

**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- 03

REVISION#: 1 08/07/98

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

LRU:

CRITICALITY OF THIS

ITEM NAME: HYDRAULIC BRAKE

FAILURE MODE: 1R3

FAILURE MODE:

FAILS TO RELEASE

MISSION PHASE:

DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:

INTERNAL LEAK BYPASSES FLUID PAST PISTON TO RETURN, JAMMED BRAKE PISTON, RESTRICTED HYDRAULIC FLUID (CONTAMINATION) TO BRAKE PISTON

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

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

PASS/FAIL RATIONALE:

A)

B)

FAILS REDUNDANCY SCREEN "B" SINCE THE 100% RATE EFFECT IS OPERATIONALLY ACCEPTABLE AND IS UNDETECTABLE BY THE CREW.

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF ONE HYDRAULIC MOTOR RPM/TORQUE INPUT INTO DIFFERENTIALS SUMMER. RUDDER OR SPEEDBRAKE OPERATES WITH REMAINING TWO HYDRAULIC MOTOR RPM/TORQUE INPUTS (100% RATE).

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE

NUMBER: 02-2A-011110-03

(B) INTERFACING SUBSYSTEM(S):

NONE.

(C) MISSION:

NONE.

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

LOSS OF MISSION, CREW/VEHICLE AFTER LOSS OF REMAINING TWO HYDRAULIC MOTOR RPM/TORQUE INPUTS INTO DIFFERENTIALS SUMMER.

-DISPOSITION RATIONALE-

(A) DESIGN:

5 MICRON HYDRAULIC SYSTEM FILTER UPSTREAM. SYSTEM DESIGNED TO BE FULLY OPERATIONAL WITH ONE MOTOR OUT. FILTER DESIGNED TO KEEP CONTAMINATION FROM BRAKE PISTON.

(B) TEST:

QUALIFICATION TESTS: VIBRATION TESTED (20 TO 2,000 HZ), PERFORMANCE, OPERATING LIFE, ULTIMATE LOAD, 100,000 PRESSURE IMPULSE CYCLE TESTED AND THERMAL TEST (-40 DEG F TO +275 DEG F). EACH BRAKE IS TESTED DURING AVIONICS TEST THEN CHANNELS ARE ISOLATED AND EACH BRAKE MUST ACT INDIVIDUALLY.

ACCEPTANCE TESTS: ACTUATING SPRING CYCLE TESTED AT BRAKE SUB-ASSEMBLY LEVEL AND AT POWER DRIVE UNIT (PDU) ASSEMBLY QUALIFICATION AND PDU ACCEPTANCE TEST.

GROUND TURNAROUND TEST

ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:

RECEIVING INSPECTION

MATERIALS AND PROCESSES CERTIFICATIONS VERIFIED BY INSPECTION, INCLUDING CHEMICAL AND MECHANICAL REQUIREMENTS.

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: 02-2A-011110- 03**

CONTAMINATION CONTROL
CLEANLINESS AND CORROSION PROTECTION REQUIREMENTS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
OPERATIONS VERIFIED BY SHOP TRAVELER MANDATORY INSPECTION POINTS (MIPS).
DIMENSIONAL CHECKS, SURFACE FINISHES, AND TORQUES PER DRAWING
REQUIREMENTS ARE VERIFIED. PISTON IS ASSEMBLED AND VERIFIED BY INSPECTION.
SPRING HEIGHT AND FORCE REQUIREMENTS VERIFIED TO DRAWINGS. LUBRICATION
VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
PENETRANT INSPECTION IS VERIFIED BY INSPECTION.

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

TESTING
ACCEPTANCE TEST CERTIFICATION AND EXAMINATION OF PRODUCT VERIFIED BY
INSPECTION.

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. Kamura 8-18-98
TECHNICAL APPROVAL : VIA APPROVAL FORM : 95-CIL-009_02-2A