

FAILURE MODE EFFECTS ANALYSIS/CRITICAL ITEMS LIST

FMEA NUMBER: EC-PORT3-02A ORIGINATOR: JSC PROJECT: EDFT-03

| | | |
|------------------------------|--|----------------|
| PART NAME: TRACK ANGLE LATCH | LRU/ORU PART NUMBER: SED39126409-301 | QUANTITY: 1 |
| PART NUMBER: SED39126473-301 | LRU/ORU PART NAME: RIG UMB ASSY/TRAN PLATE | SYSTEM: GFE |
| LSC CONTROL NO: N/A | DRAWING/REF DESIGNATOR: SEE P/N | SUBSYSTEM: EVA |
| ZONE/LOCATION: PORT 3 & 4 | EFFECTIVITY/AFFECT STAGE: STS-72 | |

CRITICALITY:

| | |
|----------------------------|---------------------------|
| CRITICAL ITEM: Yes | SUCCESS PATHS: 2 |
| CRITICALITY CATEGORY: 1R/2 | SUCCESS PATH REMAINING: 1 |

END ITEM NAME: N/A
 END ITEM FUNCTIONAL: N/A
 END ITEM CAPABILITY: N/A
 END ITEM FAILURE TOLERANCE: N/A

REDUNDANCY SCREENS:

- A/1. C/O PRELAUNCH: Pass
2. C/O ON ORBIT: N/A for NSTS
- B/3. DETECTION FLIGHT CREW: Pass
4. DETECTION GROUND CREW: N/A
- C/5. LOSS OF REDUNDANCY FROM SINGLE CAUSE: Pass

FUNCTION: The RU Track Angle Assembly Latch is used to secure the RU to the transition plate. The latch consists of a captured EVA bolt, two hinge locks (which prevent the bolt from backing out), and a ball detent (preventing rotation of the bolts until a overriding torque is applied to bolt). The hinge locks are freed when a socket is inserted on the bolt.

FAILURE MODE CODE: N/A for NSTS

FAILURE MODE: 1) Unable to fully close a track angle latch 2) Hinge lock open.

CAUSE: galling, contamination.

| | |
|--|-------------------------------------|
| REMAINING PATHS: 1 remove RU from FSE and jettison. | EFFECT/ MISSION PHASE: EVA, landing |
|--|-------------------------------------|

CORRECTIVE ACTION: jettison RU

-FAILURE EFFECTS-

END ITEM/LRU/ORU/ASSEMBLY: Unable to secure RU following EVA operations

SUBSYSTEM/NEXT ASSEMBLY/INTERFACE: N/A

SYSTEM/END ITEM/MISSION: None

CREW/VEHICLE: RU may become free in PLB and damage vehicle if latch opens.

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| LSC CONTROL NO: N/A | DRAWING/REF DESIGNATOR: SEE P/N | SUBSYSTEM: EVA |
| ZONE/LOCATION: PORT 3 & 4 | EFFECTIVITY/AFFECT STAGE: ST5-72 | |

HAZARD INFORMATION:

HAZARD: N/A

HAZARD ORGANIZATION CODE: N/A

HAZARD NUMBER: N/A

TIME TO EFFECT: Hours

TIME TO DETECT: Seconds

TIME TO CORRECT: Minutes

FAILURE DETECTION/FLIGHT Visual hinge lock will not be closed

REMARKS:

-RATIONALE FOR ACCEPTABILITY-

(A) DESIGN: Track Angle latch design incorporates two hinge locks either one of which can prevent the EVA captive bolt from backing out and a ball detent to prevent bolt rotation. The latch EVA bolt on the bay 4 FSE is not required to be screwed into a mating part of the RU for stowage of the RU. Instead structural integrity is achieved by a forced fit of the bottom of the bolt against an load bearing area on the RU. This traps the RU into the bay 4 track angle in all directions. The other track angles securing the RU are allowed to be free in the x direction.

(B) TEST:

Acceptance: Functional (performed at predelivery acceptance, preinstallation acceptance, pre/post environmental test, and demonstrated during the Thermal Vacuum test.

