

PAGE: 1

PRINT DATE: 08/30/93

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CRITICAL HARDWARE

NUMBER: 06-1B-0368-X

SUBSYSTEM NAME: ARS-COOLING

REVISION: 5 08/25/93

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: CO2 ABS & TEMP CONTROL ASSY HAMILTON STANDARD	MC621-0008-0412 SV55503-4
LRU	: VALVE; CABIN TEMP CONTROL	SV755531

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

QUANTITY OF LIKE ITEMS: 1

FUNCTION:

VARIES THE AIRFLOW THROUGH BYPASS DUCT AND HUMIDITY CONTROL HEAT EXCHANGER IN ORDER TO MAINTAIN CABIN TEMPERATURE WITHIN SELECTED RANGE. THE VALVE IS SET IN FULL COOL POSITION DURING LAUNCH AND OPERATED ON AUTOMATIC CONTROL ON ORBIT. THE VALVE POSITION IS CONTROLLED AUTOMATICALLY VIA CABIN TEMPERATURE CONTROLLER, OR BY MANUAL OVERRIDE OPERATION.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CRITICAL FAILURE MODE
NUMBER: 06-1B-0368-02**

REVISION# 4 08/25/93 R

SUBSYSTEM: ARS - COOLING

LRU: CO2 ABS & TEMP CONTROL ASSY

ITEM NAME: VALVE, CABIN TEMP CONTROL

CRITICALITY OF THIS
FAILURE MODE: 2/2

FAILURE MODE:

INABILITY TO OPEN - FLAPPER STUCK IN FULL BYPASS

MISSION PHASE:

LO LIFT-OFF
OO ON-ORBIT
DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:

PHYSICAL BINDING/JAMMING, CORROSION, MECHANICAL SHOCK, VIBRATION

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)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF CAPABILITY TO DIRECT TOTAL AIRFLOW TO HUMIDITY SEPARATOR AND CABIN HEAT EXCHANGER. BYPASS FLOW PATH PROVIDES SUFFICIENT CONTINGENCY COOLING CAPABILITY.

(B) INTERFACING SUBSYSTEM(S):

LOSS OF FINE CONTROL OF CABIN AIR TEMPERATURE. NONESSENTIAL EQUIPMENT POWERED DOWN DURING ENTRY.

(C) MISSION:

POSSIBLE EARLY MISSION TERMINATION FOR SIGNIFICANT DECREASE OF AVIONICS COOLING.

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

**FAILURE MODES EFFECTS ANALYSIS (FMEA) - CRITICAL FAILURE MODE
NUMBER: 06-1B-0368-02**

NO EFFECT - EARLY MISSION TERMINATION WILL PRECLUDE LOSS OF CREW/VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:

-DISPOSITION RATIONALE-

(A) DESIGN:

THE VALVE IS A PIVOTING FLAPPER VALVE. THE FLAPPER VALVE IS POWERED BY ONE OF TWO REDUNDANT ACTUATORS. THE VALVE BODY, FLAPPERS AND ACTUATOR HOUSING ARE MADE OF ALUMINUM WHILE THE VALVE SHAFT IS CONSTRUCTED OF STAINLESS STEEL AND KEYED-IN CONNECTED TO THE ACTUATOR ARM. WHEN FLAPPER IS STUCK IN FULL BYPASS POSITION, VALVE IS DESIGNED TO ALLOW 30% AIR FLOW THROUGH THE CABIN HEAT EXCHANGER. THIS FAILURE IS CONSIDERED REMOTE.

(B) TEST:

ACCEPTANCE TEST - THERE IS NO SPECIFIC ATP FOR THE VALVE. CABIN FAN ASSEMBLY ATP INCLUDES THE VALVE PERFORMANCE TEST.

QUALIFICATION TEST - THE VALVE IS QUALIFIED TOGETHER WITH THE FAN PACKAGE ASSEMBLY:

FAN PACKAGE ASSEMBLY SUBJECTED TO RANDOM VIBRATION SPECTRUM ENVELOPE OF 20 TO 150 HZ INCREASING AT 6 DB/OCTAVE TO 0.09 G**2/HZ AT 150 HZ, CONSTANT AT 0.09 G**2/HZ FROM 150 TO 900 HZ, DECREASING AT 9 DB/OCTAVE FROM 900-2000 HZ FOR 48 MINUTES PER AXIS IN THREE ORTHOGONAL AXES. DESIGN SHOCK - THREE TERMINAL SAWTOOTH PULSES OF 20 G PEAK AMPLITUDE AND 11 MS DURATION APPLIED IN BOTH DIRECTIONS ALONG EACH OF THREE ORTHOGONAL AXES. SALT SPRAY TEST WITH SOLUTION OF FIVE PARTS OF SALT BY WEIGHT AND 80% RH FOR 120 HOURS, CYCLED BETWEEN 60 AND 120F.

OMRSD - CONTROL VALVE FUNCTION IS VERIFIED IN FLIGHT.

(C) INSPECTION:

RECEIVING INSPECTION

INCOMING PARTS ARE VERIFIED FOR MATERIALS AND PROCESS CERTIFICATION.

CONTAMINATION CONTROL

MAINTENANCE OF EXTERNAL AND INTERNAL SURFACES ARE VERIFIED PER H.S. SPECIFICATION.

ASSEMBLY/INSTALLATION

TORQUES APPLIED TO MOUNTING SCREWS ARE VERIFIED PER H.S. REQUIREMENT. SUPER KOROPON APPLICATION IS VERIFIED BY INSPECTION. DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

ANODIZING AND PASSIVATION ARE VERIFIED BY INSPECTION.

TESTING

ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGING FOR SHIPMENT IS VERIFIED BY INSPECTION.

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CRITICAL FAILURE MODE
NUMBER: 06-1B-0368-02

(D) FAILURE HISTORY:

NO FAILURE HISTORY APPLICABLE TO INABILITY TO OPEN FAILURE MODE. THE CONTROL VALVE HAS SUCCESSFULLY PERFORMED WITHOUT FAILURE THROUGH THE DURATION OF THE SHUTTLE PROGRAM.

(E) OPERATIONAL USE:

NONE.

- APPROVALS -

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

Handwritten signatures and dates:
8/30/93
9/1/93
:SS0250U