

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE
NUMBER:05-1-FC3442 -X

SUBSYSTEM NAME: GUIDANCE, NAVIGATION, & CONTRCL
REVISION: 0 02/09/88

PART DATA

	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
LRU	:RUDDER PEDAL TRANSDUCER ASSY	MC621-0043-3440

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
RUDDER PEDAL TRANSDUCER ASSEMBLY (RPTA) COMMANDER AND PILOT.

REFERENCE DESIGNATORS: 30V73A14
30V73A15

QUANTITY OF LIKE ITEMS: 2
TWO REQUIRED, FLIGHT DECK

FUNCTION:
CONVERTS PEDAL DISPLACEMENTS INTO ELECTRICAL STEERING COMMANDS FOR
AERODYNAMIC FLIGHT AND NOSEWHEEL STEERING.

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE

NUMBER: 05-1-FC3442-03

REVISION#: 1 01/03/96

SUBSYSTEM NAME: GUIDANCE, NAVIGATION, & CONTROL

LRU: RUDDER PEDAL TRANSDUCER ASSY

ITEM NAME: RUDDER PEDAL TRANSDUCER ASSY

CRITICALITY OF THIS
FAILURE MODE: 1/1

FAILURE MODE:

ERRONEOUS OUTPUT (TWO OR MORE CHANNELS)

MISSION PHASE: DO DE-ORBIT

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

CAUSE:

PHYSICAL JAMMING DUE TO VIBRATION, MECHANICAL SHOCK, MISHANDLING/ABUSE,
PIECE PART STRUCTURAL FAILURE, CONTAMINATION OR LINKAGE FAILURE.

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:

ERRONEOUS COMMAND SIGNAL SENT TO FLIGHT CONTROL SYSTEM.

(B) INTERFACING SUBSYSTEM(S):

SAME AS (A)

(C) MISSION:

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LOSS OF RUDDER/NOSEWHEEL STEERING IF EITHER RPTA FAILS IN THE HARDOVER POSITION DURING LANDING/ROLLOUT. REDUNDANCY MANAGEMENT SELECTS THE LARGER SIGNAL OF EITHER THE LEFT OR RIGHT RPTA.

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

(E) FUNCTIONAL CRITICALITY EFFECTS:
CRITICALITY 1 BECAUSE OF INADEQUATE TIME FOR CREW TO DETECT FAILURE, REMOVE POWER FROM AFFECTED RPTA AND REGAIN CONTROL WITH OTHER STATION

-DISPOSITION RATIONALE-

(A) DESIGN:

THE ELECTROMECHANICAL DESIGN HAS A CERTIFIED OPERATIONAL LIFE OF 23,500 HOURS. THE QUALIFIED CYCLIC LIFE FOR THE MAJOR AXIS INCLUDING TRANSDUCER INTERFACE, IS CERTIFIED FOR 25,500 CYCLES. ANALYSIS OF THE LOAD BEARING MECHANISMS INDICATE A YIELD LIMIT OF AT LEAST 1.4 TIMES THE OPERATIONAL DESIGN LOAD. UNIT IS COMPLETELY ENCLOSED TO PREVENT DEBRIS FROM ENTERING AND JAMMING MECHANISM.

ALL ELECTRICAL, ELECTRONIC, AND ELECTROMECHANICAL (EEE) PIECE PARTS WHICH MAKE UP THE RPTA ARE CONTROLLED TO THE ORBITER PROJECT PARTS LIST (OPPL) REQUIREMENTS OF MF0004-400. PASSIVE SEE PARTS AND ELECTRICAL CONNECTORS ARE MILITARY QUALIFIED AND 100% SCREENED TO OPPL REQUIREMENTS. MICRO-CIRCUITS ARE QUALIFIED TO MIL-M-38510 AND SCREENED TO MIL-S-883. LEVEL B. SEMICONDUCTOR DEVICES ARE JANTXV LEVEL. CIRCUIT DESIGN LIMITS WORST CASE JUNCTION TEMPERATURES TO 95°C, AND ELECTRICAL STRESSES TO 50% OF RATED CAPABILITY FOR ALL PARTS.

(B) TEST:

ACCEPTANCE TESTING, WHICH INCLUDES ACCEPTANCE THERMAL TESTING (ATT) AND ACCEPTANCE VIBRATION TESTING (AVT), IS PERFORMED ON EACH UNIT. QUALIFICATION TESTING, INCLUDING VIBRATION, SHOCK, TEMPERATURE WAS COMPLETED TO CERTIFY THE DESIGN. INTEGRATED AND SUBSYSTEM VERIFICATION TESTS ARE PERFORMED TO RE-ESTABLISH THE RPTA INTEGRITY DURING TURNAROUND.

(C) INSPECTION:

RECEIVING INSPECTION
INCOMING MATERIAL IS VERIFIED BY RECEIVING INSPECTION.

CONTAMINATION CONTROL

HARDWARE AND FACILITY CONTAMINATION CONTROL MONITORED BY INSPECTION. FINAL ASSEMBLY AND REWORK PERFORMED IN A CLEAN ROOM.

ASSEMBLY/INSTALLATION

QUALITY PLANNING ENSURES ALL DRAWING AND PROCUREMENT REQUIREMENTS ARE PUT INTO IN-PROCESS WORK TICKETS. TORQUING (ACCEPT/REJECT) VERIFIED BY INSPECTION. MECHANICAL RIGGING AND TORQUING ARE VERIFIED BY INSPECTION.

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NONDESTRUCTIVE EVALUATION
RADIOGRAPHIC ANALYSIS, ULTRASONIC TESTING, DYE PENETRANT AND MAGNETIC
PARTICLE ANALYSIS VERIFIED BY INSPECTION.

CRITICAL PROCESSES
POTTING, BONDING, FUSION WELDING, SOLDERING AND MATERIAL CLEANING VERIFIED
BY INSPECTION.

TESTING
ENVIRONMENTAL ACCEPTANCE TESTING IS OBSERVED AND VERIFIED BY QUALITY
CONTROL.

HANDLING/PACKAGING
THE PACKING AND PACKAGING REQUIREMENTS ARE MET BY USE OF SPECIAL
QUALIFIED CONTAINERS FOR IN-PLANT TRANSPORTATION AND SHIPPING.

(D) FAILURE HISTORY:
NO PHYSICAL JAMMING FAILURES INCLUDING LINKAGE FAILURES HAVE OCCURRED
DURING DEVELOPMENT, QUALIFICATION OR ACCEPTANCE TESTING; FIELD TESTING
AND FLIGHT OPERATIONS.

(E) OPERATIONAL USE:
NONE

- APPROVALS -

EDITORIALLY APPROVED	: RI	: <u> </u> 1/17/96
EDITORIALLY APPROVED	: JSC	: <u> </u> 1-25-96
TECHNICAL APPROVAL	: APPROVAL FORM	: 95-CIL-001-RI