

FAILURE MODE EFFECTS ANALYSIS/CRITICAL ITEMS LIST

FMEA NUMBER: EC-FWP72-12 ORIGINATOR: JSC PROJECT:EDFT-03

PART NAME: LOAD LIMITER LRU/ORU PART NUMBER: SED39126415-301 QUANTITY:1
 PART NUMBER: SED39127153-301 LRU/ORU PART NAME: APFR SYSTEM:GFE
 LSC CONTROL NO: N/A DRAWING/REF DESIGNATOR: SEE P/N SUBSYSTEM: EVA
 ZONE/LOCATION: STBD-2 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: N/A
4. DETECTION GROUND CREW: N/A
- C/5. LOSS OF REDUNDANCY FROM SINGLE CAUSE: Pass
6. ON-ORBIT RESTORABILITY: N/A for NSTS

FUNCTION: The APFR load alleviator limits crew induced bending and torsions loads to less than 4200 in-lb. bending and 274 lb. shear into support structure (1800 in-lb for EDFT-03).

FAILURE MODE CODE: N/A for NSTS

FAILURE MODE: Relieve High (above 4200 in-lb bending and torsion or 274 lb. shear).

CAUSE: Contamination, wear, piece part defect.

REMAINING PATHS: 1 - Support Structure.

EFFECT/ MISSION PHASE: EVA

CORRECTIVE ACTION: None, a load alleviator failure will not be detected by EVA crew. Support structure is not designed to withstand generic EVA loads.

-FAILURE EFFECTS-

END ITEM/LRU/ORU/ASSEMBLY: If load alleviator failure occurs, there is no affect unless the crew induce a load through the APFR to its support structure which is over the structure limit.

SUBSYSTEM/NEXT ASSEMBLY/INTERFACE: Possible yielding or failure.

SYSTEM/END ITEM/MISSION: None, failure would not be detected until a structural failure occurred.

CREW/VEHICLE : Possible structural failure of DTO hardware. Structural failure may allow loose equipment in the payload bay, or subsequent loads on the structure may cause a failure during descent.

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PART NUMBER: SED39127153-301	LRU/ORU PART NAME: APFR	SYSTEM: GFE
LSC CONTROL NO: N/A	DRAWING/REF DESIGNATOR: SEE P/N	SUBSYSTEM: EVA
ZONE/LOCATION: STBD-2	EFFECTIVITY/AFFECT STAGE: STS-72	

HAZARD INFORMATION:

HAZARD: N/A

HAZARD ORGANIZATION CODE: N/A

HAZARD NUMBER: N/A

TIME TO EFFECT: Hours

TIME TO DETECT: N/A

TIME TO CORRECT: N/A

FAILURE DETECTION/FLIGHT: None

REMARKS:

-RATIONALE FOR ACCEPTABILITY-

(A) DESIGN: The APFR load alleviator is designed to trip at below 4200 in-lb bending and torsion or 274 lb. shear and tension at its coldest operating temperature (-100°F). The load attenuation is achieved by a tapered rod being squeezed (as loads are developed) by a tapered ring. Initial displacement of the alleviator is controlled by a belleville spring stack.

(B) TEST: (Applicable requirements from JSC33009)

Acceptance: (performed pre and post environmental test and at predelivery acceptance)

1) Functional test to verify that the load alleviator limits maximum loads to 4200 in-lb bending and torsion or 274 lb. shear and tension. (1800 in-lb. for EDFT-03)

Vibration: An acceptance vibration test was performed to the following levels in all axes for a duration of 1 minute.

Qualification:

Qualification Vibration: A vibration test was performed to the following levels for a duration of 1 minute in each axis as a part of the Bay two starboard integrated proto-flight vibration test:

X AXIS	Y AXIS	Z AXIS
20 - 80 Hz	20 - 45 Hz	20 - 45 Hz
80 - 350 Hz	45 - 600 Hz	45 - 70 Hz
350 - 2000 Hz	600 - 2000 Hz	70 - 600 Hz
6.1 grms	7.7 grms	600 - 2000 Hz
		7.0 grms

Qualification / Acceptance Thermal: Functional test performed between -100°F and +140°F. Load calibration curves were generated to ensure the load alleviator stayed within limits.

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(C) INSPECTION:

Fabrication - All APFR components are verified to visibly clean individually.

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

(D) FAILURE HISTORY: None

(E) OPERATIONAL USE:

- 1) Operational Effect - Higher than expected loads transmitted to support structure. Structure of DTO items may yield.
- 2) Crew Action - If detected, discontinue inputting high loads into APFR if the load alleviator cannot be tripped using normal working loads.
- 3) Crew Training - Crew trained in proper operation of APFR.
- 4) Mission constraint - None.
- 5) In Flight Checkout - Proper function verified during EVA operations.

(F) MAINTAINABILITY: N/A

PREPARED BY: G. Wright

REVISION:

DATE: 8/10/95

WAIVER NUMBER:
