

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE
 NUMBER: 06-18-0920-X

SUBSYSTEM NAME: ARS - COOLING

REVISION : 1 06/26/92

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
■ LRU :	REGENERABLE CO2 REMOVAL SYSTEM	MC623-0016
■ SRU :	DUCTS, VACUUM	SV807120
■ SRU :	DUCTS, VACUUM	SV807135
■ SRU :	DUCTS, AIR	SV807141
■ SRU :	DUCTS, AIR	V070-623600

 PART DATA

- EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
RCRS AIR AND VACUUM DUCTS
- QUANTITY OF LIKE ITEMS: 1
ONE SET
- FUNCTION:
PROVIDE AIR FLOW PATH FROM RCRS INLET THROUGH THE TWO SORBENT BEDS AND THE PRESSURE EQUALIZATION VALVE MODULE TO THE ULLAGE SAVE COMPRESSOR, AND RETURN TO THE ARS CABIN AIR RETURN STREAM. PROVIDE FLOW PATH TO THE VACUUM VENT DUCT FOR THE PURPOSE OF BED REGENERATION.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE
NUMBER: 06-1B-0920-02

SUBSYSTEM: ARS - COOLING
LRU :REGENERABLE CO2 REMOVAL SYSTEM
ITEM NAME: DUCTS, AIR

REVISION# 1 06/26/92 R

CRITICALITY OF THIS
FAILURE MODE:2/2

- FAILURE MODE:
RESTRICTED FLOW

MISSION PHASE:
OO 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

- FAILURE EFFECTS -

- (A) SUBSYSTEM:
REDUCTION OF AIRFLOW TO THE ABSORBING BED IF THE RESTRICTION IS IN THE AIR DUCT. INABILITY TO COMPLETELY REGENERATE THE DESORBING BED IF RESTRICTED FLOW IS IN THE VACUUM DUCT. FAILURE OF EITHER DUCT WILL RESULT IN SHUTTING DOWN OF THE RCRS DUE TO INABILITY TO REMOVE CO2.

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- (B) INTERFACING SUBSYSTEM(S):
INCREASED PPO2 IN CABIN.
- (C) MISSION:
POSSIBLY SHORTENED MISSION.
- (D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT
- (E) FUNCTIONAL CRITICALITY EFFECTS:
LOSS OF USE OF RCRS - LIOH MUST BE USED FOR CO2 REMOVAL UNTIL LANDING,
THE LIOH CANISTER SUPPLY IS ADEQUATE TO REMOVE CO2 FOR 3 DAYS (MINIMUM).
LOSS OF ALL REDUNDANCY MAY RESULT IN LOSS OF CREW/VEHICLE. A IR3 PPP
CRITICALITY SCENARIO RESULTS.

 - DISPOSITION RATIONALE -

- (A) DESIGN:
THE RCRS DUCTING CONSISTS OF VACUUM DUCT AND AIR DUCT. THE VACUUM
DUCT IS FABRICATED FROM ALUMINUM WITH FLANGES FABRICATED FROM ALUMINUM
BAR. THE AIR DUCT IS A RIGID-ARAMID FABRIC EPOXY RESIN IMPREGNATION.
THE SECTIONS ARE HARD MOUNTED BY BRACKET/BAND CLAMP ASSEMBLY.
- (B) TEST:
QUALIFICATION TEST FOR 100 MISSION LIFE:
VACUUM VENT DUCT:
CERTIFICATION BY ANALYSIS FOR PRESSURE, HUMIDITY, SALT, FOG, TEMPERATURE
ENVIROMENT, FUNGUS, ACCELERATION, SHOCK AND VIBRATION.

AIR DUCT:
RANDOM VIBRATION AT PLUS 6 db/oct FROM 20 TO 150 Hz; CONSTANT AT 0.09
g2/Hz FROM 150 TO 900 Hz; DECREASING AT 6 db/oct FOR THE DURATION OF 48
MINUTES PER AXIS. TESTING OF SIMILAR MATERIAL SHOWS THAT RIGID
EPOXY/ARAMID DUCTS ARE UNAFFECTED BY HUMIDITY AND TEMPERATURE WITHIN
THE LIMITS IMPOSED BY THE CABIN ATMOSPHERE. TENSILE STRENGTH (50 KSI)
REMAINED UNCHANGED AFTER EXPOSURE TO 100 PHM (PARTS PER HUNDRED
MILLION) AT 70F FOR 1000 HOURS.

ACCEPTANCE TEST: FLOW TEST IS VERIFIED DURING ACCEPTANCE TESTING FOR
NO FLOW RESTRICTION. PROOF PRESSURE TEST TO 1.5 TIMES THE OPERATING
PRESSURE (18 PSIA MAX) WITH NO EVIDENCE OF FAILURE.
OMRSD:
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD
AT SYSTEM LEVEL.

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■ (C) INSPECTION:

RECEIVING INSPECTION

INCOMING PART/MATERIAL IDENTIFICATION AND CERTIFICATION VERIFIED BY INSPECTION. DIMENSIONAL VERIFICATION OF PARTS PERFORMED AT VENDOR BY H. S. SOURCE INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCESSES AND CLEAN AREAS VERIFIED BY INSPECTION. PRECISION CLEAN VERIFIED AT RCRS UNIT LEVEL.

ASSEMBLY/INSTALLATION

INSTALLATION VERIFIED BY INSPECTION. BONDING OF PORT VERIFIED BY INSPECTION.

CRITICAL PROCESSES

WELDING VERIFIED BY INSPECTION (VISUAL). BONDING VERIFIED BY INSPECTION. TORQUE OPERATIONS VERIFIED TO H. S. REQUIREMENTS. RIVETING OPERATIONS VERIFIED BY INSPECTION.

TESTING

FUNCTION AND LEAK TEST PERFORMED AS PART OF RCRS ATP WHICH IS VERIFIED BY INSPECTION. VIBRATION TEST OF ORIGINAL DEVELOPMENT TEST UNIT AS A DETAIL OF RCRS ASSEMBLY VERIFIED BY INSPECTION DURING QUALIFICATION TESTING.

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 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 :

K.L. Priebe for T.J. Eavenson 6/30/92
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Eric S. MacLennan
William J. MacLennan 9/8/92
Eric S. MacLennan 9/9/92
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