

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

NUMBER: 06-1A-1631-X

SUBSYSTEM NAME: ARS - AIRLOCK

REVISION : 2 09/21/90

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	ISOLATION VALVE, VACUUM VENT CARLETON TECHNOLOGIES	MC250-0002-0100 2710-0001-1

## PART DATA

## ■ EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:

## ■ QUANTITY OF LIKE ITEMS: 1

## ■ FUNCTION:

PROVIDES CAPABILITY TO ISOLATE THE TWO INCH AIRLOCK DEPRESSURIZATION LINE AT THE XD 576 BULKHEAD TO PRECLUDE A SINGLE FAILURE FROM DEPRESSURIZING THE CABIN. VALVE HAS A BLEED HOLE (3 LB/HR) FOR H2 SEPARATOR AND WCS VENTING.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL FAILURE MODE  
NUMBER: 06-1A-1631-03

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SUBSYSTEM: ARS - AIRLOCK  
LRU : ISOLATION VALVE, VACUUM VENT  
ITEM NAME: ISOLATION VALVE, VACUUM VENT

CRITICALITY OF THIS  
FAILURE MODE: 1/1

- FAILURE MODE:  
EXTERNAL LEAKAGE (I.E. CRACKED VALVE BODY)

MISSION PHASE:

PL	PRELAUNCH
LO	LIFT-OFF
OO	ON-ORBIT
DO	DE-ORBIT
LS	LANDING SAFING

- VEHICLE/PAYLOAD/KIT EFFECTIVITY:
 

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

- CAUSE:  
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 VACUUM VENT LINE ISOLATION CAPABILITY:

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- (B) INTERFACING SUBSYSTEM(S):  
EXCESSIVE LOSS OF CABIN AIR INTO VACUUM. IF RCRS IS INSTALLED, THE ABILITY TO REGENERATE ADSORBENT BED MAY BE DECREASED.
- (C) MISSION:  
EARLY MISSION TERMINATION.
- (D) CREW, VEHICLE, AND ELEMENT(S):  
POSSIBLE LOSS OF CREW/VEHICLE IF EQUIVALENT HOLE SIZE IS GREATER THAN 0.45 INCH IN THE VALVE BODY DOWNSTREAM OF THE BUTTERFLY VALVE. A LEAK ON THE UPSTREAM SIDE OF THE BUTTERFLY VALVE COULD POSSIBLY CAUSE A HIGH CONCENTRATION MIXTURE OF HYDROGEN AND OXYGEN IN THE VACUUM VENT DUCT WHICH COULD RESULT IN EXPLOSION AND POSSIBLE LOSS OF CREW/VEHICLE.
- (E) FUNCTIONAL CRITICALITY EFFECTS:  
NONE.

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- DISPOSITION RATIONALE -  
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- (A) DESIGN:  
VALVE BODY IS FABRICATED OF 6061-T6 ALUMINUM WITH A THICKNESS OF 0.05 INCH. VALVE IS MOUNTED ON THE CREW MODULE SIDE OF THE 576 BULKHEAD WITH A CIRCLE OF SIX BOLTS AND USING A BUTYL RUBBER O-RING PER MB0130-028 TYPE 1. VALVE IS CONNECTED TO THE TWO INCH VENT LINE WITH A V-BAND CLAMP AND BUTYL RUBBER O-RING. VALVE STEM HAS DUAL O-RING SEALS.
- (B) TEST:  
QUALIFICATION TESTS FOR 100 MISSION LIFE: BURST PRESSURE TEST AT 18-20 PSIG FOR FIVE MINUTES, WITH TEST CHAMBER PRESSURIZED AND VACUUM ON VALVE BODY.  
  
ACCEPTANCE TEST - THE VALVE WAS PROOF PRESSURE TEST AT 24-26 PSIG FOR 3 MINUTES. EXTERNAL LEAK TEST AT 15 PSIG, 1.0 SCCM MAXIMUM ALLOWED LEAKAGE.  
  
IN-VEHICLE TESTING - 3.2 PSID CABIN LEAK TEST.  
  
OMRSD - VACUUM DECAY AND 2 PSID CABIN LEAK TEST PRIOR TO EACH FLIGHT.
- (C) INSPECTION:  
RECEIVING INSPECTION  
RAW MATERIAL VERIFIED.

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CONTAMINATION CONTROL  
CORROSION PROTECTION PROVISIONS AND CONTAMINATION CONTROL PLAN  
VERIFIED BY INSPECTION. CLEAN LEVELS AND 100 ML RINSE VERIFIED BY  
INSPECTION.

## ASSEMBLY/INSTALLATION

PARTS PROTECTION, MANUFACTURING PROCESS, INSTALLATION AND ASSEMBLY  
VERIFIED BY INSPECTION. DIMENSIONAL CHECKS PERFORMED BY INSPECTION.  
VISUAL INSPECTION USING 10X MAGNIFICATION ON SEAL RING. LUBRICANT  
APPLICATION ON SEAL RING VERIFIED BY INSPECTION. TORQUE IS VERIFIED  
BY INSPECTION.

## NONDESTRUCTIVE EVALUATION

LEAK TEST IS VERIFIED BY INSPECTION. BRAZING AND WELDING NDE  
CERTIFICATIONS VERIFIED BY INSPECTION.

## CRITICAL PROCESSES

PASSIVATED PARTS VERIFIED BY INSPECTION. HEAT TREAT VERIFIED BY  
INSPECTION.

## TESTING

ATP VERIFIED BY INSPECTION.

## HANDLING/PACKAGING

PARTS PROTECTION VERIFIED BY INSPECTION.

## ■ (D) FAILURE HISTORY:

NO FAILURE HISTORY.

## ■ (E) OPERATIONAL USE:

NO CREW ACTION REQUIRED.

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- APPROVALS -  
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RELIABILITY ENGINEERING:	D. R. RISING	DR	:	<u>DR</u>
DESIGN ENGINEERING	: K. KELLY	KK	:	<u>KK</u>
QUALITY ENGINEERING	: M. SAVALA	MS	:	<u>MS</u>
NASA RELIABILITY	:		:	<u>MS</u>
NASA SUBSYSTEM MANAGER	:		:	<u>MS</u>
NASA QUALITY ASSURANCE	:		:	<u>MS</u>

06-1A-1631-03  
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