

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE  
NUMBER: 02-6-E02 -X**

**SUBSYSTEM NAME: HYDRAULICS**

**REVISION: 1 07/24/98**

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**PART DATA**

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	<b>PART NAME</b>	<b>PART NUMBER</b>
	<b>VENDOR NAME</b>	<b>VENDOR NUMBER</b>
LRU	QUICK DISCONNECT SYMETRICS	MC621-0024

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**

QUICK DISCONNECT, HYDRAULIC, SELF SEALING (MALE HALF WITH CAP) (PRESSURE AND RETURN)

**REFERENCE DESIGNATORS:** 50V58PD13  
50V58PD14  
50V58PD15  
50V58PD16  
50V58PD17  
50V58PD18

**QUANTITY OF LIKE ITEMS:** 6  
TWO PER POWER SYSTEM

**FUNCTION:**

PROVIDE CAPABILITY FOR CONNECTING/DISCONNECTING GSE HYDRAULIC LINES TO/FROM THE SUBSYSTEM WITHOUT ENTRAPPING AIR INTO OR RELEASING FLUID FROM THE HYDRAULIC SYSTEM DURING GROUND TURNAROUND OPERATIONS. ON VEHICLES OV103 AND OV104. THE PRESSURE LINE DISCONNECT IS MOUNTED ON THE FILTER MODULE (02-6-E08). ON VEHICLE OV102 THE PRESSURE LINE DISCONNECT IS MOUNTED ON THE HYDRAULIC SERVICE PANEL. IN ALL CASES. THE RETURN LINE DISCONNECTS ARE MOUNTED ON THE HYDRAULIC SERVICE PANEL.

## FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 02-6-E02-01

REVISION#: 2 07/24/98

SUBSYSTEM NAME: HYDRAULICS

LRU: QUICK DISCONNECT

ITEM NAME: QUICK DISCONNECT

CRITICALITY OF THIS

FAILURE MODE: 1R3

## FAILURE MODE:

LEAKAGE. SELF SEALING POPPET

## MISSION PHASE:

LO LIFT-OFF

DO DE-ORBIT

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

## CAUSE:

DAMAGED SEAL/POPPET, CONTAMINATION

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN	A) PASS
	B) FAIL
	C) PASS

## PASS/FAIL RATIONALE:

A)

"A" SCREEN IS PASS SINCE SEALING CAP CAN BE REMOVED AND POPPET CAN BE INSPECTED DURING GROUND TURNAROUND.

B)

"B" SCREEN IS FAIL SINCE SEALING CAP WOULD MASK POPPET FAILURE DURING FLIGHT.

C)

## - FAILURE EFFECTS -

## (A) SUBSYSTEM:

FIRST FAILURE-NONE. LOSS OF ONE HYDRAULIC SYSTEM POWER AFTER TWO FAILURES: LOSS OF SEALING CAP AND LEAKAGE PAST THE SEALING POPPET.

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

FIRST FAILURE-NONE. SECOND FAILURE, (FAILURE OF SEALING CAP): LOSS OF HYDRAULIC POWER FOR ENGINE VALVE CONTROL FOR ONE ENGINE RESULTING IN LOSS OF ONE SSME THRUST CONTROL. HOWEVER, ENGINE VALVES WILL LOCK INTO POSITION AND ENGINE WILL CONTINUE TO OPERATE. LOSS OF REDUNDANT NOSE WHEEL STEERING, HYDRAULIC LANDING GEAR REDUNDANT DEPLOYMENT CAPABILITY IF SYSTEM ONE IS LOST. HYDRAULIC FLUID ON TPS SCREED MAY CAUSE DEGRADED TPS BONDS.

**(C) MISSION:**

NO EFFECT-FIRST FAILURE

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

NO EFFECT-FIRST FAILURE

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

POSSIBLE LOSS OF CREW/VEHICLE AFTER THREE FAILURES: LOSS OF SEALING CAP, LEAKAGE PAST THE SEALING POPPET AND LOSS OF ANOTHER HYDRAULIC SYSTEM.

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**-DISPOSITION RATIONALE-**

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**(A) DESIGN:**

COUPLING MATES IN A MANNER TO PREVENT CONTAMINATION FROM ENTERING SEALING SURFACES WHEN CONNECTED. CAP ACTS AS REDUNDANT SEAL TO POPPET AND IS PERFORMANCE TESTED AT SAME OPERATING PRESSURE AS POPPET

**(B) TEST:**

**QUALIFICATION:**

- IMPULSE CYCLING TEST - 50,000 CYCLES COUPLED, 1500-4500 PSIG (PRESSURE)/0-3000 PSIG (RETURN), 30-120 CYCLES PER MINUTE. PASS/FAIL CRITERIA: SUBSEQUENT PASSAGE OF PERFORMANCE RECORD TEST (COUPLED AND UNCOUPLED).
- SIDE LOAD TEST - 400 IN-LBS AT COUPLING INTERFACE, 3000 PSIG (PRESSURE)/1500 PSIG (RETURN) FOR 1 MINUTE. PASS/FAIL CRITERIA: NO EXTERNAL LEAKAGE OR PERMANENT DEFORMATION
- THERMAL VACUUM TEST - TESTED AT -65 DEG F AND 3000 PSIG (PRESSURE)/1500 PSIG (RETURN) AT VACUUM; REPEATED AT 200 DEG F, 6 HOURS EACH, COUPLED AND UNCOUPLED. PASS/FAIL CRITERIA: NO EXTERNAL LEAKAGE.

