

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

SUBSYSTEM NAME: ECLSS - ARPCS

REVISION: 2 04/08/97

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:HATCH ASSEMBLY ROCKWELL INT'L	M072-593830-001 M072-593830-001
SRU	:GAUGE, DELTA PRESSURE CARELTON TECHNOLOGIES	MC250-0004-0007 2767-0001-7

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

QUANTITY OF LIKE ITEMS: 2
TWO

FUNCTION:
 PROVIDES STATUS OF EXTERNAL AIRLOCK AFT HATCH DIFFERENTIAL PRESSURE BETWEEN EXTERNAL AIRLOCK AND OUTSIDE ENVIRONMENT (WHEN NO PRESSURIZED PAYLOAD IS INSTALLED) OR BETWEEN EXTERNAL AIRLOCK AND TUNNEL ADAPTER (WHEN A PRESSURIZATION PAYLOAD IS INSTALLED) 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: M072-593830
 V519-331051

FAILURE MODES EFFECTS ANALYSIS FMEA - NON-CIL FAILURE MODE

NUMBER: M8-1SS-E008-01

REVISION#: 2 04/08/97

SUBSYSTEM NAME: ECLSS - APRCS
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: 103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:

CORROSION, VIBRATION, MECHANICAL SHOCK, POROSITY

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:

INSTRUMENTATION - DELTA-PRESSURE INDICATION. VISUAL OBSERVATION - LOSS OF PRESSURE WITHIN EXTERNAL AIRLOCK.

CORRECTING ACTION: MANUAL

CORRECTING ACTION DESCRIPTION:

CREW COULD SEAL LEAK USING TAPE OR OTHER AVAILABLE MATERIAL OR ISOLATE LEAK BY CLOSING 576 BULKHEAD HATCH.

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REMARKS/RECOMMENDATIONS:

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. LEAKAGE OF A SINGLE PRESSURE GAUGE WILL NOT EXCEED CONSUMABLE MAKEUP CAPABILITY OF THE ORBITER APPCS.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF ISOLATION BETWEEN EXTERNAL AIRLOCK AND OUTSIDE ENVIRONMENT (WHEN A PRESSURIZED PAYLOAD IS NOT INSTALLED) OR BETWEEN EXTERNAL AIRLOCK AND TUNNEL ADAPTER (WHEN A PRESSURIZED PAYLOAD IS INSTALLED).

(B) INTERFACING SUBSYSTEM(S):

SLOW PRESSURE LEAK TO OUTSIDE (WHEN NO PRESSURIZED PAYLOAD IS INSTALLED) OR INTO A DEPRESSURIZED TUNNEL ADAPTER DURING AN EVA (WHEN A PRESSURIZED PAYLOAD IS INSTALLED). BOTH SCENARIOS WILL RESULT IN A LOSS OF CONSUMABLES WITHIN THE EXTERNAL AIRLOCK WHICH WOULD NOT EXCEED CONSUMABLE MAKEUP CAPABILITY OF THE ORBITER ECLSS SYSTEM.

(C) MISSION:

WORST CASE, CREW DECISION TO ABORT MISSION DUE TO LOSS OF CONSUMABLES. IF FAILURE OCCURS WHEN A PRESSURIZED PAYLOAD IS NOT INSTALLED - LOSS OF CAPABILITY TO PERFORM A PLANNED EVA DUE TO DIFFICULTY IN REPRESSURIZING THE ODS VOLUMES FOR RETURNING TO THE CREW MODULE.

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

WHEN A PRESSURIZED PAYLOAD IS INSTALLED - NO EFFECT ON CREW AND VEHICLE. IF NO PRESSURIZED PAYLOAD IS INSTALLED - NO EFFECT FIRST FAILURE. INABILITY TO CORRECT AN EXTERNAL LEAKAGE CONDITION OF BOTH GAUGES MAY CAUSE LOSS OF EVA CREWMEMBERS IF EXTERNAL AIRLOCK CANNOT BE REPRESSURIZED FOR CREWMEMBERS RETURN TO CREW CABIN.

(E) FUNCTIONAL CRITICALITY EFFECTS:

FIRST FAILURE - SLOW LEAKAGE OF ODS PRESSURE TO OUTSIDE (WHEN PRESSURIZED PAYLOAD IS NOT INSTALLED) OR SLOW LEAKAGE OF EXTERNAL AIRLOCK PRESSURE INTO A DEPRESSURIZED TUNNEL ADAPTER DURING AN EVA MAY RESULT IN CREW ACTION TO ABORT MISSION. - CRITICALITY 2/2 CONDITION.

DURING EVA WHEN NO PRESSURIZED PAYLOAD IS INSTALLED:

(2A) SECOND FAILURE (LEAKAGE OF SECOND GAUGE) - PRESSURE WITHIN EXTERNAL AIRLOCK CANNOT BE MAINTAINED FOR EVA CREWMEMBER'S RETURN TO CREW CABIN. - CRITICALITY 1R2 CONDITION.

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**DURING IVA WHEN NO PRESSURIZED PAYLOAD IS INSTALLED:
(2B) SECOND FAILURE (LEAKAGE OF SECOND GAUGE) - EXCESSIVE EXTERNAL
LEAKAGE OF HABITABLE PRESSURE WOULD EXCEED CONSUMABLE MAKEUP
CAPABILITY OF ORBITER ARPCS RESULTING IN AN INCREASED USE OF CONSUMABLES
WITHIN EXTERNAL AIRLOCK. - CRITICALITY 1R2 CONDITION.**

**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 EVA WHEN NO PRESSURIZED PAYLOAD IS INSTALLED:
(3A) THIRD FAILURE (INABILITY TO SEAL LEAK ON BOTH GAUGES) - 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.**

**DURING IVA WHEN NO PRESSURIZED PAYLOAD IS INSTALLED:
(3B) THIRD FAILURE (INABILITY TO SEAL LEAK ON BOTH GAUGES) - UNABLE TO STOP
EXCESSIVE EXTERNAL LEAKAGE OF PRESSURE WITHIN EXTERNAL AIRLOCK.
(4B) FOURTH FAILURE (INABILITY TO CLOSE 576 BULKHEAD HATCH) - LOSS OF
CAPABILITY TO ISOLATE EXTERNAL LEAKAGE OF HABITABLE PRESSURE COULD
RESULT IN LOSS OF CREW AND VEHICLE. - CRITICALITY 1R3 CONDITION.**

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTING ACTION: MINUTES

**IS TIME REQUIRED TO IMPLEMENT CORRECTING ACTION LESS THAN TIME TO EFFECT?
YES**

**RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
CREW HAS SUFFICIENT TIME TO SEAL A LEAK ON BOTH PRESSURE GAUGES BEFORE
THE PROBLEM BECAME CATASTROPHIC.**

HAZARD REPORT NUMBER(S): ORBI 511, ORBI 162

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HAZARD(S) DESCRIPTION:

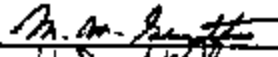
LOSS OF HABITABLE PRESSURE IN CREW CABIN HABITABLE VOLUME (ORBI 511),
INABILITY TO RETURN FROM EVA DUE TO AIRLOCK HATCH FAILURES AND / OR
REPRESSURIZATION OF THE AIRLOCK (ORBI 162).

-DISPOSITION RATIONALE-

- APPROVALS -

SS & PAE
DESIGN ENGINEER

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

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