS SUPPLY VALVE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[P]	[P]	[ ]	[ ] *
IOA	[3 /3]	[ ]	[ ]	[ ]	[ ]
COMPARE	[/]	[N]	[N]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-2181X
NASA FMEA #: 1.11.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 2181
ITEM: FLEX HOSE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA, EXCEPT THAT RECHARGING IS UNDERSTOOD TO BE DONE DURING POST-OPS PERIOD.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/27/87
ASSESSMENT ID: MMU-2391X
NASA FMEA #: 2.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 2391
ITEM: FOOT RESTRAINT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
CRITICALITY FOR IOA IS PRELIMINARY. FINAL ANALYSIS IS RESERVED UNTIL MODIFICATION TO THE RESTRAINT IS AVAILABLE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-2392X
NASA FMEA #: 2.2.3

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 2392
ITEM: FSS FOOT RESTRAINT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[ ]	[ ]	[ ]	[ ]
COMPARE	[/]	[ ]	[ ]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE: 3/23/87
ASSESSMENT ID: MMU-4000X
NASA FMEA #:

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4000
ITEM: ARM STRAP

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[/]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[3 /3]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:	3/23/87	NASA DATA:	
ASSESSMENT ID:	MMU-4001X	BASELINE	[ ]
NASA FMEA #:	5.1.1	NEW	[X]

SUBSYSTEM: MMU
MDAC ID: 4001
ITEM: ARM STRAPS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /3]	[ ]	[ ]	[ ]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[ ]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /3]	[ ]	[ ]	[ ]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
TWO LATCHES AND THIS HINGE HAVE TO FAIL FOR THE ARM TO BECOME A PROJECTILE IN THIS PAYLOAD BAY.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4002X
NASA FMEA #: 5.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4002
ITEM: MMU BATTERY RECHARGE CABLE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FMEA CONSIDERED POSSIBILITY OF BATTERY EXPLOSION FOR WHICH THE IOA ANALYSIS DISAGREED.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4003X
NASA FMEA #: 5.2.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4003
ITEM: MMU BATTERY RECHARGE CABLE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
SEE MMU-4002 REMARKS.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4004X
NASA FMEA #: 5.3.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4004
ITEM: TRUNNION PIN ATTACHMENT DEVICE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[1 /1]	[ ]	[ ]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[N]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THE FMEA ASSUMES THAT EQUIPMENT TO BE ATTACHED ARE NEEDED FOR RESCUE (LIFE SAVING) OPERATION. THIS ALREADY ASSUMES A CONTINGENCY SCENARIO AND THEREFORE MULTIPLE FAILURE.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4005X
NASA FMEA #: 5.5.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4005
ITEM: BATTERY TRANSFER BAG

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[3 /2R]	[P]	[F]	[P]	[ ]
COMPARE	[N /N]	[ ]	[N]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

	[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
ADDITIONAL BATTERIES EXIST TO REPLACE THE LOST ONE, AND ALSO HAS A TETHER ATTACHED - SEE FMEA 5.6.1 (MMU-4006).

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4006X
NASA FMEA #: 5.6.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4006
ITEM: BATTERY TETHER STRAP

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[N /N]	[ ]	[ ]	[N]	[N]

RECOMMENDATIONS: (If different from NASA)

[3 /2R]	[P]	[P]	[P]	[D] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA CONSIDERED BACK-UP BATTERIES TO REPLACE THE LOST ONE. ALSO, THE FAILED TETHER CAN BE REPLACED WITH ANOTHER ONE (OTHER MMU).

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4007X
NASA FMEA #: 5.7.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4007
ITEM: CONTINGENCY TOOL

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[ ]	[ ]	[ ]	[X] *
IOA	[2 /2]	[P]	[P]	[P]	[X]
COMPARE	[/]	[N]	[N]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4008X
NASA FMEA #: 5.7.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4008
ITEM: CONTINGENCY TOOL

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4009X
NASA FMEA #: 5.8.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4009
ITEM: 5/16" THIN WALL SOCKET

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4010X
NASA FMEA #: 5.8.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4010
ITEM: 5/16" THIN WALL SOCKET

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /2R]	[P]	[P]	[ ]	[ ] *
IOA	[3 /2R]	[P]	[P]	[P]	[ ]
COMPARE	[/]	[ ]	[ ]	[N]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4011X
NASA FMEA #: 5.9.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4011
ITEM: SUBWAY STRAPS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[ ]	[ ]	[ ]	[ ]
COMPARE	[/]	[ ]	[ ]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4012X
NASA FMEA #: 5.10.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4012
ITEM: THRUSTER CUE LIGHT EXTENDER

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[P]	[ ]	[ ]	[ ]
COMPARE	[/]	[N]	[ ]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4013X
NASA FMEA #: 5.11.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4013
ITEM: CAMERA BRACKET

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[3 /3]	[ ]	[ ]	[ ]	[ ] *
IOA	[3 /3]	[ ]	[ ]	[ ]	[ ]
COMPARE	[/]	[ ]	[ ]	[ ]	[ ]

RECOMMENDATIONS: (If different from NASA)

	[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA IS IN AGREEMENT WITH THE FMEA.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4014X
NASA FMEA #: 4.7.1

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4014
ITEM: SUNSHIELD

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /1R]	[P]	[P]	[ ]	[X] *
IOA	[/NA]	[ ]	[ ]	[ ]	[ ]
COMPARE	[N /N]	[N]	[N]	[ ]	[N]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)
ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
THIS FAILURE MODE WAS CONSIDERED NOT APPLICABLE DUE TO: 1)THE COMPONENT IS CONSIDERED IN THE SAME FASHION AS THE ORBITER SKIN, AND THEREFORE NOT CONSIDERED, 2)THE CAUSE OF FAILURE IS NOT REALISTIC, 3)THE ONLY POSSIBILITY FOR FAILURE MAY BE THROUGH VIBRATION AND SHOCK. HOWEVER THIS CAN ONLY OCCUR DURING LIFTOFF AND THE FSS ISOLATE THE SYSTEM.

APPENDIX C
ASSESSMENT WORKSHEET

ASSESSMENT DATE:
ASSESSMENT ID: MMU-4015X
NASA FMEA #: 4.2.2

NASA DATA:
BASELINE [ ]
NEW [X]

SUBSYSTEM: MMU
MDAC ID: 4015
ITEM: HEATERS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

ASSESSMENT:

	CRITICALITY FLIGHT HDW/FUNC	REDUNDANCY SCREENS A	B	C	CIL ITEM
NASA	[2 /2]	[P]	[P]	[ ]	[X] *
IOA	[/NA]	[ ]	[ ]	[ ]	[ ]
COMPARE	[N /N]	[N]	[N]	[ ]	[N]

RECOMMENDATIONS: (If different from NASA)

[/]	[ ]	[ ]	[ ]	[ ] (ADD/DELETE)

* CIL RETENTION RATIONALE: (If applicable)

ADEQUATE [ ]
INADEQUATE [ ]

REMARKS:
IOA RECOMMENDS DELETING THIS FAILURE MODE SINCE IT IS NOT CREDIBLE.

APPENDIX D

CRITICAL ITEMS

APPENDIX D
POTENTIAL CRITICAL ITEMS

NASA FMEA	MDAC-ID	ITEM	FAILURE MODE
1.1.2	100	GN2 TANK	LEAK
1.5.3	102	TOGGLE VALVE	FAIL OPEN
1.5.2	103	TOGGLE VALVE	FAIL CLOSED
1.4.1	104	ISOLATION VALVE	FAIL OPEN
1.4.2	105	ISOLATION VALVE	FAIL CLOSE
1.7.3	106	GN2 LINES (ISOL VLV - REG	LEAK
1.7.4	106	GN2 LINES (REG-THRUSTERS)	LEAK
1.7.1	106	GN2 LINES (XFEED VLV - XF	LEAK
1.7.2	106	GN2 LINES (TANK-ISOL VLV)	LEAK
	110	THRUSTER MANIFOLD	LEAK
	111	THRUSTER MANIFOLD	CONSTRICTION
1.6.2	112	THRUSTER	FAIL OPEN
1.6.4	113	THRUSTER	FAIL CLOSED
1.6.3	114	THRUSTER	LEAK
1.2.4	116	GN2 REGULATOR	FAIL CLOSED
1.2.3	117	GN2 REGULATOR	FAIL OPEN
1.2.6	119	GN2 REGULATOR	FAIL LOW
1.2.2	120	GN2 RELIEF VALVE	FAIL OPEN
	121	GN2 RELIEF VALVE	FAIL CLOSED
1.8.1	122	PRESSURE GAGE	LEAK
	127	GN2 TEST PORT	LEAK
3.11.1	128	BATTERY	NO OUTPUT-LOW OUTPUT
	129	INT/EXT POWER SWITCH	FAIL OPEN
3.14.3	130	INT/EXT POWER SWITCH	FAIL TO INTERNAL POSITION
3.14.4	130	INT/EXT POWER SWITCH	FAIL TO INTERNAL POSITION
3.14.1	131	INT/EXT POWER SWITCH	FAIL TO EXTERNAL POSITION
	132	TERMINAL BOARD	SHORT
	133	TERMINAL BOARD	FAIL OPEN
3.13.1	134	MAIN POWER SWITCH	FAIL OFF
3.13.2	134	MAIN POWER SWITCH	FAIL OFF
3.13.4	135	MAIN POWER SWITCH	FAIL ON
3.9.1	136	LTS/HTR.cb	FAIL OPEN
3.8.1	138	CEA CIRCUIT BREAKER	FAIL OPEN
3.7.1	142	VDA cb	FAIL OPEN
3.12.5	152	CEA POWER SWITCH	FAIL ON IN ISO.
3.12.6	152	CEA POWER SWITCH	FAIL ON IN ISO.
3.12.1	154	CEA POWER SWITCH	FAIL OFF
3.12.2	154	CEA POWER SWITCH	FAIL OFF
	158	CEA	FAIL ON 1-12 CH.
3.3.1	159	CEA	FAIL OFF 1-12 CH.
3.3.3	160	CEA	NOISY OUTPUT

