

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ACTUATION MECH-RADIATORS FMEA NO 02-4G -181 -1 REV:03/07/88

ASSEMBLY :RADIATOR LATCHING MECH CRIT. FUNC: 1R
P/N RI :V070-594480 (2 REQ) CRIT. HDW: 2
:V070-594490 (4 REQ)
QUANTITY :12 VEHICLE 102 103 104
EFFECTIVITY: X X X
:SIX PER DOOR PHASE(S): PL LO OO X DO LS

PREPARED BY: REDUNDANCY SCREEN: A-PASS B-N/A C-PASS
DES M. A. ALLEN APPROVED BY: APPROVED BY (NASA):
REL M. B. MOSKOWITZ REL *R.C. Moore 3/18/88*
QE W. J. SMITH QE *[Signature]*

ITEM:
TORQUE SHAFT - POWER DRIVE

FUNCTION:
TRANSMITS TORQUE FROM THE POWER DRIVE UNIT (PDU) TO THE ROTARY ACTUATORS AND BETWEEN ROTARY ACTUATORS.

FAILURE MODE:
STRUCTURAL FAILURE

CAUSE(S):
ADVERSE TOLERANCES/WEAR, CORROSION, DEFECTIVE PART/MATERIAL OR MANUFACTURING DEFECT, EXCESSIVE LOAD, FATIGUE

EFFECTS ON:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE
(A) LOSS OF LATCHING OR UNLATCHING CAPABILITY.
(B,C) NONE. 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.

DISPOSITION & RATIONALE:
(A) SUBSYSTEM (B) INTERFACES (C) MISSION (D) CREW/VEHICLE

(A) DESIGN
MATERIALS, 2024-T81 TORQUE SHAFTS WITH 6AL-4V TITANIUM COUPLINGS CHOSEN FOR HIGH STRENGTH/LOW WEAR CHARACTERISTICS. POSITIVE MARGIN OF SAFETY ON ALL MECHANISM COMPONENTS.

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(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 THAT 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

MATERIALS AND PROCESS CERTIFICATIONS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CONTAMINATION CONTROL AND CORROSION PROTECTION VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

PROCESSING MATERIALS WHICH CONTACT TITANIUM IS PER APPLICABLE SPECIFICATION. MACHINING OPERATIONS ARE PER DRAWING AND MACHINING SPECIFICATION AND VERIFIED BY INSPECTION. ALL ASSEMBLY DETAILS AND COMPONENTS ARE MANUFACTURED PER DRAWING AND APPLICABLE SPECIFICATIONS AND ALL ARE VERIFIED BY INSPECTION. CENTERING CENTERLINE OF SPLINE VERIFIED BY INSPECTION. LENGTH DIMENSION IS VERIFIED PRIOR TO DRILLING, AND ALL OPERATIONS ARE VERIFIED BY INSPECTION. THE COMPLETE ASSEMBLY IS VERIFIED BY INSPECTION. FABRICATION OF ALUMINUM TUBING PER MA0102-306 VERIFIED BY INSPECTION. APPLICATION OF DRY FILM LUBE LB0140-004 PER DRAWING REQUIREMENTS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION OF ALUMINUM TORQUE SHAFTS AND TITANIUM COUPLINGS PER MT0501-504 VERIFIED BY INSPECTION.

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CRITICAL PROCESSES

HEAT TREATMENT OF ALUMINUM TUBING VERIFIED BY INSPECTION.

TESTING

ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING

IDENTIFICATION AND PACKAGING ARE PER APPLICABLE SPECIFICATIONS 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.