

PAGE: 1

PRINT DATE: 10/10/95

## FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE

NUMBER: M8-1MR-E006-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 AFT 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 AFT HATCH.

REFERENCE DOCUMENTS: M072-593626

PAGE: 2

PRINT DATE: 10/20/95

## FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE

NUMBER: M8-1MR-E006-01

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:

INABILITY TO MATE

## MISSION PHASE:

00 ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

## CAUSE:

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

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 - AT LEAST TWO REMAINING PATHS ARE DETECTABLE IN FLIGHT.

C)

## METHOD OF FAULT DETECTION:

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

CORRECTING ACTION: NO CREW ACTION REQUIRED UNTIL VALVE INTERNALLY LEAKS. THEN PRESSURE CAP ON REDUNDANT VALVE CAN BE UTILIZED. CREW CAN ISOLATE EXTERNAL LEAKAGE BY CLOSING APPROPRIATE HATCH(S).

## REMARKS/RECOMMENDATIONS:

IN THE EVENT CONTINGENCY EVA IS REQUIRED NO CREWMEMBERS WILL REMAIN IN SPACELAB (MIR 1 ONLY). 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: MS-1MR-E006-01**

**- 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: (1) SPACELAB DURING EVA AND PERFORM SUBSEQUENT REPRESSURIZATION OF EXTERNAL AIRLOCK VOLUME WHEN EVA IS PERFORMED OUT EXTERNAL AIRLOCK (MIR 1); OR (2) OUTSIDE ATMOSPHERE WOULD RESULT IN EXTERNAL LEAKAGE OF PRESSURE AND SUBSEQUENT LOSS OF CONSUMABLES WITHIN HABITABLE VOLUME (MULTI-MIR).

**(C) MISSION:**

NO EFFECT UNTIL EQUALIZATION VALVE INTERNALLY LEAKS. THEN FAILURE TO MATE PRESSURE CAP MAY PRECLUDE A PLANNED EVA.

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

NO EFFECT UNTIL EQUALIZATION VALVE INTERNALLY LEAKS. 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 EVA RESULTING IN POTENTIAL LOSS OF CREWMEMBERS (MULTI-MIR).

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

FIRST FAILURE - NO EFFECT.

SECOND ASSOCIATED FAILURE (EQUALIZATION VALVE INTERNAL 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 OOS VOLUME CANNOT BE REPRESSURIZED FOR RETURN TO CREW CABIN. (EVA CREWMEMBERS MUST REMAIN IN AIRLOCK UNTIL LANDING). (MIR 1 & MULTI-MIR)

FOURTH & FIFTH 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

PAGE: 4

PRINT DATE: 10/20/95

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NUMBER: M8-1MR-E006-01

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: SECONDS

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): ORB/ 511

HAZARD(S) DESCRIPTION:  
LOSS OF HABITABLE PRESSURE.

- APPROVALS -

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

*M. W. Guenther*  
*K. J. Kelly*