NASA FMEA	MDAC-ID	ITEM	FAILURE MODE
3.3.3	161	CEA	LOGIC FAILURE
	162	ISOLATION VALVE TIMER	FAIL OFF
	163	ISOLATION VALVE TIMER	TOO SHORT
	164	ISOLATION VALVE TIMER	FAILS ON
3.3.2	166	VALVE DRIVER AMPLIFIER	FAIL OFF
	167	VALVE DRIVER AMPLIFIER	FAIL ON
3.2.1	169	THC	FAIL ON 1-3 AXES
3.2.2	169	THC	FAIL ON 1-3 AXES
3.1.1	171	RHC	FAIL ON (1-3 AXES)
3.1.2	171	RHC	FAIL ON (1-3 AXES)
3.2.7	173	THC ISOLATE SWITCH	FAIL ON
3.2.9	174	THC ISOLATE SWITCH	FAIL OFF
3.2.10	174	THC ISOLATE SWITCH	FAIL OFF
3.3.1	182	CEA PWR SPLY	FAIL HIGH OR LOW
3.4.1	183	WIRE HARNESS	SHORT OR OPEN CIRCUIT
3.5.1	184	EXTERNAL POWER CONNECTOR	FAIL OPEN
4.1.1	185	HEATERS	FAIL OFF
4.2.1	185	HEATERS	FAIL OFF
2.1.9	190	ARM LENGTH ADJUST	FAIL UNLATCHED
	191	ARM LENGTH ADJUST	FAIL LATCHED SHORT
2.1.7	192	ARM LENGTH ADJUST	FAIL LATCHED LONG
2.1.8	192	ARM LENGTH ADJUST	FAIL LATCHED LONG
3.6.1	194	EXTERNAL POWER CONNECTOR	FAIL CONNECTED
3.6.2	195	EXTERNAL POWER CONNECTOR	FAIL DISCONNECTED
2.5.1	196	PLSS LATCHES	FAIL OPEN
2.5.3	196	PLSS LATCHES	FAIL OPEN
2.3.2	199	MMU BATTERY LATCHES	FAIL LATCHED
	200	BACKUP ARM LATCH	FAIL LATCHED
	201	BACKUP ARM LATCH	FAIL UNLATCHED
4.6.1	203	BATTERY THERMAL COVER	FAIL OPEN
5.4.1	206	BACKUP PLSS LATCHES (LAP	FAIL OPEN
	207	BACKUP PLSS LATCHES	FAIL CLOSED
2.6.1	220	GAS ACTUATED NUTS (4)	FAIL CLOSED
	222	FILTER	FRACTURE
4.2.1	224	HEATER FOR FSS RECHARGE S	FAIL OPEN
4.4.2	228	HEATER THERMOSTATS	FAIL OPEN
4.4.1	229	HEATER THERMOSTATS	FAIL CLOSED
1.1.1	1001	GN2 TANK	RUPTURE
1.5.1	1031	TOGGLE VALVES	EXTERNAL LEAKAGE
1.4.3	1051	ISOLATION VALVE	EXTERNAL LEAKAGE
1.6.1	1141	THRUSTER TRIAD	SHORT IN SOLENOID
3.2.6	1704	THC	FAILS OFF
1.2.6	1191	REGULATOR	OUT OF TOLERANCE
1.2.1	1211	GN2 REGULATOR	PISTON JAMMED
1.2.5	1212	GN2 REGULATOR	EXTERNAL LEAKAGE
3.1.6	1724	RHC	FAIL OFF THREE AXES
3.2.8	1731	THC	MECHANICALLY JAMS
4.3.2	1861	CEA THERMOSTATS (2 SETS)	FAILED CLOSED

NASA FMEA	MDAC-ID	ITEM	FAILURE MODE
4.3.1	1862	MMU THERMOSTATS	FAILS OFF
2.1.6	1896	ARM ANGLE ADJUST	INADVERTENTLY UNLOCKS
	1899	ARM ANGLE ADJUST	FAILS FROM WORK
2.3.1	1981	MMU BATTERY LATCHES	LATCH FAILS OPEN
1.13.3	2143	FSS SUPPLY VALVE	EXTERNAL LEAKAGE
5.7.1	4007	CONTINGENCY TOOL	FAILS TO RELEASE FLEX

APPENDIX E
DETAILED ANALYSIS

This appendix contains the IOA analysis worksheets supplementing previous results reported in STSEOS Working Paper 1.0-WP-VA86001-09, Analysis of the Manned Maneuvering Unit, (21 November 1986). Prior results were obtained independently and documented before starting the FMEA/CIL assessment activity. Supplemental analysis was performed to address failure modes not previously considered by the IOA. Each sheet identifies the hardware item being analyzed, parent assembly and function performed. For each failure mode possible causes are identified, and hardware and functional criticality for each mission phase are determined as described in NSTS 22206, Instructions for Preparation of FMEA and CIL, 10 October 1986. Failure mode effects are described at the bottom of each sheet and worst case criticality is identified at the top.

LEGEND FOR IOA ANALYSIS WORKSHEETS

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

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

Redundancy Screen A:
- 1 = Is Checked Out PreFlight
- 2 = Is Capable of Check Out PreFlight
- 3 = Not Capable of Check Out PreFlight
- NA = Not Applicable

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

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1001 FLIGHT: 1/1

ITEM: GN2 TANK
FAILURE MODE: RUPTURE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) PROPULSION SYSTEM
3)
4)
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7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	1/1
OPS:	1/1
POST-OPS:	1/1

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

LOCATION:
PART NUMBER:

CAUSES: FATIGUE, MATERIAL FAILURE

EFFECTS/RATIONALE:
POSSIBLE LOSS OF CREW/VEHICLE FROM SHARPNEL AND/OR IMPULSIVE DELTA V.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1031 FLIGHT: 2/1R

ITEM: TOGGLE VALVES
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) PROPULSION SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	2/1R
POST-OPS:	2/2

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

LOCATION: SIDE A OR B
PART NUMBER:

CAUSES: SEAL (O-RING) FAILURE, SEAT GALLED

EFFECTS/RATIONALE:
LOSS OF GN2 ON THE SIDE WITH LEAK. POSSIBLE LOSS OF CREWPERSON BY STRANDING IF OTHER SIDE ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: MMU
MDAC ID: 1051

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: ISOLATION VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) PROPULSION SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	2/1R
POST-OPS:	2/2

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

LOCATION: SIDE A OR B
PART NUMBER:

CAUSES: SEAL (O-RING) FAILURE/DAMAGE, SEAT GALLED

EFFECTS/RATIONALE:
LOSS OF GN2 FROM THE SIDE WITH LEAKING VALVE. POSSIBLE LOSS OF CREWMEMBER BY STRANDING IF OTHER GN2 SIDE FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1141 FLIGHT: 2/1R

ITEM: THRUSTER TRIAD
FAILURE MODE: SHORT IN SOLENOID

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) PROPULSION SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	2/1R
POST-OPS:	2/2

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

LOCATION: SIDE A OR B
PART NUMBER:

CAUSES: CONTAMINATION, CHAFFING FROM VIBRATION, INSULATION FAILURE

EFFECTS/RATIONALE:
LOSS OF SIDE DUE TO CIRCUIT BREAKER TRIPPING OR EXCESSIVE BATTERY DRAIN. POSSIBLE STRANDING OF THE CREW PERSON IF OTHER SIDE ALSO FAILS DURING EVA OPS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: MMU
MDAC ID: 1191

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: REGULATOR
FAILURE MODE: OUT OF TOLERANCE (HIGH)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) PROPULSION SUBSYSTEM
3) A OR B SIDE
4) REGULATOR
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	2/1R
POST-OPS:	2/2

