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PRINT DATE: 06/29/92

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 06-1B-0800-X

SUBSYSTEM NAME: ARS - COOLING

REVISION : 7 06/26/92

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
■ LRU :	REGENERABLE CO2 REMOVAL SYSTEM	MC623-0016
■ SRU :	HS-C CANISTER	SV806930

PART DATA

■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
SORBENT HS-C CANISTER

■ QUANTITY OF LIKE ITEMS: 1

■ FUNCTION:

BRAZED ALUMINUM CANISTER CONTAINS SOLID AMINE SORBENT IN 2 SORBENT BEDS WHICH REMOVES CO2 FROM THE AIR STREAM BY ADSORPTION OF IT ONTO SORBENT MATERIAL. THIS CO2 IS DESORBED FROM THE BEDS BY EXPOSURE TO SPACE VACUUM. THE HEAT GENERATED BY ADSORPTION FROM ONE OF THE BEDS IS USED TO HELP DESORB CO2 FROM THE OTHER BED.

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LRU :REGENERABLE CO2 REMOVAL SYSTEM
ITEM NAME: HS-C CANISTER

REVISION# 7 06/26/92 R

CRITICALITY OF THIS
FAILURE MODE:2/2

- FAILURE MODE:
EXTERNAL LEAKAGE, INTERNAL LEAKAGE (ADSORBING BED TO DESORBING BED).

MISSION PHASE:
00 ON-ORBIT

- VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
: 105 ENDEAVOUR

- CAUSE:
MECHANICAL SHOCK, VIBRATION, CORROSION, MANUFACTURING DEFECT,
MISHANDLING.

- 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)

- MASTER MEAS. LIST NUMBERS: V61P2901A
: V61P2902A
: V61P2911A
: V61P2912A
: V61P2921A V61P2540A

- FAILURE EFFECTS -

- (A) SUBSYSTEM:
THE CONTROLLER WILL DETECT THE ANOMALY IN THE BED PRESSURE THROUGH THE
PRESSURE SENSOR AND AUTOMATICALLY SHUT DOWN THE SYSTEM. LOSS OF THE USE
OF THE RCRS.

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- (B) INTERFACING SUBSYSTEM(S):
INCREASED CABIN PPCO2.
- (C) MISSION:
POSSIBLE EARLY MISSION TERMINATION.
- (D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT
- (E) FUNCTIONAL CRITICALITY EFFECTS:
LOSS OF USE OF THE RCRS. LIOH CANISTERS MUST BE USED FOR CO2 REMOVAL UNTIL LANDING. THE LIOH SUPPLY IS ADEQUATE TO ACCOMMODATE A 3 DAY MISSION. TWO ADDITIONAL FAILURES (VCV OF LEAKING BED FAILS OPEN AND VACUUM VENT ISOLATION VALVE FAILS OPEN) WILL RESULT IN LOSS OF CABIN ATMOSPHERE (CRIT 1R3 PPP SCENARIO RESULTS).

- DISPOSITION RATIONALE -

- (A) DESIGN:
THE CANISTER IS CONSTRUCTED WITH ALTERNATING LAYERS OF 0.250 THICK HOG-OUT ALUMINUM FRAMES, BRAZED TOGETHER UTILIZING FLUXLESS METHOD. THE LAYERS ARE SEPARATED BY PARTING SHEETS AND PROTECTED BY END SHEETS ON EITHER END OF THE CORE. HEADERS ARE CONNECTED TO BOTH ENDS TO FORM TWO SEPARATE BEDS. HEADER IS 300 STAINLESS STEEL BOLTED TO THE CANISTER WITH AN ADHESIVE MIX WITH 0.008 DIAMETER GLASS BEADS AS A SEALING GASKET. EACH BED CONTAINS 27 LBS OF SOLID AMINE, AN ADSORBENT MATERIAL KNOWN AS HS-C. HS-C IS AN AGE SENSITIVE LIMITED LIFE ITEM.
- (B) TEST:
QUALIFICATION TEST FOR 100 MISSIONS:
QUAL TEST WILL BE CONDUCTED AT THE RCRS PACKAGE LEVEL OF ASSEMBLY. RANDOM VIBRATION INCREASING AT PLUS 6 db/oct FROM 20 TO 45 HZ; CONSTANT AT 0.003 g2/HZ FROM 45 TO 1000 HZ; DECREASING AT MINUS 6 db/oct FROM 1000 TO 2000 HZ FOR 48 MINUTES PER AXIS IN THREE ORTHOGONAL AXES.

