

FAILURE MODE EFFECTS ANALYSIS/CRITICAL ITEMS LIS

FMEA NUMBER: CSD-TB-32 **ORIGINATOR:** JSC **PROJECT:** EDFT-02
PART NAME: BRT **LRU/ORU PART NUMBER:** SED39127455-301 **QUANTITY:** 1
PART NUMBER: SED39127455-301 **LRU/ORU PART NAME:** BRT **SYSTEM:** DTO 671
LSC CONTROL NO: N/A **DRAWING/REF DESIGNATOR:** SEE P/N **SUBSYSTEM:** EVA
ZONE/LOCATION: CABIN/PLB **EFFECTIVITY/AFFECT STAGE:** STS-69 & SUBS

CRITICALITY:

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

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 Body Restraint Tether (BRT) is a semi-rigid crew restraint aid available to EVA crewman at free float worksites. The BRT interfaces with the MMWS and a handrail.

FAILURE MODE CODE: N/A for NSTS
FAILURE MODE: Cable or outer sheath breaks.

CAUSE: Contamination, galling, piece part defect.

REMAINING PATHS: 1) Cable or sheath. **EFFECT/ MISSION PHASE:** EVA

CORRECTIVE ACTION: Discontinue use of BRT.

-FAILURE EFFECTS-

END ITEM/LRU/ORU/ASSEMBLY:
 Unable to rigidize BRT if cable fails. None if sheath fails

SUBSYSTEM/NEXT ASSEMBLY/INTERFACE: N/A

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

CREW/VEHICLE : None for single failure. If 2 failures were to occur the nested balls in the BRT would possibly be free to drift in the PLB. Possible impact of loose equipment at landing could occur.

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HAZARD INFORMATION:

HAZARD: YES: 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 BRT Assy. is designed to withstand a 300 in-lb torsional and 100 lb. tension load along its long axis without functional degradation and a 125 lb. kick load. The cable and sheath are designed to withstand this load independently. If cable failure were to occur, the sheath is designed to prevent any of the loose parts from becoming free in the PLB. Additionally, the multi-disk clutch joints are designed to slip between 10 and 140 in-lb. (nominal 50 in-lb.) which will prevent the possibility of overloading the ball stack in most BRT orientations. Strength verification is performed by analysis with a ultimate factor of safety of 2.0. Positive margin is required.

(B) TEST:

Acceptance:

- 1) Functional: Verified at Predelivery Acceptance Test, Preinstallation acceptance, and Pre/Post environmental test. Minimum of 30 actuation cycles
 - a) Ball stack shall withstand without deflection a minimum of 5 lb. crew induced load applied at the clutch joint verified per TPS.
 - b) BRT multi-disk clutch joints shall withstand between 10 and 140 in-lb. prior to the clutch system being overdriven and slipping 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	0.01g 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.
Load test : Sheath load tested to 183 lb. verified per TPS.

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(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.

(D) FAILURE HISTORY: None.

(E) OPERATIONAL USE:

- 1) Operational Effect - For cable failure - Loss of BRT function . For sheath failure none, unless cable also fails. Possible loose debris in payload bay.
- 2) Crew Action - None
- 3) Crew Training - Crew trained in proper operation of BRT.
- 4) Mission constraint - When rigidized the BRT should not be operated with the ball stack bent at more than 90 degrees.
- 5) In Flight Checkout - None.

(F) MAINTAINABILITY: N/A

PREPARED BY: G. Wright

REVISION:

DATE: 4/15/95

WAIVER NUMBER
