

FAILURE MODE EFFECTS ANALYSIS/CRITICAL ITEMS LIS

FMEA NUMBER: CSD-TB-24 ORIGINATOR: JSC PROJECT: GFE Orbiter
 PART NAME: END EFFECTOR LRU/ORU PART NUMBER: SED39127455-301 QUANTITY: 1
 PART NUMBER: SED39127458-301 LRU/ORU PART NAME: BRT SYSTEM: DTO 0671
 LSC CONTROL NO: N/A DRAWING/REF DESIGNATOR: SEE P/N SUBSYSTEM: EVA EXP.
 ZONE/LOCATION: FLB EFFECTIVITY/AFFECT STAGE: STS-69&SUBS

CRITICALITY:

CRITICAL ITEM? Yes
 CRITICALITY CATEGORY 1R/2

SUCCESS PATHS: 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
- B/3. DETECTION FLIGHT CREW: N/A
4. DETECTION GROUND CREW: N/A
- C/5. LOSS OF REDUNDANCY FROM SINGLE CAUSE: Pass
6. ON-ORBIT RESTORABILITY: N/A

FUNCTION: The Body Restraint Tether provides a means for the EVA crewmember to semi-rigidly restrain themselves at a worksite. The BRT incorporates a feature which allows it to be attached to the modified mini workstation base plate. The end effector of the BRT incorporated jaws which are able to be secured to a dog bone handrail.

FAILURE MODE CODE: N/A

FAILURE MODE: Unable to release end effector from handrail.

CAUSE: Contamination, wear, piece part defect.

REMAINING PATHS: Tapered Pin on BRT
 and MMWS base plate.

EFFECT/MISSION PHASE: EVA

CORRECTIVE ACTION: Disconnect BRT at MMWS or disconnect MMWS base plate and perform contingency removal of handrail. Handrails are fixed to task board with 7/16" hex head bolts. Stow loose equipment in cabin or jettison.

-FAILURE EFFECTS-

END ITEM/LRU/ORU/ASSEMBLY: Unable to release crewmember restraint.

SUBSYSTEM/NEXT ASSEMBLY/INTERFACE: N/A

SYSTEM/END ITEM/MISSION: Partial loss of DTO objective.

CREW/VEHICLE : None for single failure. Loss of crewmember if they unable to free themselves from tether or structure and return to airlock. Also the BRT would not be properly stowed for landing. Possible impact damage to vehicle if BRT becomes loose during landing.

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ZONE/LOCATION: PLB	EFFECTIVITY/AFFECT STAGE: STS-69&5UBS	

HAZARD INFORMATION:

HAZARD: YES x NO

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

REMARKS:

-RATIONALE FOR ACCEPTABILITY-

(A) DESIGN:

The Body Restraint Tether end effector is a spring load latch mechanism that will snap closed when triggered. Due to the kinematics (over-center mechanism) of the end effector's design, the jaws can not be opened unless both levers operating the latch are depressed.

(B) TEST: Applicable requirements from ISC33033.**Acceptance:**

- 1) Functional: Verified at Predelivery Acceptance Test, Preinstallation acceptance, and Pre/Post environmental test. Minimum of 30 actuation cycles total during test program.
 - a) Force to open the end effector jaws shall be between 3.5 and 12 lb. verified per TPS.
 - b) Force required to activate trigger shall be between 1/2 to 3.5 lb. verified per TPS.
 - c) Force required to actuate locking pin lever between 4 and 12 lb. verified per TPS.

2) Environmental: Acceptance Vibration

The BRT is subjected to the following vibration in each axis for a duration of 1 minute verified per TPS.

20 Hz	0.01 g ² /Hz
20 to 80 Hz	+3.0dB/oct
80 to 350 Hz	.040 g ² /Hz
350 to 2000 Hz	-3.0dB/oct
2000 Hz	0.007g ² /Hz
load factor 6.1 Grms	

Qualification:**Environmental:**

Thermal: Functional verification performed at -100°F and + 200°F verified per TPS.

(C) INSPECTION:

Fabrication - All BRT components are verified to be built to print and generally clean individually. The BRT assy. is verified to be visually clean at predelivery acceptance.
 Test - Quality Assurance surveillance is required at all test and inspections. Discrepancy reports are written on all noncompliance's.

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(D) FAILURE HISTORY: None

(E) OPERATIONAL USE:

- 1) Operational Effect - Entrapped crewman or equipment in unsafe configuration for landing.
- 2) Crew Action - Crew can separate themselves from BRT at toggle latches on BRT or MMWS. If the BRT will not release from the handrail, the handrail must be removed.
- 3) Crew Training - Crew trained in proper operation of mounting the BRT .
- 4) Mission constraint - None.
- 5) In Flight Checkout - Proper function of the BRT end effector verified by crew.

(F) MAINTAINABILITY: N/A

PREPARED BY: G.Wright

REVISION:

DATE: 05/15/95

WAJVER NUMBER