

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ACTUATION MECH-PBD FMEA NO 02-4B -008 -1 REV:03/08/88

ASSEMBLY	: LATCHING MECHANISM, PBD				CRIT. FUNC:	1R
P/N RI	: V070-594314, 315, 319 (FWD)				CRIT. HDW:	2
	: V070-594316, 317, 270, 271 (AFT)	VEHICLE	102	103	104	
QUANTITY	: 16	EFFECTIVITY:	X	X	X	
	: 8 PER FWD BULKHEAD	PHASE(S):	PL	LO	OO X DO	LS
	: 8 PER AFT BULKHEAD					

PREPARED BY:		REDUNDANCY SCREEN:	A-PASS	B-FAIL	C-PASS
DES	M. A. ALLEN	APPROVED BY:	APPROVED BY (NASA):		
REL	M. B. MOSKOWITZ	DES	<i>J. Campbell</i>	SSM	<i>S.C. M... 3/18/88</i>
QE	W. J. SMITH	REL	<i>M.B. Moskowitz</i>	REL	<i>[Signature]</i>
		QE	<i>[Signature]</i>	QE	<i>[Signature]</i>

ITEM:

LATCH HOOK AND ROLLER, FORWARD AND AFT BULKHEAD LATCHES

FUNCTION:

ENGAGES ROLLER ON FORWARD/AFT BULKHEAD TO PROVIDE STRUCTURAL ATTACHMENT OF PAYLOAD BAY DOOR TO MID FUSELAGE.

FAILURE MODE:

FAILS TO ENGAGE

CAUSE(S):

ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECT/DEBRIS, FAILURE/DEFLECTION OF INTERNAL PART, IMPROPER RIGGING/ADJUSTMENT, THERMAL DISTORTION, STRUCTURAL FAILURE

EFFECTS ON:

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

(A) FAILS TO SECURE PAYLOAD BAY DOOR IN CLOSED POSITION.

(B) DEGRADED STRUCTURAL INTEGRITY OF FUSELAGE IN DESCENT PHASE.

(C) ENTRY MAY PROCEED WITH ANY SINGLE LATCH DISENGAGED OR ANY ONE OF FOUR BULKHEAD LATCH GANGS DISENGAGED, REF. JSC08934.

(D) POSSIBLE LOSS OF CREW VEHICLE IF MORE THAN ONE GANG OF BULKHEAD LATCHES FAIL TO LATCH.

FAILS REDUNDANCY SCREEN "B" SINCE THE INDICATION SWITCHES INDICATE ALL LATCHES ARE ENGAGED ONLY WHEN THE ACTUATOR HAS COMPLETED ITS TRAVEL, REGARDLESS IF ONE OR MORE LATCHES ARE NOT ENGAGED.

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DISPOSITION & RATIONALE:

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

(A) DESIGN

ADJUSTMENT CAPABILITY PROVIDED IN LATCH LINKAGES AND ACTUATOR ATTACHMENTS. LATCH REACH CAPABILITY SUFFICIENT TO CAPTURE ROLLERS UNDER WORST CASE DOOR STALL AND WARPAGE CONDITIONS. LATCH AND MECHANISM MATERIALS, 6AL-4V TITANIUM, INCONEL 718, A286 CRES, CHOSEN FOR HIGH STRENGTH/LOW WEAR CHARACTERISTICS. POSITIVE MARGIN OF SAFETY ON ALL MECHANISM COMPONENTS. ALL MECHANISMS DESIGNED WITH DUAL ROTATING SURFACES AND DUAL LOCKING DEVICES ON PIVOT SHAFTS. DESIGN OF THE ACTUATION SYSTEM PERMITS PARTIAL WORKAROUND OF THIS FAILURE MODE BY EXTRAVEHICULAR ACTIVITY (EVA) CREW IF PAYLOAD DOES NOT LIMIT ACCESS.

