

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 02-4B-002-X

SUBSYSTEM NAME: PAYLOAD BAY DOOR MECHANISMS

REVISION : 0 12/15/88 W

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	PART NAME	PART NUMBER
	VENDOR NAME	VENDOR NUMBER
SRU :	CENTERLINE LATCH ASSY	V070-594360

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QUANTITY OF LIKE ITEMS: 4

DESCRIPTION/FUNCTION:

GANGED LATCH SYSTEM CONTAINS A POWER DRIVE UNIT (PDU) MC287-0040 (REF. FMEA/CIL NO. 02-4B-005-1) PROVIDING THE ROTARY MOTION AND DRIVES BELLCRANKS FOR PIVOTING THE HOOKS TO LATCH OR UNLATCH THE RIGHT-HAND DOORS TO THE LEFT-HAND DOORS.

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SUMMARY

SUBSYSTEM NAME: PAYLOAD BAY DOOR MECHANISMS

ITEM NAME: CENTERLINE LATCH ASSY

FMEA NUMBER	ABBREVIATED FAILURE MODE DESCRIPTION	CIL FLG	CRIT	RCD FLG
02-4B-002-01	FAILS TO ENGAGE	X	1R2	
02-4B-002-03	FAILS TO DISENGAGE	X	2 2	

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 02-4B-002-01

SUBSYSTEM: PAYLOAD BAY DOOR MECHANISMS

REVISION: 0 12/15/88 W

ITEM NAME: CENTERLINE LATCH ASSY

CRITICALITY OF THIS  
FAILURE MODE: 1R2

FAILURE MODE:  
FAILS TO ENGAGE.

MISSION PHASE:  
CO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:	102	COLUMBIA
	103	DISCOVERY
	104	ATLANTIS

CAUSE:  
ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECT/DEBRIS, LOSS OF  
LUBRICANT, THERMAL DISTORTION OF STRUCTURE, PHYSICAL BINDING/JAMMING

CRITICALITY 1/1 DURING INTACT ABORT ONLY? N

REDUNDANCY SCREEN A) PASS  
B) N/A  
C) PASS

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:  
4-GANGED LATCH FAILS TO SECURE IN CLOSED POSITION. POSSIBLE DAMAGE TO  
STRUCTURE OR LINKAGE IF JAM OCCURS WITH LINKAGE AT OR NEAR ON-CENTER  
POSITION.

(B) INTERFACING SUBSYSTEM(S):  
DOOR TO AIRFRAME DEGRADED STRUCTURAL INTEGRITY.

(C) MISSION:  
SAFE ENTRY MAY PROCEED WITH ANY GANG OF CENTERLINE LATCHES DISENGAGED,  
REF JSC08934.

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## (D) CREW, VEHICLE, AND ELEMENT(S):

POSSIBLE LOSS OF CREW/VEHICLE IF MORE THAN ONE GANG OF CENTERLINE LATCHES FAIL TO LATCH.

## (E) FUNCTIONAL CRITICALITY EFFECTS

NONE

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 - DISPOSITION RATIONALE -  
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## (A) DESIGN:

LATCH AND MECHANISM MATERIALS (6AL-4V TITANIUM, INCONEL 718, A286 CRES) CHOSEN FOR HIGH STRENGTH/LOW WEAR CHARACTERISTICS. LATCH MECHANISM DESIGNED WITH POSITIVE MARGINS OF SAFETY FOR ACTUATOR STALL CONDITION AT MAXIMUM REACH TO 10 DEGREES FROM ON-CENTER POSITION. LATCH MECHANISM HOOK REACH CAPABILITY EXCEEDS MAXIMUM PREDICTED ROLLER DISTANCE FOR WORST CASE THERMAL CONDITION (TAIL SUN). Y-Z ALIGNMENT ROLLERS ENSURE PROPER CAPTURE ENVELOPE FOR DOOR OVERLAP CASE. ALL LINKAGES 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 EXCEPT FOR CERTAIN PAYLOADS WHICH MAY LIMIT ACCESS.

