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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) -- NON-CIL FAILURE MODE

NUMBER: M8-1MR-E004-01

REVISION# 2 9/15/95

SUBSYSTEM NAME: ECLSS - VESTIBULE TUNNEL

LRU: SCREEN, DEPRESS VALVE INLET DEBRIS

CRITICALITY OF THIS

ITEM NAME: SCREEN, DEPRESS VALVE INLET DEBRIS

FAILURE MODE: 1R3

FAILURE MODE:

*RESTRICTED FLOW (CLOGGING)

MISSION PHASE:

OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 104 ATLANTIS

CAUSE:

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:

INSTRUMENTATION - DELTA PRESSURE READINGS ACROSS UPPER EXTERNAL AIRLOCK HATCH (BOTH INSTRUMENTATION AND MECHANICAL GAUGES). PHYSICAL OBSERVATION - INABILITY TO DEPRESSURIZE VESTIBULE TUNNEL.

CORRECTING ACTION: INTERNAL DEPRESSURIZATION OF THE VESTIBULE TUNNEL CAN BE ACCOMPLISHED MANUALLY BY: FIRST, OPENING ONE OR BOTH EQUALIZATION VALVES AT THE EXTERNAL AIRLOCK UPPER HATCH; AND SECOND, DEPRESSURIZING EXTERNAL AIRLOCK VOLUME WITH ALL HATCHES CLOSED. FOLLOWING DEPRESSURIZATION EXTERNAL AIRLOCK UPPER HATCH EQUALIZATION VALVE(S) ARE CLOSED AND THE EXTERNAL AIRLOCK REPRESSURIZED. THIS WORKAROUND WOULD DEPEND ON THE AVAILABLE SUPPLY OF CONSUMABLES. VESTIBULE TUNNEL AND EXTERNAL AIRLOCK VOLUMES MUST BE DEPRESSURIZED SIMULTANEOUSLY SINCE EXTERNAL AIRLOCK UPPER HATCH CANNOT WITHSTAND A 14.7 PSID NEGATIVE PRESSURE (I.E. OUTSIDE TO INSIDE). CREW COULD UTILIZE TUNNEL ADAPTER "C" HATCH TO PERFORM AN EVA.

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REMARKS/RECOMMENDATIONS:

EXTERNAL AIRLOCK UPPER HATCH IS A "B" TYPE HATCH WHICH CANNOT WITHSTAND A 14.7 PSID IN THE NEGATIVE DIRECTION (OUTSIDE TO INSIDE). DURING DOCKED OPERATIONS THE VESTIBULE TUNNEL MUST BE DEPRESSURIZED PRIOR TO DEPRESSURIZING THE EXTERNAL AIRLOCK FOR PERFORMING AN EVA. TUNNEL ADAPTER "C" HATCH IS THE PRIMARY HATCH FOR PERFORMING AN EVA.

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF CAPABILITY TO VENT PRESSURE OUT OF VESTIBULE TUNNEL THROUGH BOTH DEPRESSURIZATION VALVES RESULTING IN THE INABILITY TO DEPRESSURIZE VESTIBULE TUNNEL.

(B) INTERFACING SUBSYSTEM(S):

INABILITY TO DEPRESSURIZE VESTIBULE TUNNEL WOULD PREVENT DEPRESSURIZING EXTERNAL AIRLOCK, SINCE HIGHER PRESSURE ON THE VESTIBULE SIDE WOULD DAMAGE THE EXTERNAL AIRLOCK UPPER HATCH. LOSS OF CAPABILITIES TO PERFORM AN EVA OUT EXTERNAL AIRLOCK.

(C) MISSION:

LOSS OF CAPABILITY TO PERFORM AN EVA OUT EXTERNAL AIRLOCK. NO EFFECT ON IVA MISSION OPERATIONS.

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

NO EFFECT UNTIL CONTINGENCY EVA IS REQUIRED. THEN INABILITY TO DEPRESSURIZE EXTERNAL AIRLOCK TO PERFORM EVA, FOLLOWING FAILURE OF EVA "C" HATCH, COULD RESULT IN LOSS OF CREW AND VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:

WORST CASE WHEN ORBITER AND MIR ARE DOCKED - FAILURE TO DEPRESSURIZE VESTIBULE TUNNEL AS THE RESULT OF A CLOGGED INLET DEBRIS SCREEN WOULD PREVENT DEPRESSURIZING EXTERNAL AIRLOCK, SINCE UPPER HATCH CANNOT WITHSTAND A DELTA-PRESSURE IN THE NEGATIVE DIRECTION. (DEPRESSURIZATION WITH THE VESTIBULE PRESSURIZED WOULD RESULT IN THE HATCH LIFTING FROM THE O-RING SEALS AND THEN RESEATING FOLLOWING PRESSURE EQUALIZATION ACROSS THE HATCH. THIS ACTION COULD RESULT IN DAMAGE TO THE O-RING SEALS AND THUS PRECLUDE REPRESSURIZATION OF EXTERNAL AIRLOCK). INABILITY TO PERFORM A NOMINAL EVA OUT EXTERNAL AIRLOCK.

FAILURE WOULD REQUIRE MIR SEPARATION WITH VESTIBULE TUNNEL PRESSURIZED RESULTING IN POSSIBLE STRUCTURAL DAMAGE TO OR MISALIGNMENT OF THE MIR ANTENNA LOCATED NEAR THE ORBITER/MIR INTERFACE (MIR 1 ONLY).

SECOND FAILURE (FAILURE NECESSITATES AN EVA TO CORRECT A CRIT 1 CONDITION) - INABILITY TO UTILIZE EXTERNAL AIRLOCK AFT HATCH TO PERFORM A CONTINGENCY EVA.

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

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

THIRD FAILURE (INABILITY TO OPEN EVA "C" HATCH) - LOSS OF CONTINGENCY EVA CAPABILITIES WITHOUT PERFORMING A WORKAROUND.

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FOURTH FAILURE (FAILURE TO PERFORM WORKAROUND TO DEPRESSURIZE VESTIBULE TUNNEL THROUGH THE EXTERNAL AIRLOCK) - LOSS OF ALL CONTINGENCY EVA CAPABILITIES RESULTING IN LOSS OF CREW AND VEHICLE.

- 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: MINUTES TO HOURS

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

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:
IN THE EVENT EVA "C" HATCH CANNOT BE OPENED TO PERFORM A CONTINGENCY EVA, CREW WOULD HAVE ENOUGH TIME TO MANUALLY DEPRESSURIZE VESTIBULE THROUGH THE EXTERNAL AIRLOCK AND UTILIZE EXTERNAL AIRLOCK AFT HATCH FOR PERFORMING THE EVA BEFORE THE NEED FOR THE CONTINGENCY EVA BECAME CATASTROPHIC.

HAZARDS REPORT NUMBER(S): DM10HA08(F)

HAZARD(S) DESCRIPTION:
EVA HAZARD.

- APPROVALS -

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