

SRB CRITICAL ITEMS LIST

SUBSYSTEM: RANGE SAFETY COMMAND DESTRUCT

ITEM NAME: Confined Detonating Fuse  
(CDF) Assembly

PART NO.: 10314-0001-123 through FM CODE: A03  
-129 and -136 through -143  
10315-0002-826 (alternate)  
10314-0002-825, 10315-0001-832,  
10315-0002-834, 10315-0003-835

ITEM CODE: 70-14 REVISION: Basic

CRITICALITY CATEGORY: 1 REACTION TIME: Immediate

NO. REQUIRED: 2 DATE: March 1, 2001 CN 042

CRITICAL PHASES: Final Countdown, SUPERCEDES: March 31, 1999 CN 042  
Boost, Separation,  
Retrieval

FMEA PAGE NO.: F-53 ANALYST: K. C. Finch/ J. McFarland CN 042

SHEET 1 OF 4 APPROVED: S. Parvathaneni CN 042

FAILURE MODE AND CAUSES: Premature operation caused by:

- High Temperature
- Shock/Vibration
- Increased sensitivity due to contamination

FAILURE EFFECT SUMMARY: Premature firing of the Range Safety destruct ordnance during countdown, boost or separation leads to fire and explosion of the Orbiter/ET resulting in loss of mission, vehicle and crew.

RATIONALE FOR RETENTION:

A. DESIGN

- Design specification USA SRBE 10SPC-0035 CN 042
  - Shock levels per paragraph 3.4.1.4. (Shock)
  - Vibration levels per paragraph 3.4.1.3. (Vibration)
  - Contamination control per paragraph 3.1.2 and 3.1.3. (Increased Sensitivity)
  - No autoignition below +400 degrees F for Cord and + 275 degree F for end Fittings per paragraph 3.3.7.2 (High Temperature)
- Predicted temperature will not exceed + 172<sup>0</sup>F per SRB Thermal Design Data Book SE-019-068-2H, Table 4.9.1.1. (High Temperature)
  - P/N 10314-0002 explosive material (PETN) certified to MIL-H-387C (Contamination) CN 042

- o P/N 10315-0002 (Ensign Bickford) explosive material (PETN) TIP certified to MIL-H-387C and (HMX) cord certified to MIL-H-45444B or P/N 10315-0001 (Teledyne McCormick Selph) explosive material (PETN) TIP certified to MIL-H-387C and (HNS) cord certified to WS5003F or P/N 10315-0003 (OEA Aerospace) explosive material (PETN) tip certified to MIL-H-387C and (HNS) cord certified to WS5003F. (Contamination)

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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.
  - Operating high temperature (250<sup>0</sup> for 30 minutes) (High Temperature)
  - 8 and 40 foot drop (Shock/Vibration)
  - Pyrotechnic Shock (Shock/Vibration)
  - Vibration (Shock/Vibration)
  - Autoignition determination per 10SPC-0035 (High Temperature)
- o Delta qualification per Ensign Bickford Test Reports 5860A, for the PETN Cord CDF Assembly and EB Test Reports 86-08-03, and 87-1435; DEN for the HMX Cord CDF Assembly and Teledyne McCormick Selph Test Report QTR 7786-324A for the HNS Cord CDF Assembly or P/N 10315-0003 or OEA Aerospace test report 11914(01) qtr. 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 TMcS 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<sup>0</sup>F) function test of five 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

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 USA SRBE Quality Assurance
    - USA SRBE Source Inspection Plan (SIP) 1149 for (PETN)-Cord, (HMX)-Cord, and (HNS)-Cord.

- o Contractor Quality Assurance
  - Ensign Bickford Inspection Procedure QA 461/2 for the (PETN)-Cord
  - Ensign Bickford Inspection Procedure QA 461/3 for the (HMX)-Cord
  - TMcS Assembly and Inspection Procedure 817296 for the (HNS)-Cord
  - 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 USA SRBE Quality Assurance. Mass ratio determination for 10315-0001 and fill density determination for 10314/10315-0002 are verified by Contractor Quality Assurance and USA SRBE Quality Assurance. For OEA Aerospace CDF assemblies only, the flexibility test is witnessed one hundred percent by Contractor and USA SRBE Quality Assurance. (Contamination)
  - o USA SRBE Quality Assurance
    - USA SRBE SIP 1149 for the (PETN)-Cord, (HMX)-Cord, and (HNS)-Cord
  - o Contractor Quality Assurance
    - Ensign Bickford Inspection Procedure QA 461/2 (PETN-Cord) or QA0461/3 (HMX-Cord)
    - Teledyne McCormick Selph Assembly and Inspection Procedure 817296HNS-Cord)
    - OEA Aerospace Procedures 11914(01) MP (HNS-Cord) or 11914(02) MP (Booster Cup)
  
- O Lot Acceptance Test. N-ray and X-ray films are examined by certified vendor personnel and verified by USA SRBE personnel. Vibration test is monitored by USA SRBE Quality Assurance and witnessed by Contractor Quality Assurance one hundred percent. 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 USA SRBE Quality Assurance. (All Failure Causes)
  - o USA SRBE Quality Assurance
    - USA SRBE SIP 1149 for the (PETN)-Cord, (HMX)-Cord and (HNS)-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 Procedures 11914(01) ATP (HNS-Cord)
  
- O Lot review and certification per USA SRBE plan 10PLN-0035.
  
- O Critical Processes/Inspections/Operations: The following critical processes/inspections/operations are used to assure that explosive charge is properly sealed.
  - 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)
  - 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 PS0115/2 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.

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KSC RELATED INSPECTION

O Receiving Inspections

- o Damage: 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.
- o Ordnance device shelf life is verified one hundred percent by Shuttle Processing Contractor Quality Assurance per OMRSD File II, Vol. 3, Table C00CA.040-000. (Contamination)
- o Verify CDF assemblies have been certified by MSFC as required by NSTS 08060. Per File V Volume 1, requirement number B00FL.002. (All failure causes)

o Installation Inspection

- Verify proper installation of the CDF assemblies to the CDF manifolds per 10REQ-0021, para. 1.1.4.1. (Contamination)

D. FAILURE HISTORY

o Criticality Category 1

- No SRB failure history for this failure mode.

E. OPERATIONAL USE

- o Not applicable to this failure mode.