

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE**

NUMBER: 02-6-G11 -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 | HOSE ASSEMBLY<br>TITEFLEX | ME271-0079           |

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**EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:**

HOSE ASSEMBLY, MAIN LANDING GEAR STRUT ACTUATOR RETRACT LINE

**REFERENCE DESIGNATORS:** 67V58FH55  
67V58FH56

**QUANTITY OF LIKE ITEMS:** 2

ONE AT EACH MAIN LANDING GEAR ACTUATOR RETRACT PORT

**FUNCTION:**

THE HOSE ASSEMBLY TRANSMITS HYDRAULIC FLUID FROM THE HYDRAULIC SYSTEM HARDLINES TO THE LANDING GEAR STRUT ACTUATORS

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 02-6-G11-01

REVISION#: 1 07/24/98

SUBSYSTEM NAME: HYDRAULICS

LRU: HOSE ASSEMBLY

ITEM NAME: HOSE ASSEMBLY

CRITICALITY OF THIS

FAILURE MODE: 1R2

FAILURE MODE:

RUPTURE HOSE

MISSION PHASE: DO DE-ORBIT

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

CAUSE:

DEFECTIVE MATERIAL OR MANUFACTURE

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

- A) PASS
- B) PASS
- C) PASS

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

ASCENT/ORBIT - NONE, ISOLATED. ENTRY (WITH DOWNGEAR COMMAND) LOSS OF SYSTEM NUMBER ONE.

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

LOSS OF NOSEWHEEL STEERING AND HYDRAULIC LANDING GEAR DEPLOYMENT CAPABILITY. PYROTECHNIC DEPLOYMENT STILL AVAILABLE. LOSS OF ONE OF THREE HYDRAULIC POWER SYSTEMS TO BRAKES. HYDRAULIC FLUID ON TPS SCREED MAY CAUSE DEGRADED TPS BONDS.

**(C) MISSION:**

NONE. ALL REQUIRED FUNCTIONS CAN BE ACCOMPLISHED EXCEPT FOR NOSE WHEEL STEERING. NOSE WHEEL STEERING BACKUP IS DIFFERENTIAL BRAKING.

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

NONE. ALL REQUIRED FUNCTIONS CAN BE ACCOMPLISHED EXCEPT FOR NOSE WHEEL STEERING. NOSE WHEEL STEERING BACKUP IS DIFFERENTIAL BRAKING.

**(E) FUNCTIONAL CRITICALITY EFFECTS:**

POSSIBLE LOSS OF CREW/VEHICLE WITH TWO FAILURES: THIS FAILURE, PLUS PYROTECHNIC LANDING GEAR DEPLOYMENT FAILURE.

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**-DISPOSITION RATIONALE-**

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**(A) DESIGN:**

HOSE INNER CORE IS EXTRUDED TFE. REINFORCEMENT IS 304 STAINLESS STEEL WIRE BRAID. PLAITS OF SMALL DIAMETER, TIERED, TENSION CONTROLLED TYPE 304 STAINLESS STEEL WIRE BRAID QUALIFIED TO MIL-H-38360. GENERAL REQUIREMENTS FOR HOSE ASSEMBLY - TFE, HIGH TEMPERATURE, HIGH PRESSURE, SYNTHETIC CARBON BASE, AIRCRAFT. HOSE END-FITTINGS ARE STAINLESS STEEL PROGRESSIVE-SWAGED WITH POSITIVE BRAID LOCK AND CONFORM TO MIL-H-38360. AUTOMATIC PYROTECHNIC DEPLOY BACKUP FOR UNLOCKING GEARS.

**(B) TEST:**

**QUALIFICATION:**

- RETURN HOSE IMPULSE ENDURANCE CYCLING - 100,000 CYCLES 0-2,250-0 PSI AT 450 DEGREES F IN ACCORDANCE WITH FIGURE 3 MIL-H-25579, WITH A RATE OF 70 CYCLES/MIN.
- BURST PRESSURE - 6,000 PSI AT 70 DEGREES F.

PRESSURE HOSE

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- IMPULSE ENDURANCE CYCLING - 250,000 CYCLES 0-4,500-0 PSI IN ACCORDANCE WITH FIGURE 3 MIL-H-38360. WITH A RATE OF 70 CYCLES/MIN. 80 PERCENT AT 400 DEGREES F, 20 PERCENT AT 70 DEGREES F
- BURST PRESSURE - 12,000 PSI AT 70 DEGREES F

**HOSE AND SWIVEL**

- ENDURANCE CYCLING - 50,000 DEFLECTION CYCLES, 50 PERCENT AT 0 DEG F 50 PERCENT AT 275 DEGREES F WITH A RATE OF 30 CYCLES/MIN. SIMULTANEOUSLY, IMPULSE CYCLES PER FIGURE 2 OF MIL-C-5513. GENERAL REQUIREMENTS FOR HYDRAULIC SWIVEL JOINTS.

**ACCEPTANCE.**

- PROOF PRESSURE - RETURN 3,000 PSI PRESSURE 6,000 PSI.
- LEAK TEST - WITH OIL 3,000 PSI INTERNAL PRESSURE APPLIED.
- LEAK TEST - WITH AIR UNDER WATER, 5-10 PSI INTERNAL PRESSURE APPLIED FOR NOT LESS THAN 2 MINUTES.

**GROUND TURNAROUND TEST**

ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

**(C) INSPECTION:**

**RECEIVING INSPECTION**

INCOMING MATERIAL IS VERIFIED BY INSPECTION AND COMPANY METALLURGIST. INCOMING MATERIAL IS TESTED AND VERIFIED BY INSPECTION, ON A SAMPLING BASIS, TO ENSURE CERTIFICATION IS CORRECT.

**CONTAMINATION CONTROL**

CLEANLINESS LEVEL 190 PER MAO110-301 IS VERIFIED BY INSPECTION

**CRITICAL PROCESSES**

WELDING AND SWAGING PROCESSES ARE VERIFIED BY INSPECTION.

**NONDESTRUCTIVE EVALUATION**

RADIOGRAPHIC INSPECTION IS PERFORMED TO ENSURE THE FOLLOWING: HOSE AND BRAID ARE PROPERLY BOTTOMED IN END FITTING; BUTT WELD TUBING IS CHECKED FOR FREEDOM FROM CRACKS, POROSITY, INCLUSIONS, OR VOIDS. RADIOGRAPH IS EXAMINED UNDER MAGNIFICATION.

**ASSEMBLY/INSTALLATION**

MANUFACTURING AND ASSEMBLY PROCESSES VERIFIED BY INSPECTION.

**TESTING**

PROOF AND LEAK TESTS PERFORMED BY TEST LAB UNDER DELEGATION OF QUALITY ASSURANCE MANAGER. ATP IS VERIFIED BY INSPECTION.

**HANDLING/PACKAGING**

INSPECTION VERIFIES PACKAGING PRIOR TO SHIPMENT.

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(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. Kemura 7-30-98

TECHNICAL APPROVAL

: VIA APPROVAL FORM

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