

SRB CRITICAL ITEMS LIST

SUBSYSTEM: SEPARATION

ITEM NAME: NSI Pressure Cartridge

PART NO.: 10303-0001-801

FM CODE: A05, A03

ITEM CODE: 30-03-01, 30-04-01A

REVISION: Basic

CRITICALITY CATEGORY: 1

REACTION TIME: Immediate

NO. REQUIRED: 2 Fwd 30-03-01
6 Aft 30-04-01A

DATE: March 31, 1998

CRITICAL PHASES: Boost

SUPERCEDES: March 31, 1997

FMEA PAGE NO.: B-45, B-57

ANALYST: V. Patel

SHEET 1 OF 4

APPROVED: P. Kalia

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FAILURE MODE AND CAUSES: Premature operation caused by:

- o High temperature
- o Shock/Vibration
- o Increased sensitivity due to contamination
- o Electromagnetic interference
- o Electrostatic discharge

FAILURE EFFECT SUMMARY: Premature operation of the Fwd NSI Pressure Cartridge will result in loss of mission, vehicle and crew due to SRB attachment rotation leading to Orbiter/ET fire and explosion. Premature operation of any Aft NSI Pressure Cartridge will result in strut detachment and subsequent loss of mission, vehicle and crew due to SRB breakaway leading to Orbiter/ET fire and explosion.

RATIONALE FOR RETENTION:

A. DESIGN

- o Design specification USBI 10SPC-0027
 - No autoignition at 170°F for a minimum of 60 minutes paragraph 3.2.5.2 (High temperature)
 - Vibration levels per para. 3.4.1.3.
 - Contamination control per para. 3.1.2 and 3.1.3.
 - Electrical bonding per para. 3.2.15. (Electrostatic Discharge)
- o Predicted cartridge temperature will not exceed 80°F per SRB Thermal Design Data book SE-019-068-2H, table 4.9.1. (High temperature)

- o Insensitive to lightning effects, shock and heat per SRB Electromagnetic Effects Control Plan 10PLN-0067.(Shock/High temperature)
- o Explosive material certified to the following: (Contamination)
 - Hi-Shear specification 700871 or Unidynamics specification 51-3789-PRS-01 or OEA Aerospace Manufacturing Procedures 40-5607100.
 - Hi-Shear source control drawing 9391576 or Unidynamics specification 51-3789-PRS-01 or OEA Aerospace Manufacturing Procedures 40-5607100
 - o Graphite per MIL-G-155
 - o Diphenylamine per MIL-D-98
 - o Nitrocellulose per MIL-N-244
 - o Potassium Sulphate per MIL-P-193A
 - o Dinitrotoluene per MIL-D-204A
- o Hermetically sealed device prevents the entry of contamination following manufacturing. (Contamination)
- o Qualification
 - Autoignition temperature (+170°F) demonstrated per 10SPC-0027 (High temperature)
 - High temperature functional test (+120°F) (High temperature)
 - Vibration (Vibration)
 - Leak test (helium) (Contamination)
- o Qualification of cartridge is documented in Hi-Shear Report 9391360-1262 or in Unidynamics Report F45-059/CM-11W-954 and USBI Similarity Report ER-PYR-88-006 or OEA Aerospace Report 10-5607100
- o Insensitivity of NSI to lightning effects reported in MSFC Report 16A00100D.

B. TESTING

- o Lot acceptance tests are conducted per:
 - Hi-Shear ATP 9391360-869 or Unidynamics 51-3789-ATP-02 or OEA Aerospace ATP 7-5607100
 - o Helium leak test the entire lot. (Contamination)
 - o Radiographic examination (X-ray) the entire lot. (Contamination)
 - o Vibration test all samples. (Vibration)
 - o Function test high temperature 5 percent of the lot. (High temperature)

- o The following tests check for the effects of stray electromagnetic interference. (EMI, Electronic Discharge)
 - Integrated power "ON" stray voltage test is performed on the forward separation bolt NSI pressure cartridges per OMRSD File II, Vol. 1, requirement number S00000.140U and V.
 - Integrated Power "OFF" Stray Voltage Test is checked per OMRSD File II, Vol. 1, requirement numbers S00GEN.635. (EMI, Electrostatic Discharge)
 - Integrated power "ON" stray voltage test is performed on all aft strut NSI pressure cartridges per OMRSD File II, Vol. 1, requirement number S00000.140M and N. DCN 035
 - Integrated power "OFF" stray voltage test is performed on all aft strut NSI pressure cartridges per OMRSD File II, Vol. 1, requirement number S00GEN.635. DCN 035

The above referenced OMRSD testing is performed every flight.

C INSPECTION

The following inspections are performed.

VENDOR RELATED INSPECTION

- o Assembly Operation. Powder calorific validation, loading and sealing operations are verified one hundred percent by contractor Quality Assurance and USBI Quality Assurance. (Contamination)
 - USBI Quality Assurance
 - o USBI Source Inspection Plan (SIP) 1311.
 - Contractor Quality Assurance
 - o Hi-Shear Corporation Assembly Operation Sheet 9391360-1 or Unidynamics NSI Cartridge Assembly Process Card PC51-3789-1 or OEA Aerospace Manufacturing Procedure 40-5607100
- o Lot acceptance test. X-ray films are examined by certified vendor personnel and verified by USBI personnel. Temperature and Helium leak tests are witnessed one hundred percent by USBI Quality Assurance and Contractor Quality Assurance. (All Failure Causes)
 - USBI Quality Assurance
 - o USBI SIP 1311
 - Contractor Quality Assurance
 - o Hi-Shear Corporation Acceptance Test Procedure 9391360-869 or Unidynamics 51-3789-ATP-02 or OEA Aerospace Acceptance Test Procedure 7-5607100
- o Lot review and certification per USBI Plan 10PLN-0042.

- o Critical Processes/Inspections: The following critical processes and inspections are used to assure propellant charge is properly sealed and free from moisture or contamination. (All Failure Causes)
 - X-ray per HSC ATP 9391360-869 or Unidynamics 51-3789-ATP-02 or OEA Aerospace ATP 7-5607100
 - Helium Leak Test per HSC 9391360-878 or Unidynamics 51-3789-ATP-02 or OEA Aerospace ATP 7-5607100

KSC RELATED INSPECTION

- o Receiving Inspection
 - Each NSI Pressure Cartridge is inspected for damage and contamination per OMRSD File V, Vol. 1, requirement number B000FL.001. (Contamination)
 - Verify that each NSI Pressure Cartridge received is listed on the NSI Pressure Cartridge certification statement by lot and serial number per OMRSD File V, Volume 1, requirement no. B000FL.002. (All Failure Causes)
- o Installation Inspection
 - Each NSI Pressure Cartridge is inspected for contamination and surface defects prior to installation into Forward Separation Bolt by SPC Quality Assurance per OMRSD File V, Vol. 1 requirement no. B000FL-005. (Contamination)
 - Bonding between all metallic faying surfaces is verified per OMRSD File V, Vol. 1, requirement number B75000.020. (Electrostatic Discharge)
 - Each NSI Pressure Cartridge and O-ring is inspected for contamination and surface defects prior to installation into Aft Separation bolts by USBI Quality Assurance per 10REQ-0021 para. 4.2.1. (Contamination)
 - Aft Bolt Cartridge/Bolt electrical bonding resistance check is performed by USBI Quality Assurance per 10REQ-0021 para. 2.2.1.2.4. (Electrostatic Discharge)

D. FAILURE HISTORY

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

E. OPERATIONAL USE

- o Not applicable to this failure mode.