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PRINT DATE: 08/30/93

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CRITICAL HARDWARE
NUMBER: 06-1B-0840-X**

SUBSYSTEM NAME: ARS - COOLING

REVISION: 8 08/30/93

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: REGENERABLE CO2 REMOVAL SYSTEM	MC623-0016
LRU	: ACTUATOR	SV801921

PART DATA

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
VACUUM CYCLE VALVE ACTUATOR**

QUANTITY OF LIKE ITEMS: 2

**FUNCTION:
ELECTRICAL ACTUATORS DRIVE THE LINKAGES WHICH OPERATE THE VACUUM CYCLE
VALVE POPPETS.**

FAILURE MODE EFFECTS ANALYSIS (FMEA) - CRITICAL HARDWARE

NUMBER: 06-1B-0840-01

REVISION# 8 08/30/93 R

**SUBSYSTEM NAME: ARS - COOLING
LRU: REGENERABLE CO2 REMOVAL SYSTEM
ITEM NAME: ACTUATOR**

**CRITICALITY OF THIS
FAILURE MODE: 2 2**

**FAILURE MODE:
FAILS TO ACTUATE**

**MISSION PHASE:
OO 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:
UNABLE TO ACTUATE VACUUM CYCLE VALVES, THUS LOSS OF USE OF THE RCRS.
LOSS OF ABILITY TO ISOLATE RCRS LEAKS.**

**(B) INTERFACING SUBSYSTEM(S):
INABILITY TO REMOVE CO2 FROM THE CABIN. INCREASED PPO2 IN CABIN.**

**(C) MISSION:
EARLY TERMINATION OF MISSION.**

(D) CREW, VEHICLE, AND ELEMENT(S):

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NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECTS:

1) LOSS OF USE OF THE RCRS. BACKUP LIQH CANISTER MUST BE USED FOR CO2 REMOVAL UNTIL LANDING. THE LIQH 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.

2) EXCESSIVE LOSS OF CONSUMABLES IF BOTH VACUUM AND AIR POPPETS IN EITHER BED FAILED OPEN. A 1R3 PPP CRIT SCENARIO RESULTS IF THE VACUUM VENT ISOLATION VALVE ALSO FAILED OPEN.

-DISPOSITION RATIONALE-

(A) DESIGN:

THE VCV ACTUATOR IS A SINGLE PHASE, 115 VOLT, 400 HZ MOTOR WITH A FLANGE MOUNTED HOUSING CONTAINING PLANETARY GEAR DRIVING THE OUTPUT SHAFT. AN INTEGRAL ELECTROMECHANICAL BRAKE PREVENTS VALVE LINKAGE BACKLASH. A POSITION INDICATOR AT THE CCW END OF TRAVEL DETERMINES IF THE VALVE IS CLOSED. THE ACTUATOR OPERATIONAL LIFE IS 86,400 FULL TRAVEL CYCLES IN 5000 HOURS AT 30 IN-LBS MINIMUM TORQUE.

(B) TEST:

QUALIFICATION TEST FOR 100 MISSIONS:

TESTING IS CONDUCTED WITH THE ACTUATOR INSTALLED IN THE RCRS PACKAGE LEVEL. RANDOM VIBRATION INCREASING AT PLUS 6 db/oct FROM 20 TO 45 HZ; CONSTANT AT 0.003 g2/HZ FROM 45 TO 1000 HZ; DECREASING AT MINUS 6 db/oct FROM 1000 TO 2000 HZ FOR 48 MINUTES PER AXIS IN THREE ORTHOGONAL AXES. THE ACTUATOR IS TESTED FOR 50,000 CYCLES WITH NO EVIDENCE OF FAILURE OR DAMAGE.

ACCEPTANCE TEST:

FUNCTIONAL AND CALIBRATION TESTS TO VERIFY PERFORMANCE AT NORMAL AND WORST CASE DESIGN POINTS. DIELECTRIC STRENGTH TEST FOR MOTOR/BRAKE AT 1250 VOLTS RMS MAXIMUM. CONTINUOUS 16+2 DAY SIMULATION TESTED WITH SEVEN MAN CREW SIZE AT CABIN PRESSURE OF 14.7 AND 10.2 PSIA WITH NO FAILURE.

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. RESISTANCE, DIELECTRIC, WEIGHT, BOND RESISTANCE, STALL, HOLDING, TRAVEL TIME AND REPEATABILITY VERIFICATION PERFORMED AS PART OF VENDOR ATP. ANODIZE AND PROTECTIVE FINISH PERFORMED AT VENDOR. VENDOR KIT, PRECAP, SOLDER AND ATP VERIFIED BY H. S. SOURCE INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCESSES AND CLEAN AREAS VERIFIED BY INSPECTION. VISUAL CLEAN VERIFIED.

ASSEMBLY/INSTALLATION

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INSTALLATION AND RIGGING VERIFIED BY INSPECTION.

CRITICAL PROCESSES
TORQUE OPERATIONS VERIFIED TO H. S. REQUIREMENTS.

TESTING
FUNCTION VERIFIED DURING RCRS UNIT ATP TESTING WHICH IS VERIFIED BY INSPECTION. VIBRATION TEST OF ORIGINAL DEVELOPMENT TEST UNIT AS A SUBASSEMBLY 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.

- APPROVALS -

EDITORIALLY APPROVED : RI
EDITORIALLY APPROVED : JSC
TECHNICAL APPROVAL : VIA CR

[Handwritten Signature]
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