FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL HARDWARE
NUMBER:M8-1SS-E006 -X

SUBSYSTEM NAME: ECLSS - ARPCS

REVISION: 2 04/08/97

PART DATA

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

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

QUANTITY OF LIKE ITEMS: 2
TWO

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

REFERENCE DOCUMENTS: M072-593830
V519-331051

PRINT DATE: 01/03/97

FAILURE MODES EFFECTS ANALYSIS FMEA – NON-CIL FAILURE MODE
NUMBER: M8-1SS-E006-01

REVISION#: 2 04/08/97

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

CRITICALITY OF THIS FAILURE MODE: 1R3

FAILURE MODE:
INABILITY TO MATE

MISSION PHASE: OO ON-ORBIT

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

CAUSE:
MECHANICAL SHOCK, EXCESSIVE VIBRATION, CONTAMINATION, PHYSICAL BINDING/JAMMING, CORROSION, MECHANICAL SHOCK

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:
PHYSICAL OBSERVATION - CREW UNABLE TO PHYSICALLY MATE PRESSURE CAP ON AFT HATCH EQUALIZATION VALVE.

CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:
NO CREW ACTION REQUIRED UNTIL VALVE INTERNALLY LEAKS. THEN CREW CAN STOP LEAKAGE BY HOLDING THE CAP AGAINST THE VALVE INLET TO ALLOW DELTA-

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PRESSURE TO HOLD THE CAP IN PLACE. IF THIS FAILS CREW COULD ISOLATE EXTERNAL LEAKAGE BY CLOSING 576 BULKHEAD HATCH.

REMARKS/RECOMMENDATIONS:
SECONDARY SEAL PROVIDED BY EQUALIZATION CAP. PRIMARY SEAL PROVIDED BY EQUALIZATION VALVE. THIS FAILURE MODE ASSUMES THAT NO OTHER CAPS CAN BE MATED TO THE SAME EQUALIZATION VALVE BECAUSE OF DAMAGE TO THE THREADS ON EQUALIZATION VALVE WHERE CAP MATES. 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 SECONDARY SEAL TO EQUALIZATION VALVE.

(B) INTERFACING SUBSYSTEM(S):
NO EFFECT. VALVE PROVIDES PRIMARY SEAL. LOSS OF ISOLATION BETWEEN EXTERNAL AIRLOCK AND OUTSIDE ATMOSPHERE FOLLOWING INTERNAL LEAKAGE OF ASSOCIATED EQUALIZATION VALVE (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 (INTERNAL LEAKAGE OF EQUALIZATION VALVE) 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. POSSIBLE LOSS OF EVA CREWMEMBERS IF SECOND ASSOCIATED FAILURE (INTERNAL LEAKAGE OF EQUALIZATION VALVE) OCCURS DURING AN EVA AND WORKAROUND CANNOT MAINTAIN PRESSURE WITHIN ODS.

(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST FAILURE (INABILITY TO MATE PRESSURE CAP) - NO EFFECT. LOSS OF SECONDARY SEAL ONLY.
SECOND ASSOCIATED FAILURE (EQUALIZATION VALVE INTERNAL LEAKAGE) IF OCCURS:

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DURING IVA:
EXTERNAL LEAKAGE OF HABITABLE PRESSURE RESULTING IN AN INCREASED USE OF CONSUMABLES. - CRITICALITY 1R2 CONDITION

DURING EVA:
UNABLE TO MAINTAIN PRESSURE WITHIN EXTERNAL AIRLOCK FOR EVA CREWMEMBERS RETURN TO CREW CABIN. - 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 IVA:
THIRD FAILURE (UNABLE TO HOLD CAP AGAINST VALVE INLET TO ALLOW DELTA-PRESSURE TO KEEP CAP IN PLACE) - UNABLE TO MAINTAIN PRESSURE WITHIN EXTERNAL AIRLOCK.
FOURTH FAILURE (INABILITY TO CLOSE 576 BULKHEAD HATCH) - LOSS OF CAPABILITY TO ISOLATE EXTERNAL LEAKAGE OF HABITABLE PRESSURE FROM CREW CABIN. INCREASED USE OF CONSUMABLES COULD JEOPARDIZE SAFETY OF CREW AND VEHICLE. - CRITICALITY 1R3 CONDITION.

DURING EVA:
THIRD FAILURE (UNABLE TO HOLD CAP AGAINST VALVE INLET TO ALLOW DELTA-PRESSURE TO KEEP CAP IN PLACE) - UNABLE TO MAINTAIN PRESSURE WITHIN EXTERNAL AIRLOCK. POSSIBLE LOSS OF CREWMEMBERS IF EXTERNAL AIRLOCK VOLUME CANNOT BE REPRESSURIZED FOR CREW RETURN TO CREW CABIN. (EVA CREWMEMBERS MUST REMAIN IN AIRLOCK UNTIL LANDING.) - CRITICALITY 1R3 CONDITION.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: IMMEDIATE

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 STOP LEAKAGE BY HOLDING CAP TO VALVE INLET OR TO ISOLATE EXTERNAL LEAKAGE OF HABITABLE PRESSURE BY CLOSING THE 576 BULKHEAD HATCH, FOLLOWING SECOND FAILURE, BEFORE THE PROBLEM BECAME CATASTROPHIC.

PRINT DATE: 01/03/97

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