

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE

NUMBER: M8-1MR-M001-X

SUBSYSTEM NAME: MECHANICAL - EXTERNAL AIRLOCK

REVISION: 3 9/15/95

	PART NAME VENDOR NAME	PART NUMBER VENDOR NUMBER
LRU	: MECHANISM, LATCH	V519-593302

PART DATA

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
EXTERNAL AIRLOCK UPPER HATCH LATCH MECHANISM (VESTIBULE ENTRY)

REFERENCE DESIGNATORS:

QUANTITY OF LIKE ITEMS: 1
ONE

FUNCTION:

THIS MECHANISM IS MOUNTED ON THE AIRLOCK SIDE OF THE EXTERNAL AIRLOCK UPPER HATCH TO SECURE IT IN THE CLOSED AND SEALED POSITION. THIS ASSEMBLY CONSISTS OF SIX (6) HATCH-TYPE LATCHES WHICH ARE JOINED BY RODS AND LINKS. THE RODS AND LINKS MOVE CIRCUMFERENTIALLY, CAUSING THE LATCHES TO MOVE AXIALLY TO SECURE THE LATCHES IN A CLOSED AND SEALED POSITION. THREE "KICKER" LATCHES INCORPORATE PROVISION FOR "BREAKING FREE" THE HATCH SEALS AGAINST ANY SMALL RESIDUAL DELTA PRESSURE, WHEN OPENING THE HATCH. THE LATCHES ARE DRIVEN BY A MANUALLY OPERATED REDUCTION GEARBOX (ACTUATOR).

REFERENCE DOCUMENTS: M072-593828

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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CIL FAILURE MODE
NUMBER: MS-1MR-M001-02

REVISION# 3 9/15/95

SUBSYSTEM NAME: MECHANICAL - EXTERNAL AIRLOCK

LRU: MECHANISM, LATCH

CRITICALITY OF THIS

ITEM NAME: MECHANISM, LATCH

FAILURE MODE: 2/2

FAILURE MODE:
FAILS TO DISENGAGE

MISSION PHASE:
OO ON-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY: 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? NO

CRITICALITY 1R2 DURING INTACT ABORT ONLY (AVIONICS ONLY)? N/A

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

PASS/FAIL RATIONALE:

A)
N/A

B)
N/A

C)
N/A

METHOD OF FAULT DETECTION:
PHYSICAL OBSERVATION - INABILITY TO OPEN EXTERNAL AIRLOCK UPPER HATCH

- FAILURE EFFECTS -

(A) SUBSYSTEM:
LOSS OF CAPABILITY TO OPEN EXTERNAL AIRLOCK UPPER HATCH. INABILITY OF
PERSONNEL TO ENTER VESTIBULE TUNNEL AND MIR DURING IVA.

(B) INTERFACING SUBSYSTEM(S):
LOSS OF CAPABILITY TO EGRESS OUT EXTERNAL AIRLOCK UPPER HATCH DURING EVA
WITH PAYLOAD BAY DOORS CLOSED AND ORBITER/MIR NOT DOCKED.

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(C) MISSION:

LOSS OF PRIMARY MISSION OBJECTIVES DUE TO INABILITY TO ACCESS THE MIR STATION THROUGH VESTIBULE TUNNEL.

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

NO EFFECT ON CREW OR VEHICLE.

(E) FUNCTIONAL CRITICALITY EFFECTS:

N/A

DESIGN CRITICALITY (PRIOR TO DOWNGRADE, DESCRIBED IN (#)): 2/2

(F) RATIONALE FOR CRITICALITY DOWNGRADE:

N/A (THERE ARE NO WORKAROUNDS TO CIRCUMVENT THIS FAILURE).

- TIME FRAME -

TIME FROM FAILURE TO CRITICAL EFFECT: MINUTES

TIME FROM FAILURE OCCURRENCE TO DETECTION: SECONDS

TIME FROM DETECTION TO COMPLETED CORRECTIVE ACTION: N/A

IS TIME REQUIRED TO IMPLEMENT CORRECTIVE ACTION LESS THAN TIME TO EFFECT? NO

RATIONALE FOR TIME TO CORRECTING ACTION VS TIME TO EFFECT:

THERE IS NO CORRECTIVE ACTION TO RESTORE THE UPPER HATCH LATCH MECHANISM THAT FAILS TO DISENGAGE SINCE LATCH MECHANISM IS ON MIR SIDE OF HATCH AND IS INACCESSIBLE TO ORBITER CREW MEMBERS IN EXTERNAL AIRLOCK.

HAZARDS REPORT NUMBER(S): NONE

HAZARD(S) DESCRIPTION:

N/A

-DISPOSITION RATIONALE-

(A) DESIGN:

LATCH MECHANISM BASED ON PROVEN APOLLO DESIGN. LINKAGE ATTACHMENTS HAVE DUAL ROTATING SURFACES. PROTECTIVE COVER MINIMIZES CONTAMINATION. MAXIMUM LATCHING FORCE IS 30 LB AT THE ACTUATOR HANDLE. ACTUATOR AND LINKAGE DESIGNED FOR 150 LB LIMIT LOAD AT THE HANDLE, POSITIVE MARGINS ON ALL COMPONENTS. LATCH AND LINKAGE MATERIALS (INCONEL, A286 CRES, BERYLLIUM COPPER) CHOSEN FOR HIGH STRENGTH AND LOW WEAR. DRY FILM LUBE ON BEARING SURFACES. HATCH WITHSTANDS DIFFERENTIAL PRESSURE IN ONE DIRECTION (INSIDE TO OUTSIDE). DESIGN STRESS ANALYSIS REPORT SD77-SH-0178, VOL. 8.

(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

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- APPROVALS -

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PAE MANAGER :	W. R. MARLOWE	<u>W. R. Marlowe</u>
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