

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE
 NUMBER: 06-1B-0850-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
■ LRU :	COMPRESSOR ASSEMBLY	SV806944
■ SRU :	COMPRESSOR HEAD	SV806923
■ SRU :	COMPRESSOR MOTOR	SV806924

 PART DATA

- EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
 ULLAGE SAVE COMPRESSOR
- QUANTITY OF LIKE ITEMS: 1
- FUNCTION:
 COMPRESSOR REDUCES AMOUNT OF CONSUMABLES LOST BY PUMPING BED PRESSURE FROM 14.7 TO 3.0 PSIA, IN 75 SECONDS, PRIOR TO BED DESORPTION.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE

NUMBER: 06-18-0850-01

REVISION# 7 06/26/92 R

SUBSYSTEM: ARS - COOLING
LRU :REGENERABLE CO2 REMOVAL SYSTEM
ITEM NAME: COMPRESSOR MOTOR

CRITICALITY OF THIS
FAILURE MODE:2/2

■ FAILURE MODE:
FAILS ON, FAILS OFF

MISSION PHASE:
00 ON-ORBIT

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

■ CAUSE:
MECHANICAL SHOCK, VIBRATION, CORROSION, ELECTRICAL SHORT.

■ 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
: V61P2922A

- FAILURE EFFECTS -

■ (A) SUBSYSTEM:
FOR FAILS ON, THE CONTROLLER WILL REMOVE POWER FROM THE COMPRESSOR.
LOSS OF USE OF THE COMPRESSOR, HOWEVER, THE RCRS WILL CONTINUE TO
OPERATE IN THE COMPRESSOR LATCH-OUT MODE.

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- (B) INTERFACING SUBSYSTEM(S):
EXCESSIVE USE OF CONSUMABLES AS COMPRESSOR CANNOT BE USED TO RECOVER CABIN AIR FROM SORBENT BED BEFORE EXPOSURE TO VACUUM.
- (C) MISSION:
POTENTIAL EARLY MISSION TERMINATION DUE TO EXCESSIVE USE OF CONSUMABLES.
- (D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT.
- (E) FUNCTIONAL CRITICALITY EFFECTS:

- DISPOSITION RATIONALE -

- (A) DESIGN:
THE COMPRESSOR IS AN OIL-LESS DESIGN, ROTARY VANE TYPE WITH 4 CARBON/PHENOLIC VANES, NITRONIC 60 LINER, AND ALUMINUM CYLINDER HOUSING. THE MOTOR PROVIDES THE ROTARY POWER TO DRIVE THE ULLAGE SAVE COMPRESSOR. THE MOTOR IS AN INDUCTION TYPE, DRIVEN BY 115 VOLT, 3 PHASE, 400 HZ. 4 WIRE WYE CONNECTED-POWER SUPPLY WITH CASE GROUND. THE MOTOR WILL OPERATE WITH A TWO PHASE POWER SUPPLY. HOWEVER, IT WILL NOT START UP ON TWO PHASE POWER. THE COMPRESSOR/MOTOR HAS SHOCK MOUNTS, MINIMUM OPERATING LIFE OF 4320 HOURS WITH 172,800 START CYCLES FOR 90 SECONDS EACH ON 11.5 MINUTE INTERVALS.
- (B) TEST:
QUALIFICATION TEST FOR 100 MISSION LIFE:
TESTING WITH THE COMPRESSOR INSTALLED AT THE ASSEMBLY LEVEL ONLY.
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 DURATION OF 48 MINUTES PER AXIS IN THREE ORTHOGONAL AXES.
SHOCK TEST BY ANALYSIS OF 20 G SAWTOOTH SHOCK IMPULSE FOR 11 MILLISECONDS DURATION.

ACCEPTANCE TEST:
MOTOR AND COMPRESSOR ARE SUBJECTED TO BURN-IN TEST/RUN-IN FOR 16 DAY MISSION SIMULATION TO VERIFY PERFORMANCE.

LIFE/ENDURANCE TEST:
100 MISSIONS EQUIVALENT - 90 SECOND ON CYCLE FOLLOWED BY 11.5 MINUTES COOLING PERIOD.
OMRSD:
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD AT SYSTEM LEVEL.

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■ (C) INSPECTION:

RECEIVING INSPECTION

INCOMING PARTS/MATERIAL IDENTIFICATION AND CERTIFICATION VERIFIED BY INSPECTION. ANODIZE AND PROTECTIVE FINISH PERFORMED AT VENDOR. RESISTANCE, DIELECTRIC, IR, BURN/RUN IN, SPEED, TORQUE, LOCKED ROTOR AND WEIGHT VERIFICATION PERFORMED AS PART OF VENDOR ATP. VENDOR KIT, SOLDER, PRECAP AND ATP VERIFIED BY H. S. SOURCE INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCESSES AND CLEAN AREAS VERIFIED BY INSPECTION. ASSEMBLY PRECISION CLEAN LEVEL VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

ASSEMBLY AND INSTALLATION OPERATIONS VERIFIED BY INSPECTION. BALANCING VERIFIED BY INSPECTION. CLEARANCE DIMENSIONS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

TORQUE OPERATIONS VERIFIED TO H. S. REQUIREMENTS.

TESTING

RUN IN, PUMP DOWN, POWER CONSUMPTION, START TIME/CURRENT VERIFIED DURING ASSEMBLY INPROCESS TESTING. FUNCTION VERIFIED DURING RCRS UNIT ATP TESTING WHICH IS VERIFIED BY INSPECTION. VIBRATION TEST OF ORIGINAL DEVELOPMENT TEST UNIT AS A DETAIL OF RCRS ASSEMBLY VERIFIED BY INSPECTION DURING QUALIFICATION.

HANDLING/PACKAGING

HANDLING/PARTS PROTECTION PER H. S. REQUIREMENTS.

■ (D) FAILURE HISTORY:

NO FAILURE HISTORY.

■ (E) OPERATIONAL USE:

1) SHUT DOWN THE RCRS WHEN CONSUMABLES LEVEL IS LOW.

2) INSTALL NEW LIOH CANISTERS FOR CO2 REMOVAL. THE LIOH 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. Preston for 6/30/92
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