FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL HARDWARE
NUMBER: M8-1MR-E009-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 UPPER HATCH DIFFERENTIAL PRESSURE GAUGE

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:
PROVIDES STATUS OF DIFFERENTIAL PRESSURE ACROSS EXTERNAL AIRLOCK UPPER HATCH (BETWEEN THE EXTERNAL AIRLOCK AND THE VESTIBULE TUNNEL) 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 UPPER HATCH (EXTERNAL AIRLOCK AND VESTIBULE TUNNEL).

REFERENCE DOCUMENTS: M072-593829

FAILURE MODES EFFECTS ANALYSIS (FMEA) – NON-CIL FAILURE MODE
NUMBER: M8-1MR-E009- 01

REVISION# 2 9/15/95

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 ACROSS UPPER HATCH.

CORRECTING ACTION: CREW COULD CLOSE APPROPRIATE HATCH(S) TO ISOLATE LEAKAGE.

REMARKS/RECOMMENDATIONS:
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 EFFECTS -

(A) SUBSYSTEM:
INABILITY TO ISOLATE THE VESTIBULE TUNNEL FROM EXTERNAL AIRLOCK ENVIRONMENT.

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(B) INTERFACING SUBSYSTEM(S):
SLOW LOSS OF CONSUMABLES, WHEN ORBITER AND MIR ARE NOT DOCKED. EXCESSIVE LOSS OF CONSUMABLES GIVEN A SIMILAR FAILURE OF SECOND DELTA-PRESSURE GAUGE ON SAME HATCH.

(C) MISSION:
NO EFFECT FIRST FAILURE. SIMILAR FAILURE OF SECOND DELTA-PRESSURE GAUGE WOULD LOOSE CAPABILITY TO PERFORM PLANNED EVA OUT EXTERNAL AIRLOCK DUE TO INABILITY TO REPRESSURIZE AIRLOCK & SPACELAB (MIR 1 ONLY) VOLUMES FOR RETURN TO CREW MODULE.

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT FIRST FAILURE SINCE AIR MAKEUP CAPABILITY OF ORBITER AIR REVITALIZATION SYSTEM WILL PRECLUDE A LOSS OF PRESSURE IN HABITABLE VOLUMES. SIMILAR FAILURE OF SECOND GAUGE ON SAME HATCH COULD RESULT IN LOSS OF CREW DURING NON-DOCKED IVA/EVA ACTIVITES.

(E) FUNCTIONAL CRITICALITY EFFECTS:
FIRST FAILURE - SLOW LOSS OF CONSUMABLES WHEN ORBITER & MIR ARE NOT DOCKED. NO EFFECT SINCE ORBITER ARPCS WILL PROVIDE AIR MAKE-UP CAPABILITIES.
SECOND FAILURE (LEAKAGE OF SECOND GAUGE):
WHEN ORBITER/MIR ARE NOT DOCKED: (1) IF SECOND FAILURE OCCURS DURING IVA (CAMERA PREPARATION FOR DOCKING OR SPACELAB OPERATIONS (MIR 1 ONLY)) EXCESSIVE LOSS OF CONSUMABLES CAN JEOPARDIZE CREW SAFETY; (2) IF SECOND FAILURE OCCURS DURING A NON-DOCKED EVA OUT EXTERNAL AIRLOCK, POSSIBLE LOSS OF EVA CREWMEMBERS IF 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

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: SECONDS

IS TIME REQUIRED TO IMPLEMENT CORRECTIVE ACTION LESS THAN TIME TO EFFECT?
YES

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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	:
DESIGN ENGINEER	:	K. J. KELLY	: