

**FAILURE MODES EFFECTS ANALYSIS (FMEA) – CIL HARDWARE**  
**NUMBER:04-2-MV01 -X**

**SUBSYSTEM NAME: AUXILIARY POWER UNIT (APU)**

**REVISION: 1 09/17/98**

**PART DATA**

	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	:VALVE, MANUAL DRAIN CIRCLE SEAL	ME284-0543-0002 P105-717

**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**

THE MANUAL DRAIN VALVE IS A HAND OPERATED VALVE. IT CONSISTS OF AN ALUMINUM BODY WITH A STAINLESS STEEL PLUG. THE PLUG IS EQUIPPED WITH 3 SEALS, WHICH ARE INDEPENDENT OF EACH OTHER. THE VALVE IS OPENED BY MANUALLY TURNING THE PLUG 90° AND IS CLOSED BY TURNING THE PLUG BACK 90°. THE OUTLET IS THEN CAPPED AND IS READY FOR FLIGHT.

**QUANTITY OF LIKE ITEMS: 3**  
ONE PER APU

**FUNCTION:**

THE MANUAL VALVE IS USED TO DRAIN THE FUEL PUMP SEAL CAVITY DRAIN COLLECTOR DURING GROUND TURNAROUND.

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**NUMBER: 04-2-MV01- 01**

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**SUBSYSTEM NAME: AUXILIARY POWER UNIT (APU)**

**LRU: VALVE, MANUAL**

**ITEM NAME: VALVE, MANUAL**

**CRITICALITY OF THIS**

**FAILURE MODE: 1/1**

**FAILURE MODE:**

**EXTERNAL LEAKAGE**

**MISSION PHASE:**

- PL PRE-LAUNCH
- 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. POOR HANDLING 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)

**- FAILURE EFFECTS -**

**(A) SUBSYSTEM:**

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POSSIBLE LOSS OF ONE APU SYSTEM BEFORE MISSION COMPLETION IF EXTERNAL LEAKAGE OCCURS. POSSIBLE LOSS OF ADJACENT AND/OR REDUNDANT APU HARDWARE DUE TO CHEMICAL ATTACK.

**(B) INTERFACING SUBSYSTEM(S):**

POSSIBLE LOSS OF SHAFT POWER TO ONE HYDRAULIC PUMP. POSSIBLE LOSS OF ADJACENT AND/OR REDUNDANT HARDWARE DUE TO FIRE OR CHEMICAL ATTACK.

**(C) MISSION:**

MANUAL DRAIN VALVE EXTERNAL LEAK COULD ALLOW HYDRAZINE LEAKAGE INTO AFT FUSELAGE WHERE IT COULD BE IGNITED CAUSING POSSIBLE LOSS OF BOTH THE MISSION AND CREW/VEHICLE.

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

POSSIBLE LOSS OF CREW/VEHICLE IF LEAKING FUEL IS IGNITED OR IF ADJACENT AND/OR REDUNDANT HARDWARE IS LOST DUE TO FIRE OR CHEMICAL ATTACK

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

POSSIBLE LOSS OF CREW/VEHICLE IF HYDRAZINE RELEASED BY FAILURES IS IGNITED

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**-DISPOSITION RATIONALE-**

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**(A) DESIGN:**

THE MANUAL DRAIN VALVE IS A HAND OPERATED CHECK VALVE. THE MANUAL DRAIN VALVE HAS 3 SEALS AND IS CAPPED DURING FLIGHT. THE FIRST SEAL IS ON THE PLUG RIGHT UNDER THE HOLE IN THE BODY TO ALLOW FLOW. THE PLUG NEEDS TO BE ROTATED 90° TO ALLOW FLOW THROUGH THE PLUG. THE OTHER TWO SEALS ARE ON EACH END OF THE PLUG, THIS PROVIDES REDUNDANCY TO THE FIRST SEAL. FINALLY, THE MANUAL DRAIN VALVE HAS A CAP THAT PROVIDES ANOTHER SEAL. DURING QUAL TESTING THE MANUAL DRAIN VALVE WAS PROOF PRESSURE TESTED TO 300 PSIG AND PASSED. THE MANUAL DRAIN VALVE IS LEAK CHECKED BEFORE AND AFTER IT IS CAPPED.

**(B) TEST:**

THE MANUAL DRAIN VALVE WAS PRESSURE TESTED DURING QUALIFICATION TESTING AND ALSO AT ATP.

**GROUND TURNAROUND TEST:**

ALL TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH THE OMRSD

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**(C) INSPECTION:**

IDENTIFICATION AND GENERAL APPEARANCE ARE VERIFIED AT RECEIVING

**CONTAMINATION CONTROL**

FLUID SAMPLES ARE ANALYZED FOR CONTAMINATION AND VERIFIED CLEAN TO LEVEL 100 BY INSPECTION. CORROSION RESISTANT MATERIALS ARE USED IN CONSTRUCTION OF THE BURST DISK

**ASSEMBLY/INSTALLATION**

MANUFACTURING, ASSEMBLY, AND INSTALLATION REQUIREMENTS ARE VERIFIED BY INSPECTION. CRITICAL DIMENSIONS AND SURFACE FINISHES ARE VERIFIED BY INSPECTION

**NON-DESTRUCTIVE EVALUATION**

PENETRANT INSPECTION OF WELDS AND ASSEMBLIES IS VERIFIED. QUALIFICATION WELDS WERE CROSS-SECTIONED AND VERIFIED BY M&P PRIOR TO PRODUCTION WELDS AND ARE ALSO VERIFIED BY PROOF PRESSURE TESTS.

**TESTING**

CALIBRATION OF TOOLS AND TEST EQUIPMENT IS VERIFIED BY INSPECTION. ATP IS WITNESSED AND VERIFIED BY INSPECTION.

**HANDLING/PACKAGING**

HANDLING, PACKAGING, AND SHIPPING PROCEDURES ARE VERIFIED.

**(D) FAILURE HISTORY:**

CURRENT DATA ON TEST FAILURES, FLIGHT FAILURES, UNEXPLAINED ANOMALIES, AND OTHER FAILURES EXPERIENCED DURING GROUND PROCESSING ACTIVITY CAN BE FOUND IN THE PRACA DATABASE

**(E) OPERATIONAL USE:**

POST MECO, CLOSE ISOLATION VALVES.

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**- APPROVALS -**

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SS & PAE MANAGER	: D F MIKULA
SS & PAE ENGINEER	: G T TATE
VEHICLE & SYSTEMS DESIGN	: M. WEISER
BNA SSM	: T. FARKAS
JSC MOD	: MEL FRANT
JSC NASA SRC QA	: D. BEAUGH
USA/SAM	: M S. BEAUGHERT

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