FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL HARDWARE
NUMBER: 02-2A-021300 -X

SUBSYSTEM NAME: FLIGHT CONTROL MECH - RUDDER SPEED BRAKE & BF
REVISION: C 02/02/88

PART DATA

	PART NAME / **VENDOR NAME**	**PART NUMBER** / **VENDOR NUMBER**
	. BODY FLAP ACTUATION	
SRU	: ROTARY ACTUATORS	MC621-0056-0021
SRU	: ROTARY ACTUATORS	MC621-0056-0022
SRU	: ROTARY ACTUATORS	MC621-0056-0024

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
ROTARY ACTUATOR

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 4
TWO INBOARD (LEFT/RIGHT)
TWO OUTBOARD (LEFT/RIGHT)

FUNCTION:
TRANSMITS RPM/TORQUE FROM BODY FLAP DRIVE SHAFTS TO NEXT DRIVE SHAFT AND BODY FLAP SURFACE.

PRINT DATE 08/18/98

FAILURE MODES EFFECTS ANALYSIS FMEA -- CIL FAILURE MODE
NUMBER: 02-2A-021300- 01

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

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

MISSION PHASE: DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102	COLUMBIA
103	DISCOVERY
104	ATLANTIS
105	ENDEAVOUR

CAUSE:
BROKEN GEAR TEETH. SEIZED GEAR OR BEARING, OVERLOAD. 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:
LOSS OF RPM/TORQUE OUTPUT FROM ONE OR MORE ROTARY ACTUATORS, RESULTING IN LOSS OF BODY FLAP FUNCTION.

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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:
GEARS AND SHAFTS DESIGNED FOR MAX TORQUE WITH 1.4 SAFETY FACTOR. CARBURIZED STEEL FOR GEARS VACUUM MELT PER AMS 6265 WITH CARBURIZING TO AGMA 246.01. SHOTPEEN TO MIL-S-13165. HEAVILY LOADED GEARS ARE GRIT BLASTED TO REMOVE IGO; LIGHTLY LOADED GEARS GROUND FOR IGO REMOVAL. GEAR STRESS ANALYSIS PER LEWIS EQUATION. FATIGUE ANALYSIS BASED ON GREATEST MISSION DUTY CYCLES X 4 FOR DESIGN REQUIREMENT. BEARINGS DESIGNED FOR B-10 LIFE MIN. SEALED GEARBOXES ACCEPTED BY PROGRAM PER MCR 231.

(B) TEST:
QUALIFICATION TESTS: QUALIFICATION TESTING CYCLE TESTED FOR OPERATING AND DYNAMIC LOAD CYCLES PER MISSION X 4 PLUS AN ULTIMATE LOAD TEST TO 1.4 X THE DESIGN LIMIT LOAD, THERMAL CYCLE (-40 DEG F TO +275 DEG F). VIBRATION (20 TO 2,000 HZ), ULTIMATE LOAD, STIFFNESS, AND FATIGUE LIFE

ACCEPTANCE TESTS: FREEPLAY, OPERATING HINGE MOMENT AND SURFACE RATE.

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

(C) INSPECTION:
RECEIVING INSPECTION
MATERIAL AND PROCESS CERTIFICATIONS VERIFIED, INCLUDING GEAR CERTIFICATIONS, CONTROLS, AND MATERIAL IDENTIFICATION, CODE, MILL SOURCE, HEAT NUMBER, CHEMICAL ANALYSIS AND HARDNESS VERIFICATION.

CONTAMINATION CONTROL

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CORROSION/CONTAMINATION PROTECTION REQUIREMENTS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
ASSEMBLY AND INSTALLATIONS ARE VERIFIED BY SHOP TRAVELER MANDATORY INSPECTION POINTS (MIPS). BALL BEARINGS ARE INSTALLED. BALL CONTROLLED AND VERIFIED BY INSPECTION. SHAFT AND SPLINE MATERIAL INSPECTED AND VERIFIED PER DRAWING REQUIREMENTS. ALIGNMENT REQUIREMENTS ARE VERIFIED. BEARING LUBRICATION VERIFIED.

NONDESTRUCTIVE EVALUATION
MAGNETIC PARTICLE INSPECTION AND ULTRASONIC INSPECTION ARE VERIFIED.

CRITICAL PROCESSES
HEAT TREATMENT AND PARTS PASSIVATION ARE VERIFIED. PLATING SHOT PEENING AND COATING PROCESS VERIFIED. APPLICATION OF DRY FILM LUBE TO INTERNAL SPLINE AFTER PLATING VERIFIED BY INSPECTION.

TESTING
ACCEPTANCE TESTS CERTIFICATIONS VERIFIED BY INSPECTION.

HANDLING/PACKAGING
HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

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