ACCEPTANCE TEST:
THE HS-C CANISTER IS TESTED FOR INTERNAL/EXTERNAL LEAKAGE TEST. THE PROOF PRESSURE TESTS EXTERNALLY APPLIED PRESSURE OF 27 PSID TO EACH CANISTER LAYER AND EXTERNALLY APPLIED PROOF PRESSURE OF 25 PSID TO THE ENTIRE CANISTER WITH NO PERMANENT DEFORMATION OR DEGRADATION OF PERFORMANCE. BURST PRESSURE TESTED AT 36 PSID TO ALTERNATE CANISTER LAYERS AND 35 PSID APPLIED TO THE ENTIRE CANISTER WITH NO LEAKAGE.
OMRSD:
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD AT SYSTEM LEVEL.

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■ (C) INSPECTION:

RECEIVING INSPECTION

INCOMING MATERIAL IDENTIFICATION AND CERTIFICATION VERIFIED BY INSPECTION. DIMENSIONAL VERIFICATION OF PARTS PERFORMED AT VENDOR BY H. S. SOURCE INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCESSES AND CLEAN AREAS VERIFIED BY INSPECTION. CLEANLINESS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

FABRICATION AND ASSEMBLY OPERATIONS VERIFIED BY INSPECTION. DIMENSIONAL VERIFICATION OF BRAZED ASSEMBLY PERFORMED BEFORE AND AFTER BRAZING.

CRITICAL PROCESSES

BRAZE PROCESSING VERIFIED BY VISUAL AND COUPON ACCEPTANCE. ADHESIVE PROCESSING VERIFIED BY INSPECTION. EXTERNAL FINISHING PROCESSES VERIFIED BY INSPECTION. TORQUE OPERATIONS VERIFIED TO H. S. REQUIREMENTS.

TESTING

PROOF PRESSURE, INTERNAL/EXTERNAL LEAK AND FLOW TESTS PERFORMED. HELIUM LEAK TEST OF CANISTER DETAIL PERFORMED. ATP VERIFIED WITHIN LIMITS BY INSPECTION. VIBRATION TESTING OF ORIGINAL DEVELOPMENT TEST UNIT AS A DETAIL OF RCRS PACKAGE VERIFIED BY INSPECTION.

HANDLING/PACKAGING

HANDLING AND PART PROTECTION MAINTAINED PER H. S. REQUIREMENTS.

■ (D) FAILURE HISTORY:

NO FAILURE HISTORY.

■ (E) OPERATIONAL USE:

- 1) SHUT DOWN THE RCRS TO ISOLATE ALL VACUUM CYCLE VALVES.
- 2) CLOSE THE VACUUM VENT ISOLATION VALVE IF CONTINUATION OF LEAKAGE IS DETECTED.
- 3) INSTALL NEW LIQH CANISTERS FOR CO2 REMOVAL. THE LIQH CANISTER SUPPLY IS ADEQUATE FOR 3 DAYS.

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- APPROVALS -

RELIABILITY MANAGER : T. J. EAVENSON
 DESIGN ENGINEERING : P. J. CHEN
 QUALITY ENGINEERING : E. OCHOA
 NASA RELIABILITY :
 NASA SUBSYSTEM MANAGER :
 NASA QUALITY ASSURANCE :

K.L. Paster for 6/30/92
P.J. Chen for 6/29/92
E. Ochoa for T.J. Eavenson 6/29/92
John P. L. Paster for 9/18/92
9/5/92
8-21-92
K 8/21/92