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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: M7-3A-E7-X

SUBSYSTEM NAME: TUNNEL ADAPTER - ECLSS

REVISION : 1 10/22/92

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	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
■ LRU :	VALVE AND CAP	ME284-0542-0001

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PART DATA

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■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
SPACELAB DUCT ISOLATION VALVE

■ QUANTITY OF LIKE ITEMS: 1  
ONE VALVE & ONE CAP

■ FUNCTION:  
PROVIDES THE CAPABILITY TO ISOLATE THE TUNNEL ADAPTER FROM THE SPACELAB ATMOSPHERE. THIS ALLOWS DEPRESSURIZATION OF THE TUNNEL ADAPTER FOR EVA, OR FLYING WITH TUNNEL INSTALLED BUT SPACELAB DISCONNECTED. CAP PROVIDES ISOLATION REDUNDANCY. CAP IS NORMALLY INSTALLED FOR ASCENT/ENTRY AND INSTALLED BY EVA CREWMAN PRIOR TO DEPRESSURIZATION OF THE TUNNEL ADAPTER.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: M7-3A-E7-01

SUBSYSTEM: TUNNEL ADAPTER - ECLSS  
LRU : VALVE AND CAP  
ITEM NAME: VALVE AND CAP

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CRITICALITY OF THIS  
FAILURE MODE: 1/1

■ FAILURE MODE:  
EXTERNAL LEAKAGE, VALVE

MISSION PHASE:  
00 ON-ORBIT

■ VEHICLE/PAYLOAD/KIT EFFECTIVITY:	102	COLUMBIA
	: 103	DISCOVERY
	: 104	ATLANTIS
	: 105	ENDEAVOUR

■ CAUSE:  
MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION, POROSITY.

■ CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

■ REDUNDANCY SCREEN A) N/A  
 ■ B) N/A  
 ■ C) N/A

PASS/FAIL RATIONALE:

- A)
- B)
- C)

- FAILURE EFFECTS -

■ (A) SUBSYSTEM:  
INABILITY TO ISOLATE TUNNEL ADAPTER FROM SPACELAB ATMOSPHERE.

■ (B) INTERFACING SUBSYSTEM(S):  
DECREASED AIRFLOW TO SPACELAB. SPACELAB PPO2 DECREASES AND TEMPERATURE INCREASES. EXCESSIVE LOSS OF CONSUMABLES IF EVA IS CONDUCTED.

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- (C) MISSION:  
POSSIBLE EARLY MISSION TERMINATION.
- (D) CREW, VEHICLE, AND ELEMENT(S):  
POSSIBLE LOSS OF CREWMEN IF CONTINGENCY EVA IS REQUIRED AND TUNNEL CANNOT BE REPRESSURIZED FOR RETURN TO CABIN (EVA CREWMEN MUST REMAIN IN AIRLOCK UNTIL LANDING).
- (E) FUNCTIONAL CRITICALITY EFFECTS:  
NONE

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- DISPOSITION RATIONALE -  
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- (A) DESIGN:  
THE ISOLATION VALVE IS A MANUALLY OPERATED BUTTERFLY VALVE WITH POSITIVE LOCKING IN THE FULL OPEN AND FULL CLOSED POSITION. THE BUTTERFLY VALVE HAS SILICONE LIP SEAL MOLDED DIRECTLY TO THE PERIMETER OF THE VALVE PLATE, WHICH PROVIDES A CONTINUOUS UNBROKEN GAS SEAL ACROSS THE EDGE OF THE VALVE. VALVE BODY IS ALUMINUM WHICH HAS TEFLON IMPREGNATED HARD COAT APPLIED TO THE VALVE BORE SEATING AREA; MAXIMUM CORROSION RESISTANCE WITH MINIMUM COEFFICIENT OF FRICTION.
- (B) TEST:  
QUALIFICATION TESTS FOR 100 MISSION LIFE: ACCELERATION OF 5 G FOR FIVE MINUTES PER AXIS. SINUSOIDAL VIBRATION @ 5-35 HZ AT AN ACCELERATION AMPLITUDE OF +/- 0.25 G PEAK PER AXIS. RANDOM VIBRATION AT THE RATE OF 6 DB/OCTAVE FROM 20-150 HZ, CONSTANT AT 0.03 G<sup>2</sup>/HZ FROM 150-1000 HZ, AND DECREASING AT 6 DB/OCTAVE FROM 1000-2000 HZ FOR A TOTAL DURATION OF 48 MINUTES PER AXIS. DESIGN SHOCK @ 20 G PER AXIS. OPERATING LIFE - OPERATED OPEN/CLOSED POSITIONS WITH PRESSURE OF 14-16 PSIG APPLIED FOR 600 CYCLES.  
  
ACCEPTANCE TEST - THE VALVE WAS PROOF PRESSURE TESTED AT 24 PSIG FOR 5 MINUTES WITH VALVE OPEN AND CLOSED. INTERNAL LEAK CHECK AT 16 PSI; 5 SCCM MAX.
- (C) INSPECTION:  
RECEIVING INSPECTION  
MATERIALS VERIFIED AT RECEIVING INSPECTION.

