

SRB CRITICAL ITEMS LIST

SUBSYSTEM: SEPARATION

ITEM NAME: Forward ET Attachment Fitting

PART NO.: 10160-0135
10160-0167
10160-0165
10175-0001
10160-0166

FM CODE: A03

REVISION: Basic

ITEM CODE: 30-03-03

CRITICALITY CATEGORY: 1

REACTION TIME: Immediate

NO. REQUIRED: 1

DATE: March 1, 2002

CRITICAL PHASES: Separation

SUPERCEDES: March 1, 2001

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FMEA PAGE NO.: B-50

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SHEET 1 OF 3

APPROVED: S. Parvathaneni

FAILURE MODE AND CAUSES: Bolt catcher fails to retain the bolt half due to structural failure caused by:

- o Improperly heat treated assembly
- o Improper honeycomb
- o Overtorqued (stripped) fasteners
- o Weld voids and cracks

FAILURE EFFECT SUMMARY: Failure of the forward bolt catcher to retain debris would result in damage to the Orbiter/ET leading to fire and explosion resulting in loss of mission, vehicle, and crew.

RATIONALE FOR RETENTION:

- A. DESIGN: The forward SRB bolt attachment fittings consist of two inserts (with matching spherical surfaces), two spherical washers, and a spherical nut.

The forward bolt catcher consists of a spin formed dome welded to a machined base. The welded assembly is then heat treated. The basic material of construction is 2219 aluminum. A filled aluminum honeycomb energy absorber is used to attenuate the kinetic energy of the separation bolt. The assembly is fastened to the external tank with standard aerospace fasteners.

The materials used in the design were selected in accordance with 10PLN-0150 (Materials Control and Verification Program Management Plan for SS SRB Program) and MSFC-SPEC-522 (Design Criteria for Controlling Stress Corrosion Cracking).

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The design allowables are in compliance with MIL-HDBK-5 (Metallic Materials and Elements for Aerospace Vehicle Structures) and MSFC-HDBK-505 (Structural Strength Program Requirements).

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

All welding is in compliance with MSFC-SPEC-504A (Welding, Aluminum Alloys). The welds receive X-ray and dye penetrant inspection. Weld wire controls are in compliance with MSFC-STD-655 (Standard Weld Filler, Control of).

Heat treat operations are in compliance with MIL-H-6088 (Heat Treatment of Aluminum Alloys).

The forward bolt catcher is qualified for use by test and analysis as documented in Certificate of Qualification A-STR-7120-1. The qualification consists of a series of static tensile loadings as referenced in test report SST-SC-TR-FR04.

production destructive test program, as outlined in USA SRBE 10PRC-0050, was used to qualify the spin forming process used to fabricate the forward bolt catcher dome.

B. TESTING:

Verification type destruct tests are conducted on two representative units from each production run (not to exceed 25 units). (Improper Heat Treat, Weld Voids and Cracks) (Dome Assy.)

Each dome is dye penetrant inspected in accordance with MIL-I-6866 (Inspection, Penetrant Method of). (Voids and Cracks)

Each weld is inspected in accordance with MSFC-STD-366 (Penetrant Inspection Method) and MIL-STD-453 (Inspection, Radiographic). (Weld Voids and Cracks)

One bolt catcher assembly shall be selected from each production run of bolt catchers and destructively tested.

A total of four tensile test coupons are from the unit. The coupons shall be oriented in the axial (flight) direction, equally spaced around the unit, and centered on the circumferential weld (Bolt Catcher Assy).

C. INSPECTION:

VENDOR RELATED INSPECTION

- o USA SRBE Source Inspection Plan (SIP) 1453 controls the USA SRBE PQAR inspection criteria at the vendor's facility. (All Failure Causes)
- o Vendor QA and USA SRBE verify the actual chemical and/or physical material analysis certificate, in accordance with SIP 1453. (Improper Honeycomb)
- o Vendor QA and USA SRBE PQAR verify the heat treat data and penetrant inspection in accordance with SIP 1453. (Improper Heat Treat, Weld Voids and Cracks)
- o USA SRBE PQAR verifies that the weld schedule is properly qualified in accordance with SIP 1453. (Weld Voids and Cracks)

The following critical processes have been identified:

- o Welding operations are performed in accordance with MSFC-SPEC-504-A. (Weld Voids and Cracks)
- o Forming operations are performed in accordance with 10PRC-0050 (Spin Forming of the Bolt Catcher Dome). (Voids and Cracks)
- o Heat treat operations are performed in accordance with MIL-H-6088. (Improper Heat Treat)
- o Radiographic inspection operations are performed in accordance with MIL-STD-453. (Voids and Cracks)
- o Dye penetrant inspection operations are performed in accordance with MIL-I-6866. (Voids and Cracks)

PRELAUNCH CHECKOUT RELATED INSPECTIONS

oThe Forward Bolt Catcher installation includes witness verification of proper installation and torque requirements by SPC QA per OMRSD File V, Vol.1 requirement no. B08GEN.010 for torque. (Overtorqued fasteners)

D. FAILURE HISTORY

- o Failure Histories may be obtained from the PRACA database.

E. OPERATIONAL USE

- o Not applicable to this failure mode.