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

LOCATION: A OR B SIDE
PART NUMBER:

CAUSES: CONTAMINATION, SPRING FAILURE, INCORRECT CALIBRATION

EFFECTS/RATIONALE:
IF DOWNSTREAM PRESSURE SUFFICIENTLY HIGH, RELIEF VALVE OPENS, LOSS OF SIDE RESULTS. AT PRESSURES BELOW RELIEF OPENING, NO SIGNIFICANT IMPACT. LOSS OF BOTH SIDES STRANDS CREWMEMBER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: MMU
MDAC ID: 1211

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: GN2 REGULATOR
FAILURE MODE: PISTON JAMMED

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) PROPULSION SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	2/1R
POST-OPS:	3/3

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

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, SHOCK, VIBRATION

EFFECTS/RATIONALE:
A POSIBILITY EXISTS TO HAVE THE PISTON JAMMED IN SUCH A MANNER WHICH MAY FAIL THE REGULATOR IN OPEN AND THE VENT PORT IN CLOSED POSITION. IN THIS CASE, THE HIGH PRESSURE DOWNSTREAM MAY DAMAGE THE THRUSTERS MANIFOLD AND LOOSE ATTITUDE CONTROL. THE AFFECTED SIDE MUST BE ISOLATED THROUGH ISOLATION VALVE, CANCEL MMU ACTIVITY AND RETURN TO ORBITER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1212 FLIGHT: 2/1R

ITEM: GN2 REGULATOR
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1)
2)
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	2/1R
POST-OPS:	2/2

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

LOCATION: SIDE A OR B
PART NUMBER:

CAUSES:

EFFECTS/RATIONALE:
LOSS OF SIDE REQUIRING IT BE ISOLATED. POSSIBLE LOSS OF CREWPERSON STRANDING IF OTHER SIDE FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1251 FLIGHT: 3/2R

ITEM: QUICK DISCONNECT
FAILURE MODE: PREMATURE OPERATION

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) PROPULSION
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	/NA
POST-OPS:	3/2R

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

LOCATION:
PART NUMBER:

CAUSES: SHOCK, VIBRATION, PART FAILURE

EFFECTS/RATIONALE:
THE QD COMING OFF PREMATURELY DURING RECHARGE POSES NO IMMEDIATE PROBLEM SINCE IT HAS SELF-SEALING CAPABILITY. NO RECHARGE CAPABILITY AT WORST CASE WILL CANCEL MMU ACTIVITY THUS LOSS OF MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1252
FLIGHT: 3/2R

ITEM: QUICK DISCONNECT
FAILURE MODE: INABILITY TO MATE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) PROPULSION
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	/NA
OPS:	/NA
POST-OPS:	3/2R

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

LOCATION:
PART NUMBER:

CAUSES: CORROSION, CONTAMINATION, PIECE PART FAILURE

EFFECTS/RATIONALE:
LOSS OF RECHARGE CAPABILITY FROM ONE PORT. TOTAL LOSS OF RECHARGE CAPABILITY WILL CANCEL SUBSEQUENT MMU ACTIVITY THUS MISSION LOSS WITH MULTIPLE MMU OPS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: MMU
MDAC ID: 1253

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: QUICK DISCONNECT
FAILURE MODE: INABILITY TO DEMATE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) PROPULSION
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	/NA
POST-OPS:	3/2R

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

LOCATION:
PART NUMBER:

CAUSES: CORROSION, CONTAMINATION, PIECE PART FAILURE

EFFECTS/RATIONALE:
THE HOSE MUST BE CUT BY EMERGENCY TOOL TO REMOVE FLEX HOSE FROM QD. THIS WILL HOWEVER NEGATE RECHARGE CAPABILITY FOR SUBSEQUENT MMU OPS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: MMU
MDAC ID: 1281

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: BATTERY
FAILURE MODE: INABILITY TO MATE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1)
2)
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	/NA
POST-OPS:	3/2R

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

LOCATION:
PART NUMBER:

CAUSES: MECHANICAL (PIN BENT), CORROSION/CONTAMINATION

EFFECTS/RATIONALE:
THE AFFECTED BATTERY NEEDS TO BE CHANGED WITH A GOOD ONE FROM ORBITER AND RESUME MMU ACTIVITIES. IF NO BATTERY EXISTS, THEN MMU ACTIVITY CANNOT BE ACCOMPLISHED - MISSION LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1681 FLIGHT: 3/2R

ITEM: GYRO POWER SUPPLY
FAILURE MODE: UNCOMMANDED OUTPUT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) ELECTRICAL SUBSYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	3/2R
POST-OPS:	3/3

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

LOCATION:
PART NUMBER:

CAUSES: SHORT

EFFECTS/RATIONALE:
UNCOMMANDED RATES PROVIDED TO MMU PROPULSION. REQUIRES REMOVAL OF POWER TO POWER SUPPLY AND LOSS OF AAH. SOME MISSION (LIKE SOLAR MAX) MAY REQUIRE AAH AND ALT CONTROL SWITCH TO SUCCESSFULLY ACCOMPLISH THE MISSION GOAL. LOSS OF AUTO CONTROL, WILL LEAVE MANUAL ATTITUDE CONTROL THROUGH RHC.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/13/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1701 FLIGHT: 3/1R

ITEM: TRANSLATIONAL HAND CONTROLLER
FAILURE MODE: FAILS OFF ELECTRICALLY IN ONE AXIS (+, -, OR + AND -)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) THC SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	3/1R
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES: LOOSE MAGNET/CONNECTOR, MECHANICAL JAMMING, CONTAMINATION, PIECE PART FAILURE

EFFECTS/RATIONALE:
CANNOT TRANSLATE IN ONE AXIS, IN ONE DIRECTION OR BOTH. THE PILOT CAN ROTATE AND TRANSLATE ON OTHER AXES. LOSS OF ALL FUNCTIONS WILL LEAVE THE PILOT STRANDED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/13/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1702 FLIGHT: 3/1R

ITEM: TRANSLATIONAL HAND CONTROLLER
FAILURE MODE: FAILS OFF MECHANICALLY IN ONE AXIS (+, -, OR + AND -)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) THC SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	3/1R
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES: LOSSE MAGNET/CONNECTOR, MECHANICAL JAMMING, CONTAMINATION, PIECE PART FAILURE

EFFECTS/RATIONALE:
CANNOT TRANSLATE IN ONE AXIS, IN ONE DIRECTION OR BOTH. THE PILOT CAN ROTATE AND TRANSLATE ON OTHER AXES. LOSS OF ALL FUNCTIONS WILL LEAVE THE PILOT STRANDED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/13/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1703 FLIGHT: 3/1R

ITEM: TRANSLATIONAL HAND CONTROLLER
FAILURE MODE: FAILS OFF IN ONE AXIS (+, -, OR + AND -)-DETACHED MAGNET

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) THC SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	3/1R
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES: LOOSE MAGNET/CONNECTOR, MECHANICAL JAMMING, CONTAMINATION, PIECE PART FAILURE

EFFECTS/RATIONALE:
CANNOT TRANSLATE IN ONE AXIS, IN ONE DIRECTION OR BOTH. THE PILOT CAN ROTATE AND TRANSLATE ON OTHER AXES. LOSS OF ALL FUNCTIONS WILL LEAVE THE PILOT STRANDED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/16/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1704 FLIGHT: 2/1R

ITEM: TRANSLATIONAL HAND CONTROLLER
FAILURE MODE: FAILS OFF IN ALL THREE AXIS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) THC SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	2/1R
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES: LOOSE MAGNET/CONNECTOR, MECHANICAL JAMMING, PIECE PART FAILURE

EFFECTS/RATIONALE:
THC FAILS ON ALL THREE AXES, PILOT CANNOT TRANSLATE. THIS FAILURE CAN BE WORKED AROUND USING THE SATELLITE STABILIZATION FUNCTION AND THE ROTATIONAL HAND CONTROLLER YAW COMMANDS WHICH WILL RESULT IN TRANSLATION ALONG THE Y AXIS. WE CONSIDER THIS AN UNLIKE REDUNDANT SYSTEM FOR TRANSLATION. LOSS OF ALL FUNCTIONS WILL RESULT IN POSSIBLE LOSS OF PILOT/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/16/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1721 FLIGHT: 3/1R

ITEM: ROTATIONAL HAND CONTROLLER
FAILURE MODE: FAILS OFF ELECTRICALLY ONE AXIS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) RHC SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	3/1R
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES: LOOSE MAGNET/CONNECTOR, MECHANICAL JAMMING, CONTAMINATION, PIECE PART FAILURE.

