

SRB CRITICAL ITEMS LIST

SUBSYSTEM: SEPARATION

ITEM NAME: Aft Booster Separation Motor (BSM)

PART NO.: 10317-0002-805, -806

FM CODE: A04

ITEM CODE: 30-02-06

REVISION: Basic

CRITICALITY CATEGORY: 1R

REACTION TIME: Immediate

NO. REQUIRED: 4 Aft

DATE: March 1, 2002

CRITICAL PHASES: Boost

SUPERCEDES: March 31, 2000

FMEA PAGE NO.: B-34A

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CN 044

SHEET 1 OF 4

APPROVED: S. Parvathaneni

FAILURE MODE AND CAUSES: Premature ignition of the igniter, main grain or BKNO₃ (two BSMs) caused by:

- o High temperature
- o Shock
- o Vibration
- o Increased sensitivity due to contamination
- o Electrostatic discharge
- o Acoustics

FAILURE EFFECT SUMMARY: Loss of separation thrust results in loss of mission, vehicle and crew.

REDUNDANCY SCREENS AND MEASUREMENTS

1. N/A
2. Fail -Loss of redundancy not detectable by flight or ground crew.
3. Pass

RATIONALE FOR RETENTION:

A. DESIGN

Design Specification is USA SRBE 10SPC-0067.

- o High temperature
 - BKNO₃, booster charge, shall not ignite when subjected to a temperature of 400°F for 15 minutes or 210°F for six hours.
 - Propellant UTP 19048 per specification SE0622- Predicted high temperature of BSM motor propellant including igniter grain will not exceed 106°F .

- BSM propellant is qualified to 120°F per Test Report CSD 5180-79-109 and CSD-5596-88-3.
- o Shock - ordnance shock performed per qual test report CSD 5180-79-109 and CSD 5596-88-3.
- o Electrostatic discharge/Lighting Effects - Propellant is encased in aluminum which is hard mounted to primary structure. The mounting surface of the BSM shall be free of resistive film and contamination so as to produce a 2.5 milliohm maximum electrical bonding.
- o Vibration - Vibration performed on eight motors per qual test report CSD 5180-79-109. Vibration performed on four motors per qual test report CSD-5596-88-3. Acoustic environment is included in vibration test criteria.
- o Delta Qualification Tests
 - The Aft BSM was qualified per qual test reports CSD-5180-79-109 and CSD-5596-88-3.
 - CSD 5597-93-2 delta qualification tests for BSM configuration 10317-0002-805. Delta qualification on two units subjected to environmental and functional tests.

B. TESTING

- o None

C. INSPECTION

- o All listed vendor related inspections are conducted 100% by vendor (or sub-tier vendor) QA personnel. Where no designated QA organization exists at a vendor, inspections are witnessed/monitored by CSD QA personnel or inspection records are evaluated for compliance with quality system requirements by CSD QA personnel.
- o All KSC related inspections are conducted 100% by USA SRBE or SPC QA personnel.

VENDOR RELATED INSPECTIONS

Propellant Constituents Inspections

Hydroxyl Terminated Poly-Butadiene

- Chemical/physical properties of the following constituents are verified by test and data evaluation.
 - Hydroxyl value
 - Water
 - Iron
 - Peroxide
 - Antioxidant
 - Viscosity @30° C
 - Insolubles
- Infrared spectra analysis performed to identify material

Isophorone Diisocyanate

- Chemical/physical properties of the following constituents are verified by test and data evaluation.
 - NCO equivalent weight
 - Dimer
 - Density @20^o C
 - Hydrolyzable chloride
 - Water
- Infrared spectra analysis performed to identify material

Di-octyl Adipate

- Chemical/physical properties of the following constituents are verified by test and data evaluation.
 - Ester content
 - Specific gravity at 25 °C
 - Acidity, as acetic acid

Stabilizer

- Melting point is verified by test and data evaluation.

Bonding Agent

- Chemical/physical properties of the following constituents are verified by test and data evaluation.
 - Imine equivalent weight
 - Hydrolyzable chloride
 - Moisture (weight percent)
- Infrared spectra analysis performed to identify material

Aluminum

- Chemical/physical properties of the following constituents are verified by test and data evaluation.
 - Free aluminum metal
 - Volatiles
 - Ether Extractables
 - Particle size distribution

Ferric Oxide

- Chemical/physical properties of the following constituents are verified by test and data evaluation.
 - Ferric oxide, assay
 - Loss on ignition
 - Water content
 - pH, water suspension
 - Particle size distribution

Ammonium Perchlorate (Standard)

- Chemical/physical properties of the following constituents are verified by test and data evaluation.
 - Ammonium perchlorate assay
 - Tricalcium Phosphate
 - Total water
 - pH of water solution
 - Sulfated ash
 - Particle size

Ammonium Perchlorate (90 micron)

- Chemical/physical properties of the following constituents are verified by test and data evaluation.
 - Ammonium perchlorate assay
 - Tricalcium Phosphate
 - Totalwater

pH of water solution
Sulfated ash
Particle size

- o Igniter/Motor Moisture/Contamination
 - A 100% inspection is performed on interior of motor just prior to installation of the nozzle assembly taping weather seal on nozzle.
 - Installation of security bag and lead seal verified.
 - BKN03 velostat bag is processed in a nitrogen box and purged with nitrogen until it reaches a specified relative humidity. BKNO3 bag welds are vacuum tested and verified.

KSC RELATED INSPECTIONS

- o Receiving Inspection (All Failure Causes)
 - Verify for each BSM received there is no evidence of damage, degradation, corrosion, misalignment or moisture per OMRSD File V, Vol. I, requirement number B000FL.005.
- o AFT BSM Installation Inspections per 10REQ-0021. (Electrostatic Discharge)
 - Resistance check of Triple Motor Module between Aft Skirt/BSM Module and BSM/Aft Support Joints verified per para. 2.2.1.2.5.
 - Resistance check of Single Motor Module between Aft Skirt/Single Motor Module Joints and between BSM/Aft Support Joints verified per para. 2.2.1.2.5.

D. FAILURE HISTORY:

Failure histories may be obtained from the PRACA database.

E. OPERATIONAL USE

- o Not applicable to this failure mode.