

## FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: 06-1B-0750-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
■ SRU :	VALVE, MANUAL	SV807021

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 PART DATA
 

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■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:  
FLOW CONTROL VALVE

■ QUANTITY OF LIKE ITEMS: 1

■ FUNCTION:

THE VALVE IS SET BEFORE LAUNCH BASED ON CREW SIZE. THIS VALVE  
MODULATES THE RCRS PROCESS AIR FLOW TO MAINTAIN PROPER CABIN  
PPCO2 AND RELATIVE HUMIDITY.

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

NUMBER: 06-1B-0750-02

REVISION# 7 06/26/92 R

SUBSYSTEM: ARS - COOLING  
 LRU :REGENERABLE CO2 REMOVAL SYSTEM  
 ITEM NAME: VALVE, MANUAL

CRITICALITY OF THIS  
 FAILURE MODE:2/2

- FAILURE MODE:  
RESTRICTED FLOW

MISSION PHASE:  
 00 ON-ORBIT

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

- CAUSE:  
MECHANICAL SHOCK, VIBRATION, CORROSION, CONTAMINATION, PHYSICAL BINDING/  
JAMMING.

- 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: V61P2924A

- FAILURE EFFECTS -

- (A) SUBSYSTEM:  
INSUFFICIENT FLOW THROUGH SORBENT BED. RCRS WILL REMOVE CO2 FROM CABIN  
AIR AT A SLOWER RATE THAN REQUIRED.
- (B) INTERFACING SUBSYSTEM(S):  
INCREASED CABIN PPCO2.

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- (C) MISSION:  
EARLY MISSION TERMINATION IF PPCO2 CANNOT BE MAINTAINED AT AN ACCEPTABLE LEVEL.
- (D) CREW, VEHICLE, AND ELEMENT(S):  
NO EFFECT.
- (E) FUNCTIONAL CRITICALITY EFFECTS:  
IF CO2 LEVEL CANNOT BE MAINTAINED, BACKUP LIQH CANISTERS MUST BE USED UNTIL LANDING. THE LIQH SUPPLY IS ADEQUATE TO REMOVE CO2 FOR 3 DAYS. LOSS OF ALL BACKUPS MAY RESULT IN LOSS OF CREW/VEHICLE. A 1R3 PPP CRITICALITY SCENARIO RESULTS.

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- DISPOSITION RATIONALE -  
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- (A) DESIGN:  
THE VALVE IS A MANUALLY ACTUATED ALUMINUM BUTTERFLY VALVE. VALVE HAS TWO FLOW POSITION SETTINGS WITH A POSITIVE LOCK NUT TO ELIMINATE ANY POTENTIAL VALVE MOVEMENT. IT WAS DESIGNED FOR A MINIMUM OF 150 CYCLES OF USEFUL LIFE (VALVE POSITION IS SET ONCE PRIOR TO MISSION).
- (B) TEST:  
QUALIFICATION TEST FOR 100 MISSIONS:  
VALVE IS QUAL TESTED WHILE IS INSTALLED AT THE RCRS ASSEMBLY 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.  
ACCEPTANCE TEST:  
PROOF PRESSURE TESTED AT 0.5 PSID INTERNALLY APPLIED, WITH THE BUTTERFLY FULLY OPEN, WITHOUT PERMANENT DEFORMATION OR DEGRADING THE PERFORMANCE. FLOW TEST IS PERFORMED DURING ACCEPTANCE TESTING TO VERIFY NO FLOW RESTRICTION.  
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. VALVE ATP VERIFIED AT VENDOR BY H. S. SOURCE INSPECTION.  
  
CONTAMINATION CONTROL  
CONTAMINATION CONTROL PROCESSES AND CLEAN AREAS VERIFIED BY INSPECTION. VALVE CLEAN REQUIREMENTS VERIFIED BY INSPECTION.

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ASSEMBLY/INSTALLATION

DIMENSIONAL VERIFICATION PERFORMED AT VENDOR BY INSPECTION. POSITIVE LOCK-NUT POSITION VERIFICATION BY INSPECTION. ASSEMBLY AND INSTALLATION VERIFIED BY INSPECTION.

CRITICAL PROCESSES

TORQUE OPERATIONS VERIFIED TO H. S. REQUIREMENTS.

TESTING

FUNCTIONAL PERFORMANCE VERIFIED BY RCRS ASSEMBLY ATP WHICH IS WITNESSED BY INSPECTION. VENDOR ATP INCLUDES PROOF, EXTERNAL LEAKAGE, DECAY, FLOW AND OPERATING TORQUE TESTING. TEST IS VERIFIED BY H. S. SOURCE INSPECTION. VIBRATION TEST OF ORIGINAL DEVELOPMENT TEST UNIT AS A DETAIL OF RCRS ASSEMBLY VERIFIED BY INSPECTION DURING QUALIFICATION.

HANDLING/PACKAGING

HANDLING AND PART PROTECTION PER H. S. REQUIREMENTS.

■ (D) FAILURE HISTORY:

NO FAILURE HISTORY IS AVAILABLE - NEW HARDWARE.

■ (E) OPERATIONAL USE:

SHUTDOWN THE RCRS AND INSTALL NEW LIOH CANISTERS IF CO2 REMOVAL IS NOT ADEQUATE. THE LIOH SUPPLY IS ADEQUATE FOR 3 DAYS.

- 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. Pactor for 6/21/92*  
*A. J. O'Connell for Mike Lorenz*  
*for K. L. Pactor for T. J. Eavenson 6/21/92*  
*for Mike Lorenz 9/8/92*  
*for 9/8/92*  
*H. J. Miller 6/21/92*  
*K. Pactor*