

SRB CRITICAL ITEMS LIST

SUBSYSTEM: SEPARATION

ITEM NAME: CDF Assembly, Forward & Aft BSMs

PART NO.: 10314-0001-105 through -109
10314-0001-110 or 10314-0001-145 (alternate)
10314-0001-111 through -122

FM CODE: A03

ITEM CODE: 30-01-04, 30-02-04

REVISION: Basic

CRITICALITY CATEGORY: 1

REACTION TIME: Immediate

NO. REQUIRED: 9 Fwd, 9 Aft

DATE: March 31, 1999

CRITICAL PHASES: Boost

SUPERCEDES: March 31, 1997

FMEA PAGE NO.: B-13, B-31

ANALYST: R. Knoche/ann/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

FAILURE EFFECT SUMMARY: Premature firing of the Aft or Forward Separation Motors results in loss of required separation thrust at separation, leading to loss of mission, vehicle and crew.

RATIONALE FOR RETENTION:

A. DESIGN

- o Design specification USBI 10SPC-0035
 - o No autoignition below 275°F, paragraph 3.3.7.2 (High Temperature)
 - o Shock levels per paragraph 3.4.1.4
 - o Vibration levels per paragraph 3.4.1.3
 - o Contamination control per paragraphs 3.1.2 and 3.1.3
- o Predicted temperature will not exceed 134°F per SRB Thermal Design Data Book SE-019-068-2H, Table 4.9.1.1. (High Temperature)
- o P/N 10314-0002 explosive material (PETN) certified to MIL-P-387. (Contamination)
- o P/N 10315-0002 (Ensign Bickford) explosive material (PETN) TIP certified to MIL-P-387 and (HMX) cord certified to MIL-II-45444 or P/N 10315-0001 (Teledyne McCormick Selph) explosive material (PETN) TIP certified to MIL-P-387 and (HNS) cord certified to WS5003 or P/N 10315-0003 (OEA Aerospace) explosive material (PETN) tip certified to MIL-P-387 and (HNS) cord certified to WS5003. (Contamination)
- o Sealed cord prevents the entry of contamination following manufacturing. (Contamination)

- o Qualification
 - o Proven design qualified for Saturn V per North American Aviation Qualification Test Summary 67MS1149.
 - o Delta Qualification for SRB
 - o Operating High temperature (250°F for 30 minutes) (High Temperature)
 - o 8 and 40 foot drop (Shock/Vibration)
 - o Pyrotechnic shock (Shock/Vibration)
 - o Vibration
 - o Autoignition determination per 10SPC-0035, paragraph 3.3.7.2 (High Temperature)
 - o Delta qualification per Ensign Bickford (EB) Test Report 5860A for the (PETN)-Cord CDF assembly and EB Test Report 86-08-03.87-1435: DEN for the (HMX)-Cord CDF assembly or Teledyne McCormick Selph (TMCs) Test Report QTR-7786-324A for the (HNS)-Cord CDF assembly or OEA Aerospace test report 11914 (01) qu. Rev. A for (HNS-Cord) CDF Assembly.

B. TESTING

- o Lot acceptance test per Ensign Bickford Procedure ATP 0030/2 (PETN- Cord) or ATP 0030/5 (HMX-Cord) or Teledyne McCormick Selph ATP 817296 (HNS-Cord) or OEA Aerospace ATP 11914(01) (HNS-Cord).
 - o Radiographic examination of entire lot. (Contamination)
 - o Vibration tests of all destructive LAT samples. (Vibration)
 - o High temperature 250°F function test of 5 percent of the lot. (High Temperature)
 - o Post-environmental X-ray and N-ray (Contamination)
 - o 100 pound pull test (Shock/Vibration)
 - o Temperature-humidity-altitude test

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C. INSPECTION

The following inspections are performed.

