

PAGE: 1

PRINT DATE: 09/18/95

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE  
NUMBER: M8-1MR-E004-X

SUBSYSTEM NAME: ECLSS - VESTIBULE TUNNEL  
REVISION: 2 9/15/95

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	SCREEN, VALVE INLET DEBRIS	V076-634029-001

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
DEPRESSURIZATION VALVE INLET DEBRIS SCREEN

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 1  
ONE

FUNCTION:  
REMOVES AIRBORNE PARTICLES GREATER THAN 300 MICRONS FROM THE AIR  
FLOWING OUT OF THE VESTIBULE TUNNEL THROUGH THE DEPRESSURIZATION  
VALVES.

REFERENCE DOCUMENTS: V628-643029  
V076-643039

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE**

NUMBER: M8-1MR-E004- G2

REVISION# 2 8/15/95

SUBSYSTEM NAME: ECSS - VESTIBULE TUNNEL

LRU: SCREEN, DEPRESS VALVE INLET DEBRIS

ITEM NAME: SCREEN, DEPRESS VALVE INLET DEBRIS

CRITICALITY OF THIS

FAILURE MODE: 2/2

**FAILURE MODE:**

FAILS TO FILTER (RUPTURED MESH)

**MISSION PHASE:**

OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

**CAUSE:**

VIBRATION, CORROSION, MECHANICAL SHOCK

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

CRITICALITY 1/2 DURING INTACT ABORT ONLY (AVIONICS ONLY)? N/A

**REDUNDANCY SCREEN**

A) N/A

B) N/A

C) N/A

**PASS/FAIL RATIONALE:**

A)

N/A

B)

N/A

C)

N/A

**METHOD OF FAULT DETECTION:**

NONE INITIALLY. HOWEVER, INABILITY TO CLOSE A DEPRESS VALVE, AS THE RESULT OF CONTAMINATION, IS DETECTABLE THROUGH PHYSICAL OBSERVATION (INABILITY TO PRESSURIZE THE VESTIBULE TUNNEL WHEN REQUIRED) AND THROUGH INSTRUMENTATION (DELTA-PRESSURE AND DEPRESS VALVE POSITION INDICATIONS).

**- FAILURE EFFECTS -**

**(A) SUBSYSTEM:**

POSSIBLE CONTAMINATION OF DEPRESSURIZATION VALVES. VALVES CAN INTERNALLY LEAK IF CONTAMINATION SETTLES ON SEATS. INABILITY TO COMPLETELY CLOSE BOTH ISO AND VENT VALVES WITHIN A SINGLE DEPRESS VALVE WILL PRECLUDE PRESSURIZING VESTIBULE TUNNEL.

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

NO EFFECT ON INTERFACING ORBITER SUBSYSTEMS.

PAGE: 6

PRINT DATE: 09/18/95

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE

NUMBER: M8-1MR-E004-02

(C) MISSION:

NO EFFECT ON INITIAL DOCKING SINCE VESTIBULE TUNNEL DEPRESSURIZATION OCCURS AT END OF DOCKED MIR OPERATIONS. HOWEVER, CONTAMINATION CAN SETTLE ON BOTH VENT AND ISO VALVE SEATS WHILE DEPRESSURIZING VESTIBULE TUNNEL, DURING SEPARATION, PREVENTING THE VALVE FROM COMPLETELY CLOSING FOR SUBSEQUENT DOCKINGS. INABILITY TO CLOSE A VALVE WILL PREVENT PRESSURIZING VESTIBULE TUNNEL FOR OPENING OF EXTERNAL AIRLOCK UPPER HATCH. FAILURE TO OPEN UPPER HATCH WILL PRECLUDE PRIMARY MISSION OBJECTIVE - ORBITER/MIR ENTRY/OPERATIONS.

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

NO EFFECT ON CREW AND VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:

N/A

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

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

N/A (UNDER WORST CASE CONDITIONS RECYCLING VALVE OR UTILIZING EXTERNAL AIRLOCK PRESSURE ESCAPING OUT DEPRESS VALVES MAY NOT REMOVE ALL CONTAMINATION ON THE VALVE SEAT. AS SUCH, THERE ARE NO WORKAROUNDS THAT CAN BE USED TO DOWNGRADE THE CRITICALITY OF THIS FAILURE).

- 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: NONE

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

N/A

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:

WORST CASE, THERE ARE NO CORRECTIVE ACTIONS TO REMOVE CONTAMINATION FROM THE VALVE SEATS.

