SUBSYSTEM: STRUCTURES & MISCELLANEOUS ITEMS

ITEM NAME: Flight Instrumentation Islands

PART NO.: 10752-0044, 0045

FM CODE: A01

ITEM CODE: 60-02-12

REVISION: Basic

CRITICALITY CATEGORY: 1

REACTION TIME: Immediate

NO. REQUIRED: 6

DATE: March 1, 2001 DCN 042

CRITICAL PHASES: Boost, Separation

SUPERCEDES: March 31, 1998 DCN 042

FMEA PAGE NO.: E-20

ANALYST: C. Reynolds/S. Parvathaneni

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APPROVED: S. Parvathaneni DCN 042

FAILURE MODE AND CAUSES: Structural failure of islands, loss of island hole plugs and /or loss of PR 1422 sealant and/or loss of EA934 NA Adhesive caused by:

o Aerodynamic loading combined with Improper fabrication, Improper Material, Improper Installation, or Unusual Environments.

o Aerodynamic loading combined with Improper Material, Improper Substrate Preparation, Improper Mixing, Improper Application (PR 1422 or EA934 NA).

FAILURE EFFECT SUMMARY: Loss of mission, vehicle and crew due to damage to the Orbiter/ET from generated debris.

RATIONALE FOR RETENTION:

A. DESIGN

O Flight instrumentation islands are designed to provide a thermal protection barrier and provide mechanical protection for sensitive measuring devices. The islands and island plugs are fabricated from a phenolic compound. The island is attached to the structure with standard aerospace fasteners. The island fasteners are counter sunk and island plugs are inserted over the fasteners. The plug is bonded to the island using EA934 NA.

O Qualification of the instrumentation islands is by analysis and testing as documented in USA SRBE Certificate of Qualification A-TPS-8104.

O Analysis shows that a factor of safety of +1.67 exists between the design of the flight instrumentation islands and the predicted maximum loading during ascent (Ref: BPC-ANAL-003-87).

O PR 1422 sealant is a two part polysulfide, liquid polymer compound which is applied to prevent moisture intrusion. It is purchased as an off the shelf item and a certificate of conformance is provided for each purchase.

O Analysis shows that a minimum factor of safety of 1.33 exists for the worst case of loading and temperature effects on material strength of PR 1422. (Ref. Analysis Report JRL-036-95-E)

O EA934 NA is purchased to source control DWG 10753-0036 and a certificate of conformance is supplied for each purchase.

O Analysis shows that for the EA934 NA island/plug interface application a factor of safety of 84.5 exists with complete island/plug interface bonding. (Ref. Analysis Report JRL-033-95-E)

B. TESTING

O The fasteners are installed in accordance with MSFC-STD-486 (Threaded Fasteners, Torque Limits for).

O Testing is performed to assure minimum hardness requirements are met per 10PRC-0642 (PR 1422) and 10PRC-0040 (EA934 NA). (Improper Material, Improper Mixing)

C. INSPECTION

VENDOR RELATED INSPECTION

O USA SRBE SIP 1263 controls the USA SRBE QAR inspection criteria at the vendor's facility for the flight instrumentation islands and island plugs. (Improper Fabrication)

O Materials are accepted on the basis of supplier certifications. Certifications are verified by USA SRBE QAR per SIP 1263 for the flight instrumentation islands and island plugs. (Improper Material)

Critical Processes/Operations:

o PR 1422 10PRC-0642.

o EA934 NA 10PRC-0040.

KSC RELATED INSPECTIONS

O Final installation is performed on new structures in accordance with assembly drawing 10125-0016 (Insulation Installation Frustum). Proper installation and torque requirements are verified by USA SRBE-QA. (Improper Installation)

O At refurbishment the flight instrumentation islands are visually inspected for cracks, chips and excessive heating. Repair/replacement as defined in 10SPC-0131 is performed. Refurbishment operations are witnessed by USA SRBE Quality inspection. (Unusual Environments)

O Visual Inspection is performed during structural integrity walkdown inspection, prior to isle transfer, in accordance with 10REQ-0021, para. 4.1.8.1. (Improper Installation)

O PR 1422 is applied is accordance with DWG 10125-0016 and 10PRC-0642 (Improper Application)

O PR 1422 substrate surface preparation is performed in accordance with 10PRC-0642. (Improper Application; Improper Substrate Preparation)

O PR 1422 mixing is performed in accordance with 10PRC-0642. (Improper Mixing)

O PR 1422 application is performed in accordance with 10PRC-0642. (Improper Application)

O USA SRBE QA performs final inspection of PR 1422 per STP-4A8.

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o Verify no loose sealant, absence of voids and bubbles over 1/8” diameter. (Improper Material, Improper Application, Improper Substrate Preparation)

- o Verify continuous application, as applicable, with no voids or breaks. (Improper Material, Improper Application)
- o Verify minimum hardness requirements are met. (Improper Material, Improper Mixing)

O EA934 NA is applied in accordance with DWG 10125-0016 and 10PRC-0040. (Improper Application)

O EA934 NA shelf life is verified per DWG 10753-0036 and 10PRC-0040. (Improper Application)

O EA934 NA surface preparation is performed per 10PRC-0040 and verified per STP-4A6. (Improper Surface Preparation)

O EA934 NA is mixed in accordance with 10PRC-0040. A cure sample is prepared and proper mixing is verified by hardness testing per STP-4A6. (Improper Mixing)

O EA934 NA minimum hardness requirements are met per 10PRC-0040 and verified per STP-4A6.

PRELAUNCH CHECKOUT RELATED INSPECTION

O Visual Inspection, in accordance to OMRSD File V, Vol I, requirement number B08ST0.010 (Improper Installation)

D. FAILURE HISTORY

O Criticality Category 1:
- o Failure Histories may be obtained from the PRACA database.

E. OPERATIONAL USE

O Not applicable to this failure mode.