VENDOR RELATED INSPECTION

- o Receiving Inspection: All explosive material certifications and test reports are verified one hundred percent. (Contamination)
 - o USBI Quality Assurance
USBI Source Inspection Plan 1149 for (PETN)-Cord, (HNS)-Cord or (HMX)-Cord
 - o Contractor Quality Assurance
Ensign Bickford Inspection Procedure QA 461/2 for the (PETN)-Cord CDF Assembly

Ensign Bickford Inspection Procedure QA 461/3 for the (HMX)-Cord CDF Assembly

TMcS Assembly and Inspection Procedure 817296 for the (HNS)-Cord CDF Assembly

OEA Aerospace Receiving Inspection Plan 11914(01) RIP for the (HNS-Cord) CDF Assembly

- o Assembly Operation. Moisture content determination, core weight, and explosive loading are verified one hundred percent by Contractor Quality Assurance and USBI Quality Assurance. Mass ratio determination for 10315-0001 and fill density determination for 10314/10315-0002 are verified by Contractor Quality Assurance and USBI Quality Assurance. For OEA Aerospace CDF assemblies only, the flexibility test is witnessed one hundred percent by Contractor and USBI Quality Assurance. (Contamination)
 - o USBI Quality Assurance

USBI Source Inspection Plan 1149 for (PETN)-Cord, (HNS)-Cord or (HMX)-Cord
 - o Contractor Quality Assurance

Ensign Bickford Inspection Procedure QA 461/2 (PETN-Cord) or QA 0461/3 (HMX-Cord).
Teledyne McCormick Selph Assembly and Inspection Procedure 817296 (HNS-Cord)
OEA Aerospace Procedures 11914(01) MP (Booster Cup) or 11914(02) MP (HNS-Cord)
- o Lot Acceptance Test. N-ray and X-ray films are examined by certified vendor personnel and verified by USBI personnel. Vibration test is monitored and high temperature function test is witnessed one hundred percent. For OEA Aerospace CDF assemblies only, Helium leak test is witnessed one hundred percent by contractor and USBI Quality Assurance. (All Failure Causes)
 - o USBI Quality Assurance

USBI Source Inspection Plan 1149 for (PETN)-Cord, (HNS)-Cord or (HMX)-Cord
 - o Contractor Quality Assurance

Ensign Bickford Acceptance Test Procedure ATP 0030/2 (PETN-Cord) or ATP 0030/5 (HMX Cord).
Teledyne McCormick Selph (TMcS) ATP 817296 (HNS-Cord)
OEA Aerospace ATP 11914(01) ATP (HNS-Cord)
- o Lot review and certification per USBI Plan 10PLN-0035.
- o Critical Processes/Inspections: The following critical processes and inspections are used to assure that explosive charge is properly assembled/sealed. (Contamination)
 - o X-ray per EB ATP 0030/2 (PETN-Cord) or ATP 0030/5 (HMX-Cord) or TMcS ATP 817296 (HNS-Cord) or OEA Aerospace ATP 11914(01) (HNS-Cord) CN 035
 - o N-ray per EB ATP 0030/2 (PETN-Cord) or ATP 0030/5 (HMX-Cord) or TMcS ATP 817296 (HNS-Cord) or OEA Aerospace ATP 11914(01) (HNS-Cord)
 - o Adhesive application per EB Inspection Procedure QA 461/2 (PETN-Cord) or QA 461/3 (HMX-Cord) or TMcS Assembly and Inspection Procedure 817296 (HNS-Cord) or OEA Aerospace manufacturing procedures 11914(01) MP.

KSC RELATED INSPECTION

- o Receiving Inspection
 - o Ordnance device shelf life is verified one hundred percent by Shuttle Processing Contractor Quality Assurance per OMRSD File II, Vol. 3, Table C00CA0.040-000. (Contamination)
 - o Each nonelectric pyrotechnic device is visually inspected for evidence of damage, degradation, corrosion, misalignment or moisture per OMRSD File V, Vol. 1, requirement number B000FL.005. (Contamination)
 - o Verify that CDF Assemblies have been flight certified by MSFC as required by NSTS 08060 per OMRSD File V, Volume 1, requirement no. B000FL.002. (All Failure Causes)
- o Installation Inspection
 - o Proper installation of the CDF assemblies to the CDF manifolds per 10REQ-0021, para. 1.1.4.1 (forward) and para. 2.1.1.1 (aft). (Contamination)

D. FAILURE HISTORY

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

E. OPERATIONAL USE

- o Not applicable to this failure mode.