EFFECTS/RATIONALE:
LOSS OF ROTATION IN ONE AXIS. THE PILOT CAN ROTATE AND TRANSLATE IN OTHER AXES. LOSS OF ALL FUNCTIONS WILL LEAVE THE PILOT STRANDED IF UNABLE TO SIGHT THE ORBITER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1722 FLIGHT: 3/1R

ITEM: ROTATIONAL HAND CONTROLLER
FAILURE MODE: FAIL OFF MECHANICALLY IN ONE AXIS

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) RHC SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	3/1R
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES: LOOSE MAGNET/CONNECTOR, MECHANICAL JAMMING CONTAMINATION, PIECE PART FAILURE

EFFECTS/RATIONALE:
LOSS OF ROTATION IN ONE AXIS. THE PILOT CAN ROTATE AND TRANSLATE IN OTHER AXES. LOSS OF ALL FUNCTIONS WILL LEAVE THE PILOT STRANDED IF UNABLE TO SIGHT ORBITER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/19/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1723 FLIGHT: 3/1R

ITEM: ROTATIONAL HAND CONTROLLER
FAILURE MODE: FAIL OFF (1-3 AXES)-DETACHED MAGNET

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) RHC SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	3/1R
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES: LOOSE MAGNET/CONNECTOR, MECHANICAL JAMMING

EFFECTS/RATIONALE:
LOSS OF ROTATION IN ONE AXIS. THE PILOT CAN ROTATE AND TRANSLATE IN OTHER AXES. LOSS OF ALL FUNCTIONS WILL LEAVE THE PILOT STRANDED IF UNABLE TO SIGHT ORBITER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/16/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1724 FLIGHT: 1/1

ITEM: ROTATIONAL HAND CONTROLLER
FAILURE MODE: FAIL OFF THREE AXES

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) RHC SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	1/1
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES: LOOSE MAGNET/CONNECTOR, MECHANICAL JAMMING, CONTAMINATION, PIECE PART FAILURE

EFFECTS/RATIONALE:
NO ROTATIONAL CONTROL. THE PILOT IS STRANDED IF UNABLE TO SIGHT THE ORBITER. THIS CRITICALITY CAN BE DOWNGRADED TO A 2/1R IF IT PROVES FEASIBLE FOR THE PILOT TO PUT A HAND ON ONE OF THE PROPULSIVE NOZZLES WHILE FIRING TRANSLATION TO FORCE A ROTATIONAL MOTION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/16/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1731 FLIGHT: 1/1

ITEM: TRANSLATIONAL HAND CONTROLLER
FAILURE MODE: MECHANICALLY JAMS IN ISO MODE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) THC SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	1/1
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES: MECHANICAL JAM, CONTAMINATION, PIECE PART FAILURE

EFFECTS/RATIONALE:
ISOLATION VALVES ARE CLOSED. LOSS OF ALL PROPULSIVE CAPABILITY. PILOT IS STRANDED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1861 FLIGHT: 2/1R

ITEM: CEA THERMOSTATS (2 SETS)
FAILURE MODE: FAILED CLOSED (HEATERS ON CONTINUOUSLY)

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) CEA
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	2/1R
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES:

EFFECTS/RATIONALE:
THIS FAILURE WILL MAINTAIN THE CONTROL ELECTRONIC ASSEMBLY HEATERS ON CONTINUOUSLY. LOSS OF ESSENTIAL EQUIPMENT IN THE CEA SUCH AS THE VALVE DRIVE AMPLIFIERS WILL FOLLOW, FORCING THE SHUTDOWN OF ONE SIDE. FUNCTION FAILURE MAY LEAVE PILOT STRANDED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1862 FLIGHT: 2/1R

ITEM: MMU THERMOSTATS
FAILURE MODE: FAILS OFF

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) CEA
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	/NA
OPS:	2/1R
POST-OPS:	/NA

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

LOCATION:
PART NUMBER:

CAUSES: ELECTRICAL OPEN

EFFECTS/RATIONALE:
HEATER WITH THE FAILED THERMOSTAT WILL NOT OPERATE. POSSIBLE COMPONENT FAILURE IF TEMPERATURE EXCEEDS LOWER LIMITS. IF FLIGHT CRITICAL COMPONENT, POSSIBLE STRANDING/LOSS OF CREWMEMBER IF OTHER SIDE ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1891 FLIGHT: 3/2R

ITEM: ARM ANGLE ADJUST
FAILURE MODE: UNABLE TO MOVE FROM WORK TO FLIGHT POSITION-LEFT ARM

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) MECHANICAL
3) ARM ASSEMBLY
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	3/2R
POST-OPS:	3/3

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

LOCATION: LEFT OR RIGHT MMU ARM
PART NUMBER:

CAUSES: PIECE PART FAILURE, VIBRATION, SHOCK, JAMMING

EFFECTS/RATIONALE:
IF FAILURE OCCURS PRE-OPS, LATCH BOLTS CAN BE REMOVED AND ARM PLACED IN FLIGHT POSITION WITH PIP PINS. HOWEVER, THIS CORRECTIVE ACTION FREEZES THE ARM IN FLIGHT POSITION AND MAY PREVENT COMPLETION OF THE MISSION. DURING THE OPS PHASE THIS FAILURE MAY PREVENT COMPLETION OF THE MISSION. POST-OPS THE ARM CAN BE LEFT IN THE FLIGHT POSITION AND CAN BE SECURED FOR LANDING WITH PIP PINS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1892 FLIGHT: 3/2R

ITEM: ARM ANGLE ADJUST
FAILURE MODE: UNABLE TO MOVE SYSTEM WORK TO FLIGHT-RIGHT ARM

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) MECHANICAL
3) ARM ASSEMBLY
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	3/2R
POST-OPS:	3/3

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

LOCATION: LEFT OR RIGHT MMU ARM
PART NUMBER:

CAUSES: PIECE PART FAILURE, VIBRATION, SHOCK, JAMMING

EFFECTS/RATIONALE:
IF FAILURE OCCURS PRE-OPS, LATCH BOLTS CAN BE REMOVED AND ARM PLACED IN FLIGHT POSITION WITH PIP PINS. HOWEVER, THIS CORRECTIVE ACTION FREEZES THE ARM IN FLIGHT POSITION AND MAY PREVENT COMPLETION OF THE MISSION. DURING THE OPS PHASE THIS FAILURE MAY PREVENT COMPLETION OF THE MISSION. POST-OPS THE ARM CAN BE LEFT IN THE FLIGHT POSITION AND CAN BE SECURED FOR LANDING WITH PIP PINS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1893 FLIGHT: 3/3

ITEM: ARM ANGLE ADJUST
FAILURE MODE: LEFT ARM FAILS TO LOCK, INADVERTENTLY UNLOCKS, ANY SINGLE POSITION

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) MECHANICAL
3) ARM ASSEMBLY
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	3/3
POST-OPS:	3/3

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

LOCATION: LEFT MMU ARM
PART NUMBER:

CAUSES: PIECE PART FAILURE, VIBRATION, SHOCK

EFFECTS/RATIONALE:
IF FAILURE OCCURS PRE-OPS, CREW INCONVENIENCE, ARM MAY HAVE TO BE PINNED IN POSITION. IF FAILURE OCCURS DURING OPERATIONS (I.E., AFTER SATELLITE SERVICING) AND ARM FAILS TO LOCK BACK IN FLIGHT POSITION, NO IMPACT. CREW INCONVENIENCE TO TRAVEL WITH UNLOCKED ARM. POST-OPS, WHILE PREPPING TO RETURN, THE ARM CAN BE STRAPPED OR LOCKED IN A DIFFERENT POSITION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1894 FLIGHT: 3/3

ITEM: ARM ANGLE ADJUST
FAILURE MODE: RIGHT ARM FAILS TO LOCK, INADVERTENTLY UNLOCKS, ANY SINGLE POSITION

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) MECHANICAL
3) ARM ASSEMBLY
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	3/3
POST-OPS:	3/3

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

LOCATION: RIGHT MMU ARM
PART NUMBER:

CAUSES: PIECE PART FAILURE, VIBRATION, SHOCK

EFFECTS/RATIONALE:
IF FAILURE OCCURS PRE-OPS, CREW INCONVENIENCE, ARM MAY HAVE TO BE PINNED IN POSITION. IF FAILURE OCCURS DURING OPERATIONS (I.E., AFTER SATELLITE SERVICING) AND ARM FAILS TO LOCK BACK IN FLIGHT POSITION, NO IMPACT. CREW INCONVENIENCE TO TRAVEL WITH UNLOCKED ARM. POST-OPS, WHILE PREPPING TO RETURN, THE ARM CAN BE STRAPPED OR LOCKED IN A DIFFERENT POSITION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1895 FLIGHT: 3/3

ITEM: ARM ANGLE ADJUST
FAILURE MODE: FAILS TO LOCK, INADVERTENTLY UNLOCKS, ANY SINGLE POSITION

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) MECHANICAL
3) ARM ASSEMBLY
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	3/3
POST-OPS:	3/3

