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PRINT DATE: 08/16/95

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE

NUMBER: M8-1MR-M003-X

SUBSYSTEM NAME: MECHANICAL - EXTERNAL AIRLOCK

REVISION: 3 9/15/95

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	ACTUATOR, HATCH LATCH	MC287-0036-0009

PART DATA

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
EXTERNAL AIRLOCK UPPER HATCH LATCH ACTUATOR**

REFERENCE DESIGNATORS:

**QUANTITY OF LIKE ITEMS: 1
ONE**

FUNCTION:

MANUALLY DRIVEN REDUCTION GEARBOX - PROVIDES A CONTROLLED OUTPUT FOR DRIVING THE LATCH MECHANISM ON EXTERNAL AIRLOCK UPPER HATCH OPEN OR CLOSED. PROVIDES THE FORCE FOR HATCH SEAL COMPRESSION AS IT PULLS THE SEALING SURFACES TOGETHER. TWO HANDLES FOR OPERATION ARE PROVIDED FOR THE HATCH; ONE IS ON EACH SIDE OF THE HATCH. A MECHANICAL LOCK AND A "NO-BACK" ARE PROVIDED FOR RESTRAINT BETWEEN USES. THE KNOB ON THE HANDLE ON THE VESTIBULE SIDE OF THE HATCH IS REMOVABLE. THE DESIGN UTILIZES DUAL O-RING SEALS TO PREVENT LEAKAGE OF OOS ATMOSPHERE THROUGH OR PAST THE ACTUATORS.

REFERENCE DOCUMENTS: M072-593829

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE

NUMBER: M8-1MR-M003-01

REVISION# 3 9/15/95

SUBSYSTEM NAME: MECHANICAL - EXTERNAL AIRLOCK

LRU: ACTUATOR, HATCH LATCH

CRITICALITY OF THIS

ITEM NAME: ACTUATOR, HATCH LATCH

FAILURE MODE: 1R3

FAILURE MODE:

PHYSICAL BINDING/JAMMING (GEARBOX)

MISSION PHASE:

OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

CAUSE:ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECT/DEBRIS, FAILURE/
DEFLECTION OF INTERNAL PART

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

CRITICALITY 1R2 DURING INTACT ABORT ONLY (AVIONICS ONLY)? N/A

REDUNDANCY SCREEN

A) PASS

B) N/A

C) PASS

PASS/FAIL RATIONALE:

A)

B)

N/A - AT LEAST TWO REMAINING PATHS ARE DETECTABLE IN FLIGHT.

C)

METHOD OF FAULT DETECTION:LATCH ACTUATOR BINDING OR JAMMING CAN VISUALLY/PHYSICALLY BE DETECTED BY
THE FLIGHT CREW.**CORRECTING ACTION:** EVA CREWMEMBER CAN REMOVE HATCH AND HOLD HATCH IN
CLOSED POSITION DURING REPRESSURIZATION OF EXTERNAL AIRLOCK, TO ALLOW RE-
ENTRY INTO CREW MODULE THROUGH FIFTH HATCH AND 'A' HATCH.**REMARKS/RECOMMENDATIONS:**EVA CAN BE PERFORMED OUT EXTERNAL AIRLOCK UPPER HATCH WHEN ORBITER AND
MIR ARE NOT DOCKED. EFFECTS ON EVA RECOVERY ARE MINIMIZED SINCE TUNNEL
ADAPTER 'C' HATCH IS THE PRIMARY HATCH FOR PERFORMING AN EVA AND AN ADDED
FIFTH HATCH WILL ISOLATE TUNNEL ADAPTER AND EXTERNAL AIRLOCK VOLUMES.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: M8-1MR-M003-01**

- FAILURE EFFECTS -

(A) SUBSYSTEM:

A JAMMED ACTUATOR WOULD PREVENT THE LATCHES FROM OPERATING. INABILITY TO LATCH EXTERNAL AIRLOCK UPPER HATCH CLOSED FOR SEPARATION AND FOR PERFORMING AN EVA OUT EXTERNAL AIRLOCK.

