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**FAILURE MODE EFFECTS ANALYSIS/CRITICAL ITEMS LIST**


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FMEA NUMBER: EC-PWP72-07	ORIGINATOR: ISC	PROJECT:EDFT-03
PART NAME:PFRWS INTERFACE	LRU/ORU PART NUMBER:SED39126415-301	QUANTITY:1
PART NUMBER: SED39126439-301	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  
 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 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: APFR is a crew restraint worksite platform. The APFRs yaw, roll, pitch and PFRWS yaw joints can be articulated by the EVA crew to position it at each worksite. The yaw and roll joint can be adjusted while the EVA crew is positioned in the foot restraint. The APFR incorporates a load limiter to limit crew induced loads into support structure to less than 4200 in-lb in bending and torsion, and 274 lb. in shear (1800 in-lb for EDFT-03).

FAILURE MODE CODE: N/A for NSTS

FAILURE MODE: Inadvertent release of socket assy.

CAUSE: Contamination, wear, piece part defect.

REMAINING PATHS: 1 - Roll Pin.

EFFECT/ MISSION PHASE: All

CORRECTIVE ACTION: 2 independent spring loaded shafts hold the PFRWS or launch restraint probe. 1 shaft is adequate to perform the function.

-FAILURE EFFECTS-

END ITEM/LRU/ORU/ASSEMBLY: If both shafts fail, loss of attachment between the APFR and PFRWS probe or launch restraint probe could occur.

SUBSYSTEM/NEXT ASSEMBLY/INTERFACE: N/A.

SYSTEM/END ITEM/MISSION: Discontinue EVA operation with PFRWS.

CREW/VEHICLE : Possible vehicle damage if increased loads due to loose launch restraint overload the remaining APFR launch restraints.

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### HAZARD INFORMATION:

HAZARD: N/A

HAZARD ORGANIZATION CODE: N/A

HAZARD NUMBER: N/A

TIME TO EFFECT: Seconds  
 TIME TO DETECT: N/A  
 TIME TO CORRECT: immediate  
 FAILURE DETECTION/FLIGHT: Visual

### REMARKS:

#### -RATIONALE FOR ACCEPTABILITY-

(A) DESIGN: The PFRWS socket is designed to the requirements specified in JSC-33009, "Certification and Acceptance Requirements Document for the Articulating Portable Foot Restraint". The socket is designed to withstand a 125 lb. kick load applied at the top of the PFRWS using a factor of safety of 1.4. The socket design incorporates two spring loaded roll pins which capture the workstation stanchion probe in the socket. On each end of the roll pin, a 7/16" bolt head is machine into the pin which can be used to rotate a jammed pin. Only one pin is required to be engage to support loads.

(B) TEST: Applicable requirements per JSC-33205

#### Acceptance:

- 1) Fit check of the socket and PFRWS probe performed at PDA.
- 2) Force required to activate the paddle shall be between 1 and 5 lb. verified at PDA, PIA, Pre and Post Environmental test and during qualification thermal test.

#### 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 integrate proto-flight vibration test:

X AXIS	Y AXIS	Z AXIS
20 - 80 Hz	-3 db/oct	20 - 45 Hz +10.0 db/oct
80 - 350 Hz	.040g <sup>2</sup> /Hz	45 - 600 Hz 0.060 g <sup>2</sup> /Hz
350 - 2000 Hz	-3db/oct	600 - 2000Hz -6.0 db/oct
6.1 grms	7.7 grms	7.0 grms

Qualification / Acceptance Thermal: Functional and interface test performed at -100°F and +200°F. During one portion of the test an interface check between the socket and PFRWS probe is performed with a minimum temperature difference of 100°F.

#### C) INSPECTION:

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

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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 - Unable to separate socket and probe. APFR remains attached to PFRWS or transition plate .
- 2) Crew Action - a) Rotate pin with tool or b)If stuck to PFRWS, jettison PFRWS/APFR. If stuck on transition plate reinstall remaining launch restraints.
- 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

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PREPARED BY: G. Wright

REVISION:

DATE: 8/10/95

WAIVER NUMBER:

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