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- THERMAL CYCLE TEST - 3000 PSIG (PRESSURE)/1500 PSIG (RETURN) MALE HALF WITH CAP, 2 CYCLES AT -73 DEG F TO 73 DEG F TO 275 DEG F TO 73 DEG F. PASS/FAIL CRITERIA: NO LEAKAGE DURING TEST.
- RANDOM VIBRATION - 3000 PSIG (PRESSURE)/1500 PSIG (RETURN) AT 135 DEG F (WITHOUT CAPS, CAPS ON TEST FIXTURE), LEVEL A FOR 12 MIN/AXIS, LEVEL B FOR 48 MIN/AXIS, LEVEL B PERFORMED WITH 400 IN-LBS SIDE LOAD. LEVEL C FOR 48 MIN/AXIS, LEVEL D FOR 12.5 HOURS/AXIS. PASS/FAIL CRITERIA: NO EXTERNAL LEAKAGE.
- BENCH SHOCK TEST - 4 CYCLES, DROPPED 4 INCHES FROM BENCH TOP PER MIL. STD-810. PASS/FAIL CRITERIA: SUBSEQUENT PASSAGE OF PERFORMANCE RECORD TEST.
- TEMPERATURE PROFILE AND ENDURANCE TEST - 3000 PSIG (PRESSURE)/1500 PSIG (RETURN), -40 DEG F TO 275 DEG F TO 40 DEG F, COUPLED AND UNCOUPLED. 1000 CYCLES DURING TRANSIENT OR STEADY-STATE TEMPERATURE CONDITION. PASS/FAIL CRITERIA: NO EXTERNAL LEAKAGE.
- BURST PRESSURE TEST - TESTED AT 275 DEG F, 7500 PSIG (PRESSURE)/4500 (RETURN) WITH CAPS OFF. PASS/FAIL CRITERIA: NO RUPTURE

**ACCEPTANCE:**

- EXAMINATION OF PRODUCT - WEIGHT, WORKMANSHIP, FINISH, DIMENSIONS, AND CONSTRUCTION. PROOF PRESSURE TEST - TESTED AT 275 DEG F AND 4500 PSIG (PRESSURE), 3000 PSIG (RETURN). PASS/FAIL CRITERIA: NO EXTERNAL LEAKAGE OR PERMANENT DEFORMATION.
- PERFORMANCE RECORD TEST.
  - TESTED AT 95 DEG F WITH 5, 20, AND 125 PSIG APPLIED TO MALE, FEMALE, THEN BOTH HALVES (ONE CYCLE CONSISTS OF COUPLING AND UNCOUPLING). PASS/FAIL CRITERIA: NO EXTERNAL LEAKAGE WHEN COUPLED OR UNCOUPLED.
  - PRESSURE CAP AND PLUG TEST - 5, 20, 125 PSIG. PASS/FAIL CRITERIA: NO EXTERNAL LEAKAGE.
- CLEANLINESS TEST - CLEANLINESS LEVEL 190 PER MAO110-301.

**GROUND TURNAROUND TEST**

ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

**(C) INSPECTION:**

RECEIVING INSPECTION

RAW MATERIALS ARE SENT TO A TEST LAB FOR MATERIAL/CHEMICAL ANALYSIS/CERTIFICATION.

CONTAMINATION CONTROL

CLEANLINESS LEVEL 190 PER MAO110-301 IS VERIFIED BY INSPECTION

CRITICAL PROCESSES

HEAT TREATMENT IS VERIFIED BY INSPECTION. SURFACE TREATMENT PROCESSES (PASSIVATION) ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE  
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SHOP TRAVELER INSPECTION IS PERFORMED ON RAW MATERIAL, PRIOR TO MACHINING. CLOSE DIMENSIONAL TOLERANCES ARE VERIFIED BY INSPECTION. ASSEMBLY OPERATIONS ARE VERIFIED BY INSPECTION. VISUAL INSPECTION FOR DAMAGE IS VERIFIED BY INSPECTION.

TESTING  
ATP IS VERIFIED BY RI INSPECTION.

HANDLING/PACKAGING  
PARTS PROTECTION IS VERIFIED BY INSPECTION.

**(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 DATA BASE.

**(E) OPERATIONAL USE:**

NONE

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**- APPROVALS -**

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EDITORIALLY APPROVED : BNA : J. Kamura 7-30-98  
TECHNICAL APPROVAL : VIA APPROVAL FORM : 95-CIL-009\_02-6