

## FAILURE MODES EFFECTS ANALYSIS (PMEA) -- CRITICAL HARDWARE

NUMBER: 06-1B-0730-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 :	MOTOR	SV766467-2
■ SRU :	FAN ASSEMBLY	SV767350-2

## PART DATA

■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
REGENERABLE CO2 REMOVAL SYSTEM CIRCULATION FAN

■ QUANTITY OF LIKE ITEMS: 1

## ■ FUNCTION:

DRAWS AIR FROM CABIN RETURN AIR DUCTING UPSTREAM OF THE CABIN FAN AND FORCES IT THROUGH THE REGENERABLE CO2 REMOVAL SYSTEM. THE AIR IS ROUTED BY VALVES THROUGH THE ON-LINE SORBENT BED AND RETURNS TO THE ATMOSPHERE REVITALIZATION SYSTEM UPSTREAM OF THE CABIN FAN.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: 06-1B-0730-02

SUBSYSTEM: ARS - COOLING  
LRU :REGENERABLE CO2 REMOVAL SYSTEM  
ITEM NAME: FAN ASSEMBLY

REVISION# 7 06/26/92 R

CRITICALITY OF THIS  
FAILURE MODE:2/2

■ FAILURE MODE:  
EXTERNAL LEAKAGE

MISSION PHASE:  
OO 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)

■ MASTER MEAS. LIST NUMBERS: V61P2901A  
: V61P2902A  
: V61P2911A  
: V61P2912A

- FAILURE EFFECTS -

■ (A) SUBSYSTEM:  
POTENTIAL SYSTEM CONTAMINATION DUE TO PROCESSING OF UNFILTERED AIR  
(FILTER IS UPSTREAM OF FAN). POSSIBLE LOSS OF USE OF THE RCRS.  
LOSS OF AIR FLOW THROUGH THE RCRS IF LEAKAGE IS DOWNSTREAM OF FAN.

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- (B) INTERFACING SUBSYSTEM(S):  
INCREASED CABIN PPCO2 LEVEL. POSSIBLE REDUCED COOLING AIR FLOW THROUGH FLIGHT DECK AVIONICS LRU'S.
- (C) MISSION:  
POSSIBLE SHORTENED MISSION. DECISION BASED ON MAGNITUDE OF LEAK.
- (D) CREW, VEHICLE, AND ELEMENT(S):  
NO EFFECT. EARLY MISSION TERMINATION WILL PRECLUDE LOSS OF CREW OR VEHICLE.
- (E) FUNCTIONAL CRITICALITY EFFECTS:  
N/A

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- DISPOSITION RATIONALE -  
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- (A) DESIGN:  
RCRS FAN IS A CENTRIFUGAL FLOW TYPE DRIVEN BY A 115 VOLT, 3 PHASE, 400 HZ, 4 WIRE WYE CONNECTED INDUCTION MOTOR. THE FAN VOLUTE HOUSING IS MADE OF CAST ALUMINUM. THE IMPELLER IS ALUMINUM. THE MOTOR HAS AN ALUMINUM FLANGED HOUSING. SEAL MATERIAL IS VITON (FLUOROCARBON RUBBER). SIGNIFICANT LEAKAGE IN THE RCRS FAN IS CONSIDERED REMOTE.
- (B) TEST:  
QUALIFICATION TEST FOR 100 MISSIONS: SUBJECTED TO RANDOM VIBRATION AT RCRS ASSEMBLY LEVEL FOR 48 MINUTES PER AXIS IN THREE ORTHOGONAL AXES, AT INCREASING RATE OF PLUS 6 db/oct FROM 20 TO 45 HZ; CONSTANT AT 0.003 g2/HZ FROM 45 TO 1000 HZ; DECREASING AT THE RATE OF MINUS 6 db/oct FROM 1000 TO 2000 HZ. SHOCK TEST OF 20 G SAWTOOTH SHOCK IMPULSE FOR 11 MILLISECOND DURATION.  
  
ACCEPTANCE TEST:  
AIR FLOW AND LEAK TEST IS VERIFIED DURING ACCEPTANCE TESTING. PROOF PRESSURE AT 1.5 TIMES THE OPERATING PRESSURE DIFFERENTIAL (18 PSI) WITH NO EVIDENCE OF DAMAGE OR PERMANENT DEFORMATION. EACH FAN IS BURNED-IN, POWER DRAIN AND POWER FACTOR ARE MEASURED. FAN PERFORMANCE IS VERIFIED FOR AIRFLOW AND DELTA-P WITH THREE AND TWO PHASE POWER SUPPLY.
- OMRSD:  
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD AT SYSTEM LEVEL.
- (C) INSPECTION:  
RECEIVING INSPECTION

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INCOMING PART/MATERIAL IDENTIFICATION AND CERTIFICATION VERIFIED BY INSPECTION. MOTOR KITTING, SOLDER, PRECAP AND ATP VERIFIED AT VENDOR BY H. S. SOURCE INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCESSES AND CLEAN AREAS VERIFIED BY INSPECTION. TEST EQUIPMENT CLEANLINESS VERIFIED BY INSPECTION. PRODUCT CLEANLINESS VERIFIED TO DRAWING REQUIREMENTS BY INSPECTION.

ASSEMBLY/INSTALLATION

ASSEMBLY OPERATIONS OF MOTOR AND ROTOR ASSEMBLY 100% VERIFIED BY INSPECTION. MAINTENANCE OF CORROSION PROTECTION REQUIREMENTS VERIFIED BY INSPECTION. ROTOR BALANCING AND CRITICAL DIMENSIONS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

ROTOR (VENDOR) AND HOUSING ANODIZE VERIFIED BY INSPECTION. TORQUE OPERATIONS VERIFIED TO H. S. REQUIREMENTS.

TESTING

PROOF, LEAK, IR, START UP CURRENT AND RUN-IN VERIFICATION PERFORMED DURING MOTOR AND ROTOR ATP. FUNCTIONAL PERFORMANCE VERIFIED AT RCRS ATP WHICH IS WITNESSED BY INSPECTION. VIBRATION TESTING PERFORMED ON DEVELOPMENT TEST UNIT.

HANDLING/PACKAGING

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

- (D) FAILURE HISTORY:  
NO FAILURE HISTORY.

- (E) OPERATIONAL USE:  
SHUT DOWN THE RCRS AND INSTALL NEW LIQH CANISTERS FOR CO2 REMOVAL. THE LIQH CANISTER SUPPLY IS ADEQUATE FOR 3 DAYS.

- 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. Patten for 6/30/92*  
*P. J. Chen 7/1/92*  
*Dr. K.L. Patten for T.J. Eavenson 6/30/92*  
*Subsystem Mgr. 9/8/92*  
*9/9/92*  
*8-2-92*  
*K/2/92*