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PRINT DATE: 10/09/95

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER: M8-1MR-E001-X

SUBSYSTEM NAME: ECLSS - EXTERNAL AIRLOCK

REVISION: 2 9/15/95

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	VALVE, EQUALIZATION CARLETON TECHNOLOGIES	MC250-0004-0012 2763-0001-9

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
EXTERNAL AIRLOCK AFT HATCH EQUALIZATION VALVE

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:
PROVIDES FOR EQUALIZING PRESSURE ACROSS THE EXTERNAL AIRLOCK AFT HATCH,
BETWEEN THE EXTERNAL AIRLOCK AND THE SPACELAB FOR MIR 1 OR BETWEEN THE
EXTERNAL AIRLOCK AND PAYLOAD BAY FOR MIR 2. EACH VALVE OPERATES
INDEPENDENTLY WITH POSITIVE DETENTS AT TWO POSITIONS. VALVE CAN BE
ACTUATED FROM EITHER SIDE OF HATCH.

REFERENCE DOCUMENTS: M072-593828

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

NUMBER: M8-1MR-E001-02

REVISION# 2 9/15/95

SUBSYSTEM NAME: ECLSS - EXTERNAL AIRLOCK

LRU: VALVE, EQUALIZATION

CRITICALITY OF THIS

ITEM NAME: VALVE, EQUALIZATION

FAILURE MODE: 1R3

FAILURE MODE:

FAILS TO CLOSE, INTERNAL LEAKAGE

MISSION PHASE:

OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

CAUSE:

CONTAMINATION, PHYSICAL BINDING/JAMMING, CORROSION, VIBRATION, MECHANICAL SHOCK, 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 - SINCE EQUALIZATION VALVE AND CAP ARE IN STANDBY REDUNDANCY TO EACH OTHER FOR "INTERNAL LEAKAGE" FAILURE MODE

C)

METHOD OF FAULT DETECTION:

NONE FOR FIRST FAILURE. SECOND FAILURE: INSTRUMENTATION - DELTA-PRESSURE INDICATION; AND VISUAL OBSERVATION - INABILITY TO REPRESSURIZE ODS FOLLOWING EVA (MIR 1) OR LOSS OF PRESSURE IN HABITABLE AREA (MULTI-MIR).

CORRECTING ACTION: FOR MIR 1 NO CREW ACTION REQUIRED IF CAP IS INSTALLED. FOR MULTI-MIR CREW COULD ISOLATE 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.

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NUMBER: M8-1MR-E001-02

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF PRIMARY SEAL.

(B) INTERFACING SUBSYSTEM(S):
NO EFFECT FIRST FAILURE SINCE CAP PROVIDES REDUNDANT SEAL. SECOND ASSOCIATED FAILURE (LOSS OF CAP) WILL CAUSE: (1) INABILITY TO ISOLATE SPACELAB DURING REPRESSURIZATION OF TUNNEL ADAPTER AND AIRLOCK VOLUMES WHEN EVA IS PERFORMED FOR MIR 1; OR (2) LEAKAGE OF PRESSURE TO PAYLOAD BAY RESULTING IN EXCESSIVE USE OF CONSUMABLES FOR MULTI-MIR.

(C) MISSION:
NO EFFECT FIRST FAILURE. SECOND FAILURE MAY PRECLUDE A PLANNED EVA.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT FIRST FAILURE. POSSIBLE LOSS OF EVA CREWMEMBERS DUE TO INABILITY TO RECOVER FROM EVA IF SECOND ASSOCIATED FAILURE (LOSS OF CAP) OCCURS (MIR 1 & MULTI-MIR). LOSS OF EXTERNAL PRESSURE IF SECOND ASSOCIATED FAILURE (LOSS OF CAP) OCCURS DURING IVA RESULTING IN POTENTIAL LOSS OF CREWMEMBERS (MULTI-MIR).

(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST FAILURE - NO EFFECT.
SECOND ASSOCIATED FAILURE (INABILITY TO MATE EQUALIZATION VALVE CAP OR CAP LEAKAGE):
MIR 1 - NO EFFECT ON EVA RECOVERY SINCE TUNNEL ADAPTER 'C' HATCH IS THE PRIMARY HATCH FOR PERFORMING AN EVA AND FIFTH HATCH WILL ISOLATE TUNNEL ADAPTER VOLUME FROM EXTERNAL AIRLOCK VOLUME.
MULTI-MIR - LOSS OF EXTERNAL AIRLOCK PRESSURE TO OUTSIDE ATMOSPHERE. INCREASED USE OF CONSUMABLES.

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

(F) RATIONALE FOR CRITICALITY DOWNGRADE:
THIRD FAILURE (INABILITY TO UTILIZE TUNNEL ADAPTER 'C' HATCH FOR PERFORMING AN EVA) - POSSIBLE LOSS OF EVA CREWMEMBERS IF EXTERNAL AIRLOCK VOLUME CANNOT BE REPRESSURIZED FOR RETURN TO CREW CABIN. (EVA CREWMEMBERS MUST REMAIN IN AIRLOCK UNTIL LANDING). (MIR 1 & MULTI-MIR)
THIRD & FOURTH FAILURES (INABILITY TO CLOSE CREW CABIN HATCH & FIFTH HATCH) - LOSS OF CAPABILITY TO ISOLATE EXTERNAL LEAKAGE OF HABITABLE PRESSURE COULD RESULT IN LOSS OF CREW AND VEHICLE. POSSIBLE LOSS OF PRESSURE IN MIR IF SECOND FAILURE OCCURS WHILE EXTERNAL AIRLOCK UPPER HATCH IS OPEN. (MULTI-MIR).

- 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

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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

M. W. Guenther
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