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PRINT DATE: 06/29/92

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE  
NUMBER: 06-1B-0880-X

SUBSYSTEM NAME: ARS - COOLING

REVISION : 7 06/26/92

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	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
■ LRU :	REGENERABLE CO2 REMOVAL SYSTEM	MC623-0016
■ SRU :	MUFFLER, OUTLET	SV807090

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PART DATA

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■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
RCRS OUTLET MUFFLER

■ QUANTITY OF LIKE ITEMS: 1

■ FUNCTION:  
ATTENUATE NOISE AT THE REGENERABLE CO2 REMOVAL SYSTEM OUTLET, WHERE AIR  
WILL RETURN TO THE ATMOSPHERE REVITALIZATION SYSTEM CABIN RETURN AIR.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: 06-1B-0880-02**

SUBSYSTEM: ARS - COOLING  
LRU :REGENERABLE CO2 REMOVAL SYSTEM  
ITEM NAME: MUFFLER, OUTLET

REVISION# 7 06/26/92 R

CRITICALITY OF THIS  
FAILURE MODE:2/2

■ FAILURE MODE:  
RESTRICTED FLOW

MISSION PHASE:  
00 ON-ORBIT

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

■ CAUSE:  
MECHANICAL SHOCK, VIBRATION, CORROSION

■ 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:  
REDUCED AIRFLOW THROUGH THE BEDS. RCRS NOT REMOVING CO2 FROM CABIN AIR.  
LOSS OF USE OF RCRS.
- (B) INTERFACING SUBSYSTEM(S):  
INCREASED PPCO2 IN CABIN.
- (C) MISSION:  
POSSIBLE EARLY MISSION TERMINATION.

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- (D) CREW, VEHICLE, AND ELEMENT(S):  
NO EFFECT.
- (E) FUNCTIONAL CRITICALITY EFFECTS:  
LOSS OF USE OF THE RCRS. THE LIQH SUPPLY MUST BE USED FOR CO2 REMOVAL UNTIL LANDING. THE LIQH SUPPLY IS ADEQUATE TO ACCOMMODATE 3 DAY MISSION LOSS OF ALL THESE BACKUPS MAY RESULT IN LOSS OF THE CREW/VEHICLE. A 1R3 PPP CRITICALITY RESULTS.

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- DISPOSITION RATIONALE -  
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- (A) DESIGN:  
THE OUTLET MUFFLER USES 0.500 INCH THICK OPEN CELL POLYIMIDE ACOUSTIC FOAM AND LINED WITH A THIN ALUMINUM SHELL. MUFFLER HOUSING IS MADE OF 6061-T6 ALUMINUM TUBING WITH 2" BEADED TUBE CONNECTIONS AT BOTH ENDS. PRESSURE DROP OF 0.10 INCH OF WATER AT A MINIMUM FLOW OF 20 CFM. THE MUFFLER HAS A USEFUL LIFE/SHELF LIFE OF 43,200 HOURS WHICH IS THE EQUIVALENT OF A 10 YEAR PERIOD.
- (B) TEST:  
QUALIFICATION TEST FOR 100 MISSIONS:  
THE RCRS OUTLET MUFFLER IS SUBJECT TO RANDOM VIBRATION OF INCREASING AT 6 db/oct FROM 20 TO 150 HZ; CONSTANT AT 0.03 g<sup>2</sup>/HZ FROM 150 TO 1000 HZ; DECREASING AT 6 db/oct FROM 1000 TO 2000 HZ FOR THE DURATION OF 48 MINUTES PER AXIS IN THREE ORTHOGONAL AXES. SHOCK TESTED AT 20 G TERMINAL SAWTOOTH SHOCK PULSE FOR 11 MILLISECOND DURATION. ACOUSTIC NOISE TESTED WITH SOUND PRESSURE LEVEL IN THE LIMITS FROM 56 db TO 35 db AT THE FREQUENCY RANGE FROM 63 HZ TO 8000 HZ.  
  
ACCEPTANCE TEST:  
PROOF PRESSURE AT 1.5 TIMES OPERATING PRESSURE (18 PSIA MAX.) WITH NO EVIDENCE OF DAMAGE OR DEGRADATION IN PERFORMANCE. LEAKAGE TESTED AT RCRS PACKAGE LEVEL OF LESS THAN 9 SCCM LEAK RATE AT CABIN PRESSURE OF 14.7-PSIA. PERFORMANCE CHARACTERISTICS ARE VERIFIED.  
  
OMRSD:  
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD AT SYSTEM LEVEL.
- (C) INSPECTION:  
RECEIVING INSPECTION  
INCOMING PART IDENTIFICATION AND CERTIFICATION VERIFIED BY INSPECTION. DIMENSIONAL VERIFICATION AT VENDOR BY H. S. SOURCE INSPECTION. ANODIZE PROCESS VERIFIED BY INSPECTION.

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CONTAMINATION CONTROL  
CONTAMINATION CONTROL PROCESSES AND CLEAN AREAS VERIFIED BY INSPECTION.  
VISUAL CLEAN MAINTAINED IN-PROCESS. UNIT INTERNAL PRECISION CLEAN LEVEL  
VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION  
FABRICATION OPERATIONS VERIFIED BY INSPECTION.

CRITICAL PROCESSES  
BONDING PROCESS VERIFIED BY INSPECTION.

TESTING  
PROOF, LEAK, AND FLOW ACCEPTANCE TESTING VERIFIED BY INSPECTION.  
VIBRATION TEST PERFORMED DURING QUALIFICATION TESTING..

HANDLING/PACKAGING  
HANDLING AND PARTS PROTECTION PER H. S. REQUIREMENTS.

■ (D) FAILURE HISTORY:  
NO FAILURE HISTORY.

■ (E) OPERATIONAL USE:

- 1) SHUT DOWN THE RCRS IF PPCO2 LEVEL BECOMES UNACCEPTABLE.
- 2) INSTALL NEW LIOH CANISTERS FOR CO2 REMOVAL. THE LIOH CANISTER  
SUPPLY IS ADEQUATE FOR 3 DAYS (MINIMUM).

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

*K. L. Preston for 6/30/92*  
*P. J. Chen*  
*for T. J. Eavenson 6/30/92*  
*for P. J. Chen 9/8/92*  
*for E. Ochoa 9/8/92*  
*for (4724) 8/21/92*  
*K 8/21/92*