

HAZARD REPORT NUMBER: RT-02		DATE: August 24, 1994	
REV. LETTER:		REV. DATE:	
Title: Impact damage to the Orbiter during landing.			
1. SEVERITY:		Critical	
2. LIKELIHOOD OF OCCURENCE:		Improbable	
3. CLASSIFICATION:		Controlled	
CAUSE: A. Unable to disconnect the RT from the MMWS at the end of EVA.		REDUNDANCY SCREENS: A - Pass B - NA C - Pass	
FMEA: #DTO671-64-2-2 Criticality 1R/2 NAME/QTY: Rigid Tether Base FUNCTION: The RT serves as a method for an EVA crewmember to restrain an ORU during transition. It is comprised of a rigid slider bar attached to a base arm. At the end of the slider bar is an attachment lock for the tether loop interface tools that are actually the attachment devices to the ORUs. FAILURE MODE: Cannot disconnect the RT from the MMWS at the end of the EVA. CAUSE(S): 1. Lock lever is jammed. 2. Balls and receptacle boss have a galled interface.		FAILURE DETECTION: Flight: Visual Ground: None CORRECTIVE ACTION: Crew must be able to jettison the RT and MMWS since the two items attached are not stowable in their original location.	
EFFECT: Possible damage to the Orbiter if jettison is not possible or is done incorrectly. Time to Effect: Hours Time to Correct: Minutes		REMAINING PATHS: 1. Disconnect MMWS from the EMU and jettison hardware.	
CONTROL/RETENTION RATIONALE (see retention rational information table): 1. Perform Thermal/Vacuum test. 2. The RT withstands AVT levels as specified in the HRD. 3. The structural materials are selected from JSC-0900F/MSFC-HDBK-527 and meet the requirements of SE-R-0008. 4. A Factor of Safety of at least 2.0 for ultimate loads is used during analysis and 1.4 during test. 5. The RT design precludes failure caused by fracture mechanics as identified in Materials Certification Memo.			
VERIFICATION: 1. Successful thermal/Vacuum test per 5B9420154 and a thermal test per TPS #579420110. 2. An AVT of the RT was successfully performed prior to flight per TPS # FV9420082. 3. Review and approval of the structural materials by ESS/Materials Branch was done per JSC Materials Certification Memo #MATL-94-116. 4. Stress Analysis report LESC-31291 verifies structural integrity of the RT components for all load conditions. 5. Fracture certification was implemented per JSC-25863 "Fracture Control Plan for JSC Flight Hardware" and documented in material certification form (MATL-94-116). There are no fracture critical parts in the RT base assembly. NOTE: Jettison procedure is outlined on page one of this HR.			

PRELIMINARY HAZARD REPORT

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B

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a: Impact damage to the Orbiter during landing.

RETENTION RATIONAL INFORMATION

I. DESIGN FEATURES TO MINIMIZE THE CHANCE OF THE FAILURE MODE OCCURRENCE

- A. Structural Margins: The RT is designed to take all limit load conditions as identified in section 3.2.3, "Load Requirements" of JSC-38039 (DTC 671 HRD). A factor of safety of 2.0 was implemented during analysis and 1.4 during testing.
- B. Thermal Tolerances: The RT is designed to operate in the thermal environment (-100°F to +250°F) as specified in section 5.3.1, "Temperature" of JSC-38039. All moving parts were analyzed during the design process to determine the clearance and gap values.
- C. Material Selection: All of the RT assembly materials that are considered safety critical are listed in Table 5-2 of JSC-38040 (DTC 671 FMEA). All material abide by SE-R-0008C and are approved per MATL-94-118 (RT), MATL-94-118(GTT), MATL-94-118 (PLTT)

II. TESTING AND ANALYSIS

- A. Testing:
1. Acceptance: The RT Assembly underwent the following PDAs: TPS# 579420050 (RT), 41080018 (GTT), and LEVA#420054 (PLTT). The RT hardware was operated in the thermal extremes during Orbiter T testing per (includes prepost fund.): 579420110 (RT), 579420111 (GTT), 579420112 (PLTT). PIA will be done prior to flight. The RT hardware was exposed to AVT environments per (includes prepost fund.): LEVA#420070 (RT and GTT), FV#420085 (PLTT)
 2. Certification: The thermal tests listed above are used for certification as well. Only one flight unit was built and it was exposed to AVT loads versus an QVT. Pre/Post test functional were done on the hardware during certification testing.
- B. Analysis: Stress analysis LESC-31291 was performed on the RT and PLTT and 10107-70974 was done for the GTT. Thermal analysis (LESC GTSD-1807) was done on the RT hardware and it did not exceed the certification limits.

III. INSPECTION

- A. Manufacturing: The RT hardware components were inspected for conformance to their applicable drawings at Bid 10 prior to assembly. The RT does not contain any fracture critical parts.
- B. Assembly: The assembly was inspected to the assembly level drawings during PDAs. The assemblies were cleaned to level VC after assembly and will be prior to flight.
- C. Testing: Pre/Post testing was conducted prior to and after all acceptance and certification testing. The hardware was verified to be working properly before the test began and after the test.

IV. FAILURE HISTORY

- A. Ground Testing: DRs were collected during the testing phase of the project but no FIARs were initiated. All DRs shall be closed prior to certification.
- B. On-Orbit Use: None

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V. OPERATIONAL USE

- A. Effects of Failure: Possible damage to the Orbiter if jettison is not possible or is done incorrectly.
- B. Crew Action: The crew has been trained in the manner for jettisoning the hardware. If a safe and approved method of stowing the item in the crew cabin exists, the crew may make a realtime call to stow versus jettison the hardware.
- C. Training: WETF runs have been conducted where the crew actions were rehearsed.
- D. Mission Constraints: None
- E. In-Flight Check-Outs: Operation of all locks and mechanisms prior to use in the Payload Bay.