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

LOCATION: LEFT OR RIGHT MMU ARM
PART NUMBER:

CAUSES: PIECE PART FAILURE, VIBRATION, SHOCK

EFFECTS/RATIONALE:
IF FAILURE OCCURS PRE-OPS, CREW INCONVENIENCE, ARM MAY HAVE TO BE PINNED IN POSITION. IF FAILURE OCCURS DURING OPERATIONS (I.E., AFTER SATELLITE SERVICING) AND ARM FAILS TO LOCK BACK IN FLIGHT POSITION, NO IMPACT. CREW INCONVENIENCE TO TRAVEL WITH UNLOCKED ARM. POST-OPS, WHILE PREPPING TO RETURN, THE ARM CAN BE STRAPPED OR LOCKED IN A DIFFERENT POSITION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1896 FLIGHT: 3/2R

ITEM: ARM ANGLE ADJUST
FAILURE MODE: INADVERTENTLY UNLOCKS (LAUNCH, LANDING), FAILS TO STAY IN LAUNCH POSITION

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) MECHANICAL
3) ARM ASSEMBLY
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	/*
POST-OPS:	3/2R

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

LOCATION: LEFT OR RIGHT MMU ARM
PART NUMBER:

CAUSES: PIECE PART FAILURE, VIBRATION, SHOCK

EFFECTS/RATIONALE:
*SEE MDAC ID-1891
THE ARMS HAVE LOCKS PLUS STRAPS TO KEEP THEM IN POSITION DURING LAUNCH OR LANDING. SHOULD ALL REDUNDANCIES FAIL, THIS MMU MISSION MAY BE LOST DUE TO AN INOPERABLE ARM.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1897
FLIGHT: 3/2R

ITEM: ARM ANGLE ADJUST
FAILURE MODE: UNABLE TO MOVE FROM LAUNCH TO WORK/FLIGHT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) MECHANICAL
3) ARM ASSEMBLY
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	3/2R
POST-OPS:	3/3

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

LOCATION: LEFT OR RIGHT MMU ARM
PART NUMBER:

CAUSES: PIECE PART FAILURE, VIBRATION, SHOCK, JAMMING

EFFECTS/RATIONALE:
IF FAILURE OCCURS PRE-OPS, LATCH BOLTS CAN BE REMOVED AND ARM PLACED IN FLIGHT POSITION WITH PIP PINS. HOWEVER, THIS CORRECTIVE ACTION FREEZES THE ARM IN FLIGHT POSITION AND MAY PREVENT COMPLETION OF THE MISSION. DURING THE OPS PHASE THIS FAILURE MAY
PREVENT COMPLETION OF THE MISSION. POST-OPS THE ARM CAN BE LEFT IN THE FLIGHT POSITION AND CAN BE SECURED FOR LANDING WITH PIP PINS.

REFERENCES:

C-4

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: MMU
MDAC ID: 1898

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: ARM ANGLE ADJUST
FAILURE MODE: UNABLE TO RELEASE ARM FROM FLIGHT TO LAUNCH/WORK

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) MECHANICAL
3) ARM ASSEMBLY
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	3/2R
POST-OPS:	3/3

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

LOCATION: LEFT OR RIGHT MMU ARM
PART NUMBER:

CAUSES: PIECE PART FAILURE, VIBRATION, SHOCK, JAMMING

EFFECTS/RATIONALE:
IF FAILURE OCCURS PRE-OPS, LATCH BOLTS CAN BE REMOVED AND ARM PLACED IN FLIGHT POSITION WITH PIP PINS. HOWEVER, THIS CORRECTIVE ACTION FREEZES THE ARM IN FLIGHT POSITION AND MAY PREVENT COMPLETION OF THE MISSION. DURING THE OPS PHASE THIS FAILURE MAY
PREVENT COMPLETION OF THE MISSION. POST-OPS THE ARM CAN BE LEFT IN THE FLIGHT POSITION AND CAN BE SECURED FOR LANDING WITH PIP PINS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1899 FLIGHT: 2/1R

ITEM: ARM ANGLE ADJUST
FAILURE MODE: FAILS FROM WORK TO LAUNCH POSITION

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) MECHANICAL
3) ARM ASSEMBLY
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	2/1R
POST-OPS:	3/3

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

LOCATION:
PART NUMBER:

CAUSES: PIECE PART FAILURE, VIBRATION, SHOCK

EFFECTS/RATIONALE:
PRE-OPS, PILOT WILL NOT PROCEED WITH THE MISSION IF PROBLEM CANNOT BE CORRECTED. DURING OPERATIONS, THE HARDWARE CRITICALITY IS BASED ON THE PILOTS ABILITY TO TETHER HIMSELF TO THE MMU, DOFF TO CORRECT THE ARM POSITION BACK TO FLIGHT AND DONNING IT FOR THE FLIGHT BACK. FAILURE TO CORRECT THIS CONDITION AND DONN THE MMU AGAIN MAY RESULT IN CREWMAN BEING STRANDED AWAY FROM THE ORBITER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 1981 FLIGHT: 3/2R

ITEM: MMU BATTERY LATCHES
FAILURE MODE: LATCH FAILS OPEN-LAUNCH AND LANDING

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) BATTERY
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	/*
POST-OPS:	3/2R

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

LOCATION:
PART NUMBER:

CAUSES:

EFFECTS/RATIONALE:
*SEE ANALYSIS MDAC ID-198.
DURING LIFTOFF, IF THE LATCH FAILS OPEN, THE VELCRO THERMAL COVER WILL HOLD THE LATCH FROM TRAVELING. THIS WILL KEEP THE BATTERY IN PLACE. THE MOMENT ARM BETWEEN THE BATTERY PIN AND THE LATCH HINGE POINT IS SMALL COMPARED TO THE MOMENT ARM BETWEEN THE END OF THE LATCH (AGAINST THE VELCRO COVER) AND THE SAME LATCH HINGE POINT. SHOULD THE SYSTEM FAIL, THE BATTERY MAY BECOME UNHINGED, CAUSING LOSS OF BATTERY AND HINGES, THUS LOSS OF MISSION.
REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 2111 FLIGHT: 3/3

ITEM: FSS PRESSURE GAUGES
FAILURE MODE: ERRONEOUS-HIGH OR LOW

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1)
2)
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	/NA
POST-OPS:	3/3

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

LOCATION: FSS
PART NUMBER:

CAUSES: CONTAMINATION, MECHANISM BINDS

EFFECTS/RATIONALE:
NO EFFECT DUE TO NO IMPACT ON THE SYSTEMS (MMU OR FSS).

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 2141 FLIGHT: /NA

ITEM: FSS SUPPLY VALVE
FAILURE MODE: FAILED OPEN

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1)
2)
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	/NA
OPS:	/
POST-OPS:	/NA

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

LOCATION:
PART NUMBER:

CAUSES:

EFFECTS/RATIONALE:
THIS FAILURE MODE WAS STUDIED UNDER THE ARPCS (ARPCS-230) WHICH WILL AFFECT MMU RECHARGE CAPABILITY DURING PRE/POST OPS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: MMU
MDAC ID: 2142

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: FSS SUPPLY VALVE
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: DUFFY, HUYNH, SAIIDI

SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3) PROPULSION
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	/NA
POST-OPS:	3/2R

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

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE

EFFECTS/RATIONALE:
THE FAILURE WILL HAVE NO EFFECT UNTIL RECHARGE IS ATTEMPTED AFTER THE FIRST MMU-OPS. LOSS OF RECHARGE CAPABILITY WILL CANCEL SUBSEQUENT MMU-OPS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: MMU
MDAC ID: 2143

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: FSS SUPPLY VALVE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3) PROPULSION
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	/NA
POST-OPS:	2/2

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

LOCATION:
PART NUMBER:

CAUSES: SHOCK, VIBRATION

EFFECTS/RATIONALE:
A SEVERE EXTERNAL LEAKAGE (IF NOT ABLE TO BE ISOLATED BY THE VALVE-DOWNSTREAM SIDE) WILL PREVENT THE MMU FROM BEING RECHARGED - GAS (GN2) WILL ESCAPE FROM ORBITER AND MMU TANKS. THUS MMU-OPS WILL BE LOST AFTER THE FIRST MMU ACTIVITY. ONLY ONE MMU REMAINING.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 2144 FLIGHT: 3/3

ITEM: FSS SUPPLY VALVE
FAILURE MODE: FAILED OPEN

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3) PROPULSION
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	/NA
POST-OPS:	3/3

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

LOCATION:
PART NUMBER:

CAUSES: VIBRATION, CORROSION, SHOCK, CONTAMINATION

EFFECTS/RATIONALE:
NO IMMEDIATE EFFECT IS RECOGNIZED, SINCE THE ORBITER MMU SUPPLY VALVES AND MMU CROSSFED VALVES MAY BE USED TO ISOLATE THE LINE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 2181 FLIGHT: 3/2R

ITEM: FLEX HOSE
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1)
2)
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	/NA
POST-OPS:	3/2R

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

LOCATION:
PART NUMBER:

CAUSES: MATERIAL FAILURE DUE TO THERMAL CYCLING OR STRESSED IN EXCESS OF ALLOWABLE BEND RADIUS.

