

SRB CRITICAL ITEMS LIST

SUBSYSTEM: RANGE SAFETY COMMAND DESTRUCT

ITEM NAME: NASA Standard Detonator(NSD)

PART NO.: SEB 26100094-201

FM CODE: A02

ITEM CODE: 70-12

REVISION: Basic

CRITICALITY CATEGORY: 1R

REACTION TIME: Immediate

NO. REQUIRED: 2

DATE: March 31, 1997

CRITICAL PHASES: Boost

SUPERCEDES: March 1, 1994

FMEA PAGE NO.: F-42

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SHEET 1 OF 4

APPROVED: P. Kalia

DCN032

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FAILURE MODE AND CAUSES: Fails to operate (both NSDs) caused by:

- Insensitive explosive degraded by moisture, contamination or chemical decomposition
- Low output/insufficient charge
- Short or open circuit
- High resistance circuit
- Defective welds
- Broken header
- Separated bridgewire/charge

FAILURE EFFECT SUMMARY: Failure of both NSDs to operate leads to loss of the ability to detonate the destruct ordnance during the boost phase which may result in loss of life and/or injury to the public or ground personnel. One success path remains after the first failure. Operation is not affected until both paths are lost.

REDUNDANCY SCREENS AND MEASUREMENTS:

1. N/A
2. N/A
3. Pass- No known common cause.

RATIONALE FOR RETENTION:

A. DESIGN

- o The NSD is GFE supplied by Johnson Space Center (JSC) and consists of a NASA Standard Initiator (NSI) (SEB26100001) with a backup ring welded to the body of the NASA Standard Detonator. The NSI is controlled by specification SKB26100066 and drawing SEB26100001. The NSD design is controlled by drawing SEB26100094 and specification SKB26100097. Two

(redundant) NSDs are designed to output shock wave to CDF manifolds. Material is A286 CRES for corrosion protection. Explosive mix is RDX and lead azide.

o Qualification:

Component Qualification Tests: Salt fog, shock, vibration, thermal cycling, high temperature firing at altitude, 8 foot drop test, sand/dust, high/low/ambient and cryogenic (-450°F) firings. Certification requirements (CR) 45-114-0018-0003, CR-45-453-0021-0009; SKB26100097. (All Failure Causes)

Assembly Qualification Tests: 26 fired in conjunction with 3/4 inch nut qualification (-200°F/-400°F/ambient); salt fog, vibration/low temperature, single detonator 120% web margin firing, limit and zero applied loads firings. CR-45-114-0018-0003.

Delta Qualification for SRB: Vibration and Shock. CR-45-453-0021-0009.

System Qualification Tests: 8 firings cryogenic temperature with flight preload 55 k-lb. (Umbilical Separation). CR-45-565330.

B. TESTING

VENDOR RELATED TESTING

- o Acceptance Tests: Helium leak test, N-ray and X-ray (Presence and Proper Orientation of Parts), weight records for explosive mix, lot firing test on random samples, insulation resistance, NSI bridewire resistance test, tensile test coupons for body. CR-45-453-0021-0009, ATP 5044; SKB26100097. (Defective Welds)

Pyro Verification Test: Sample lot firing yearly at KSC until age life expires. (All Failure Causes)

KSC RELATED TESTING

- o The following SRB/ET Tests are performed: (Short or open circuit, high resistance circuit)
- o SRB PIC resistance Test performed with NSI GO type simulator connected per OMRSD File V, Vol. 1, requirement number B75PI0.011.
 - o NSI not connected PIC resistance Test performed with neither GO type simulators nor flight NSIs connected per OMRSD File II, Vol. 1, requirement number S00000.411.

- o PIC resistance Test performed with flight NSIs connected per OMRSD File II, Vol. 1, requirement number S00000.410.
- o PIC resistance Test (GO mode) performed at T-24 hours or later on all active shuttle PICs per OMRSD File II, Vol. 1, requirement no. S00FA0.015.

O The above referenced OMRSD testing (except PVT) is performed every flight.

C. INSPECTION:

VENDOR RELATED INSPECTION

o Receiving inspection:

Raw material is verified by inspection to assure specific shuttle requirements are satisfied. (Contamination)

o Contamination Control:

Contamination control and corrosion protection process verified by inspection. (Contamination)

o Assembly/Installation:

Selected manufacturing/assembly steps are identified by NASA and quality assurance and verified by Government Inspection Mandatory Inspection Points (MIPS). (All Failure Causes)

o Nondestructive Evaluation:

Parts are X-rayed and N-rayed to verify correct assembly and presence of all detail parts and explosives. X-rays and N-rays are reviewed by vendor, DCMC, NASA quality and engineering. (Improper Material and Contamination)

o Critical Processes:

All manufacturing processes such as welding, plating, heat treating, passivation and anodizing are verified by inspection. (Improper Material and Defective Welds)

o Storage:

Storage environment verified by inspection. (Contamination/High Temperature)

KSC RELATED INSPECTION

O Receiving Inspections

- o Shelf life is verified by SPC Quality Assurance per OMRSD File II, Vol. 3, Req. C00CA0.040-000. (Insensitive Explosive)
- o Visual Inspection for cleanliness and damage to o-rings, pins, connectors, threads and body is performed per OMRSD File V, Vol. 1, requirement number B000FL.001. (Defective Welds)

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- o Bridgewire resistance test is performed per OMRSD File V, Vol. 1, requirement number B000FL.001. (Short, Open, High Resistance circuit)
- O Installation Inspection
 - o Inspection of the installation of the NSDs is performed by SPC Quality Assurance. (Improper Installation)
 - o Torque NSD per OMRSD File V, Vol. 1, requirement no. B55TQ0.010. (Broken Header)
 - o Lockwire NSD per OMRSD File V, Vol. 1, requirement no. B55TQ0.020. (Low Output)

D. FAILURE HISTORY:

Failure Histories may be obtained from the PRACA database.

E. OPERATIONAL USE

- o Not applicable to this failure mode.