

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 02-6-H04 -X

SUBSYSTEM NAME: HYDRAULICS

REVISION: 1 07/24/98

PART DATA

| | PART NAME | PART NUMBER |
|-----|--------------------------|----------------------|
| | VENDOR NAME | VENDOR NUMBER |
| LRU | HOSE ASSEMBLY TITFLEX | ME271-0079 |

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
 HOSE ASSEMBLY, NOSE WHEEL STEERING ACTUATOR

REFERENCE DESIGNATORS: 21V58FH80
 21V58FH81

QUANTITY OF LIKE ITEMS: 2
 ONE TO EACH END OF NOSE WHEEL STEERING ACTUATOR

FUNCTION:
 TO COMPENSATE FOR RELATIVE MOTION OF STEERING ACTUATOR AND RIGID LINES
 MOUNTED TO STRUCTURE

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 02-6-H04-01

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:

NO EFFECT, ISOLATED UNTIL DOWN GEAR COMMAND. UPON DOWN GEAR COMMAND, LOSS OF SYSTEM ONE.

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(B) INTERFACING SUBSYSTEM(S):

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

(C) MISSION:

NONE, COMMITTED

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

NONE, FULL FLIGHT CONTROL CAPABILITY. ENTRY THROUGH DOWN GEAR ARMING - LANDING GEAR CIRCUIT ISOLATED. ARMING TO DOWN GEAR COMMAND - NONE NOSE GEAR CIRCUIT CONTROLLED BY CONTROL VALVE. (E02). SUBSEQUENT TO DOWN GEAR COMMAND - LOSS OF SYSTEM ONE (LOSS OF NOSE WHEEL STEERING).

(E) FUNCTIONAL CRITICALITY EFFECTS:

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

-DISPOSITION RATIONALE-

(A) DESIGN:

HOSE INNER CORE IS EXTRUDED TFE. REINFORCEMENT IS 304 STAINLESS STEEL WIRE BRAID. HOSE IS SINGLE PLAITS OF SMALL DIAMETER, TIERED, TENSION CONTROLLED TYPE 304 STAINLESS STEEL WIRE BRAID RETURN HOSE IS 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 BRAIDLOCK AND CONFORM TO MIL-H-38360.

(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-J-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

- APPROVALS -

EDITORIALLY APPROVED
TECHNICAL APPROVAL

: BNA
: VIA APPROVAL FORM

J. Kemura 7-30-98
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