EFFECTS/RATIONALE:
LOSS OF GN2 TO SPACE. PROBABLE INEFFICIENT AND UNACCEPTABLE CHANGE TO MMU. MISSION IMPACT IF REDUNDANT FSS CHARGE CAPABILITY ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/27/87 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 2391 FLIGHT: 3/2R

ITEM: FOOT RESTRAINT
FAILURE MODE: BOOT JAMS IN FOOT RESTRAINT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) FSS
2) MECHANICAL
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	/NA
POST-OPS:	3/2R

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

LOCATION:
PART NUMBER:

CAUSES:

EFFECTS/RATIONALE:
FOOT RESTRAINT IS BEING MODIFIED SUCH THAT THE HEEL CLIP CAN COME OFF IF THE FOOT JAMS INSIDE. FINAL ANALYSIS SHOULD BE RESERVED UNTIL MODIFICATION IS AVAILABLE TO IOA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 2392 FLIGHT: 3/3

ITEM: FSS FOOT RESTRAINT
FAILURE MODE: INABILITY TO CAPTURE BOOT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) FSS
2) FOOT RESTRAINT
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	3/3
POST-OPS:	3/3

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

LOCATION: FSS, RIGHT OR LEFT RESTRAINT
PART NUMBER:

CAUSES: WEAR, DAMAGE TO BOOT OR FOOT RESTRAINT

EFFECTS/RATIONALE:
IF BOTH RESTRAINTS FAIL, GREATER EFFORT IN HOLDING POSITION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/87
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4000
FLIGHT: 3/3

ITEM: ARM STRAP
FAILURE MODE: FAILS LATCHED

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) ARM ASSEMBLY
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	3/3
POST-OPS:	3/3

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

LOCATION:
PART NUMBER:

CAUSES: PIECE PART FAILURE, JAMMING

EFFECTS/RATIONALE:
STRAP CAN BE FORCEFULLY UNLATCHED OR IT CAN BE CUT. THE PRIMARY LATCH CAN BEAR ENTRY LOADS, OR ARM CAN BE PINNED IN THE FLIGHT POSITION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 3/23/87
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4001
FLIGHT: 3/3

ITEM: ARM STRAPS
FAILURE MODE: FAILS UNLATCHED

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) ARM ASSEMBLY
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	/*
POST-OPS:	3/3

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

LOCATION:
PART NUMBER:

CAUSES:

EFFECTS/RATIONALE:
*SEE MDAC-201.
THIS PRIMARY LATCH HOLDS THE ARM IN PLACE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4002 FLIGHT: 3/2R

ITEM: MMU BATTERY RECHARGE CABLE
FAILURE MODE: FAILURE TO PROVIDE A RECHARGE INTERFACE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	/NA
POST-OPS:	3/2R

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

LOCATION: ORBITER AIRLOCK
PART NUMBER:

CAUSES: MECHANICAL FAILURE, ELECTRICAL OPEN

EFFECTS/RATIONALE:
LOSS OF INTERFACE PREVENTS RECHARGE OF BATTERY AND RESULTS IN A MISSION IMPACT IF OTHER BATTERIES AND RECHARGING FUNCTIONS ARE FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4003 FLIGHT: 3/2R

ITEM: MMU BATTERY RECHARGE CABLE
FAILURE MODE: FAILURE TO PROVIDE A RECHARGE INTERFACE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	3/3
POST-OPS:	3/3

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

LOCATION: ORBITER AIRLOCK
PART NUMBER:

CAUSES: SHORT DUE TO CONTAMINATION, FRAYED CONNECTOR

EFFECTS/RATIONALE:
EXCESSIVE CURRENT DRAW FROM ORBITER WHICH WILL LIKELY RESULT IN AIRLOCK RPC AUTOMATICALLY OPENING.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4004 FLIGHT: 3/2R

ITEM: TRUNNION PIN ATTACHMENT DEVICE
FAILURE MODE: FAILS TO PROVIDE ATTACHMENT

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	3/2R
POST-OPS:	3/3

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

LOCATION:
PART NUMBER:

CAUSES: MATERIAL FAILURE, MISALIGNMENT (BENT)

EFFECTS/RATIONALE:
INABILITY TO ATTACH MISSION SPECIFIC AUXILLARY HARDWARE. MISSION IMPACT IF REMAINING DEVICE ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4005
FLIGHT: 3/2R

ITEM: BATTERY TRANSFER BAG
FAILURE MODE: FAILS OPEN

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) STRUCTURE AND MECHANISM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	/NA
POST-OPS:	/NA

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

LOCATION: ANCILLARY EQUIPMENT
PART NUMBER:

CAUSES: MATERIAL FAILURE

EFFECTS/RATIONALE:
POSSIBLE LOSS OF BATTERY IF OPENING SUFFICIENT ENOUGH TO LOSE ENTIRE BATTERY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4006 FLIGHT: 3/2R

ITEM: BATTERY TETHER STRAP
FAILURE MODE: FAILS TO RETAIN BATTERY

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) STRUCTURE AND MECHANISM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	/NA
POST-OPS:	/NA

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

LOCATION:
PART NUMBER:

CAUSES: MATERIAL FAILURE, BRACKET FRACTURES, SNAP FRACTURES/RELEASES

EFFECTS/RATIONALE:
BATTERY LOST TO SPACE. MISSION IMPACT IF OTHER TETHER ALSO NON-FUNCTIONAL.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4007 FLIGHT: 2/2

ITEM: CONTINGENCY TOOL
FAILURE MODE: FAILS TO RELEASE FLEX HOSE FROM QD

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	2/2
OPS:	/NA
POST-OPS:	/NA

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

LOCATION: ANCILLARY EQUIPMENT
PART NUMBER:

CAUSES: BINDING, MATERIAL FAILURE

EFFECTS/RATIONALE:
INABILITY TO REMOVE/SEPARATE FLEX HOSE FROM QD. MMU RETAINED IN FSS AND UNAVAILABLE FOR MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4008 FLIGHT: 3/2R

ITEM: CONTINGENCY TOOL
FAILURE MODE: FAILS TO RELEASE ARM ANGLE MECHANISM

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	/NA
POST-OPS:	/NA

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

LOCATION: ANCILLARY EQUIPMENT
PART NUMBER:

CAUSES: BINDING, MATERIAL FAILURE

EFFECTS/RATIONALE:
INABILITY TO RELEASE ARM WOULD RESULT IN MISSION IMPACT IF POWER TOOL HAS ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4009
FLIGHT: 3/2R

ITEM: 5/16" THIN WALL SOCKET
FAILURE MODE: FAILS TO INTERFACE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI
SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	/NA
POST-OPS:	3/2R

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

LOCATION: ANCILLARY EQUIPMENT
PART NUMBER:

CAUSES: MATERIAL FAILURE, SOCKET STRIPPED OR BENT

EFFECTS/RATIONALE:
INABILITY TO EMPLOY SOCKET ON LAUNCH BOLTS OR ARM CONTINGENCY BOLTS. IF CONTINGENCY TOOL ALSO FAILED MISSION IMPACT RESULTS FROM INABILITY TO RELEASE MMU.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4010 FLIGHT: 3/2R

ITEM: 5/16" THIN WALL SOCKET
FAILURE MODE: FAILS TO INTERFACE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/2R
OPS:	/
POST-OPS:	3/2R

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

LOCATION: ANCILLARY EQUIPMENT
PART NUMBER:

CAUSES: MATERIAL FAILURE, SOCKET STRIPPED OR BENT

EFFECTS/RATIONALE:
INABILITY TO EMPLOY SOCKET ON LAUNCH BOLTS OR ARM CONTINGENCY BOLTS. IF CONTINGENCY TOOL ALSO FAILED MISSION IMPACT RESULTS FROM INABILITY TO RELEASE MMU.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4011 FLIGHT: 3/3

ITEM: SUBWAY STRAPS
FAILURE MODE: SEPARATES FROM DONNING STATION

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) FSS
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	/NA
POST-OPS:	3/3

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

LOCATION:
PART NUMBER:

CAUSES: MATERIAL FAILURE

EFFECTS/RATIONALE:
NO EFFECTS DUE TO STRAPS BEING NON-CRITICAL IN DONNING OR DOFFING PROCESSES.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4012 FLIGHT: 3/3

ITEM: THRUSTER CUE LIGHT EXTENDER
FAILURE MODE: DOES NOT OPERATE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) STRUCTURE AND MECHANISM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	3/3
POST-OPS:	3/3

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

LOCATION: ANCILLARY EQUIPMENT
PART NUMBER:

