

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.

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NUMBER: 06-1B-0850-03

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

CRITICALITY OF THIS
FAILURE MODE:2/2

■ FAILURE MODE:
EXTERNAL LEAKAGE

MISSION PHASE:
00 ON-ORBIT

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

■ CAUSE:
MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION

■ 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:
UPSTREAM EXTERNAL LEAKAGE MAY RESULT IN INABILITY TO PERFORM ULLAGE
SAVE. POSSIBLE REVERSE AIR FLOW FROM THE CABIN TO THE RCRS DURING BED
EQUALIZATION. THE CONTROLLER WILL SHUT DOWN THE RCRS.

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

- DISPOSITION RATIONALE -

- (A) DESIGN:
THE COMPRESSOR IS OF OIL-LESS DESIGN ROTARY VANE TYPE WITH 4 CARBON/PHENOLIC VANES, NITRONIC 60 LINER, AND ALUMINUM CYLINDER HOUSING. THE MAXIMUM OPERATING LIFE OF 4320 HOURS WITH 172,800 START CYCLES OF 90 SECONDS EACH ON 11.5 MINUTE INTERVALS.
- (B) TEST:
QUALIFICATION TEST FOR 100 MISSIONS:
TESTING WITH THE COMPRESSOR INSTALLED IN THE HIGHER LEVEL ASSEMBLY ONLY. RANDOM VIBRATION INCREASING AT 6 db/oct FROM 20 TO 45; CONSTANT AT 0.003 g²/HZ FROM 45 TO 1000 HZ; THEN DECREASE AT -6 db/oct FROM 1000 TO 2000 HZ FOR DURATION OF 48 MINUTES PER AXIS IN 3 ORTHOGONAL AXES. SHOCK TEST BY ANALYSIS OF 20 G SAWTOOTH SHOCK IMPULSE FOR 11 MILLISECONDS DURATION.

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

LIFE/ENDURANCE TEST:
FOR 100 MISSIONS - 90 SECOND ON CYCLE FOLLOWED BY 11.5 MINUTE 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. 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:

SHUTDOWN THE RCRS AND INSTALL NEW CANISTERS FOR CO2 REMOVAL. THE LIOH CANISTER SUPPLY IS ADEQUATE FOR 3 DAYS (MINIMUM).

- APPROVALS -

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

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