

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ACTUATION MECH-RADIATORS FMEA NO 02-4G -176 -1 REV:03/07/83

ASSEMBLY :RADIATOR LATCH MECHANISM		CRIT. FUNC:	1R
P/N RI :V070-594461,462,465,466		CRIT. HOW:	2
P/N VENDOR:	VEHICLE	102	103 104
QUANTITY :48	EFFECTIVITY:	X	X X
:24 PER DOOR	PHASE(S):	PL LO	CO X DO LS

REDUNDANCY SCREEN: A-PASS B-N/A C-PASS

PREPARED BY:	APPROVED BY:	APPROVED BY (NASA):
DES M. A. ALLEN	DES <i>D. Campbell</i>	SSM <i>R.C. Moore 3/18/83</i>
REL M. B. MOSKOWITZ	REL <i>M. B. Moskowitz</i>	REL <i>D. Campbell</i>
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ITEM:

LINKAGE, ACTUATING LATCHES

FUNCTION:

BELLCRANKS TRANSMIT MOTION FROM ROTARY ACTUATOR LINKAGE TO THE RADIATOR LATCH HOOKS FOR LATCHING AND UNLATCHING TO THE PAYLOAD BAY DOORS.

FAILURE MODE:

PHYSICAL BINDING/JAMMING

CAUSE(S):

ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECT/DEBRIS, DEFECTIVE PART/MATERIAL OR MANUFACTURING DEFECT, THERMAL DISTORTION, VIBRATION

EFFECTS ON:

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

(A) LOSS OF LATCHING AND UNLATCHING CAPABILITY. POSSIBLE DAMAGE TO LINKAGE OR STRUCTURE IF JAM OCCURS WITH LINKAGE AT OR NEAR ON CENTER POSITION.

(B,C) REDUCED COOLING CAPACITY OF FREON COOLANT LOOPS (APPROXIMATELY 10%) IF RADIATOR CANNOT BE DEPLOYED.

(D) NONE - FIRST FAILURE: LATCHING OF RADIATORS IS NOT CRITICAL FOR SAFE ENTRY UNLESS THE OTHER FREON COOLANT LOOP HAS ALREADY BEEN LOST.

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DISPOSITION & RATIONALE:

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

(A) DESIGN

MATERIALS-2024-T8511 BELLCRANKS, AND INCONEL 718 BEARINGS CHOSEN FOR HIGH STRENGTH/LOW WEAR CHARACTERISTICS. MECHANISM SIZED FOR FULL STALL OUTPUT OF POWER DRIVE UNIT (PDU). POSITIVE MARGIN OF SAFETY ON ALL MECHANISM COMPONENTS. ALL MECHANISMS DESIGNED WITH DUAL ROTATING SURFACES AND DUAL LOCKING DEVICES ON PIVOT SHAFTS. DESIGN PERMITS EXTRAVEHICULAR ACTIVITY (EVA) WORKAROUND IF PAYLOAD DOES NOT LIMIT ACCESS AND IF RADIATORS ARE FULLY DEPLOYED.

(B) TEST

QUALIFICATION TESTS: THE TWO DIFFERENT ACTUATORS HAVE BEEN CERTIFIED PER CR-29-287-0037-0001G (REF. FMEA/CIL NO. 02-4G-153-1) AND CR-29-147-0016-0001A (REF. FMEA/CIL NO. 02-4G-182-1) RESPECTIVELY. THE RADIATOR DEPLOYMENT MECHANISM HAS BEEN CERTIFIED PER CR-29-594400-001D.

QUALIFICATION TESTS OF RADIATOR DEPLOYMENT MECHANISM ON FORWARD 15 FT PAYLOAD BAY DOOR TEST ARTICLE (087) INCLUDE: ACCEPTANCE - TO CONFIRM ALL COMPONENTS HAVE BEEN ASSEMBLED AND RIGGED PER MLO308-0023.; CYCLE FUNCTION - CYCLED 42 TIMES UNDER THREE DIFFERENT TEST CONDITIONS (CONTROL, NON-DISTORTED AND DISTORTED) THROUGH UNLATCH, DEPLOY, STOW AND LATCH CYCLE WITH SIMULATED ZERO GRAVITY; ORBITAL FUNCTION - CYCLED 18 TIMES UNDER THREE DIFFERENT TEST CONDITIONS (TAIL SUN, BOTTOM SUN WITH PAYLOAD BAY DOOR PANEL NO. 1 AND BOTTOM SUN WITH PAYLOAD BAY DOOR PANEL NO. 2) THROUGH UNLATCH AND LATCH CYCLE WITH PAYLOAD BAY DOOR HINGE LINE DISTORTED; ACOUSTIC - TESTED IN ACCORDANCE WITH MF0004-014C (25 HZ TO 8,000 HZ FOR 5 MINUTES); CERTIFICATION BY ANALYSIS/SIMILARITY - PRESSURE, FUNGUS, HUMIDITY, OZONE, TEMPERATURE-CYCLE, TRANS-PACKAGE, LANDING, SHOCK, BASIC DESIGN, ACCELERATION, SALT SPRAY, SAND/DUST, TRANSPORTATION-VIBRATION, LIMIT LOAD, ULTIMATE LOAD AND MARGIN OF SAFETY.

ACCEPTANCE TESTS: THE RADIATOR DEPLOYMENT MECHANISMS WERE RIGGED PER CONTROLLED SPECIFICATION MLO308-0023. OPERATION OF RADIATORS DEPLOYMENT MECHANISMS WERE VERIFIED IN CHECKOUT AT KSC WHICH INCLUDED RADIATOR FUNCTIONAL CHECK.

OMRSD: GROUND TURNAROUND INCLUDES VISUAL INSPECTION OF HARDWARE TO INSURE PARTS ARE NOT BROKEN OR DEFORMED AND MONITORING FUNCTIONAL TEST FOR EVIDENCE OF BINDING OR JAMMING. THESE TESTS ARE PERFORMED FIRST FLIGHT AND FOR EVERY FLIGHT WHERE THE RADIATORS WILL BE DEPLOYED.

(C) INSPECTION

RECEIVING INSPECTION

MATERIAL AND PROCESS CERTIFICATIONS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL AND CORROSION PROTECTION PER MA0608-301 REQUIREMENTS ARE VERIFIED BY INSPECTION.

02-46.50

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ASSEMBLY/INSTALLATION

MATERIAL USED FOR FABRICATION OF BELLCRANKS IS VERIFIED BY INSPECTION ON MANUFACTURING ORDERS. MACHINING OPERATIONS ARE VERIFIED BY INSPECTION PER DRAWING AND MACHINING SPECIFICATION. BUSHING INSTALLATION IS PER APPLICABLE SPECIFICATION AND IS VERIFIED BY INSPECTION - TOOL USED FOR AID.

NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION PER MTO501-504 IS REQUIRED AND VERIFIED BY INSPECTION.

CRITICAL PROCESSES

HEAT TREATMENT VERIFIED BY INSPECTION.

TESTING

ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PACKAGED PER APPLICABLE SPECIFICATION AND VERIFIED BY INSPECTION.

(D) FAILURE HISTORY

THERE HAVE BEEN NO ACCEPTANCE TEST, QUALIFICATION TEST, FIELD OR FLIGHT FAILURES ASSOCIATED WITH THIS FAILURE MODE.

(E) OPERATIONAL USE

NONE.