

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

SUBSYSTEM NAME: ECLSS - ARPCS

REVISION: 2 04/08/97

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:HATCH ASSEMBLY	M072-593830-001
	ROCKWELL INT'L	M072-593830-001
SRU	:VALVE, EQUALIZATION	MC250-0004-0012
	CARLETON TECHNOLOGIES	2763-0001-9

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

**QUANTITY OF LIKE ITEMS: 2
TWO**

FUNCTION:

PROVIDES FOR EQUALIZING PRESSURE ACROSS THE EXTERNAL AIRLOCK AFT HATCH, BETWEEN THE EXTERNAL AIRLOCK AND PAYLOAD BAY (WHEN NO PRESSURIZED PAYLOAD IS INSTALLED) OR BETWEEN THE EXTERNAL AIRLOCK AND TUNNEL ADAPTER (WHEN A PRESSURIZED PAYLOAD IS INSTALLED). EACH VALVE OPERATES INDEPENDENTLY WITH POSITIVE DETENTS AT TWO POSITIONS. VALVE CAN BE ACTUATED FROM EITHER SIDE OF HATCH.

REFERENCE DOCUMENTS: M072-593828

FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE

NUMBER: M8-1SS-E001-02

REVISION#: 2 04/08/97

SUBSYSTEM NAME: ECLSS - ARPCS

LRU: VALVE, EQUALIZATION

ITEM NAME: VALVE, EQUALIZATION

CRITICALITY OF THIS

FAILURE MODE: 1R3

FAILURE MODE:

FAILS TO CLOSE, INTERNAL LEAKAGE

MISSION PHASE: OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:	103	DISCOVERY
	104	ATLANTIS
	105	ENDEAVOUR

CAUSE:

CONTAMINATION, PHYSICAL BINDING/JAMMING, MECHANICAL SHOCK, EXCESSIVE VIBRATION, CORROSION, POROSITY

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

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 - LOSS OF PRESSURE WITHIN EXTERNAL AIRLOCK.

CORRECTING ACTION: MANUAL

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CORRECTING ACTION DESCRIPTION:

NO CREW ACTION REQUIRED IF CAP IS INSTALLED. IF CAP IS NOT INSTALLED, CREW SHOULD INSTALL CAP AND USE REDUNDANT EQUALIZATION VALVE. IN THE EVENT THE CAP CANNOT BE INSTALLED, CREW COULD UTILIZE ANY AVAILABLE MATERIAL, INCLUDING THE CAP, TO HOLD AGAINST VALVE INLET AND ALLOW DELTA-PRESSURE ACROSS MATERIAL TO KEEP IT IN PLACE. IF THIS FAILS, CREW COULD ISOLATE LEAKAGE FROM CREW CABIN, DURING IVA, BY CLOSING 576 BULKHEAD HATCH.

REMARKS/RECOMMENDATIONS:

SECONDARY SEAL PROVIDED BY EQUALIZATION CAP. CRITICALITY OF THIS FAILURE MODE IS BASED ON THE WORST CASE EFFECT WHEN THERE IS NO PRESSURIZED PAYLOAD INSTALLED. RECOMMEND THAT THE EXTERNAL AIRLOCK AFT HATCH BE REMOVED IF A PRESSURIZED PAYLOAD IS INSTALLED.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF PRIMARY SEAL (INTERNAL VALVE SEAL).

(B) INTERFACING SUBSYSTEM(S):

NO EFFECT FIRST FAILURE SINCE CAP PROVIDES REDUNDANT SEAL. SECOND ASSOCIATED FAILURE (LOSS OF CAP) WILL CAUSE EXTERNAL LEAKAGE OF PRESSURE WITHIN EXTERNAL AIRLOCK TO PAYLOAD BAY (WHEN NO PRESSURIZED PAYLOAD IS INSTALLED) OR LEAKAGE OF EXTERNAL AIRLOCK PRESSURE INTO A DEPRESSURIZED TUNNEL ADAPTER DURING AN EVA (WHEN A PRESSURIZED PAYLOAD IS INSTALLED). BOTH SCENARIOS RESULT IN AN EXCESSIVE USE OF CONSUMABLES.

