PAGE: 1 PRINT DATE: 10/11/95

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER: M8-1MR-E007-X

SUBSYSTEM NAME: ECLSS - EXTERNAL AIRLOCK
REVISION: 2 9/15/95

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	CAP, PRESSURE CARELTON TECHNOLOGIES	MC250-0004-0010 2763-2001-7

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
EXTERNAL AIRLOCK UPPER HATCH EQUALIZATION VALVE PRESSURE CAP

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:
CAPS ONTO EQUALIZATION VALVE TO PROVIDE SECONDARY PROTECTION FOR INTERNAL LEAKAGE ACROSS EXTERNAL AIRLOCK UPPER HATCH.

REFERENCE DOCUMENTS: M072-593629

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M8-1MR-E007-02

REVISION# . 2 9/15/95

SUBSYSTEM NAME: ECLSS - EXTERNAL AIRLOCK
LRU: CAP, EQUALIZATION VALVE PRESSURE
ITEM NAME: CAP, EQUALIZATION VALVE PRESSURE

CRITICALITY OF THIS FAILURE MODE: 1R3

FAILURE MODE:
LEAKAGE

MISSION PHASE:
OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

CAUSE:
MECHANICAL SHOCK, VIBRATION, CORROSION, POROSITY

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 - VALVE IS THE PRIMARY SEALING COMPONENT AND THE CAP IS STANDBY REDUNDANCY.

C)

METHOD OF FAULT DETECTION:
A CRACKED PRESSURE CAP COULD BE VISUALLY DETECTED AT TIME OF INSTALLATION OR REMOVAL. DELTA PRESSURE ACROSS EXTERNAL AIRLOCK UPPER HATCH WOULD INDICATE LEAKAGE ONLY AFTER AN INTERNAL LEAKAGE FAILURE OF ASSOCIATED EQUALIZATION VALVE AND WHILE ORBITER AND MIR ARE NOT DOCKED.

CORRECTING ACTION: CREW COULD USE REDUNDANT PRESSURE CAP (FROM OTHER VALVES) ON EQUALIZATION VALVE THAT REQUIRES SECONDARY LEAKAGE PROTECTION. DURING IVA WHILE ORBITER AND MIR ARE NOT DOCKED CREW COULD ISOLATE EXTERNAL LEAKAGE BY CLOSING APPROPRIATE HATCH(S).

REMARKS/RECOMMENDATIONS:
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-E007- 02

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF SECONDARY SEAL TO EQUALIZATION VALVE.

(B) INTERFACING SUBSYSTEM(S):
NO EFFECT UNTIL PRIMARY SEAL (EQUALIZATION VALVE) IS LOST. THEN INABILITY TO ISOLATE EXTERNAL AIRLOCK AND VESTIBULE TUNNEL.

(C) MISSION:
NO EFFECT UNTIL PRIMARY SEAL (EQUALIZATION VALVE) IS LOST. THEN: (1) IF VALVE FAILURE OCCURS PRIOR TO DOCKING WITH THE MIR STATION, MISSION WOULD BE TERMINATED DUE TO EXCESSIVE LOSS OF CONSUMABLES; (2) IF VALVE FAILURE OCCURS WHILE ORBITER & MIR ARE DOCKED - INABILITY TO DEPRESSURIZE VESTIBULE TUNNEL FOR SEPARATION WITHOUT EFFECTING THE EXTERNAL AIRLOCK VOLUME; (3) LOSS OF CAPABILITY TO PERFORM PLANNED EVA OUT EXTERNA AIRLOCK WHEN ORBITER/MIR ARE NOT DOCKED DUE TO INABILITY TO REPRESSURIZE AIRLOCK VOLUME FOR RETURNING TO THE CREW MODULE.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT UNTIL EQUALIZATION VALVE INTERNALLY LEAKS. THEN POSSIBLE LOSS OF CREW DURING NON-DOCKED IVA ACTIVITES.

(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST FAILURE - NO EFFECT. SECOND ASSOCIATED FAILURE (INTERNAL LEAKAGE OF EQUALIZATION VALVE) WHEN ORBITER/MIR ARE NOT DOCKED: (1) IF SECOND FAILURE OCCURS DURING IVA (CAMERA PREPARATION FOR DOCKING OR SPACELAB OPERATIONS (MIR 1 ONLY)) EXCESSIVE LOSS OF CONSUMABLES CAN JEOPARDIZE CREW SAFETY; (2) IF SECOND FAILURE OCCURS DURING EVA OUT EXTERNAL AIRLOCK, POSSIBLE LOSS OF EVA CREWMEMBERS IF AIRLOCK VOLUME CANNOT BE REPRESSURIZED FOR RETURN TO CREW CABIN. (EVA CREWMEMBERS MUST REMAIN IN AIRLOCK UNTIL LANDING). THIS WOULD REQUIRE AN ADDITIONAL FAILURE TO OPEN TUNNEL ADAPTER "C" HATCH SINCE THIS HATCH IS PRIMARY FOR PERFORMING AN EVA.

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 1R2

(F) RATIONALE FOR CRITICALITY DOWNGRADE:
THIRD & FOURTH FAILURES (INABILITY TO CLOSE FIFTH HATCH AND CREW CABIN HATCH) OCCUR DURING UNDOCKED IVA ACTIVITIES - LOSS OF CAPABILITY TO ISOLATE EXTERNAL LEAKAGE OF HABITABLE PRESSURE FROM CREW CABIN RESULTING IN EXCESSIVE LOSS OF CONSUMABLES. CREW SAFETY JEOPARDIZED UPON LOSS OF CONSUMABLES.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: HOURS TO DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS TO MINUTES

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: SECONDS

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
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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 ENOUGH TIME TO ISOLATE EXTERNAL LEAKAGE OF HABITABLE PRESSURE BY CLOSING THE APPROPRIATE HATCHES BEFORE THE PROBLEM BECAME CATASTROPHIC.

HAZARDS REPORT NUMBER(S): ORBI 511

HAZARD(S) DESCRIPTION:
LOSS OF HABITABLE PRESSURE.

- APPROVALS -

PRODUCT ASSURANCE ENGR	:	M. W. GUENTHER	:
DESIGN ENGINEER	:	K. J. KELLY	: