FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 02-6-G15 -X

SUBSYSTEM NAME: HYDRAULICS

REVISION: 1 07/24/98

PART DATA

	PART NAME / **VENDOR NAME**	**PART NUMBER** / **VENDOR NUMBER**
LRU	: HOSE ASSEMBLY TITEFLEX	ME363-0046

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
HOSE ASSEMBLY, MAIN LANDING GEAR HYDRAULIC BRAKE LINES

REFERENCE DESIGNATORS:
62V58HR1B
62V58HR2B
62V58HR3B
62V58HR4B
62V58HR1D
62V58HR2D
62V58HR3D
62V58HR4D
67V58HR1B
67V58HR2B
67V58HR3B
67V58HR4B
67V58HR1D
67V58HR2D
67V58HR3D
67V58HR4D

QUANTITY OF LIKE ITEMS: 16
FOUR AT EACH MAIN LANDING GEAR WHEEL ASSEMBLY

FUNCTION:
THE HOSE ASSEMBLY TRANSMITS HYDRAULIC FLUID FROM THE MAIN LANDING GEAR SKID CONTROL ASSEMBLY TO THE WHEEL BRAKES.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE
NUMBER: 02-6-G15- 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) FAIL
C) PASS

PASS/FAIL RATIONALE:
A)

B)
B SCREEN IS FAILED SINCE THIS FAILURE WOULD NOT BE DETECTABLE UNTIL BRAKING SYSTEM IS UTILIZED.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
FIRST FAILURE - NO EFFECT; FLOW LIMITER LIMITS FLUID LOSS TO MAXIMUM OF 60 CUBIC INCHES. LOSS OF A HYDRAULIC SYSTEM AFTER TWO FAILURES. HOSE RUPTURE AND BRAKE DISPLACEMENT LIMITER FAILING OPEN.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 02-6-G15- 01

(B) INTERFACING SUBSYSTEM(S):
FIRST FAILURE - LOSS OF HALF OF BRAKING CAPABILITY ON ONE OF FOUR WHEELS. SECOND FAILURE (DISPLACEMENT LIMITER FAILS OPEN) - THE ONLY REMAINING HYDRAULIC DEMANDS ARE BRAKING AND NOSEWHEEL STEERING. THIS FAILURE CAUSES LOSS OF A HYDRAULIC SYSTEM, BUT DOES NOT AFFECT REMAINING BRAKING CAPABILITY; NOSEWHEEL STEERING WILL BE LOST IF SYSTEM IS LOST. THE LEAKAGE OF HYDRAULIC FLUID OVER THE HOT BRAKES POSES A FIRE HAZARD.

(C) MISSION:
NO EFFECT - ADEQUATE BRAKING CAPABILITY IS STILL AVAILABLE

(D) CREW, VEHICLE, AND ELEMENT(S):
NO EFFECT - ADEQUATE BRAKING CAPABILITY IS STILL AVAILABLE

(E) FUNCTIONAL CRITICALITY EFFECTS:
POSSIBLE LOSS OF CREW/VEHICLE WITH TWO FAILURES. THIS FAILURE RESULTING IN LOSS OF POWER TO ONE SET OF BRAKE ACTUATORS ON ONE WHEEL AND THE DISPLACEMENT LIMITER FAILING OPEN CAUSING HYDRAULIC FLUID TO SPILL OVER THE HOT BRAKES WHICH WOULD IGNITE THE HYDRAULIC FLUID.

-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 BRAID LOCK 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.

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 02-6-G15- 01

PRESSURE HOSE
- 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 SW VEL
- 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 ASSSURANCE MANAGER. ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING
INSPECTION VERIFIES PACKAGING PRIOR TO SHIPMENT

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 02-6-G15-01

(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:
FIRST FAILURE - NONE SECOND FAILURE - RAPID LEAK WOULD DEPLETE HYDRAULIC SYSTEM BEFORE ACTION COULD BE TAKEN.

- APPROVALS -

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