

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 02-4A-592302-X

SUBSYSTEM NAME: PERSONNEL HATCHES

REVISION : 0 12/13/88 W

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	ACTUATOR, AIRLOCK HATCH LATCH	MC287-0036-0008 ELLANEF A1039A10-8,9
LRU :	ACTUATOR, AIRLOCK HATCH LATCH	MC287-0036-0009 ELLANEF A1039A10-8,9

QUANTITY OF LIKE ITEMS: 2

**DESCRIPTION/FUNCTION:**

THIS DEVICE IS MOUNTED ON BOTH AIRLOCK HATCHES "A" AND "B" AND IS A SEALED AND MANUALLY DRIVEN REDUCTION GEARBOX THAT PROVIDES A CONTROLLED OUTPUT FOR DRIVING THE LATCH MECHANISM OPEN OR CLOSED. IN SO DOING, IT PROVIDES THE FORCE FOR HATCH SEAL COMPRESSION AS IT PULLS THE SEALING SURFACES TOGETHER. TWO HANDLES FOR OPERATION ARE PROVIDED; ONE IS ON EACH SIDE OF EACH HATCH. A MECHANICAL LOCK AND A "NO-BACK" IS PROVIDED FOR RESTRAINT BETWEEN USES. THE KNOB ON THE HANDLE ON THE PAYLOAD BAY SIDE OF HATCH "B" IS REMOVABLE. THE DESIGN UTILIZES DUAL O-RING SEALS TO PREVENT LEAKAGE OF CABIN/AIR LOCK ATMOSPHERE THROUGH OR PAST THE ACTUATORS.

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 02-4A-593302-X

## SUMMARY

SUBSYSTEM NAME: PERSONNEL HATCHES  
 LRU ACTUATOR, AIRLOCK HATCH LATCH  
 LRU PART #: MC287-0036-0008  
 ITEM NAME: ACTUATOR, AIRLOCK HATCH LATCH

FMEA NUMBER	ABBREVIATED FAILURE MODE DESCRIPTION	CIL FLG	CRIT	RSD FLG
02-4A-593302-01	PHYSICAL BINDING/JAMMING*	X	1 1	
02-4A-593302-02	LEAKAGE*	X	2B3	
02-4A-593302-03	FAILS TO UNLOCK*	X	2 2	

PRINT DATE: 12/13/85

SHUTTLE CRITICAL ITEMS LIST - ORBITER

NUMBER: 02-4A-593302-03

SUBSYSTEM: PERSONNEL HATCHES  
 LRU ACTUATOR, AIRLOCK HATCH LATCH  
 ITEM NAME: ACTUATOR, AIRLOCK HATCH LATCH

REVISION: 0 12/13/88 W

CRITICALITY OF THIS  
 FAILURE MODE: 2 2

FAILURE MODE:  
 FAILS TO UNLOCK

MISSION PHASE:  
 OO ON-ORBIT

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

CAUSE:  
 CONTAMINATION/FOREIGN OBJECTS/DEBRIS, DEFECTIVE PART/MATERIAL, FAILURE/  
 DEFLECTION OF INTERNAL PART, PHYSICAL BINDING/JAMMING

CRITICALITY 1/1 DURING ABORT? N

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

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:  
 LOSS OF ABILITY TO OPERATE HATCH LATCH MECHANISM.

(B) INTERFACING SUBSYSTEM(S):  
 LOSS OF ABILITY TO SUPPORT EXTRAVEHICULAR ACTIVITY (EVA) OR PRE-EVA  
 TRANSFERS.

(C) MISSION:  
 SAME AS (B)

(D) CREW, VEHICLE, AND ELEMENT(S):  
 NO EFFECT ON CREW/VEHICLE. LATCH LINKAGES CAN BE DISCONNECTED AND THEN

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 02-4A-593302-03

UNLATCHED SEPARATELY USING AVAILABLE TOOLS FROM INSIDE THE AIRLOCK FOR RE-ENTRY INTO THE CABIN THROUGH HATCH "A", POST-EVA; HATCH "B" REMAINS OPEN AND UNLATCHED DURING EVA.

(E) FUNCTIONAL CRITICALITY EFFECTS

- DISPOSITION RATIONALE -

(A) DESIGN:

THE ACTUATOR HANDLE LOCK PROVIDES A POSITIVE MEANS TO LOCK OR UNLOCK THE LATCH ACTUATOR BY RESTRAINING OR UNRESTRAINING THE HANDLE WITH A SHEAR-PIN THAT IS ACTIVATED BY A FLIP-OVER LOCKING-LEVER (LOCATED ON EACH HANDLE). THE LOCKING-LEVER ALSO PROVIDES A VISUAL INDICATION OF THE LOCKED AND UNLOCKED CONDITION OF THE ACTUATOR AND REQUIRES 8-10 LB FORCE (TO OPPOSE A SPRING-LOADED DETENT) TO BE PLACED IN THE UNLOCKED POSITION. VIBRATION, BUMPING, KICKING OR OTHER UNINTENTIONAL MEANS SHALL NOT UNLOCK THE ACTUATOR.

(B) TEST:

QUALIFICATION TESTS: COMPONENT QUALIFIED BY SIMILARITY TO MC287-0036-0004 AND -0005 (PER CR-287-0036-0006C). QUALIFICATION TESTS INCLUDE: VIBRATION FOR 48 MINUTES IN EACH OF 3 ORTHOGONAL AXES, CABIN ATMOSPHERE (PER MIL-STD-810B, INCLUDES: 1 HOUR SALT/FOG, THERMAL/HUMIDITY AT +50 DEG F TO +120 DEG F AT 80% RELATIVE HUMIDITY FOR 120 HOURS), LIMIT LOAD (150 LB AT HANDLE 3,750-4,941 LB AT OUTPUT ARM, 10 CYCLES), THERMAL CYCLE TESTS (INCLUDES: THERMAL - VACUUM AT -65 DEG F AND +275 DEG F FOR 5 OPERATIONAL CYCLES, AT EACH TEMPERATURE), PROOF PRESSURE/LEAK AT 16/16.5 PSID, CRASH/SHOCK AT +/- 20 G'S (FOR 11 MILLISECONDS PER MIL-STD-810B), ACCELERATION (5 G'S IN EACH OF ORTHOGONAL AXES, 5 MINUTES EACH), BACKLASH TESTS (MAXIMUM +/- 1 DEGREE WITH +/- 10 LB ON OUTPUT ARM, AND OPERATING LIFE (2,000 CYCLES) WITH 775 LB AT OUTPUT ARM. "NO-BACK" TEST (4,941 LB AND NO GREATER THAN 2 DEGREES DEFLECTION AT OUTPUT ARM), MECHANICAL STOP TEST (ROTATE HANDLE TO EACH STOP AND APPLY 150 LB, 50 CYCLES WITH NO JAMMING), LOCK CONTROL AND INDICATOR TEST (APPLY 150 LB TO LOCKED HANDLE, 10 TIMES, WITH LOCK OPERABLE FROM BOTH HANDLES; APPLY 8-10 LB TO LOCKING-LEVER TO UNLOCK 25 TIMES), MECHANICAL LOCK TEST (APPLY 223 LB TO INPUT LOAD CABLE, WITH NON-REMOVABLE HANDLE FULL CLOCKWISE AND LOCKED).

ACCEPTANCE TESTS: ACTUATOR ACCEPTANCE TESTS INCLUDE MECHANICAL LOCK TEST (NO ROTATION WITH 150 LB LIMIT LOAD AT HANDLE), NORMAL LOAD TESTS (10 CYCLES, WITH 30 LB AT HANDLE AND 775-988 LB AT OUTPUT ARM), X-RAY (2 VIEWS, PER MIL-STD-453, FOR FOREIGN OBJECTS/MATERIALS, AND LEAKAGE TEST (MAXIMUM 0.00001 STD CC/SEC/INCH OF SEAL WITH 16 PSID LIMIT).

OMRSD: HATCH LATCH ACTUATOR WILL BE FUNCTIONALLY OPERATED FOR EVIDENCE OF BINDING, SURFACE CONTAMINATION AND POSSIBLE DAMAGE. VISUALLY INSPECT AIRLOCK HATCH "A" OPERATIONS CABIN/AIRLOCK SIDE AND AIRLOCK HATCH "B" OPERATIONS AIRLOCK SIDE EVERY FLIGHT. HATCH "B" FUNCTIONALS

## SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 02-4A-993302-03

FROM THE PAYLOAD BAY SIDE ARE PERFORMED FIRST FLIGHT AND LRU RETEST. ALL ACTUATOR AND LATCH MECHANISM COMPONENTS ARE TESTED BY PERFORMING FUNCTIONALS FROM EITHER SIDE OF HATCHES.

**(C) INSPECTION:**

## RECEIVING INSPECTION

RAW MATERIAL VERIFIED VISUAL INSPECTION/IDENTIFICATION PERFORMED, PARTS PROTECTION VERIFIED. O-RINGS ARE MAGNIFICATION INSPECTED FOR DAMAGE.

## CONTAMINATION CONTROL

CONTAMINATION CONTROL PROCESSES AND CORROSION PROTECTION PROVISIONS VERIFIED. ALL PARTS ARE CLEANED TO 300 LEVEL PRIOR TO ASSEMBLY AND VERIFIED BY INSPECTION.

## ASSEMBLY/INSTALLATION

MANUFACTURING, INSTALLATION AND ASSEMBLY OPERATIONS VERIFIED BY SHOP TRAVELER. MANDATORY INSPECTION POINTS (MIPS), LATCH AND HANDLE FORCES, GEARBOX ASSEMBLY, AND BEARING INSTALLATION ARE VERIFIED BY INSPECTION. ALL PURCHASED PART DATA PACKS AND SPRING DIAMETERS AND FORCES ARE VERIFIED BY INSPECTION. DETAIL PARTS CONFIGURATION VERIFIED BY INSPECTION. O-RINGS ARE MAGNIFICATION INSPECTED PRIOR TO INSTALLATION.

## NONDESTRUCTIVE EVALUATION

STRUCTURAL INTEGRITY VERIFIED BY NONDESTRUCTIVE EVALUATION (NDE) (X-RAY) AND TECHNICIANS CERTIFICATIONS ARE VERIFIED BY INSPECTION.

## HANDLING/PACKAGING

PROPERLY MONITORED HANDLING AND STORAGE ENVIRONMENT VERIFIED.

**(D) FAILURE HISTORY:**

THERE HAVE BEEN NO ACCEPTANCE TEST, QUALIFICATION TEST, FIELD OR FLIGHT FAILURES ASSOCIATED WITH THIS FAILURE MODE.

**(E) OPERATIONAL USE:**

LATCH MECHANISMS ON A LATCHED HATCH "A" CAN BE DISCONNECTED FROM THE ACTUATOR AND EACH LATCH RELEASED INDIVIDUALLY USING AVAILABLE TOOLS BY EVA CREWMEMBER IN THE AIRLOCK, TO REGAIN ACCESS TO THE CREW CABIN; POST-EVA. HATCH "B" REMAINS OPEN AND UNLATCHED WHILE CREWMEMBERS ARE OUTSIDE THE AIRLOCK DURING EVA.

-----  
- APPROVALS -  
-----

RELIABILITY ENGINEERING:	M. B. MOSKOWITZ	:	<u>M.B. Moskowitz</u> 12/16/88
DESIGN ENGINEERING	: R. H. YEE	:	<u>R.H. Yee</u> 12/15/88
QUALITY ENGINEERING	: W. J. SMITH	:	<u>W.J. Smith</u> 12 Dec 88
NASA RELIABILITY	:	:	<u>W.M. Smith</u> 12/15/88
NASA SUBSYSTEM MANAGER	:	:	<u>R.C. Moore</u> 12/28/88
NASA QUALITY ASSURANCE	:	:	<u>R.C. Moore</u>