

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :FLT CONT MECH-ELEVON SEAL FMEA NO 02-2D-E100 -1 REV:02/17/88

ASSEMBLY :ELEVON SEAL MECHANISM				CRIT. FUNC:	1
P/N RI :V070-596002 (OUTBD PANEL)				CRIT. HDW:	1
P/N VENDOR:V070-596001 (INBD PANEL)	VEHICLE	102	103	104	
QUANTITY :34	EFFECTIVITY:	X	X	X	
:17 EACH WING	PHASE(S):	PL	LO X	OO X	DO X LS

	REDUNDANCY SCREEN:	A-	B-	C-
PREPARED BY:	APPROVED BY:	APPROVED BY (NASA):		
DES R. H. YEE	DES <i>R. H. Yee</i>	SSM		
REL J. S. MULLEN	REL <i>J. S. Mullen</i>			
QE W. J. SMITH	QE <i>W. J. Smith</i>			

ITEM:

LINKAGE ASSEMBLY, OUTBOARD/INBOARD ELEVON SEAL PANEL

FUNCTION:

THE ELEVON SEAL PANEL LINKAGE ASSEMBLY IS USED TO DRIVE THE ELEVON SEAL PANELS. THIS MECHANISM IS DRIVEN BY ELEVON MOVEMENT AND MAINTAINS A GAP BETWEEN THE EDGE OF THE ELEVON AND THE ELEVON SEAL PANEL OVER THE REQUIRED RANGE OF ELEVON TRAVEL. THERE ARE 15 ELEVON PANELS AND 17 ASSOCIATED MECHANISMS ON THE LEFT-HAND AND RIGHT-HAND WINGS.

FAILURE MODE:

INOPERATIVE

CAUSE(S):

PHYSICAL BINDING/JAMMING, STRUCTURAL FAILURE.

EFFECT(S) ON:

(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) HEAT INGESTION TO ELEVON SPAR FITTINGS.

(B) STRUCTURAL DEGRADATION OF ELEVON AND WING. POTENTIAL DAMAGE TO HYDRAULIC/ELECTRICAL LINES/COMPONENTS.

(C) NONE.

(D) POSSIBLE LOSS OF CREW/VEHICLE.

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DISPOSITION & RATIONALE:

(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN

THE ELEVON SEAL MECHANISM IS A GROUP OF KINEMATIC SLAVE LINKAGES (COMPOSED OF PUSH RODS AND BELLCRANKS THAT ARE JOINED/CONNECTED BETWEEN THE ELEVON SPAR FITTINGS) TO CONTROL THE MOVEMENT AND POSITION OF THE HINGED SEAL PANELS; TO PROVIDE A SMOOTH AERODYNAMIC UPPER TRANSITION SURFACE FROM THE WING TORQUE BOX TO THE MOVEABLE ELEVONS; TO CLOSEOUT THE WING/ELEVON CAVITY. SAFETY FACTOR 1.4 MINIMUM; BEARINGS HAVE DUAL ROTATING SURFACES AND DRY-FILM LUBE. MATERIALS USED: 2024-T62 ALUMINUM, INCONEL 718 AND A-286 CRESS STEEL.

(B) TEST

QUALIFICATION TESTS: QUALIFICATION-CERTIFIED PER CR-28-596008-001E. ACOUSTIC VIBRATION TEST (AERO-ACOUSTIC NOISE SPECTRA) PER DATA BOOK SD74-SH-0082A WAS PERFORMED. CERTIFICATION BY FORMAL ANALYSIS (PER MF0004-014C) FOR FUNGUS, SALT SPRAY, SAND/DUST AND TEMPERATURE (HIGH/LOW CYCLE, +350 DEG F/-140 DEG F) WAS DONE. CERTIFICATION BY FORMAL ANALYSIS FOR LIMIT LOAD (DUE TO 3.4A LOADS), FULL LIFE/100-MISSION FRACTURE LIFE AND MARGIN OF SAFETY (PER STRESS ANALYSIS REPORT SD77-SH-1078, SECTIONS 11.18 AND 15.11) WAS DONE. THERMAL CYCLE TESTS ON WALLS ACOUSTIC TEST ARTICLE.

ACCEPTANCE TESTS: INSTALLATION AND RIGGING PER MLO308-0093; FUNCTIONALLY TESTED AT PALMDALE AND KSC.

OMRSD: DETAILED INSPECTION OF THE INTERNAL WING/ELEVON AREAS FOR EVIDENCE OF CRACKING, FRACTURES OR STRUCTURAL IRREGULARITIES. FREQUENCY - ALL VEHICLES AT GROUND TURNAROUND, AFTER EVERY FIVE FLIGHTS OR CONTINGENCY IF 2 YEARS BETWEEN FLIGHTS.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL AND PROCESS CERTIFICATIONS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS PER MA0110-301 SPECIFICATION REQUIREMENTS IS MAINTAINED. CORROSION PROTECTION PER MA0608-301 VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

INSPECTION VERIFIES PROPER PROCESSING OF SUBASSEMBLIES TO DRAWING REQUIREMENTS, INCLUDING MACHINING, INSTALLATION OF THREADED FASTENERS PER MA0101-301, INSTALLATION OF BUSHINGS, APPLICATION OF SOLID FILM LUBRICANT TO THE BELLCRANKS, AND CHROME PLATING OF THE V070-596083 BOLT. INSTALLATION/RIGGING IS PER SPECIFICATION (MLO308-0093).

NONDESTRUCTIVE EVALUATION

INSPECTION VERIFIES BELLCRANKS, BUSHINGS, BOLTS AND PUSH/PULL ROD ASSEMBLY COMPONENTS ARE PENETRANT INSPECTED.

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CRITICAL PROCESSES

INSPECTION VERIFIES HEAT TREATING OF INCONEL V070-596083 BOLT TO THE REQUIREMENTS OF MA0111-303 (HEAT TREAT FOR MAXIMUM CREEP RESISTANCE).

HANDLING/PACKAGING

PARTS PROTECTION AND HANDLING REQUIREMENTS ARE VERIFIED BY INSPECTION.

TESTING

FUNCTIONAL TESTING AT PALMDALE AND KSC IS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

CAR NO. AD2017 : LOCKING TAB WASHERS DAMAGED DUE TO INSTALLATION/ MAINTENANCE OPERATIONS. INSTALLATION AND MAINTENANCE PROCEDURES MODIFIED.

(E) OPERATIONAL USE

NONE, NO WORKAROUND AVAILABLE.