PRINT DATE: 08/24/98

FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 02-2C-C01-PP-A -X

SUBSYSTEM NAME: FLIGHT CONTROL MECH

REVISION: 0 12/04/87

PART DATA

	PART NAME / **VENDOR NAME**	**PART NUMBER** / **VENDOR NUMBER**
LRU	:ELEVON ACTUATOR MOOG	MC621-0014
SRU	:PISTON POSITION TRANSDUCERS	

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
TRANSDUCER, PISTON POSITION (QUAD)

QUANTITY OF LIKE ITEMS: 16
FOUR PER ACTUATOR

FUNCTION:
PROVIDES PISTON SIGNAL FOR ELECTRICAL CLOSED LOOP OPERATION THROUGH INTERFACE WITH THE AVIONIC FLIGHT CONTROL SYSTEM.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE
NUMBER: 02-2C-C01-PP-A- 07

REVISION#: 1 08/20/98

SUBSYSTEM NAME: FLIGHT CONTROL - ELEVON ACTUATOR
LRU: ELEVON ACTUATOR **CRITICALITY OF THIS**
ITEM NAME: PISTON POSITION TRANSDUCERS **FAILURE MODE:** 1/1

FAILURE MODE:
LOSS OF OUTPUT, FOUR CHANNELS

MISSION PHASE: LO LIFT-OFF
DO DE-ORBIT

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

CAUSE:
SEPARATION OF END FITTING COMMON TO ALL FOUR TRANSDUCER COILS, SEPARATION OF TRANSDUCER MOUNTING FLANGE FROM TAILSTOCK

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):
COMPLETE LOSS OF CONTROL OF 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:
MATCHED SETS OF PARTS MAINTAINED AND VERIFIED DURING MANUFACTURING. ATTACHMENT VERY LIGHTLY LOADED. TRANSDUCERS HAVE LARGE CLEARANCE BETWEEN CORE/CORE ASSEMBLY. THE FOUR DRIVE RODS ARE BRAZED TO A COMMON DRIVE MEMBER AFTER NULL ADJUSTMENT. THE DRIVE MEMBER IS MOUNTED IN A PRELOADED DOUBLE-ANGULAR CONTACT BALL BEARING PROVIDED TO ALLOW FOR ROTATION OF THE PISTON ROD RELATIVE TO THE BODY. THE DRIVE MEMBER HAS BEEN SIZED, MOUNTED AND DUAL-RETENTION SECURED IN THE PISTON ROD TO PROVIDE A NONCREDIBLE SINGLE FAILURE POINT.

(B) TEST:
QUALIFICATION: ENDURANCE CYCLING-400 MISSION DUTY CYCLES UNDER LOAD AT MAXIMUM TEMPERATURE OF 250 DEGREES F. ACTUATOR WAS VIBRATED AT FLIGHT LEVELS AND TESTED AT -65 AND 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. PERFORMANCE RECORD TESTS CONDUCTED AT 35 AND 225 DEGREES F FOLLOWING ENDURANCE TESTING. VERIFIED THAT ALL PARTS WERE WITHIN ACCEPTABLE LIMITS DURING DISASSEMBLY AND INSPECTION AT COMPLETION OF QUALIFICATION.

ACCEPTANCE: PERFORMANCE TESTS VERIFY PISTON POSITION TRANSDUCERS ARE OPERATIONAL.

GROUND TURNAROUND TEST

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NUMBER: 02-2C-C01-PP-A- 07

ANY TURNAROUND CHECKOUT TESTING IS ACCOMPLISHED IN ACCORDANCE WITH OMRSD.

(C) INSPECTION:
RECEIVING INSPECTION
RAW MATERIAL CERTIFICATIONS ARE VERIFIED. SPECIAL MATERIAL REQUIREMENTS ARE IDENTIFIED IN CERTIFICATIONS. END FITTING IS MANUFACTURED BY MOOG AND SUPPLIED TO TRANSDUCER VENDOR.

ASSEMBLY/INSTALLATION
SAFETY WIRING AND TORQUING OPERATIONS ARE PERFORMED AND VERIFIED BY MANDATORY INSPECTIONS. SPECIALLY DESIGNED ASSEMBLY TOOLS/FIXTURES ARE REQUIRED BY ASSEMBLY DOCUMENTATION.

TESTING
ATP WITNESSED BY ROCKWELL QUALITY AND DCAS. TRANSDUCER ATP PERFORMED AT COMPONENT LEVEL AND AT ACTUATOR LEVEL. 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 CONTROL PLAN.

(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. Kennedy 3-24-98
TECHNICAL APPROVAL	: VIA APPROVAL FORM	: 85-CIL-009_02-2C