HAZARDS REPORT NUMBER(S): NONE

HAZARD(S) DESCRIPTION:

N/A

-DISPOSITION RATIONALE-

(A) DESIGN:

THE DEPRESSURIZATION VALVE INLET DEBRIS SCREEN IS CIRCULAR IN SHAPE AND SIMILAR IN DESIGN TO ONE CURRENTLY BEING UTILIZED FOR THE CABIN PRESSURE BLEED VALVE. THE SCREEN IS 1.778 INCHES IN DIAMETER AND COMPOSED OF .25 INCH RATING 321 CRESCENT STAINLESS STEEL MESH. THE MESH WIRE IS .032 INCHES IN

PAGE: 7

PRINT DATE: 09/18/95

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL FAILURE MODE  
NUMBER: M8-1MR-E004-C2**

DIAMETER AND THERE ARE ABOUT 4 MESHES PER INCH. ABOUT 76% OF THE TOTAL SCREEN AREA IS OPEN FOR AIRFLOW.

**(B) TEST:**

QUALIFICATION/ACCEPTANCE TEST - THERE IS NO QTP/ATP FOR THE INDIVIDUAL DEBRIS SCREEN. TESTING VERIFIED BY SIMILARITY TO CABIN PRESSURE BLEED VALVE DEBRIS SCREEN. OVERALL PERFORMANCE OF MIR ECLSS SYSTEM DURING INTEGRATED SYSTEM CHECKOUT OF EXTERNAL AIRLOCK AND GROUND CHECKOUT INCLUDES THE DEPRESS VALVE DEBRIS SCREEN.

INTEGRATED SYSTEM CHECKOUT (EXTERNAL AIRLOCK) - LEAK TEST CONDUCTED AS PART OF INTEGRATED TEST. HIGH PRESSURE LEAK TEST PERFORMED AT 14.9 ± 0.2 PSIG USING AIR OR GN2 FOR 4.0 HOURS MINIMUM. MAXIMUM ALLOWABLE LEAK RATE OF 6 SCIM.

OMRSD - TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

**(C) INSPECTION:**

RECEIVING INSPECTION

INCOMING PARTS ARE VISUALLY INSPECTED FOR MATERIAL AND PROCESS CERTIFICATION.

**CONTAMINATION CONTROL**

CLEANING REQUIREMENTS TO THE GENERALLY CLEAN (GC) LEVEL. CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION.

**ASSEMBLY/INSTALLATION**

ASSEMBLY/INSTALLATION VERIFIED BY INSPECTION. INSPECTION VERIFIES ABSENCE OF DEBRIS AND CLOGGING.

**CRITICAL PROCESSES**

WELDING OF WIRE MESHES VERIFIED BY INSPECTION.

**TESTING**

INTEGRATED SYSTEM OMRSD TESTING VERIFIED BY INSPECTION.

**HANDLING/PACKAGING**

HANDLING, PACKAGING, STORAGE, AND SHIPPING PROCEDURES ARE VERIFIED BY INSPECTION.

**(D) FAILURE HISTORY:**

CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN PRACA DATA BASE.

**(E) OPERATIONAL USE:**

NONE FOR INITIAL CONTAMINATION CONDITION. HOWEVER, IF CONTAMINATION RESULTS IN A DEPRESS VALVE FAILING TO FULLY CLOSE, CREW COULD ATTEMPT TO RECYCLE VALVE CLOSED. IF THIS FAILS TO CLOSE VALVE, CREW COULD OPEN ONE OR BOTH EQUALIZATION VALVE(S) ON EXTERNAL AIRLOCK UPPER HATCH AND UTILIZE THE ODS PRESSURE ESCAPING OUT VESTIBULE TUNNEL THROUGH OPEN DEPRESS VALVE TO REMOVE CONTAMINATION.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE

NUMBER: M8-1MR-E004-02

- APPROVALS -

PRODUCT ASSURANCE ENGR. :  
 PAE MANAGER :  
 DESIGN ENGINEER :  
 CHIEF ENGINEER :  
 NASA SS/MA :  
 NASA SUBSYSTEM MANAGER :  
 JSC MOD :

M. W. GUENTHER  
 W. R. MARLOWE  
 K. J. KELLY  
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*W. R. Marlowe U.S. Gov't*  
*D. M. Kelly 9/22/95*  
*George ... for ULC*