(B) TEST

QUALIFICATION TESTS: THE QUALIFICATION ACTUATOR IS CERTIFIED PER CR-29-287-0039-0001D (REF. FMEA/CIL 02-4B-007-3). THE PAYLOAD BAY DOOR LATCHING MECHANISM IS CERTIFIED PER CR-29-594160-001D FOR FORWARD MECHANISM AND CR-29-594260-001E FOR AFT MECHANISM. SYSTEM QUALIFICATION TESTS ON 15 FOOT PAYLOAD BAY DOOR TEST ARTICLE (087) INCLUDED: ACCEPTANCE - TO CONFIRM ALL COMPONENTS HAVE BEEN ASSEMBLED AND RIGGED PER MLO308-0022; THERMAL CYCLE TEST - CYCLED 5 TIMES BETWEEN -40 DEG F AND +282 DEG F AT DOOR AND BETWEEN -120 DEG F AND +100 DEG F AT THE FORWARD BULKHEAD; AND CYCLED 5 TIMES BETWEEN +15 DEG F AND +325 DEG F AT DOOR AND BETWEEN -180 DEG F AND +120 DEG F AT AFT BULKHEAD; THE FORWARD LATCHES WERE CYCLED AT -55 DEG F AND +50 DEG F AT BULKHEAD AND AT 0 DEG F AND +190 DEG F AT DOOR. THE AFT LATCHES WERE CYCLED AT -35 DEG F AND +60 DEG F AT BULKHEAD AND AT +40 DEG F AND +245 DEG F AT DOOR; HUMIDITY TEST - ON AFT LATCH MECHANISM PER CONDITION DURING THE SECOND CYCLE; ORBITAL FUNCTIONS - 3 THERMAL CONDITIONS WITH SIMULATED THERMAL DISTORTIONS OF BULKHEAD AND SILL LONGERONS; OPERATING LIFE TEST - MECHANICAL SYSTEMS CYCLED 262 TIMES AT FORWARD BULKHEAD AND 265 TIMES AT AFT BULKHEAD; ACOUSTIC TEST - PER MF0004-014C FOR MINUTES. CERTIFICATION BY ANALYSIS/SIMILARITY INCLUDED FUNGUS, OZONE PACKAGING, THERMAL VACUUM, SALT SPRAY, SAND/DUST SHOCK-BASIC DESIGN, ULTIMATE LOADS, ACCELERATION, MARGIN OF SAFETY AND MISSION ACOUSTIC LIFE.

OMRSD: GROUND TURNAROUND INCLUDES VISUAL INSPECTION FOR EVIDENCE OF BINDING OR JAMMING.

(C) INSPECTION

RECEIVING INSPECTION

RAW MATERIAL AND PROCESS CERTIFICATIONS ARE VERIFIED BY INSPECTION.

CONTAMINATION CONTROL

INSPECTION VERIFIES CLEANLINESS, AND CORROSION CONTROL PER MA0608-301 REQUIREMENTS.

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ASSEMBLY/INSTALLATION

BUSHING INSTALLATION VERIFIED BY INSPECTION. MACHINED AND ETCHED PER MATERIAL PROCESSING PROCEDURE (MPP), GRAIN DIRECTION NOTE. ETCH TIME RECORDED AND VERIFIED BY INSPECTION. ALL PARTS ARE DIMENSIONALLY INSPECTED. PROCESSING MATERIALS WHICH CONTACT TITANIUM PER MF0004-018 VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

HOOK IS PENETRANT INSPECTED PER MT0501-504, VERIFIED BY INSPECTION.

CRITICAL PROCESSES

GLASS BEAD BLASTING VERIFIED BY INSPECTION. DRY FILM LUBRICATION VERIFIED BY INSPECTION.

TESTING

ACCEPTANCE TESTING IS VERIFIED BY INSPECTION.

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

THERMAL CONDITIONING OF VEHICLE CAN BE DONE TO ATTEMPT TO ALLEVIATE PROBLEM. LATCH TOOLS ARE AVAILABLE FOR EVA WORKAROUND EXCEPT IN THE CASE OF CERTAIN PAYLOADS WHICH LIMIT ACCESS.