

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 02-2A-011110 -X**

SUBSYSTEM NAME: FLIGHT CONTROL MECH - RUDDER SPEED BRAKE & BF
REVISION: 0 02/02/88

PART DATA

| | PART NAME | PART NUMBER |
|------|----------------------------|----------------------|
| | VENDOR NAME | VENDOR NUMBER |
| ASSY | : RUDDER/SPEEDBRAKE (R/SB) | MC621-0053-0068 |
| | SUN | 5004918B |
| SRU | : HYDRAULIC BRAKE | |

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
HYDRAULIC BRAKE

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 6
3 PER RUDDER & SPEEDBRAKE

FUNCTION:

COUPLED TO ONE RUDDER OR SPEEDBRAKE HYDRAULIC MOTOR, THE BRAKE PREVENTS BACKDRIVING OF THE HYDRAULIC MOTOR IN THE EVENT THE MOTOR'S SUPPLY HYDRAULIC SYSTEM FAILS (I.E., PREVENTS TORQUE SPILL-OUT OF NOMINALLY OPERATING HYDRAULIC MOTOR(S) INTO INOPERATIVE HYDRAULIC MOTOR). DURING NORMAL FLIGHT CONTROL OPERATION, THE BRAKING SURFACE IS KEPT RELEASED BY THE SUPPLY HYDRAULIC SYSTEM PRESSURE, AND THE BRAKE SHAFT TRANSMITS RPM/TORQUE OUTPUT FROM THE HYDRAULIC MOTOR TO THE SUMMER DIFFERENTIALS.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 02-2A-011110- 02

REVISION#: 1 08/07/98

SUBSYSTEM NAME: FLIGHT CONTROL MECH- RUDDER SPEED BRAKE & BF

LRU:

CRITICALITY OF THIS

ITEM NAME: HYDRAULIC BRAKE

FAILURE MODE: 1R2

FAILURE MODE:

FAILS TO BRAKE

MISSION PHASE:

DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

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

CAUSE:

FRACTURED ACTUATING SPRING, PRESSURE PLATE, BRAKE PLATE; SHEARED BRAKE PLATE SPLINE; WORN BRAKE PLATE

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

- A) PASS
- B) N/A
- C) PASS

PASS/FAIL RATIONALE:

A)

B)

"B" SCREEN IS N/A SINCE A BRAKE FAILURE IS FAILURE OF STANDBY REDUNDANCY.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

NONE.

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(B) INTERFACING SUBSYSTEM(S):
NONE.

(C) MISSION:
NONE.

(D) CREW, VEHICLE, AND ELEMENT(S):
LOSS OF MISSION. CREW/VEHICLE AFTER TWO FAILURES - THIS HYDRAULIC BRAKE FAILURE AND OPEN DRIVELINE IN COUPLED HYDRAULIC MOTOR. REMAINING TWO HYDRAULIC MOTORS BACKDRIVE INTO FAILED BRAKE/OPEN DRIVELINE, RESULTING IN LOSS OF RUDDER OR SPEEDBRAKE FUNCTIONS.

-DISPOSITION RATIONALE-

(A) DESIGN:
PLATE SURFACE HEAT TREATED. SPRINGS/SPLINES SIZED FOR MAX LOAD X 1.4 SAFETY FACTOR. BRAKE PLATE SURFACE ASBESTOS/CELLULOSE COMPOSITION, BONDED TO STEEL BACKING PLATES.

(B) TEST:
QUALIFICATION TESTS: PERFORMANCE, OPERATING LIFE, ULTIMATE LOAD, IMPULSE CYCLING, AND VIBRATION TESTED AT 20 TO 2,000 HZ.

ACCEPTANCE TESTS: PROOF PRESSURE, FAILURE MODE TEST, AND FUNCTIONAL TEST. TORQUE HOLDING CAPABILITY VERIFIED DURING POWER DRIVE UNIT (PDU) ACCEPTANCE TEST. BRAKE TESTING DURING ACCEPTANCE TEST PROCEDURE (ATP) REQUIRES EACH BRAKE FUNCTION INDIVIDUALLY.

GROUND TURNAROUND TEST
ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:
RECEIVING INSPECTION
MATERIAL AND PROCESSES CERTIFICATIONS VERIFIED BY INSPECTION, INCLUDING CHEMICAL AND MECHANICAL REQUIREMENTS.

CONTAMINATION CONTROL
CLEANLINESS AND CORROSION PROTECTION REQUIREMENTS VERIFIED BY INSPECTION.

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ASSEMBLY/INSTALLATION

OPERATIONS VERIFIED BY SHOP TRAVELER MIPS. DIMENSIONAL CHECKS, SURFACE FINISHES AND TORQUES PER DRAWING REQUIREMENTS VERIFIED. PISTON IS ASSEMBLED AND VERIFIED BY INSPECTION. SPRING HEIGHT AND FORCE REQUIREMENTS VERIFIED TO DRAWINGS.

NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

HEAT TREATMENT, PARTS PASSIVATION, AND ANODIZING ARE VERIFIED. DRY FILM LUBRICANT, CHEMICAL FILM, AND ELECTROLESS NICKEL PLATING ARE VERIFIED.

TESTING

ACCEPTANCE TESTS CERTIFICATIONS VERIFIED.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED.

(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

: BNA

: J. Kumala 8-18-98

TECHNICAL APPROVAL

: VIA APPROVAL FORM

: 95-CIL-009_02-2A