PAGE: 1 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 TECHNOLIGIES	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

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M8-1MR-E001- 03

REVISION# 2 9/15/95

SUBSYSTEM NAME: ECLSS - EXTERNAL AIRLOCK
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: 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:
OBSERVATION - DELTA PRESSURE GAUGE AT EXTERNAL AIRLOCK AFT HATCH.

CORRECTING ACTION: MIR 1 - USE REDUNDANT EQUALIZATION VALVE) TO EQUALIZE PRESSURE BETWEEN EXTERNAL AIRLOCK AND SPACELAB.
MULTI-MIR - UTILIZE: (1) REDUNDANT EQUALIZATION VALVE ON EXTERNAL AIRLOCK AFT HATCH, (2) INTERNAL AIRLOCK DEPRESSURIZATION VALVE, OR (3) EVA "C" HATCH EQUALIZATION VALVES TO EQUALIZE AIRLOCK/OUTSIDE PRESSURE.

REMARKS/RECOMMENDATIONS:
EXTERNAL AIRLOCK AFT HATCH SHOULD NOT BE OPENED IF PRESSURE BETWEEN EXTERNAL AIRLOCK AND SPACELAB TUNNEL CANNOT BE EQUALIZED (MIR 1 ONLY).
EXTERNAL AIRLOCK AFT HATCH CAN BE USED FOR EVA PURPOSES (MULTI-MIR ONLY).

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE
NUMBER: M8-1MR-E001-03

- FAILURE EFFECTS -

(A) SUBSYSTEM:
MIR 1 - NO EFFECT FIRST FAILURE. SECOND FAILURE - LOSS OF ABILITY TO EQUALIZE PRESSURE BETWEEN EXTERNAL AIRLOCK AND SPACELAB RESULTING IN THE INABILITY TO OPEN THE AFT HATCH FOR CREW ACCESS TO SPACELAB.
MULTI-MIR - NO EFFECT. EXTERNAL AIRLOCK AFT HATCH REMAINS CLOSED DURING NOMINAL MISSION.

(B) INTERFACING SUBSYSTEM(S):
NO EFFECT ON ORBITER INTERFACING SUBSYSTEMS.

(C) MISSION:
MIR 1 - NO EFFECT FIRST FAILURE. SECOND VALVE FAILURE WILL PRECLUDE SPACELAB OPERATIONS.
MULTI-MIR - NO EFFECT ON A NOMINAL MISSION.

(D) CREW, VEHICLE, AND ELEMENT(S):
MIR 1 - NO EFFECT ON CREW OR VEHICLE
MULTI-MIR - NO EFFECT UNTIL ALL MEANS OF EQUALIZING EXTERNAL AIRLOCK AND OUTSIDE ATMOSPHERE IS LOST.

(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST FAILURE (FIRST EQUALIZATION VALVE FAILS TO OPEN) - NO EFFECT.
SECOND FAILURE (SECOND EQUALIZATION VALVE FAILS TO OPEN) - INABILITY TO EQUALIZE PRESSURE ACROSS EXTERNAL AIRLOCK AFT HATCH. LOSS OF CAPABILITY TO OPEN HATCH RESULTING IN PARTIAL LOSS OF MISSION OBJECTIVES (SPACELAB OPERATIONS) - CRITICALITY 2R3 CONDITION (MIR-1); OR INABILITY TO VENT OUT EXTERNAL AIRLOCK PRESSURE THROUGH THESE VALVES (MULTI-MIR).
THIRD & FOURTH FAILURES (INABILITY TO OPEN BOTH EQUALIZATION VALVES ON EVA "C" HATCH) - INABILITY TO VENT OUT TUNNEL ADAPTER PRESSURE THROUGH THESE VALVES (MULTI-MIR).
FIFTH FAILURE (INTERNAL AIRLOCK DEPRESSURIZATION VALVE FAILS TO OPEN) - LOSS OF CAPABILITY TO EQUALIZE PRESSURE BETWEEN ODS AND OUTSIDE ENVIRONMENT. FAILURE TO EQUALIZE PRESSURE WILL PRECLUDE OPENING OF TUNNEL ADAPTER "C" HATCH AND EXTERNAL AIRLOCK AFT HATCH RESULTING IN THE INABILITY TO PERFORM AN EVA (MULTI-MIR).
SIXTH FAILURE (FAILURE NECESSITATES AN EVA TO CORRECT A CRIT 1 CONDITION) - POSSIBLE LOSS OF CREW AND VEHICLE - CRITICALITY 1R3 CONDITION (MULTI-MIR).

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): 2R3

(F) RATIONALE FOR CRITICALITY DOWNGRADE:
NONE. CRITICALITY IS BEING UPGRADED TO A 1R3 BASED ON INABILITY TO PERFORM A CONTINGENCY EVA WHEN REQUIRED.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: HOURS TO DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: SECONDS TO MINUTES

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M8-1MR-E001-03

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 OPEN EVA "C" HATCH EQUALIZATION VALVES OR INTERNAL AIRLOCK MANUAL DEPRESS VALVE TO EQUALIZE PRESSURE TO THE OUTSIDE ATMOSPHERE BEFORE THE NEED FOR CONTINGENCY EVA BECAME CATASTROPHIC.

HAZARDS REPORT NUMBER(S): 0M10HA06(F)

HAZARD(S) DESCRIPTION:
EVA HAZARD.

- APPROVALS -

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