- 1) Torque required to tighten or loosen the track angle latch bolts is between 200 and 260 in-lb.
- 2) Hinge locks verified to remain in position during all environmental tests and verified to swing at the time of socket insertion or removal.

Acceptance vibration test performed on the flight RU was performed to the following levels for a duration of 1 minute per axis:

X,Y,Z AXIS

| | |
|---------------|------------------------|
| 20 Hz | .01g ² /Hz |
| 20 - 80Hz | +3 db/oct |
| 80 - 350 Hz | .040g ² /Hz |
| 350 - 2000 Hz | -3db/oct |
| 2000 Hz | .007g ² /Hz |
| 6.1 grms | |

Acceptance Thermal/Vacuum test performed at a temperature of -100°F and pressure of 1×10^{-5} torr at Human thermal/vacuum test.

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ORIGINATOR: JSC

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PART NAME: TRACK ANGLE LATCH

LRU/ORU PART NUMBER: SED39126409-301

QUANTITY: 1

PART NUMBER: SED39126473-301

LRU/ORU PART NAME: RIG UMB ASSY/TRAN PLATE

SYSTEM: GFE

LSC CONTROL NO: N/A

DRAWING/REF DESIGNATOR: SEE P/N

SUBSYSTEM: EVA

ZONE/LOCATION: PORT 3 & 4

EFFECTIVITY/AFFECT STAGE: STS-72

Qualification:

Qualification for Acceptance Vibration was performed to the following levels for a duration of 2 minutes per axis:

| | |
|---------------|-------------------------|
| 20 Hz | .017g ² /Hz |
| 20 - 80Hz | +3 db/oct |
| 80 - 350 Hz | .0670g ² /Hz |
| 350 - 2000 Hz | -3db/oct |
| 2000 Hz | .012g ² /Hz |
| 7.87 grms | |

Qualification Vibration : A vibration test was performed to the following levels for a duration of 1 minute in each axis: Each redundant path was verified on the track angle assy. latch during x-axis vibration test (x axis was the only axis where anomalies from an earlier test occurred on earlier design of the latch.)

X AXIS

| | |
|---------------|------------------------|
| 20 - 32 Hz | .003g ² /Hz |
| 20 - 32 Hz | +5 db/oct |
| 80 - 350 Hz | .040g ² /Hz |
| 350 - 2000 Hz | -3db/oct |
| 6.1 grms | |

Y AXIS

| | |
|-------------|------------------------|
| 20 - 45 Hz | +10 db/oct |
| 45 - 600 Hz | .060g ² /Hz |
| 600 - 2000 | -10db/oct |
| 7.7 grms | |

Z AXIS

| | |
|--------------|-------------------------|
| 20 - 45Hz | .009g ² /Hz |
| 45 - 70 Hz | +12 db/oct |
| 70 - 600 Hz | .050 g ² /Hz |
| 600 - 2000Hz | -6 db/oct |
| 7.0 grms | |

(C) INSPECTION:

Fabrication - All latch components are verified to generally clean individually. The RU and RU FSE is verified to be visually clean at prodelivery acceptance.

Test - Quality Assurance surveillance is required at all test and inspections. Discrepancy reports are written on all noncompliances.

(D) FAILURE HISTORY: None for this failure mode, the bolt did back out during x axis vibration testing on a earlier version of the track angle latch. Hinge locks were modified and a ball detent added on all of the RU and track angle latches to correct this anomaly. Modified design passed 2nd series of vibration tests.

(E) OPERATIONAL USE:

1) Operational Effect -Track Angle Assy. latch may not close. Hinge locks not in correct position. Release of the RU is possible during deorbit/landing if double failure occurs. Loose equipment could impact the vehicle.

2) Crew Action - If latch cannot be closed, remove RU from FSE and jettison.

3) Crew Training - Crew trained in proper operation of track angle latch.

4) Mission constraint - None.

5) In Flight Checkout - Proper stowage verified during EVA operations. Bolt turns are counted and the hinge locks visually verified to be in position.

(F) MAINTAINABILITY: N/A

PREPARED BY: G. Wright

REVISION:

DATE: 8/10/95

WAIVER NUMBER: