PRINT DATE: 12/20/88

UTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 02-4A-593301-X

SUBSYSTEM NAME: PERSONNEL HATCHES

REVISION : 0 12/20/88 W

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU :	LATCH MECHANISM, AIRLOCK HATCH	V075-593301

QUANTITY OF LIKE ITEMS: 2

DESCRIPTION/FUNCTION:
THIS MECHANISM IS MOUNTED ON BOTH AIRLOCK HATCHES "A" AND "B" TO SECURE EACH HATCH IN THE CLOSED AND SEALED POSITION. THIS MECHANISM CONSISTS OF MECHANICAL LINKS, BELLCRANKS, LATCHES AND ATTACHMENTS. THIS MECHANISM IS DRIVEN BY A MANUALLY OPERATED REDUCTION GEARBOX (ACTUATOR) AND UTILIZES 6 APOLLO CREW MODULE-TYPE LATCHES. THREE "KICKER" LATCHES ON HATCH "A" AND TWO "KICKER" LATCHES ON HATCH "B" INCORPORATE PROVISION FOR "BREAKING" THE HATCH SEALS AGAINST ANY SMALL RESIDUAL DELTA PRESSURE WHEN OPENING THE HATCHES.

PRINT DATE: 12/20/88

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 02-4A-593301-X

SUMMARY

SUBSYSTEM NAME: PERSONNEL HATCHES
LRU LATCH MECHANISM, AIRLOCK HATCH
LRU PART #: V075-593301
ITEM NAME: LATCH MECHANISM, AIRLOCK HATCH

FMEA NUMBER	ABBREVIATED FAILURE MODE DESCRIPTION	CIL FLG	CRIT	HZD FLG
02-4A-593301-01	FAILS TO DISENGAGE*	X	2 2	
02-4A-593301-02	FAILS TO ENGAGE*	X	1 1	

SHUTTLE CRITICAL ITEMS LIST - ORBITER NUMBER: 02-4A-593301-01

REVISION: 0 12/20/88 W

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

CRITICALITY OF THIS FAILURE MODE: 2 2

FAILS TO DISENGAGE

MISSION PHASE:
OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

	102	COLUMBIA
:	103	DISCOVERY
:	104	ATLANTIS

CAUSE:
ADVERSE TOLERANCES/WEAR, CONTAMINATION/FOREIGN OBJECT/DEBRIS, FAILURE/DEFLECTION OF INTERNAL PART, PHYSICAL BINDING/JAMMING

CRITICALITY 1/1 DURING INTACT ABORT ONLY? N

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

PASS/FAIL RATIONALE:
A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF ABILLITY TO TRANSFER THROUGH HATCH OPENING.

(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 UNLATCHED SEPARATELY (WITH AVAILABLE TOOLS) FROM INSIDE THE AIRLOCK FOR

RE-ENTRY INTO THE CABIN THROUGH HATCH "A", POST-EVA.

(E) FUNCTIONAL CRITICALITY EFFECTS

- DISPOSITION RATIONALE -

(A) DESIGN:
LATCH MECHANISM BASED ON PROVEN APOLLO DESIGN, LINKAGE, ATTACHMENTS HAVE DUAL ROTATING SURFACES, MAXIMUM UNLATCHING FORCE IS 20 LB AT THE HANDLE, ACTUATOR AND LINKAGE DESIGNED FOR 150 LB LIMIT LOAD AT THE HANDLE, POSITIVE MARGINS ON ALL COMPONENTS, SEAL COMPRESSIVE FORCE ASSISTS UNLATCHING. LATCH AND LINKAGE MATERIALS (INCONEL, A286 CRES AND BERYLLIUM COPPER) CHOSEN FOR HIGH STRENGTH AND LOW WEAR. DRY FILM LUBE ON BEARING SURFACES. DESIGN STRESS ANALYSIS REPORT SD77-SH-0178, VOL. 6.

(B) TEST:
QUALIFICATION TESTS: LATCHES AND ACTUATOR SYSTEM QUALIFIED BY SIMILARITY (PER CR-28-593201-001C) TO THE MECHANISMS ON THE INGRESS/EGRESS HATCH. REFERENCE FMEA/CIL 02-4A-593201-01. ACTUATOR ALSO COMPONENT QUALIFIED BY SIMILARITY TO ACTUATOR ON INGRESS/EGRESS HATCH (PER CR-28-287-0036-0006C); REFERENCE FMEA/CIL 02-4A-593202-01. CERTIFICATION BY SIMILARITY/ANALYSIS (PER MF0004-014) INCLUDED: FUNGUS, SALT/FOG, OZONE, SAND/DUST, TEMPERATURE CYCLE, CRASH/SHOCK, ACCELERATION, CABIN ATMOSPHERE, LIFE CYCLE (2,000 CYCLES), VIBRATION AND STRUCTURAL LOAD REQUIREMENTS.

CERTIFICATION TESTS INCLUDED: ZERO-"G" AND ONE-"G" OPERATION (USING APPROPRIATE GSE EQUIPMENT) AND HATCH SEALING/LEAK TEST (WITH 15.0 PSID ACROSS HIGH-PRESSURE SIDE OF HATCH, WITH MAXIMUM ALLOWABLE LEAK RATE OF 1.03 SCIM), PROOF PRESSURE 17.7 PSID FOR 2.0 +/- 1.0 MINUTE (PER ML0206-0089). LATCH MECHANISM INSTALLED AND RIGGED PER TECH ORDER INSTALLATION M072-593301.

OMRSD: MECHANISM IS FUNCTIONALLY OPERATED FOR EVIDENCE OF BINDING, SURFACE CONTAMINATION AND POSSIBLE DAMAGE. VISUALLY INSPECT AIRLOCK HATCH "A" OPERATIONS ON CABIN/AIRLOCK SIDE AND AIRLOCK HATCH "B" OPERATIONS ON AIRLOCK SIDE EVERY FLIGHT. HATCH "B" FUNCTIONALS 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
MATERIAL AND PROCESS CERTIFICATIONS VERIFIED BY INSPECTION.

CONTAMINATION CONTROL
ASSEMBLY IS PERFORMED IN CLEAN ENVIRONMENT WHICH IS MONITORED BY INSPECTION.

ASSEMBLY/INSTALLATION
ASSEMBLY, ADJUSTMENT, TORQUING AND RIGGING ARE VERIFIED BY INSPECTION (M072-593301).

NONDESTRUCTIVE EVALUATION
PENETRANT INSPECTION OF DETAIL HARDWARE IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES
DRY FILM LUBRICATION IS VERIFIED BY INSPECTION.

TESTING
FUNCTIONAL TESTING IS VERIFIED BY INSPECTION.

(D) FAILURE HISTORY:
CAR NO. 09F005: AIRLOCK HATCH "A" (BETWEEN CREW MODULE AND AIRLOCK) DURING STS-9 MISSION WAS DIFFICULT TO OPEN; UPPER CENTER GUIDE SUPPORT BRACKET DEBONDED FROM THE HATCH AND HATCH MOVED UPWARD AFTER LATCHES WERE RELEASED, ALLOWING AIRLOCK FLANGE TO BECOME TRAPPED BETWEN UPPER CENTER LATCH "KICKER" ARM AND ROLLER; DEBONDED GUIDE SUPPORT WAS REBONDED.

(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 AN 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	
DESIGN ENGINEERING	R. H. YEE	
QUALITY ENGINEERING	W. J. SMITH	
NASA RELIABILITY		
NASA SUBSYSTEM MANAGER		
NASA QUALITY ASSURANCE		