CAUSES: FRACTURED, MATERIAL FAILURE, SEPARATED FROM MMU

EFFECTS/RATIONALE:
CREW INCONVENIENCE, OTHERWISE NO MAJOR IMPACT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4013 FLIGHT: 3/3

ITEM: CAMERA BRACKET
FAILURE MODE: FAILS TO INTERFACE

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) STRUCTURE AND MECHANISM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	3/3
OPS:	/NA
POST-OPS:	/NA

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

LOCATION: ANCILLARY EQUIPMENT
PART NUMBER:

CAUSES: MATERIAL FAILURE

EFFECTS/RATIONALE:
INABILITY TO ATTACH CAMERA. THE CAMERA IS NOT CONSIDERED A CRITICAL COMPONENT FOR MISSION SUCCESS, LIFE SUPPORT, OR VEHICLE OPERATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4014 FLIGHT: /NA

ITEM: SUNSHIELD
FAILURE MODE: LOSS OF THERMAL PROTECTION

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) STRUCTURES AND MECHANISM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	/NA
OPS:	/NA
POST-OPS:	/NA

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

LOCATION:
PART NUMBER:

CAUSES: MATERIAL FAILURE

EFFECTS/RATIONALE:
THE COMPONENT IS CONSIDERED IN THE SAME FASHION AS THE ORBITER SKIN AND THEREFORE NOT CONSIDERED FOR ANALYSIS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: MMU
MDAC ID: 4015 FLIGHT: /NA

ITEM: HEATERS
FAILURE MODE: FAILS ON

LEAD ANALYST: DUFFY, HUYNH, SAIIDI SUBSYS LEAD: M.J. SAIIDI

BREAKDOWN HIERARCHY:
1) MMU
2) ELECTRICAL SYSTEM
3)
4)
5)
6)
7)
8)
9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-OPS:	/NA
OPS:	/NA
POST-OPS:	/NA

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

LOCATION:
PART NUMBER:

CAUSES: SHORT CIRCUIT

EFFECTS/RATIONALE:
THE CAUSE FOR FAILURE IS NOT CREDIBLE.

REFERENCES:

APPENDIX F

NASA FMEA TO IOA WORKSHEET CROSS REFERENCE/RECOMMENDATIONS

This section provides a cross reference between the NASA FMEA and corresponding IOA analysis worksheet(s) included in Appendix E. The Appendix F identifies: NASA FMEA Number, IOA Assessment Number, NASA criticality and redundancy screen data, and IOA recommendations.

Appendix F Legend

Code	Definition
1	IOA recommends changing the second failure mode described in the effects field.
2	IOA recommends deleting the IOA failure mode.

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APPENDIX F

NASA FMEA TO IOA WORKSHEET CROSS REFERENCE / RECOMMENDATIONS

IDENTIFIERS		NASA		IOA RECOMMENDATIONS *			
NASA FMEA NUMBER	IOA ASSESSMENT NUMBER	CRIT HW/F	SCREENS A B C	CRIT HW/F	SCREENS A B C	OTHER (SEE LEGEND CODE)	ISSUE
	MMU-110	/		2/1R	P P P		X
	MMU-111	/		2/1R	P P P		X
	MMU-121	/		3/2R	P F P		X
	MMU-127	/		2/1R	P P P		X
	MMU-129	/		2/1R	P P P		X
	MMU-132	/		2/1R	P P P		X
	MMU-133	/		2/1R	P P P		X
	MMU-155	/		/			
	MMU-158	/		2/1R	P P P		X
	MMU-162	/		2/2			X
	MMU-163	/		2/2			X
	MMU-164	/		2/1R	P F P		X
	MMU-167	/		2/1R	P P P		X
	MMU-168	/		/			
	MMU-170	/		/			
	MMU-172	/		/			
	MMU-180	/		3/2R	P P P		X
	MMU-181	/		3/2R	P P P		X
	MMU-186	/		/			
	MMU-189	/		/			
	MMU-1899X	/		2/1R	P P F		X
	MMU-191	/		2/2	P P P		X
	MMU-198	/		3/3			X
	MMU-200	/		2/2			X
	MMU-201	/		2/2			X
	MMU-207	/		2/2			X
	MMU-210	/		3/2R	P P P		X
	MMU-221	/		3/2R	P P P		X
	MMU-222	/		3/2R	P F P		X
	MMU-231	/		3/3			X
	MMU-232	/		3/3			X
	MMU-233	/		/			
	MMU-234	/		/			
	MMU-237	/		/			
	MMU-238	/		3/3	P P P		X
	MMU-242	/		3/3	P P P		X
	MMU-243	/		3/2R	P P P		X
	MMU-244	/		/			
	MMU-245	/		/			
	MMU-4000X	/		3/3			X
1.1.1	MMU-1001X	1/1		/			
1.1.2	MMU-100	2/1R	P P	/			
1.10.1	MMU-211	3/2R	P P	/			
1.10.2	MMU-2111X	3/3		/			
1.11.1	MMU-2181X	3/2R	P P	/			

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IDENTIFIERS		NASA				IOA RECOMMENDATIONS *						
NASA FMEA NUMBER	IOA ASSESSMENT NUMBER	CRIT HW/F	SCREENS A	B	C	CRIT HW/F	SCREENS A	B	C	OTHER (SEE LEGEND CODE)	ISSUE
1.12.1	MMU-213	3/2R	P	P		/					
1.12.2	MMU-214	3/2R	P	P		/					
1.12.3	MMU-212	3/3	P	P		/					
1.13.1	MMU-2141X	3/2R		P		/					X
1.13.2	MMU-2142X	3/2R	P	P		/					
1.13.3	MMU-2143X	3/2R	P	P		2/2					X
1.13.4	MMU-2144X	3/3	P	P		/					
1.2.1	MMU-1211X	1/1				2/1R	P	P	P		X
1.2.2	MMU-120	2/1R	P	P		/					
1.2.3	MMU-117	2/1R	P	P		/					
1.2.4	MMU-116	2/1R	P	P		/					
1.2.5	MMU-1212X	2/1R	P	P		/					
1.2.6	MMU-119	3/2R	P	P		2/1R	P	P	P		X
	MMU-1191X	3/2R	P	P		2/1R	P	P	P		X
1.3.1	MMU-1251X	1/1				3/2R	P	P	P		X
1.3.2	MMU-125	2/2	P	P		3/3					X
	MMU-217	2/2	P	P		3/2R	P	P	P		X
1.3.3	MMU-126	3/2R	P	P		/					
	MMU-216	3/2R	P	P		/					
	MMU-218	3/2R	P	P		/					
1.3.4	MMU-1252X	3/2R	P	P		/					
1.3.5	MMU-1253X	3/2R	P	P		/					
1.3.6	MMU-125A	3/2R	P	P		3/3					X
	MMU-215	3/2R	P	P		/					
1.4.1	MMU-104	2/1R	P	F		2/2					X
1.4.2	MMU-105	2/1R	P	P		/					
1.4.3	MMU-1051X	2/1R	P	P		/					
1.5.1	MMU-1031X	2/1R	P	P		/					
1.5.2	MMU-103	2/2	P	P		/					
1.5.3	MMU-102	3/2R	P	F		3/2R	P	F	F		X
1.6.1	MMU-1141X	2/1R	P	P		/					
1.6.2	MMU-112	2/1R	P	P		/					
1.6.3	MMU-114	2/1R	P	P		/					
1.6.4	MMU-113	3/2R	P	P		2/1R	P	P	P		X
1.7.1	MMU-106B	1/1	P	P		2/1R	P	P	P		X
1.7.2	MMU-106D	1/1	P	P		2/1R	P	P	P		X
1.7.3	MMU-106	1/1	P	P		2/1R	P	P	P		X
1.7.4	MMU-106A	1/1	P	P		2/1R	P	P	P		X
1.8.1	MMU-122	3/1R	P	P		/					
1.8.2	MMU-123	3/3	P	P		3/2R	P	P	P		X
	MMU-124	3/3	P	F		3/2R	P	P	P		X
1.9.1	MMU-208	1/1				3/2R	P	P	P		X
2.1.1	MMU-1891X	1/1				3/2R	P	P	P		X
2.1.10	MMU-1897X	3/2R	P	P		/					
2.1.11	MMU-1898X	3/3				3/2R	P	P	P		X
2.1.2	MMU-1892X	2/1R	P	P		3/2R	P	P	P		X
2.1.3	MMU-1893X	1/1				3/3					X
2.1.4	MMU-1894X	2/1R	P	P		3/3					X
2.1.5	MMU-1895X	3/2R	P	P		3/3					X
2.1.6	MMU-1896X	1/1				3/2R	P	F	F		X

