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-0920-01

REVISION# 7 06/26/92 R

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

CRITICALITY OF THIS FAILURE MODE:1/1

■ FAILURE MODE:
EXTERNAL LEAKAGE

MISSION PHASE:
OO ON-ORBIT

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

■ CAUSE:
MECHANICAL SHOCK, VIBRATION, CORROSION

■ 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:
LOSS OF USE OF RCRS. EXCESSIVE SYSTEM LEAKAGE WILL CAUSE THE RCRS TO SHUT DOWN AUTOMATICALLY.

■ (B) INTERFACING SUBSYSTEM(S):
POSSIBLE LOSS OF COOLING AIR FLOW THROUGH FLIGHT DECK AVIONICS LRU'S.

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CONNECTION OF CABIN AIR TO VACUUM IF VACUUM DUCT IS LEAKING.

■ (C) MISSION:
EARLY MISSION TERMINATION. LIOH CANISTER MUST BE USED UNTIL LANDING.

■ (D) CREW, VEHICLE, AND ELEMENT(S):
POSSIBLE LOSS OF CREW/VEHICLE DUE TO FAILURE OF THE AFFECTED AVIONICS AS THE RESULT OF LRU OVERHEATING.

■ (E) FUNCTIONAL CRITICALITY EFFECTS:
1) LOSS OF USE OF THE RCRS. LIOH MUST BE USED FOR CO2 REMOVAL UNTIL LANDING. THE LIOH CANISTER SUPPLY IS ADEQUATE FOR THREE DAYS (MINIMUM). LOSS OF ALL REDUNDANCY MAY RESULT IN LOSS OF CREW/VEHICLE (1R3 PPP CRIT)

2) LEAK IN VACUUM DUCT PLUS FAILED OPEN OF VACUUM VENT ISOLATION VALVE RESULTS IN VENTING CABIN ATMOSPHERE OVERBOARD (1R2 PPP EFFECT).

- 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 BRAKET/BAND CLAMP ASSEMBLY.

■ (B) TEST:
QUALIFICATION TEST FOR 100 MISSION LIFE:
VACUUM DUCT:
CERTIFICATION BY ANALYSIS FOR PRESSURE, HUMIDITY, SALT, FOG, TEMPERATURE ENVIRONMENT, FUNGUS, ACCELERATION, SHOCK AND VIBRATION.

AIR DUCT:
THE TEST OF SIMILAR MATERIAL SHOW 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) OZONE AT 70F FOR 1000 HOURS. TRANSIENT VIBRATIONS, RANDOM VIBRATIONS AND CRASH LOADS WERE CERTIFIED BY TEST AND ANALYSIS.

ACCEPTANCE TEST: LEAKAGE TEST IS VERIFIED DURING ACCEPTANCE TESTING WITH SYSTEM LEAKAGE NOT TO EXCEED 9 SCCM AT 14.7 PSIA CABIN ATMOSPHERE. PROOF PRESSURE TESTED AT 1.5 TIMES OPERATING PRESSURE (18 PSIA MAX) WITH NO EVIDENCE OF DAMAGE OR PERMANENT DEFORMATION. VACUUM DUCT IS SUBJECT TO 20 PSID PRESSURE TEST TO VERIFY NO COLLAPSE OCCURRED.
OMRSD:
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD

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AT SYSTEM LEVEL.

■ (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:
CLOSE VACUUM VENT ISOLATION VALVE TO LIMIT CABIN AIR OVERBOARD TO LESS THAN FOUR (4) LBS/HR. SHUT DOWN THE RCRS AND INSTALL NEW LIOH CANISTERS FOR CO2 REMOVAL. LIOH CANISTER SUPPLY IS ADEQUATE FOR 3 DAYS (MINIMUM).

- APPROVALS -

RELIABILITY MANAGER	T. J. EAVENSON	K. L. Preston for 6/20/92
DESIGN ENGINEERING	P. J. CHEN	
QUALITY ENGINEERING	E. OCHOA	K. L. Preston for T. J. Eavenson 6/30/
NASA RELIABILITY		9/8/92
NASA SUBSYSTEM MANAGER		9/9/92
NASA QUALITY ASSURANCE		8-21-92

8/21/92