

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 02-1B-030 -X

SUBSYSTEM NAME: LANDING/DECELERATION - BRAKE/SKID CONTROL SYS
REVISION: 0 01/06/98

PART DATA

| | PART NAME | PART NUMBER |
|-----|----------------------------------|-------------------------|
| | VENDOR NAME | VENDOR NUMBER |
| | : BRAKE SKID CONTROL | |
| LRU | : MLG BRAKE SYSTEM HYDRO-AIRE | MC621-0055 33-017500 |

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
BRAKE/SKID CONTROL MODULE INLET FILTER.

QUANTITY OF LIKE ITEMS: 8
TWO PER MODULE

FUNCTION:
FILTERS INLET HYDRAULIC FLUID TO BRAKE/SKID CONTROL MODULE SWITCHING VALVE.

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LRU: MLG BRAKE SYSTEM

CRITICALITY OF THIS

ITEM NAME: BRAKE/SKID CONTROL MODULE INLET FILTER

FAILURE MODE: 1/1

FAILURE MODE:

PARTIALLY CLOGGED (APPROX. 90%).

MISSION PHASE:

LS LANDING/SAFING

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

| | |
|-----|-----------|
| 102 | COLUMBIA |
| 103 | DISCOVERY |
| 104 | ATLANTIS |
| 105 | ENDEAVOUR |

CAUSE:

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:

LOSS OF SUBSYSTEM FUNCTION. A PARTIALLY CLOGGED (90%) INLET FILTER TO THE PRIMARY SYSTEM IS INITIALLY REQUIRED. AS BRAKE ISOLATION VALVES OPEN AT MAIN GEAR TOUCHDOWN, THE SELECTOR VALVE WILL GO TO BACKUP POSITION. SLOW PRESSURE RISE RATE DUE TO A PARTIALLY CLOGGED FILTER CAN CAUSE THE SELECTOR VALVE TO BECOME STUCK IN MID-POSITION SUCH THAT BOTH PRIMARY AND

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BACKUP RETURN PORTS ARE BLOCKED. WITH BRAKE COMMAND INITIATED, UNCOMMANDED BRAKE PRESSURE WILL RESULT BECAUSE THE RETURN PORTS ARE BLOCKED AND THE SERVO VALVES CANNOT VENT PRESSURE.

(B) INTERFACING SUBSYSTEM(S):

DURING THE INITIAL PHASE OF ROLLOUT (NOSE UP ATTITUDE), A CLOGGED FILTER OF THIS NATURE CAN CAUSE MLG TIRE FAILURE. LOW VERTICAL TIRE LOADS DUE TO THE HIGH ANGLE OF ATTACK AT TOUCHDOWN COUPLED WITH UNCOMMANDED BRAKE PRESSURE CAN CAUSE MLG TIRE SKID/FAILURE AND LOSS OF LATERAL CONTROL. IF FAILURE OCCURS AFTER NOSE GEAR TOUCHDOWN, LATERAL CONTROL CAN BE MAINTAINED BECAUSE NOSE WHEEL STEERING WILL BE AVAILABLE.

(C) MISSION:

LOSS OF MISSION DUE TO LOSS OF VEHICLE DURING ROLLOUT.

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

LOSS OF CREW AND VEHICLE DUE TO LOSS OF LATERAL CONTROL DURING LANDING.

(E) FUNCTIONAL CRITICALITY EFFECTS:

-DISPOSITION RATIONALE-

(A) DESIGN:

THE HYDRAULIC SYSTEM FILTER MODULE IS 5 MICRON ABSOLUTE AND IS SIZED TO FILTER THE BULK OF ANY CONTAMINATE(S). THE BRAKE/SKID CONTROL HYDRAULIC MODULE INLET AND OUTLET FILTERS ARE 70 MICRON NOMINAL, 100 MICRON ABSOLUTE AND THE SERVO VALVE FILTER IS 15 MICRON NOMINAL, 40 MICRON ABSOLUTE.

(B) TEST:

QUALIFICATION TESTS: ENVIRONMENTAL TESTING INCLUDES; HUMIDITY, SALT FOG, VIBRATION ACCELERATION AND SHOCK - TEST SPECIMENS ARE SUBJECTED TO FUNCTIONAL TESTS BEFORE AND AFTER EACH ENVIRONMENT TEST. EQUIPMENT NORMALLY OPERATING DURING EXPOSURE TO THESE ENVIRONMENTS ARE ALSO FUNCTIONALLY MONITORED DURING QUALIFICATION TESTING.

ACCEPTANCE TESTS ARE PERFORMED ON ALL UNITS DELIVERED FOR FUNCTIONAL USE. THESE TESTS INCLUDE; COMPONENT FUNCTIONAL TESTS AND PROOF PRESSURE. TESTING: ALL HYDRAULIC COMPONENTS ARE CAPABLE OF WITHSTANDING 60,000 PRESSURE IMPULSE CYCLES WHILE AT FLUID TEMPERATURE OF 200 DEG F.

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HIGH TEMPERATURE TESTING IS PERFORMED ON ALL EQUIPMENT EXCEPT THE CONTROL BOX AND COMMAND TRANSDUCER PER METHOD 501, PROCEDURE I, OF MIL-STD-810, TEST TEMP IS 275 DEG F.

LOW TEMP TESTING IS CONDUCTED AT MINUS 80 DEG F AND MINUS 65 DEG F.

OMRSD: ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

HYDRAULIC SWITCHING/CONTROL VALVE:
TEST CONDITIONS -

- (1) WOW SIGNAL ACTIVATED
- (2) HYDRAULIC SYSTEM 1,2 & 3 SUPPLY PRESSURE AT 3000 PLUS OR MINUS 200 PSI
- (3) ANTISKID NOT ACTIVATED (FAIL LIGHT ON)

THIS TEST VERIFIES OPERATION OF THE BRAKE MODULE AS DIRECTED BY THE ANTI-SKID CONTROL BOXES "A" AND "B".

FREQUENCY - ALL VEHICLES AT GROUND TURNAROUND

(C) INSPECTION:

RECEIVING INSPECTION
MATERIAL AND PROCESS CERTIFICATIONS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL
CLEANLINESS AND CORROSION PROTECTION REQUIREMENTS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
FILTER VISUALLY AND DIMENSIONALLY VERIFIED DURING FABRICATION.

CRITICAL PROCESSES
WELDING IS VERIFIED BY INSPECTION.

TESTING
ATP IS VERIFIED BY INSPECTION.

PACKAGING/HANDLING
HANDLING AND PACKAGING REQUIREMENTS ARE 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 -

PRODUCT ASSURANCE ENGR : G. T. TATE
PRODUCT ASSURANCE MGR : D. F. MIKULA
SUBSYSTEM MANAGER : M. T. PORTER
JSC MOD :

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