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 / **VENDOR NAME**	**PART NUMBER** / **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 SUFACE 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- 01

REVISION#: 1 08/07/98
SUBSYSTEM NAME: FLIGHT CONTROL MECH - RUDDER SPEED BRAKE & BF
LRU: **CRITICALITY OF THIS**
ITEM NAME: HYDRAULIC BRAKE **FAILURE MODE:** 1/1

FAILURE MODE:
FAILS TO TRANSMIT RPM/TORQUE, OPEN DRIVELINE

MISSION PHASE: DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:
HYDRAULIC BRAKE INTERNAL SPLINE OR SHAFT SHEARED (MATERIAL DEFECT)

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:
REMAINING TWO HYDRAULIC MOTORS BACKDRIVE INTO FAILED HYDRAULIC BRAKE/OPEN DRIVELINE, RESULTING IN LOSS OF RUDDER OR SPEEDBRAKE FUNCTIONS.

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(B) INTERFACING SUBSYSTEM(S):
NONE.

(C) MISSION:
LOSS OF MISSION, CREW/VEHICLE.

(D) CREW, VEHICLE, AND ELEMENT(S):
SAME AS (C)

-DISPOSITION RATIONALE-

(A) DESIGN:
SHAFT AND SPLINES DESIGNED FOR LIMIT HOLDING TORQUE X 1.4 SAFETY FACTOR. SPLINES DESIGNED TO ANSI B 92-1. SHAFT SPLINES DESIGNED LIKE GEARS ON ACTUATOR, WITH FATIGUE ANALYSIS SHOWING POSITIVE MARGIN OF SAFETY BASED ON MISSION DUTY CYCLES X 4.

(B) TEST:
QUALIFICATION TESTS: POWER DRIVE UNIT (PDU) QUALIFICATION TEST - THERMAL CYCLE (-40 DEG F TO +275 DEG F), FULL LIFE/LIMIT LOAD (400 MISSION DUTY CYCLES), BRAKE HOLDING CAPABILITY, RANDOM VIBRATION (20- 2000 HZ), PROOF PRESSURE (1.5 X OPERATING PRESSURE), ULTIMATE LOAD, 100,000 PRESSURE IMPULSE CYCLES (1.5 X OPERATING PRESSURE), BURST (2.5 X OPERATING PRESSURE AT +275 DEG F).

ACCEPTANCE TESTS: PDU ACCEPTANCE TEST - PROOF PRESSURE, IMPULSE AND THERMAL CYCLING. BRAKE TESTING DURING ACCEPTANCE TEST PROCEDURE (ATP) REQUIRES EACH BRAKE MUST FUNCTION INDIVIDUALLY.

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.

CONTAMINATION CONTROL
CLEANLINESS AND CORROSION PROTECTION REQUIREMENTS VERIFIED BY INSPECTION.

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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.

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