SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM :ACTUATION MECH-PBD FMEA NO 02-4B -110 -1 REV:03/08/88

ASSEMBLY :CENTERLINE LATCH MECH
P/N RI :V070-594330
P/N VENDOR:
QUANTITY :16
:FOUR LATCH GANGS
:FOUR ROLLERS PER GANG

CRIT. FUNC: 1R
CRIT. HDW: 2

VEHICLE EFFECTIVITY:	102	103	104
	X	X	X

PHASE(S): PL LO OO X DO LS

REDUNDANCY SCREEN: A-PASS B-FAIL C-PASS

PREPARED BY:		APPROVED BY:	APPROVED BY (NASA):
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ITEM:
LATCH ASSEMBLY, ROLLER, HANGER ASSEMBLY

FUNCTION:
PROVIDES ATTACHMENT POINT (ROLLER) ON LEFT SIDE OF PAYLOAD BAY DOOR FOR ENGAGEMENT WITH LATCH HOOK ON RIGHT SIDE OF DOOR, AND INCORPORATES GUIDE TO FACILITATE LATCH ENGAGEMENT

FAILURE MODE:
FAILS TO ENGAGE

CAUSE(S):
ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECT/DEBRIS, FAILURE/ DEFLECTION OF INTERNAL PART, IMPROPER RIGGING/ADJUSTMENT, THERMAL DISTORTION

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

(A) POSSIBLE INABILITY TO CLOSE PAYLOAD BAY DOOR, POSSIBLE DAMAGE TO LATCH, ROLLER ASSEMBLY OR DOOR STRUCTURE. ENTRY IS ALLOWABLE WITH ANY ONE CENTERLINE LATCH DISABLED.

(B) INCOMPLETE LATCHING OF DOORS, IMPAIRED STRUCTURAL INTEGRITY OF FUSELAGE.

(C,D) FIRST FAILURE: NO EFFECT. SECOND FAILURE: POSSIBLE LOSS OF VEHICLE IF MORE THAN ONE CENTERLINE LATCH CANNOT BE LATCHED. FAILS REDUNDANCY SCREEN "B" SINCE THE INDICATION SWITCHES INDICATE ALL LATCH HOOKS ARE ENGAGED WITH THE ROLLERS ON THE CENTERLINE LATCH ASSEMBLY 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
LATCH AND MECHANISM MATERIALS (6AL-4V TITANIUM, INCONEL 718, A286 CRES) CHOSEN FOR HIGH STRENGTH/LOW WEAR CHARACTERISTICS. MECHANISM EXHIBITS POSITIVE ULTIMATE MARGIN OF SAFETY FOR DESIGN CASE CONDITIONS (ASCENT AND DESCENT STATIC LOADS). LATCH REACH CAPABILITY EXCEEDS PREDICTED GAPS. MECHANISMS DESIGNED WITH DUAL ROTATING SURFACES AND DUAL LOCKING DEVICES ON PIVOT SHAFTS. DESIGN OF THE ACTUATION SYSTEM PERMITS PARTIAL WORK-AROUND OF THIS FAILURE MODE(EXCEPT FRACTURED BRACKET) BY EXTRAVEHICULAR ACTIVITY (EVA) CREW IF PAYLOAD DOES NOT LIMIT ACCESS.

(B) TEST
QUALIFICATION TESTS: THE ACTUATOR IS CERTIFIED PER CR-28-287-0040-0001H (REF. FMEA/CIL NO. 02-4B-005-1). THE PAYLOAD BAY DOOR LATCHING MECHANISM IS CERTIFIED PER CR-29-594360-001E FOR CENTERLINE LATCH MECHANISM. SYSTEM QUALIFICATION TEST ON 15 FOOT PAYLOAD BAY DOOR TEST ARTICLES (087) INCLUDED: ACCEPTANCE TO CONFORM ALL COMPONENTS HAVE BEEN ASSEMBLED AND RIGGED PER MLO308-0022. ORBITAL FUNCTIONS 3 THERMAL CONDITIONS WITH SIMULATED THERMAL DISTORTIONS OF BULKHEADS AND SILL LONGERONS AND ONE CENTERLINE OVERLAP AND ONE CENTERLINE GAP TEST. OPERATIONAL LIFE TESTS A TOTAL OF 360 CYCLES WERE CONDUCTED ON THE FORWARD AND 334 CYCLES WERE CONDUCTED ON THE AFT CENTERLINE LATCHES. ACOUSTIC TESTS PER MF0004-014C SPEC. CERTIFICATION BY ANALYSIS/SIMILARITY HUMIDITY, FUNGUS, OZONE, PACKAGING, THERMAL VACUUM, SALT SPRAY, SAND/DUST, SHOCK-BASIC DESIGN ULTIMATE LOADS, ACCELERATION, MARGIN OF SAFETY AND MISSION ACOUSTIC LIFE.

ACCEPTANCE TESTS: THE CENTERLINE LATCHING MECHANISMS WERE RIGGED PER CONTROLLED SPECIFICATION MLO308-0022. OPERATION OF LATCHES ARE VERIFIED DURING CHECKOUT AT KSC WHICH INCLUDES PAYLOAD BAY DOOR FUNCTIONAL AND FINAL CHECKOUT PRIOR TO FLIGHT.

OMRSD: GROUND TURNAROUND INCLUDES VISUAL INSPECTION OF PAYLOAD BAY DOORS, ROLLERS, AND GUIDES FOR EVIDENCE OF BINDING.

(C) INSPECTION

RECEIVING INSPECTION
RECEIVING INSPECTION VERIFIES MATERIAL AND PROCESS CERTIFICATIONS.

CONTAMINATION CONTROL
CORROSION PROTECTION VERIFIED BY INSPECTION. CLEANLINESS MAINTAINED PER MA0110-311 VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION
INSTALLATION OF THREADED FASTENERS PER MA0101-301 VERIFIED BY INSPECTION. MACHINE TOLERANCES VERIFIED BY INSPECTION. ASSEMBLY OF ROLLER AND COMPONENTS IS VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION
PENETRANT INSPECTION VERIFIED BY INSPECTION.

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CRITICAL PROCESSES
MALCOMIZE HARDNESS COAT IS APPLIED PER APPLICABLE SPECIFICATION, AND VERIFIED BY INSPECTION. APPLICATION OF DRY FILM LUBE PER DRAWING VERIFIED BY INSPECTION ON MANUFACTURING ORDERS.

TESTING
ACCEPTANCE TESTING IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING
HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED.

(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.