

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 02-2A-021100 -X

SUBSYSTEM NAME: FLIGHT CONTROL MECH R/SB & BF

REVISION: 0 (02/02/88)

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
ASSY	: BODY FLAP ACTUATION	MC621-0056-0083
SRU	: POWER DRIVE UNIT ASSEMBLY	

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
 POWER DRIVE UNIT ASSEMBLY

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 1
 ONE

FUNCTION:
 CONVERTS HYDRAULIC FLUID PRESSURE/FLOW INTO A ROTARY MOTION TO POSITION
 THE BODY FLAP UP OR DOWN AS COMMANDED.

FAILURE MODES EFFECTS ANALYSIS FMEA -- GIL FAILURE MODE

NUMBER: 02-2A-021100- 01

REVISION#: 1 08/07/98

SUBSYSTEM NAME: FLIGHT CONTROL - RUDDER SPEED BRAKE

LRU:

CRITICALITY OF THIS

ITEM NAME: POWER DRIVE UNIT ASSEMBLY

FAILURE MODE: 1R2

FAILURE MODE:

EXTERNAL LEAKAGE

MISSION PHASE:

LO LIFT-OFF
DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:

COMPLETE SEAL FAILURE/HOUSING FRACTURE (SOLENOID VALVE MOUNTING SURFACE,
RECIRCULATION/SPOOL VALVE CAPS, LEE PLUG INSTALLATIONS, ETC.)

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

A) PASS
B) PASS
C) PASS

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

LOSS OF ONE HYDRAULIC MOTOR RPM/TORQUE INPUT INTO SUMMER DIFFERENTIAL
BODY FLAP OPERATES WITH REMAINING TWO HYDRAULIC MOTOR RPM/ TORQUE INPUTS
(100% RATE).

**FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
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(B) INTERFACING SUBSYSTEM(S):
LOSS OF ONE HYDRAULIC SYSTEM.

(C) MISSION:
ASCENT - POSSIBLE ABORT DECISION. DEORBIT - NONE, COMMITTED.

(D) CREW, VEHICLE, AND ELEMENT(S):
NONE. LOSS OF MISSION, CREW/VEHICLE AFTER LOSS OF SECOND HYDRAULIC SYSTEM. CRIT 1 FOR SPACE SHUTTLE MAIN ENGINE (SSME) INDUCED RTLS IF LOSS OF HYDRAULIC SYSTEM OCCURS DURING MAX Q THROTTLE DOWN.

-DISPOSITION RATIONALE-

(A) DESIGN:
EXTERNAL DYNAMIC LEAKAGE NOT TO EXCEED ONE DROP IN 100 CYCLES.
ATMOSPHERIC SEALS INCLUDE BACK-UP RING AND BARRIER SEALS. CONDUCTED LEAKAGE, TOLERANCE ASSESSMENT, CRITICAL SEAL STUDY SSV76-36. BARRIER SEAL LIMITS LEAKAGE RATE TO 6 GPH CALCULATED. NO INTERCONNECTION BETWEEN HYDRAULIC SYSTEMS. PDU IS DESIGNED FOR 100K PRESSURE IMPULSE CYCLES (1.5 X OPERATING PRESSURE) AND A BURST PRESSURE OF 2.5 X OPERATING.

(B) TEST:
QUALIFICATION TESTS: THERMAL CYCLE (-40 DEG F TO +275 DEG F), FULL LIFE/LIMIT LOAD (400 MISSION DUTY CYCLES), RANDOM VIBRATION, PROOF PRESSURE (1.5 X OPERATING PRESSURE), ULTIMATE LOAD, 100,000 PRESSURE IMPULSE CYCLES (1.5 X OPERATING PRESSURE), AND BURST (2.5 X OPERATING PRESSURE AT +275 DEG F).

ACCEPTANCE TESTS: PROOF PRESSURE, PROOF LOW PRESSURE, QUIESCENT LEAKAGE, AND FUNCTIONAL TEST.

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

(C) INSPECTION:
RECEIVING INSPECTION

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

NONDESTRUCTIVE EVALUATION
PIECE PARTS EVALUATED BY SELECTED PENETRANT, MAGNETIC PARTICLE, ULTRASONIC, AND RADIOGRAPHIC INSPECTIONS.

ASSEMBLY/INSTALLATION
CLOSE TOLERANCE FITS AND ASSEMBLY TORQUES ARE VERIFIED BY INSPECTION. PERSONNEL ARE TRAINED/CERTIFIED IN THE USE OF SPECIALLY DESIGNATED TOOLS/FIXTURES WHICH ARE REQUIRED IN ASSEMBLY DOCUMENTATION. CORRECT SEAL AND MATING PART. ASSEMBLY AND INSTALLATION VERIFIED.

TESTING
ATP IS VERIFIED BY INSPECTION. ROCKWELL DESIGN AND QUALITY PERSONNEL, WITH NASA PARTICIPATION, CONDUCT A DETAILED ACCEPTANCE REVIEW OF THE HARDWARE AT THE VENDOR'S FACILITY, PRIOR TO THE SHIPMENT OF EACH END ITEM COVERED BY THE CONTROL PLAN.

HANDLING/PACKAGING
HANDLING/PACKAGING PROCESSES UTILIZE SPECIALLY DESIGNED CONTAINERS AND INSERTS PROTECTING FROM STRUCTURAL/ENVIRONMENTAL DAMAGE

(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	: <u>J. Kumura 8-18-98</u>
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 95-CIL-009_02-2A