

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE

NUMBER: 02-2C-C01-ST-A -X

SUBSYSTEM NAME: FLIGHT CONTROL - ELEVON ACTUATOR

REVISION: 0

12/04/87

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:ELEVON ACTUATOR MOOG	MC621-0014

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
ELEVON ACTUATOR, STRUCTURE

QUANTITY OF LIKE ITEMS: 4
ONE FOR EACH OF FOUR ELEVON PANELS

FUNCTION:
PROVIDES FORCE AND CONTROL FOR POSITIONING THE SPACE SHUTTLE ELEVONS.

FAILURE MODES EFFECTS ANALYSIS FMEA - CIL FAILURE MODE

NUMBER: 02-2C-C01-ST-A-02

REVISION#: 1 08/20/98

SUBSYSTEM NAME: FLIGHT CONTROL - ELEVON ACTUATOR

LRU: ELEVON ACTUATOR

ITEM NAME: ELEVON ACTUATOR

CRITICALITY OF THIS
FAILURE MODE: 1/1**FAILURE MODE:**

FRACTURE OF ACTUATOR TAILSTOCK, ROD END, PISTON HEAD, PISTON ROD

MISSION PHASE: LO LIFT-OFF
DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:	102	COLUMBIA
	103	DISCOVERY
	104	ATLANTIS
	105	ENDEAVOUR

CAUSE:

MATERIAL DEFECT, FATIGUE

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 ONE ACTUATOR FUNCTION.

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(B) INTERFACING SUBSYSTEM(S):

LOSS OF CONTROL FOR ONE ELEVON SURFACE.

(C) MISSION:

POSSIBLE LOSS OF MISSION, CREW/VEHICLE. LOSS OF FUNCTION CAN RESULT IN LOSS OF VEHICLE CONTROL.

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

SAME AS (C)

-DISPOSITION RATIONALE-

(A) DESIGN:

PISTON HEAD MARGIN OF SAFETY (MS) IS 0.18 MINIMUM (MIN). ROD END MS IS 0.38 MIN, PISTON ROD MS IS 0.46 MIN AND TAIL STOCK MS IS 0.35 MIN, WITH FRACTURE MECHANICS APPLIED.

(B) TEST:

QUALIFICATION: ENDURANCE CYCLING - 400 MISSION DUTY CYCLES UNDER LOAD AT MAXIMUM TEMPERATURE OF 250 DEGREES F. 100,000 PRESSURE IMPULSE CYCLES AT EACH SUPPLY AND RETURN PORT, AT 225 DEGREES F. SUPPLY PORTS WERE CYCLED FROM 3,000 PSIG TO 4,500 PSIG TO 1,500 PSIG, BACK TO 3,000 PSIG EACH CYCLE; RETURN PORTS, FROM 750 PSIG TO 1,500 PSIG TO 0 PSIG, BACK TO 750 PSIG. BURST PRESSURE OF 9,000 PSIG APPLIED AT SUPPLY PORTS; 4,500 PSIG AT RETURN. VERIFIED THAT ALL PARTS WERE WITHIN ACCEPTABLE LIMITS DURING DISASSEMBLY AND INSPECTION AT COMPLETION OF QUALIFICATION. COLUMN LOAD APPLIED AT 4,500 PSIG IN BOTH EXTEND AND RETRACT POSITIONS. 20G SHOCK PULSE APPLIED IN EACH OF THREE AXES.

ACCEPTANCE: PROOF PRESSURE OF 4,500 PSIG APPLIED AT SUPPLY PORTS. BURN-IN PRESSURE IMPULSE CYCLE TESTS AT 250 DEGREES F: (1) 1,500 IMPULSE CYCLES, 2,400-3,800 PSIG APPLIED AT SUPPLY PORTS, (2) SIMULTANEOUSLY, 1,500 IMPULSE CYCLES, 0-1,500 PSIG AT RETURN PORTS. PERFORMANCE TESTS VERIFY ALL ACTUATOR COMPONENTS ARE OPERATIONAL.

GROUND TURNAROUND TEST

ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

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(C) INSPECTION:

RECEIVING INSPECTION

COMPONENT RAW MATERIAL CERTIFICATIONS ARE VERIFIED BY INSPECTION AND ANALYSIS.

CRITICAL PROCESSES

SWAGING OF ROD END AND TAILSTOCK BEARINGS IS VERIFIED BY INSPECTION.

NDE

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

SPECIAL PROCESSES

CRITICAL/CLOSE TOLERANCE DIMENSIONS AND FINISHES ARE 100 PERCENT INSPECTED FOLLOWING MACHINING.

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.

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

TECHNICAL APPROVAL

: VIA APPROVAL FORM

: J. Kamala 8-24-98

: 95-CIL-009_02-2C