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IDENTIFIERS		NASA				IOA RECOMMENDATIONS *					
NASA FMEA NUMBER	IOA ASSESSMENT NUMBER	CRIT HW/F	SCREENS A	B	C	CRIT HW/F	SCREENS A	B	C	OTHER (SEE LEGEND CODE)	ISSUE
2.1.7	MMU-192	1/1				2/2					X
2.1.8	MMU-192A	2/1R	P	P		2/2					X
2.1.9	MMU-190	2/2				/					
2.2.1	MMU-2391X	1/1				3/2R	P	P	P		X
2.2.2	MMU-239	3/3				/					
2.2.3	MMU-2392X	3/3				/					
2.3.1	MMU-1981X	1/1				3/2R	P	F	P		X
2.3.2	MMU-199	2/2				/					
2.4.1	MMU-235	1/1				/					X
2.5.1	MMU-196	2/1R	P	P		/					
2.5.2	MMU-197	2/1R	P	P		3/2R	P	P	P		X
2.5.3	MMU-196A	2/2	P	P		2/1R	P	P	P		X
2.6.1	MMU-220	2/2	P	P		/					
2.6.2	MMU-219	2/1R	P	P		/					
2.6.3	MMU-219A	3/2R	P	P		3/1R	P	P	P		X
2.7.1	MMU-241	3/2R	P	P		/					
2.7.2	MMU-240	3/2R	P	P		/					
3.1.1	MMU-171	1/1	P	P		/					
3.1.2	MMU-171A	2/1R	P	P		1/1					X
3.1.3	MMU-1721X	2/2				3/1R	P	P	P		X
3.1.4	MMU-1722X	2/2				3/1R	P	P	P		X
3.1.5	MMU-1723X	2/2	P	P		3/1R	P	P	P		X
3.1.6	MMU-1724X	2/1R	P	P		1/1					X
3.1.7	MMU-176	3/3				3/2R	P	P	P		X
3.1.8	MMU-175	3/3	P	P		/					
3.10.1	MMU-141	2/2	P	P		3/3					X
3.10.2	MMU-140	3/2R	P	P		/					
3.11.1	MMU-128	2/1R	P	P		/					
3.11.2	MMU-1281X	2/2				3/2R	P	P	P		X
3.12.1	MMU-154	2/1R	P	P		2/2					X
3.12.2	MMU-154A	2/1R	P	P		/					
3.12.3	MMU-153	2/1R	P	P		3/3					X
3.12.4	MMU-153A	2/1R	P	P		3/3					X
3.12.5	MMU-152	2/1R	P	P		2/2					X
3.12.6	MMU-152A	2/1R	P	P		/					
3.13.1	MMU-134	2/2	P	P		2/1R	P	P	P		X
3.13.2	MMU-134A	2/1R	P	P		2/2					X
3.13.3	MMU-135	3/3				/					
3.13.4	MMU-135A	3/3	P	P		1/1					X
3.14.1	MMU-131	2/2	P	P		2/1R	P	P	P		X
3.14.2	MMU-131A	2/2	P	P		3/3					X
3.14.3	MMU-130	2/2	P	P		/					
3.14.4	MMU-130A	2/2	P	P		/					
3.15.1	MMU-178	3/2R	P	P		/					
3.15.2	MMU-178A	3/2R	P	P		/					
3.15.3	MMU-177	3/3	P	P		3/2R	P	P	P		X
3.15.4	MMU-177A	3/3	P	P		3/2R	P	P	P		X
3.15.5	MMU-179	3/3	P	P		3/2R	P	P	P		X
3.15.6	MMU-179A	3/3	P	P		3/2R	P	P	P		X
3.16.1	MMU-149	3/3	P	P		3/2R	P	P	P		X

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IDENTIFIERS		NASA				IOA RECOMMENDATIONS *					
NASA FMEA NUMBER	IOA ASSESSMENT NUMBER	CRIT HW/F	SCREENS A	B	C	CRIT HW/F	SCREENS A	B	C	OTHER (SEE LEGEND CODE)	ISSUE
3.16.2	MMU-150	3/3	P	P		/					
3.17.1	MMU-144	3/3	P	P		/					
3.17.2	MMU-144A	3/3	P	P		/					
3.17.3	MMU-145	3/3	P	P		/					
	MMU-146	3/3	P	P		/					
3.17.4	MMU-145A	3/3	P	P		/					
	MMU-146A	3/3	P	P		/					
3.18.1	MMU-147	3/3	P	P		/					
3.19.1	MMU-148	3/3	P	P		/					
3.2.1	MMU-169	1/1	P	P		/					
3.2.10	MMU-174A	2/1R	P	P		1/1					X
3.2.2	MMU-169A	2/1R	P	P		1/1	P	P	P		X
3.2.3	MMU-1701X	2/2	P	P		3/1R	P	P	P		X
3.2.4	MMU-1702X	2/2	P	P		3/1R	P	P	P		X
3.2.5	MMU-1703X	2/2	P	P		3/1R	P	P	P		X
3.2.6	MMU-1704X	2/1R	P	P		/					
3.2.7	MMU-173	2/1R	P	P		/					
3.2.8	MMU-1731X	1/1				/					
3.2.9	MMU-174	2/1R	P	P		1/1					X
3.20.1	MMU-157A	3/3	P	P		/					
3.21.1	MMU-156	3/2R	P	P		/					
3.3.1	MMU-159	2/1R	P	P		/					
	MMU-182	2/1R	P	P		/					
3.3.2	MMU-166	2/1R	P	F		/					
3.3.3	MMU-160	2/2	P	P		2/1R	P	P	P		X
	MMU-161	2/2	P	P		2/1R	P	P	P		X
3.3.4	MMU-157	3/3	P	P		/					
3.3.5	MMU-1681X	3/3				3/2R	P	P	P		X
3.3.6	MMU-151	3/3	P	P		3/2R	P	P	P		X
3.3.7	MMU-151A	3/3	P	P		3/2R	P	P	P		X
3.3.8	MMU-188	3/3				3/2R	P	P	P		X
3.3.9	MMU-187	3/3				3/2R	P	P	P		X
3.4.1	MMU-183	2/1R	P	P		/					
3.5.1	MMU-184	2/2				/					
3.6.1	MMU-194	2/2	P	P		/					
3.6.2	MMU-195	2/2	P	P		/					
3.7.1	MMU-142	2/1R	P	P		/					
3.7.2	MMU-143	2/1R	P	P		3/3					X
3.8.1	MMU-138	2/1R	P	P		/					
3.8.2	MMU-139	2/1R	P	P		3/3					X
3.9.1	MMU-136	2/1R	P	P		/					
3.9.2	MMU-137	2/1R	P	P		3/3					X
4.1.1	MMU-185	2/1R	P	F		/					
4.2.1	MMU-185A	2/2	P	F		2/1R	P	F	P		X
	MMU-223	2/2				3/2R	P	P	P		X
	MMU-224	2/2				3/2R	P	F	P		X
	MMU-225	2/2				3/2R	P	P	P		X
	MMU-226	2/2				3/3					X
	MMU-227	2/2				3/2R	P	P	P		X
4.2.2	MMU-4015X	2/2	P	P		/					X

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IDENTIFIERS		NASA				IOA RECOMMENDATIONS *					
NASA FMEA NUMBER	IOA ASSESSMENT NUMBER	CRIT HW/F	SCREENS A	B	C	CRIT HW/F	SCREENS A	B	C	OTHER (SEE LEGEND CODE)	ISSUE
4.3.1	MMU-1862X	2/1R	P	F		/					
4.3.2	MMU-1861X	2/1R	P	P		/					
4.4.1	MMU-229	3/2R	P	F		2/2					X
4.4.2	MMU-228	3/2R	P	P		2/2					X
4.5.1	MMU-230	3/3				/					
4.6.1	MMU-202	2/1R	P	P		3/2R	P	P	P		X
	MMU-203	2/1R	P	P		2/2					X
	MMU-204	2/1R	P	P		3/3					X
	MMU-205	2/1R	P	P		3/3					X
4.7.1	MMU-4014X	2/1R	P	P		/					X
5.1.1	MMU-4001X	1/1				3/3					X
5.10.1	MMU-4012X	3/3				/					
5.11.1	MMU-4013X	3/3				/					
5.2.1	MMU-4002X	1/1				3/2R	P	P	P		X
	MMU-4003X	1/1				3/2R	P	P	P		X
5.3.1	MMU-4004X	1/1				3/2R	P	P	P		X
5.4.1	MMU-206	2/1R	P	P		/					
5.5.1	MMU-4005X	2/2	P	P		3/2R	P	P	P		X
5.6.1	MMU-4006X	2/2	P	P		3/2R	P	P	P		X
5.7.1	MMU-4007X	2/2				/					
5.7.2	MMU-4008X	3/2R	P	P		/					
5.8.1	MMU-4009X	3/2R	P	P		/					
5.8.2	MMU-4010X	3/2R	P	P		/					
5.9.1	MMU-4011X	3/3				/					

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