

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE
NUMBER: M8-1SS-E002 -X

SUBSYSTEM NAME: ECLSS - ARPCS

REVISION: 2

04/08/97

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:HATCH ASSEMBLY ROCKWELL INT'L	M072-593828-001 M072-593828-001
SRU	:VALVE, EQUALIZATION CARLETON TECHNOLOGIES	MC250-0004-0012 2763-0001-9

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

QUANTITY OF LIKE ITEMS: 2
 TWO

FUNCTION:
 PROVIDES FOR EQUALIZING PRESSURE ACROSS THE EXTERNAL AIRLOCK UPPER HATCH, BETWEEN THE EXTERNAL AIRLOCK AND THE VESTIBULE TUNNEL. EACH VALVE OPERATES INDEPENDENTLY WITH POSITIVE DETENTS AT TWO POSITIONS. VALVE CAN BE ACTUATED FROM EITHER SIDE OF HATCH.

REFERENCE DOCUMENTS: V519-331052
 V519-593302

FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE

NUMBER: M8-1SS-E002-03

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 OPEN

MISSION PHASE: OO ON-ORBIT

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

CAUSE:MECHANICAL SHOCK, EXCESSIVE VIBRATION, PHYSICAL BINDING/JAMMING,
CORROSION, PIECE PART STRUCTURAL FAILURE

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN	A) PASS
	B) PASS
	C) PASS

PASS/FAIL RATIONALE:

A)

B)

C)

METHOD OF FAULT DETECTION:OBSERVATION - DELTA PRESSURE GAUGE AT EXTERNAL AIRLOCK UPPER HATCH
WOULD INDICATE PRESSURE IS NOT BEING EQUALIZED. PHYSICAL OBSERVATION -
CREW UNABLE TO PHYSICALLY OPEN VALVE.**CORRECTING ACTION: MANUAL****CORRECTING ACTION DESCRIPTION:**WHEN ORBITER/ISS ARE DOCKED CREW COULD USE REDUNDANT EQUALIZATION
VALVE TO EQUALIZE PRESSURE ACROSS UPPER HATCH PRIOR TO ITS OPENING.

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WHEN ORBITER/ISS ARE NOT DOCKED AND A PRESSURIZED PAYLOAD IS NOT INSTALLED, CREW COULD UTILIZE REDUNDANT EQUALIZATION VALVE ON UPPER HATCH, MANUAL DEPRESS VALVE WITHIN EXTERNAL AIRLOCK, OR EITHER EXTERNAL AIRLOCK AFT HATCH EQUALIZATION VALVE TO DEPRESSURIZE EXTERNAL AIRLOCK FOR PERFORMING AN EVA.

REMARKS/RECOMMENDATIONS:

EXTERNAL AIRLOCK UPPER HATCH SHOULD NOT BE OPENED IF PRESSURE ACROSS IT CANNOT BE EQUALIZED. THESE VALVES CAN BE USED TO DEPRESSURIZE EXTERNAL AIRLOCK FOR AN EVA OUT EXTERNAL AIRLOCK WHEN: (1) ORBITER/ISS ARE NOT DOCKED; AND (2) WHEN THERE IS NO PRESSURIZED PAYLOAD INSTALLED.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

NO EFFECT FIRST FAILURE. WHEN ORBITER/ISS ARE DOCKED - LOSS OF CAPABILITY TO EQUALIZE PRESSURE ACROSS THE EXTERNAL AIRLOCK UPPER HATCH IF BOTH EQUALIZATION VALVES FAIL RESULTING IN INABILITY TO OPEN UPPER HATCH. WHEN ORBITER/ISS ARE NOT DOCKED - LOSS OF CAPABILITY TO DEPRESSURIZE EXTERNAL AIRLOCK FOR PERFORMING AN EVA OUT EXTERNAL AIRLOCK WHEN A PRESSURIZED PAYLOAD IS NOT INSTALLED.

