PAGE: 1 PRINT DATE: 10/11/95

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER: M8-1MR-E008-X

SUBSYSTEM NAME: ECLSS - EXTERNAL AIRLOCK
REVISION: 2 9/15/95

		PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	:	GAUGE, DELTA PRESSURE CARELTON TECHNOLOGIES	MC250-0004-0007 2767-0001-7

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
EXTERNAL AIRLOCK AFT HATCH DIFFERENTIAL PRESSURE GAUGE

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:
PROVIDES STATUS OF EXTERNAL AIRLOCK AFT HATCH DIFFERENTIAL PRESSURE BETWEEN EXTERNAL AIRLOCK AND SPACELAB FOR MIR 1 OR BETWEEN EXTERNAL AIRLOCK AND PAYLOAD BAY FOR MULTI-MIR, SO THAT CREW CAN ASCERTAIN CONDITIONS BEFORE OPENING THE HATCH. GAUGE MEASURES DELTA PRESSURE BETWEEN PLUS 20 AND MINUS 20 PSID AND IS LOCATED ON BOTH SIDES OF THE EXTERNAL AIRLOCK AFT HATCH.

REFERENCE DOCUMENTS: M072-593828

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- NON-CIL FAILURE MODE
NUMBER: M8-1MR-E008-01

REVISION# 1- 5/19/95

SUBSYSTEM NAME: ECLSS - EXTERNAL AIRLOCK
LRU: GAUGE, DELTA PRESSURE
ITEM NAME: GAUGE, DELTA PRESSURE

CRITICALITY OF THIS FAILURE MODE: 1R3

FAILURE MODE:
LEAKAGE

MISSION PHASE:
OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

CAUSE:
CORROSION, VIBRATION, MECHANICAL SHOCK, POROSITY

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:
INSTRUMENTATION - DELTA-PRESSURE INDICATION. PHYSICAL OBSERVATION - INABILITY TO REPRESSURIZE ODS FOLLOWING EVA (MIR 1) OR LOSS OF PRESSURE WITHIN ODS (MULTI-MIR).

CORRECTING ACTION: MIR 1 - THE RATE OF LEAKAGE AND THE FEASIBILITY OF COMPLETING THE MISSION OR EVA CAN BE DETERMINED.
MULTI-MIR - CREW COULD CLOSE APPROPRIATE HATCH(S) TO ISOLATE LEAKAGE.

REMARKS/RECOMMENDATIONS:
NONE

- FAILURE EFFECTS -

(A) SUBSYSTEM:
MIR 1 - INABILITY TO ISOLATE SPACELAB ENVIRONMENT FROM EXTERNAL AIRLOCK.
MULTI-MIR - LOSS OF ISOLATION BETWEEN EXTERNAL AIRLOCK AND OUTSIDE ENVIRONMENT.

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-OIL FAILURE MODE
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(B) INTERFACING SUBSYSTEM(S):
MIR 1 - NO EFFECT DURING IVA SINCE EXTERNAL AIRLOCK AFT HATCH REMAINS OPEN. POSSIBLE EXCESSIVE LOSS OF CONSUMABLES IF EVA IS CONDUCTED FOLLOWING SIMILAR FAILURE OF SECOND DELTA-PRESSURE GAUGE.
MULTI-MIR - SLOW PRESSURE LEAK TO OUTSIDE. LOSS OF CONSUMABLES WOULD NOT EXCEED AIR MAKEUP CAPABILITY OF THE ORBITER ECLSS SYSTEM.

(C) MISSION:
NO EFFECT FIRST FAILURE. SIMILAR FAILURE OF SECOND DELTA-PRESSURE GAUGE WOULD LOOSE CAPABILITY TO PERFORM PLANNED EVA OUT EXTERNAL AIRLOCK AFT HATCH DUE TO INADEQUATE CONSUMABLES TO REPRESSURIZE AIRLOCK & SPACELAB (MIR 1 ONLY) VOLUMES FOR RETURN TO CREW MODULE (MIR 1 & MULTI-MIR); OR RESULT IN POSSIBLE LOSS OF MISSION OR EARLY MISSION TERMINATION DUE TO EXCESSIVE LOSS OF CONSUMABLES (MULTI-MIR ONLY).

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT FIRST FAILURE. LEAKAGE OF SECOND DELTA PRESSURE GAUGE ON SAME HATCH COULD JEOPARDIZE THE SAFETY OF EVA CREWMEMBERS IF EVA IS REQUIRED OUT EXTERNAL EXTERNAL AIRLOCK WHEN ORBITER & MIR ARE NOT DOCKED (MIR 1) OR JEOPARDIZE THE SAFETY OF CREWMEMBERS DURING IVA DUE TO LOSS OF PRESSURE (MULTI-MIR).

(E) FUNCTIONAL CRITICALITY EFFECTS:
NO EFFECT FIRST FAILURE.
SECOND FAILURE (LEAKAGE OF SECOND DELTA PRESSURE GAUGE ON SAME HATCH):
MIR 1 - EXCESSIVE LOSS OF CONSUMABLES WILL PREVENT REPRESSURIZATION OF AIRLOCK AND SPACELAB VOLUMES IF EVA IS PERFORMED OUT EXTERNAL AIRLOCK UPPER HATCH WHEN ORBITER & MIR ARE NOT DOCKED. EVA CREWMEMBERS COULD BE LOST SINCE AIRLOCK & SPACELAB VOLUMES CANNOT BE REPRESSURIZED FOR RETURN TO CABIN (EVA CREWMEMBERS MUST REMAIN IN INTERNAL AIRLOCK DURING LANDING).
MULTI-MIR - (1) EXCESSIVE LOSS OF PRESSURE WITHIN HABITABLE AREAS. CREW SAFETY JEOPARDIZED UPON LOSS OF CONSUMABLES DURING IVA. (2) POSSIBLE LOSS OF EVA CREWMEMBERS IF SECOND FAILURE OCCURS DURING EVA OUT EXTERNAL AIRLOCK. SINCE AIRLOCK VOLUME CANNOT BE REPRESSURIZED FOR RETURN TO CREW CABIN. (EVA CREWMEMBERS MUST REMAIN IN AIRLOCK UNTIL LANDING). THIS WOULD REQUIRE AN ADDITIONAL FAILURE TO OPEN TUNNEL ADAPTER "C" HATCH SINCE THIS HATCH IS PRIMARY FOR PERFORMING AN EVA.

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

(F) RATIONALE FOR CRITICALITY DOWNGRADE:
THIRD & FOURTH FAILURES (INABILITY TO CLOSE FIFTH HATCH AND CREW CABIN HATCH) OCCUR DURING UNDOCKED IVA ACTIVITIES - LOSS OF CAPABILITY TO ISOLATE EXTERNAL LEAKAGE OF HABITABLE PRESSURE FROM CREW CABIN RESULTING IN EXCESSIVE LOSS OF CONSUMABLES. CREW SAFETY JEOPARDIZED UPON LOSS OF CONSUMABLES.

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: HOURS TO DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS TO MINUTES

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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): ORBI 511

HAZARD(S) DESCRIPTION:
LOSS OF HABITABLE PRESSURE.

- APPROVALS -

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