

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.

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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:
 FAILS OFF, LOSS OF OUTPUT.

MISSION PHASE:
 00 ON-ORBIT

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

- CAUSE:
 MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION, PHYSICAL BINDING/
 JAMMING, ELECTRICAL OPEN.

- 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
 : V61P2923A

- FAILURE EFFECTS -

- (A) SUBSYSTEM:
 NO AIR IS FLOWING THROUGH THE ADSORBENT BED, THUS, NO CO2 IS BEING
 REMOVED FROM THE CABIN. LOSS OF USE OF THE RCRS.

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- **(B) INTERFACING SUBSYSTEM(S):**
INCREASE IN CABIN CO2 CONCENTRATION.
- **(C) MISSION:**
POSSIBLE EARLY MISSION TERMINATION DUE TO LOSS OF RCRS CAPABILITY TO REMOVE CO2.
- **(D) CREW, VEHICLE, AND ELEMENT(S):**
NO EFFECT
- **(E) FUNCTIONAL CRITICALITY EFFECTS:**
LOSS OF USE OF THE RCRS, BACKUP LIQH CANISTER MUST BE USED FOR CO2 REMOVAL UNTIL LANDING. THE LIQH SUPPLY IS ADEQUATE TO ACCOMMODATE A 3 DAY MISSION. LOSS OF ALL BACKUPS MAY RESULT IN LOSS OF CREW/ VEHICLE. A 1R3 PPP CRITICALITY SCENARIO RESULTS.

- DISPOSITION RATIONALE -

- **(A) DESIGN:**
RCRS FAN IS A CENTRIFUGAL FLOW TYPE DRIVEN BY A 115 VOLT, 4000 HZ, 4 WIRE WYE CONNECTED INDUCTION MOTOR. THE FAN VOLUTE HOUSING IS MADE OF CAST ALUMINUM. THE IMPELLER IS ALUMINUM. THE MOTOR HAS A ALUMINUM FLANGED HOUSING AND IS CAPABLE OF OPERATING UNDER A 2 PHASE CONDITION OR THE LOSS OF ANY ONE PHASE. THE MOTOR HAS PRECISION BALL BEARINGS OF THE DEEP GROOVE TYPE AND IS PRELOADED TO MINIMIZE THE EFFECTS OF THE INDUCED ENVIRONMENT UPON THE PERFORMANCE OF THE FAN. THE BEARINGS SELECTED ARE FROM A FAMILY OF BEARINGS WHICH HAVE OPERATED FOR MORE THAN 120,000 HOURS (B10).
- **(B) TEST:**
QUALIFICATION TEST FOR 100 MISSIONS: AT RCRS ASSEMBLY LEVEL RANDOM VIBRATION INCREASING AT 6 db/oct FROM 20 TO 45 HZ; CONSTANT AT 0.003 g2/HZ FROM 45 TO 1000 HZ; DECREASING AT -6 db/oct FROM 1000 TO 2000 HZ FOR 48 MINUTES PER AXIS IN THREE ORTHOGONAL AXES. SHOCK TEST OF 20 G SAWTOOTH SHOCK IMPULSE FOR 11 MILLISECOND DURATION. 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.
- 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.

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OMRSD:

ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD AT SYSTEM LEVEL.

■ (C) INSPECTION:

RECEIVING INSPECTION

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

MOTOR CONTINUITY, DIELECTRIC, IR, BURN-IN, STARTING CURRENT, SHAFT DEFLECTION AND ELECTRICAL BONDING VERIFICATION PERFORMED AT VENDOR AND VERIFIED BY H. S. SOURCE INSPECTION. PROOF, LEAK, IR, START UP CURRENT, AND RUN-IN VERIFICATION PERFORMED DURING MOTOR AND ROTOR ATP. FUNCTIONAL PERFORMANCE VERIFIED AT RCRS ASSEMBLY ATP WHICH IS WITNESSED BY INSPECTION. VIBRATION TESTING OF ORIGINAL DEVELOPMENT TEST UNIT.

HANDLING/PACKAGING

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

■ (D) FAILURE HISTORY:

NO FAILURE HISTORY OF SIMILAR IMU FAN.

■ (E) OPERATIONAL USE:

SHUTDOWN THE RCRS AND INSTALL NEW CANISTERS FOR CO2 REMOVAL. THE L10H 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 :

V.L. Proctor for 6/20/92
[Signature]
Dir V.L. Proctor for T.J. Eavenson 6/20/92
J.P. [Signature] 7/18/92
[Signature] 9/9/92
[Signature] 8/1/92
[Signature] 8/1/92