(B) INTERFACING SUBSYSTEM(S):

NO EFFECT ON ORBITER INTERFACING SUBSYSTEMS.

(C) MISSION:

NO EFFECT FIRST FAILURE. POSSIBLE LOSS OF PRIMARY MISSION OBJECTIVES (ACCESS TO THE SPACE STATION) FOLLOWING SECOND ASSOCIATED VALVE FAILURE.

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

POSSIBLE LOSS OF CREW/VEHICLE IF CONTINGENCY EVA CANNOT BE PERFORMED FOLLOWING FIVE FAILURES WHEN ORBITER/ISS ARE NOT DOCKED AND THERE IS NO PRESSURIZED PAYLOAD INSTALLED.

(E) FUNCTIONAL CRITICALITY EFFECTS:

FIRST EQUALIZATION VALVE FAILURE - NO EFFECT.

SECOND EQUALIZATION VALVE FAILURE, IF OCCURS WHEN:
ORBITER/ISS ARE DOCKED - FAILURE TO EQUALIZE THE PRESSURE ACROSS EXTERNAL AIRLOCK UPPER HATCH, THUS PREVENTING IT'S OPENING. MISSION OBJECTIVES ARE LOST FOLLOWING INABILITY TO OPEN HATCH FOR ORBITER CREW ACCESS INTO SPACE STATION AND VICE VERSA. - CRITICALITY 2R3 CONDITION

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ORBITER/ISS ARE NOT DOCKED AND PRESSURIZED PAYLOAD IS NOT INSTALLED - UNABLE TO USE EITHER EQUALIZATION VALVE ON UPPER HATCH TO DEPRESSURIZE EXTERNAL AIRLOCK. NO EFFECT UNTIL OTHER VALVING CANNOT BE USED.
THIRD FAILURE (MANUAL DEPRESS VALVE FAILS TO OPEN) - UNABLE TO DEPRESSURIZE EXTERNAL AIRLOCK. NO EFFECT UNTIL BOTH AFT HATCH EQUALIZATION VALVES FAIL TO OPEN.
FOURTH & FIFTH FAILURES (BOTH AFT HATCH EQUALIZATION VALVES FAIL TO OPEN) - UNABLE TO DEPRESSURIZE EXTERNAL AIRLOCK FOR PERFORMING AN EVA. LOSS OF MISSION OBJECTIVES ASSOCIATED WITH A PLANNED EVA. - CRITICALITY 2R3 CONDITION
SIXTH FAILURE (FAILURE REQUIRING A CONTINGENCY EVA) - POSSIBLE LOSS OF CREW AND VEHICLE IF CONTINGENCY EVA IS REQUIRED TO CORRECT A CRIT 1 CONDITION. - CRITICALITY 1R3 CONDITION.

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 1R3

**(F) RATIONALE FOR CRITICALITY DOWNGRADE:
ALL WORKAROUNDS HAVE ALREADY BEEN CONSIDERED WHEN DETERMINING CRITICALITY OF THIS FAILURE MODE.**

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: SECONDS

**IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?
YES**

**RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW WOULD HAVE ENOUGH TIME TO: (1) USE REDUNDANT EQUALIZATION VALVE BEFORE THE PROBLEM BECAME CRITICAL TO MISSION SUCCESS; OR (2) UTILIZE OTHER EXTERNAL AIRLOCK/AFT HATCH VALVING TO DEPRESSURIZE EXTERNAL AIRLOCK FOR PERFORMING A CONTINGENCY EVA WHEN ORBITER/ISS ARE NOT DOCKED AND THERE IS NO PRESSURIZED PAYLOAD INSTALLED BEFORE PROBLEM BECAME CATASTROPHIC.**

HAZARD REPORT NUMBER(S): FF-09

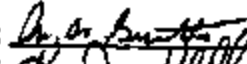
**HAZARD(S) DESCRIPTION:
INABILITY TO SAFELY PERFORM EVA**

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- APPROVALS -

SS & PAE
DESIGN ENGINEER

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

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