

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ACTUATION MECH-RADIATORS FMEA NO 02-4G -157 -1 REV:03/07/88

ASSEMBLY :RADIATOR DEPLOY MECH		CRIT. FUNC:	1R
P/N RI :MEL31-0051-0009		CRIT. HDW:	2
P/N VENDOR:U.S. BEARING	VEHICLE	102	103 104
QUANTITY :4	EFFECTIVITY:	X	X X
:TWO PER SIDE	PHASE(S):	PL LO	OO X DO LS

		REDUNDANCY SCREEN:	A-FAIL B-FAIL C-PASS
PREPARED BY:		APPROVED BY:	APPROVED BY (NASA):
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ITEM:
BEARING, TORQUE SHAFT SUPPORT

FUNCTION:
PROVIDES ALIGNMENT AND SUPPORT FOR RADIATOR DEPLOYMENT TORQUE SHAFT MIDWAY BETWEEN TWO ROTARY ACTUATORS FOR EACH OF FOUR PANELS.

FAILURE MODE:
FAILS TO ROTATE

CAUSE(S):
ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECT/DEBRIS, SEIZED BEARING, TEMPERATURE, MISALIGNMENT

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

(A) LOSS OF RADIATOR DEPLOYMENT/STOWAGE CAPABILITY.

(B) POSSIBLE INTERFERENCE WITH CLOSING PAYLOAD BAY DOOR IF RADIATOR CANNOT BE STOWED.

(C) REDUCED COOLING CAPACITY IF RADIATOR CANNOT BE DEPLOYED; POSSIBLY RESTRICTING MISSION.

(D) POSSIBLE LOSS OF VEHICLE/CREW IF RADIATOR CANNOT BE STOWED RESULTING IN INTERFERENCE WITH CLOSING OF PAYLOAD BAY DOORS.

FAILS REDUNDANCY SCREEN "A" SINCE THERE ARE NO TURNAROUND TESTS FOR FIRST FAILURE OF BEARING WHICH FAILS TO ROTATE AND FAILS SCREEN "B" SINCE FIRST FAILURE OF THE TORQUE SHAFT SUPPORT BEARINGS CANNOT BE DETECTED IN FLIGHT.

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DISPOSITION & RATIONALE:

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

(A) DESIGN

MULTIPLE ROTATING SURFACES-SHAFT/BEARING BORE, BEARING BALL/OUTER RACE, OUTER RACE/HOUSING. BEARING BALL AND RACE ARE INCONEL 718 DRY FILM LUBED. HOUSING AND PORTION OF SHAFT THROUGH BEARING ARE TITANIUM 6AL-4V. DESIGN OF THE ACTUATION SYSTEM PERMITS PARTIAL WORKAROUND OF THIS FAILURE MODE BY EXTRAVEHICULAR ACTIVITY (EVA) CREW 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: THERE IS NO PRACTICAL OMRSD TEST TO DETECT FIRST FAILURE.

(C) INSPECTION

RECEIVING INSPECTION

MATERIAL AND PROCESS CERTIFICATIONS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

CLEANLINESS AND CONTAMINATION CONTROL REQUIREMENTS ARE VERIFIED BY INSPECTION.

02-46.44

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ASSEMBLY/INSTALLATION

RACE INSPECTED FOR FACING, CHAMBER, BORE, EDGE DIMENSIONS, RADIAL DIAMETER, OUTER DIAMETER, AND EDGE DIMENSIONS, CHROME PLATING CERTIFICATIONS AND DRY LUBE PER NPI-1220. BEARING ASSEMBLY INSPECTED FOR STAKING, INNER DIAMETER, HONE, OUTER DIAMETER, GRIND, EDGE BREAK, AND DRY LUBE. DIMENSIONAL MEASUREMENTS AND DIAMETRAL CLEARANCE PERFORMED ON FINAL INSPECTION.

NONDESTRUCTIVE EVALUATION

PENETRANT INSPECTION PERFORMED BY CERTIFIED PROCESSOR AND VERIFIED BY INSPECTION.

CRITICAL PROCESSES

HEAT TREAT AND CHROME PLATING VERIFIED BY INSPECTION.

TESTING

FUNCTIONAL TESTS MONITORED FOR EVIDENCE OF BINDING OR JAMMING.

HANDLING/PACKAGING

HANDLING AND PACKAGING REQUIREMENTS ARE 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

EVA WORKAROUND IS POSSIBLE IF RADIATORS ARE FULLY DEPLOYED.