## (B) TEST:

QUALIFICATION TESTS: THE QUALIFICATION 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 MECHANISM. SYSTEM QUALIFICATION TEST ON 15 FOOT PAYLOAD BAY DOOR TEST ARTICLES (087) INCLUDED: ACCEPTIONALE - TO CONFIRM ALL COMPONENTS HAVE BEEN ASSEMBLED AND RIGGED PER ML0308-0022; ORBITAL FUNCTIONS - 3 THERMAL CONDITION WITH SIMULATED THERMAL DISTORTIONS OF BULKHEADS AND SILL LONGERONS AND ONE OVERLAP AND ONE GAP TEST; OPERATING LIFE TESTS - A TOTAL OF 360 CYCLES WERE CONDUCTED ON THE FORWARD AND 334 CYCLES WERE CONDUCTED ON THE AFT LATCHES; ACOUSTIC TESTS - PER MF0004-014C FOR 5 MINUTES; CERTIFICATION BY ANALYSIS/SIMILARITY INCLUDED: 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 LATCHING MECHANISMS WERE RIGGED PER CONTROLLED SPECIFICATION ML0308-0022. 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 DUAL MOTOR FUNCTIONAL CHECK OF LATCHING OPERATION. PROPER FUNCTION OF THE COMPONENTS IS VERIFIED PERIODICALLY AS PART OF THE MAINTENANCE SAMPLING PROGRAM.

## (C) INSPECTION:

RECEIVING INSPECTION

RECEIVING INSPECTION VERIFIES MATERIAL AND PROCESS CERTIFICATIONS.

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CONTAMINATION CONTROL  
CLEANLINES VERIFICATION OF MATING SURFACE IS PERFORMED PRIOR TO  
INSTALLATION.

ASSEMBLY/INSTALLATION  
DETAIL HARDWARE FABRICATION IS VERIFIED AND INSPECTED ON INDIVIDUAL  
PLANNING DOCUMENTS. THREADED FASTENER INSTALLATION INCLUDING TORQUE,  
LOOP PIN INSTALLATION AND SAFETY WIRING OF REQUIRED FASTENERS VERIFIED  
BY INSPECTION. INSTALLATION IS A SAFETY CRITICAL OPERATION AND ADHERED  
TO. FINAL RIGGING, ALIGNMENT, AND SHIMMING ARE PER MLO SPECIFICATION  
AND VERIFIED BY INSPECTION. LUBRICANT APPLICATION VERIFIED BY  
INSPECTION.

NONDESTRUCTIVE EVALUATION  
PENETRANT INSPECTION IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES  
HEAT TREATMENT IS VERIFIED BY INSPECTION.

TESTING  
ACCEPTANCE TESTING VERIFIED BY INSPECTION.

HANDLING/PACKAGING  
HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:  
CAR NO. AB4639 : EXCESSIVE TORQUE WAS REQUIRED TO ROTATE ONE OF FOUR  
CENTERLINE LATCHES IN LATCH GANG ON FORWARD PAYLOAD BAY DOOR TEST  
ARTICLE IN PRE-QUALIFICATION FUNCTIONAL CHECK; FAILURE CAUSED BY  
PRESENCE OF A PLASTIC FILM (LOCTITE) ON THE AFT BUSHING. LATCH WAS  
REDRYFILM LUBED AND BUSHINGS WERE SOLVENT CLEANED PRIOR TO REASSEMBLY.

(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.

- APPROVALS -

RELIABILITY ENGINEERING:	M. B. MOSKOWITZ	:	
DESIGN ENGINEERING	: M. A. ALLEN	:	
QUALITY ENGINEERING	: W. J. SMITH	:	
NASA RELIABILITY	:	:	
NASA SUBSYSTEM MANAGER	:	:	
NASA QUALITY ASSURANCE	:	:	