(C) MISSION:

NO EFFECT FIRST FAILURE. LOSS OF MISSION IF SECOND ASSOCIATED FAILURE (EQUALIZATION VALVE CAP LEAKAGE) OCCURS DUE TO: (1) EXCESSIVE LOSS OF CONSUMABLES; OR (2) LOSS OF CAPABILITY TO PERFORM PLANNED EVA DUE TO INABILITY TO REPRESSURIZE EXTERNAL AIRLOCK VOLUME FOR RETURNING TO THE CREW MODULE.

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

NO EFFECT FIRST FAILURE. LOSS OF CREW/VEHICLE IF SECOND ASSOCIATED FAILURE (EQUALIZATION VALVE CAP LEAKAGE) OCCURS AND EXTERNAL AIRLOCK PRESSURE CANNOT BE MAINTAINED.

(E) FUNCTIONAL CRITICALITY EFFECTS:

FIRST FAILURE - NO EFFECT.

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DURING EVA WHEN NO PRESSURIZED PAYLOAD IS INSTALLED:

(2A) SECOND ASSOCIATED FAILURE (INABILITY TO MATE EQUALIZATION VALVE CAP OR CAP LEAKAGE) - UNABLE TO NOMINALLY MAINTAIN PRESSURE WITHIN EXTERNAL AIRLOCK FOR EVA CREWMEMBERS RETURN TO CREW CABIN. - CRITICALITY 1R2 CONDITION.

DURING IVA WHEN NO PRESSURIZED PAYLOAD IS INSTALLED:

(2B) SECOND ASSOCIATED FAILURE (INABILITY TO MATE EQUALIZATION VALVE CAP OR CAP LEAKAGE) - EXTERNAL LEAKAGE OF HABITABLE PRESSURE IF SECOND ASSOCIATED FAILURE (LOSS OF CAP) OCCURS DURING IVA RESULTING IN AN INCREASED USE OF CONSUMABLES. - CRITICALITY 1R2 CONDITION.

**IF SECOND FAILURE OCCURS WHEN EXTERNAL AIRLOCK UPPER HATCH IS OPEN:
POSSIBLE LOSS OF PRESSURE IN SPACE STATION.**

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

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

DURING EVA WHEN NO PRESSURIZED PAYLOAD IS INSTALLED:

(3A) THIRD FAILURE (INABILITY TO HOLD ANY AVAILABLE MATERIAL AGAINST VALVE INLET) - POSSIBLE LOSS OF EVA CREWMEMBERS IF ODS VOLUMES CANNOT BE REPRESSURIZED FOR CREW RETURN TO CREW CABIN. (EVA CREWMEMBERS MUST REMAIN IN AIRLOCK UNTIL LANDING). - CRITICALITY 1R3 CONDITION.

DURING IVA WHEN NO PRESSURIZED PAYLOAD IS INSTALLED:

(3B) THIRD FAILURE (INABILITY TO HOLD ANY AVAILABLE MATERIAL AGAINST VALVE INLET) - UNABLE TO STOP EXTERNAL LEAKAGE OF PRESSURE.

(4B) THIRD FAILURE (INABILITY TO CLOSE 576 BULKHEAD HATCH):
WHEN ORBITER AND SPACE STATION ARE NOT DOCKED - LOSS OF CAPABILITY TO ISOLATE EXTERNAL LEAKAGE OF HABITABLE PRESSURE FROM CREW CABIN.
INCREASED USE OF CONSUMABLES COULD JEOPARDIZE SAFETY OF CREW AND VEHICLE DURING IVA (CAMERA PREPARATION FOR DOCKING). - CRITICALITY 1R3 CONDITION.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: MINUTES

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: N/A

**IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?
NO**

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:

CREW WOULD HAVE ENOUGH TIME TO STOP EXTERNAL LEAKAGE OF HABITABLE PRESSURE BY INSTALLING CAP OR HOLDING ANY MATERIAL AGAINST VALVE INLET OR

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ISOLATE LEAKAGE BY CLOSING THE 576 BULKHEAD HATCH BEFORE THE PROBLEM BECAME CATASTROPHIC.

HAZARD REPORT NUMBER(S): ORBI 511, ORBI 162


HAZARD(S) DESCRIPTION:

LOSS OF HABITABLE PRESSURE IN CREW CABIN HABITABLE VOLUME (ORBI 511),
INABILITY TO RETURN FROM EVA DUE TO AIRLOCK HATCH FAILURES AND / OR
REPRESSURIZATION OF THE AIRLOCK (ORBI 162).

- APPROVALS -

SS & PAE
DESIGN ENGINEER

: M. W. GUENTHER
: K. J. KELLY

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