

PAGE: 1

PRINT DATE: 10/11/95

FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL HARDWARE  
NUMBER: M8-1MR-E010-X

SUBSYSTEM NAME: ECLSS - EXT AIRLOCK/VEST TUNNEL

REVISION: 2 9/15/95

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: SENSOR, DELTA PRESSURE	ME449-0177-9991

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**PART DATA**

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EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
EXTERNAL AIRLOCK/VESTIBULE TUNNEL DELTA PRESSURE SENSOR

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 1  
ONE

**FUNCTION:**

PROVIDES STATUS OF PRESSURE DIFFERENTIAL BETWEEN EXTERNAL AIRLOCK AND VESTIBULE TUNNEL. THIS DELTA PRESSURE READING IS REQUIRED PRIOR TO OPENING EXTERNAL AIRLOCK UPPER HATCH AND IS MONITORED BY THE CREW AND DOWNLINKED TO GROUND PERSONNEL. THIS SENSOR IS ALSO UTILIZED IN PERFORMING A LEAK CHECK ACROSS THE UPPER EXTERNAL AIRLOCK HATCH PRIOR TO SEPARATION.

REFERENCE DOCUMENTS: V826-754124  
VS70-973099

PAGE: 2

PRINT DATE: 10/20/95

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M8-1MR-E010-01**

REVISION# 2 0/15/95  
SUBSYSTEM NAME: ECLSS - EXT AIRLOCK/VEST TUNNEL  
LRU: SENSOR, DELTA PRESSURE  
ITEM NAME: SENSOR, DELTA PRESSURE  
CRITICALITY OF THIS FAILURE MODE: 1R3

**FAILURE MODE:**  
OPEN, SHORTED, OUT-OF-TOLERANCE

**MISSION PHASE:**  
OO ON-ORBIT

**VEHICLE/PAYLOAD/KIT EFFECTIVITY:** 104 ATLANTIS

**CAUSE:**  
MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION

**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:**  
DELTA PRESSURE ANOMALY

**MASTER MEAS. LIST NUMBERS:** V64P0127A

**CORRECTING ACTION:** CREW CAN UTILIZE HATCH DELTA-PRESSURE GAUGE OR EXTERNAL AIRLOCK PRESSURE TRANSDUCER TO DETERMINE DELTA PRESSURE ACROSS EXTERNAL AIRLOCK UPPER HATCH OR OPEN ONE OR BOTH EQUALIZATION VALVES ON EXTERNAL AIRLOCK UPPER HATCH TO INSURE THAT PRESSURE BETWEEN EXTERNAL AIRLOCK AND VESTIBULE IS EQUALIZED PRIOR TO OPENING HATCH.

**REMARKS/RECOMMENDATIONS:**  
EXTERNAL AIRLOCK UPPER HATCH SHOULD NOT BE OPENED IF DELTA PRESSURE ACROSS HATCH IS NOT VERIFIED. DELTA-PRESSURE SENSOR IS UTILIZED TO MONITOR DIFFERENTIAL PRESSURE ACROSS EXTERNAL AIRLOCK UPPER HATCH AS PART OF THE UPPER HATCH LEAK TEST BEING PERFORMED PRIOR TO ORBITER/MIR SEPARATION. LEAK TESTS HAVE BEEN ESTABLISHED BY ORBITER TO BE A CRITICALITY 1 EVENT.

PAGE: 3

PRINT DATE: 10/12/95

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - NON-CIL FAILURE MODE  
NUMBER: M8-1MR-E01D-01**

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**- FAILURE EFFECTS -**

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**(A) SUBSYSTEM:**

LOSS OF FUNCTION - UNABLE TO REMOTELY MONITOR DELTA PRESSURE BETWEEN EXTERNAL AIRLOCK AND VESTIBULE TUNNEL.

**(B) INTERFACING SUBSYSTEM(S):**

NO EFFECT ON ORBITER INTERFACING SUBSYSTEMS.

**(C) MISSION:**

NO EFFECT FIRST FAILURE. POSSIBLE LOSS OF MISSION FOLLOWING LOSS OF ALL DELTA PRESSURE INDICATIONS.

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

NO EFFECT UNTIL ALL DELTA-PRESSURE INDICATIONS ACROSS EXTERNAL AIRLOCK UPPER HATCH ARE LOST. THEN CREW WOULD NOT BE ABLE TO PERFORM A LEAK CHECK ACROSS THIS HATCH PRIOR TO ORBITER/MIR SEPARATION.

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

FIRST FAILURE (DELTA-PRESSURE SENSOR FAILURE) - LOSS OF CREW CABIN CAPABILITY TO MONITOR DELTA-P ACROSS EXTERNAL AIRLOCK UPPER HATCH.  
SECOND FAILURE (ERRONEOUS DELTA-P GAUGE READING ON EXTERNAL AIRLOCK UPPER HATCH) - UNABLE TO LOCALLY MONITOR DELTA-PRESSURE BETWEEN EXTERNAL AIRLOCK AND VESTIBULE TUNNEL. FAILURE TO DETERMINE PRESSURE DIFFERENTIAL ACROSS EXTERNAL AIRLOCK UPPER HATCH WOULD PRECLUDE ITS OPENING RESULTING IN A LOSS OF PRIMARY MISSION OBJECTIVE (MIR ENTRY/OPERATIONS). - CRITICALITY 2R3  
THIRD FAILURE (ERRONEOUS EXTERNAL AIRLOCK PRESSURE TRANSDUCER READING) - UNABLE TO DETERMINE IF A LEAK EXISTS ACROSS EXTERNAL AIRLOCK UPPER HATCH DURING THE LEAK CHECK THAT IS PERFORMED PRIOR TO ORBITER/MIR SEPARATION. - CRITICALITY 1R3

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (F)): N/A

**(F) RATIONALE FOR CRITICALITY DOWNGRADE:**

NONE. THE CRITICALITY OF THIS FAILURE MODE REMAINS UNCHANGED.

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**- TIME FRAME -**

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TIME FROM FAILURE TO CRITICAL EFFECT: HOURS TO DAYS

TIME FROM FAILURE OCCURRENCE TO DETECTION: MINUTES

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: MINUTES

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 UTILIZE OTHER ANNUNCIATIONS TO DETERMINE DELTA PRESSURE ACROSS THE HATCH BEFORE ALL LEAK CHECK CAPABILITIES ARE LOST.

PAGE: 4

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NUMBER: M8-1MR-E010-01

HAZARDS REPORT NUMBER(S): NONE

HAZARD(S) DESCRIPTION:  
N/A

- APPROVALS -

PRODUCT ASSURANCE ENGR. : M. W. GUENTHER  
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*M. W. Guenther*  
*K. J. Kelly*