(B) INTERFACING SUBSYSTEM(S):

INABILITY TO LATCH EXTERNAL AIRLOCK UPPER HATCH CLOSED WOULD EXPOSE INTERFACING SUBSYSTEMS TO VACUUM DURING SEPARATION AND PREVENT THE CAPABILITY TO RECOVER FROM AN EVA OUT EXTERNAL AIRLOCK.

(C) MISSION:

INABILITY TO PERFORM A PLANNED EVA OUT EXTERNAL AIRLOCK, IF JAMMED ACTUATOR PREVENTS EXTERNAL AIRLOCK UPPER HATCH FROM CLOSING WHEN ORBITER AND MIR ARE NOT DOCKED.

(D) CREW, VEHICLE, AND ELEMENT(S):

POSSIBLE LOSS OF EVA CREWMEMBERS IF UPPER HATCH CANNOT BE CLOSED AND SEALED FOLLOWING AN EVA OUT EXTERNAL AIRLOCK WHEN ORBITER AND MIR ARE NOT DOCKED.

IF EXTERNAL AIRLOCK UPPER HATCH IS REMOVED AND HELD INTO PLACE WHILE RE-PRESSURIZING EXTERNAL AIRLOCK VOLUME, THE POTENTIAL EXISTS FOR DAMAGE TO THE EXTERNAL AIRLOCK DURING DESCENT. ONCE PRESSURE ACROSS THIS HATCH HAS EQUALIZED THE UNATTACHED HATCH IS ALLOWED TO MOVE FREELY.

(E) FUNCTIONAL CRITICALITY EFFECTS:

A JAMMED ACTUATOR WOULD PREVENT EXTERNAL AIRLOCK UPPER HATCH FROM CLOSING. INABILITY TO CLOSE EXTERNAL AIRLOCK UPPER HATCH, AFTER PERFORMING A PLANNED EVA OUT EXTERNAL AIRLOCK WHEN ORBITER AND MIR ARE NOT DOCKED, WOULD PREVENT THE ABILITY TO REPRESSURIZE EXTERNAL AIRLOCK VOLUME. POSSIBLE LOSS OF EVA CREW MEMBERS IF EVA IS PERFORMED OUT EXTERNAL AIRLOCK UPPER HATCH AND HATCH CANNOT BE CLOSED & SEALED DURING REPRESSURIZATION FOR CREW RETURN TO CABIN (EVA CREW MEMBERS MUST REMAIN IN AIRLOCK UNTIL LANDING). THIS WOULD FIRST REQUIRE A FAILURE TO OPEN TUNNEL ADAPTER "C" HATCH SINCE IT IS PRIMARY FOR PERFORMING AN EVA.

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 1/1

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

THIRD FAILURE (INABILITY TO DISCONNECT HINGE OR HOLD HATCH IN CLOSED POSITION) - INABILITY TO CLOSE AND SEAL EXTERNAL AIRLOCK UPPER HATCH. EXTERNAL AIRLOCK VOLUME CANNOT BE REPRESSURIZED FOLLOWING A PLANNED EVA OUT THE UPPER HATCH WHEN ORBITER AND MIR ARE NOT DOCKED. POSSIBLE LOSS OF EVA CREW MEMBERS IF HABITABLE VOLUMES CANNOT BE REPRESSURIZED FOR CREW RETURN TO CABIN (EVA CREW MEMBERS MUST REMAIN IN AIRLOCK UNTIL LANDING).

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE
NUMBER: MB-1MR-M003-01

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: HOURS TO DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: MINUTES TO HOURS

IS TIME REQUIRED TO IMPLEMENT CORRECTIVE ACTION LESS THAN TIME TO EFFECT?
YES

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW WOULD HAVE AMPLE TIME TO REMOVE HATCH AND HOLD HATCH IN CLOSED
POSITION TO ALLOW REPRESSURIZATION OF EXTERNAL AIRLOCK TO HOLD HATCH IN
CLOSED POSITION BEFORE FAILURE BECAME CATASTROPHIC.

HAZARDS REPORT NUMBER(S): DM10HA06(F)

HAZARD(S) DESCRIPTION:
EVA HAZARD.

- APPROVALS -

PRODUCT ASSURANCE ENGR. :	M. W. GUENTHER	: <u><i>M. W. Guenther</i></u>
DESIGN ENGINEER :	T. S. COOK	: <u><i>T. S. Cook</i></u>