

SRB CRITICAL ITEMS LIST

SUBSYSTEM: RANGE SAFETY COMMAND DESTRUCT

ITEM NAME: Safe and Arm Assembly

PART NO.: 10311-0003-801

FM CODE: A03

CN 035

ITEM CODE: 70-13

REVISION: Basic

CRITICALITY CATEGORY: 1R

REACTION TIME: Immediate

NO. REQUIRED: 1

DATE: March 31, 1999

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CRITICAL PHASES: Countdown, Boost,  
Separation

SUPERCEDES: March 31, 1998

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FMEA PAGE NO.: F-44A

ANALYST: K.C.Finch/ S. Roney

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SHEET 1 OF 4

APPROVED: P. Kalia

FAILURE MODE AND CAUSES: Fails to safe when commanded and premature operation of either of the NSDs or PETN explosive leads caused by:

- o Open circuit
- o Mechanical Failure which prevents shaft/barrier rotation
  
- o Failure of torque motor to rotate  
AND
- o Electromagnetic Interference
- o Electrostatic discharge
- o Increased sensitivity due to contamination
- o Temperature
- o Shock

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FAILURE EFFECT SUMMARY: Failure of the Safe and Arm assembly to safe when commanded after a mission abort occurring during countdown, will result in loss of mission, vehicle and crew due to fire and explosion on the pad, if either of the NSDs or PETN explosive leads prematurely operates. Failure of the Safe and Arm assembly to safe when commanded during boost, coupled with subsequent premature operation of either of the NSDs or PETN explosive leads during boost or separation, will result in loss of mission, vehicle and crew due to fire and explosion of the orbiter/ET.

REDUNDANCY SCREENS AND MEASUREMENTS:

- 1) Pass - Monitored during final countdown by event measurements RSS S&A assembly safed B55X1860X and RSS S&A assembly armed B55X1870X.

2) Pass - Safe and arm assembly position N/A-NSD and PETN explosive leads

3) Pass - No known common cause

NOTE: The rationale for retention for the NSD for the premature operation failure mode is found in CIL 70-12-A03. The rationale for retention for the PETN explosive lead for premature operation failure mode is found in CIL 70-13-A07.

RATIONALE FOR RETENTION:

A. DESIGN

O Design specification USBI 10SPC-0230

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- o Torque motor performance per paragraph 3.3.2 (Open Circuit, Locked Shaft/Barrier Assembly)
- o Power "ON" and power "OFF" performance requirements per paragraph 3.3.3. (Open circuit)

O Qualification

- o S&A Assembly 10311-0003-801 is qualified per SDI QTR107190-2022 (Connector) and SDI RPT-106521 Volume I-IV (includes (NTS) Test Report 8971 (CC-16837-14) Volumes I-IV. (COQ A-PYR-6135-1). (1 Missions - SRB)

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O Qualification Test

- o Life cycle test (cycle-2 S&A assemblies through 1000 cycles of 90° rotation).

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B. TESTING

O Lot acceptance test per SDI Procedure ATP 106521

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- o Vibration test of entire lot. (All Failure Causes)
- o N-ray inspection of entire lot. (Broken, Missing, Misaligned Components)
- o X-ray inspection of entire lot. (Broken, Missing, Misaligned Components)

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- o High (+165°F) and low (+20°F) temperature electrical checkout and cycle of entire lot. (Cycle from safe to arm to safe four times at 21, 28 and 32 Vdc for S&A 10311-0003-801. (All Failure Causes) CN 035
- o Ambient temperature electrical checkout and cycle of entire lot. (Cycle from safe to arm to safe four times at 21, 28 and 32 Vdc for S&A 10311-0003-801 contact test; torque motor current and insulation resistance test, and continuity test). (All Failure Causes) CN 035
- o Vibration test of all DLAT samples. (All Failure Causes)

C. INSPECTION

VENDOR RELATED INSPECTION

- O Installation of S&A components is verified by Contractor Quality Assurance and is verified by USBI Quality Assurance per: (Broken roll pin) CN 035
  - o USBI Quality Assurance
    - USBI SIP 1485
  - o Contractor Quality Assurance
    - SDI Manufacturing and Inspection Plan/Drawing 106521 . CN 035
- O Lot Acceptance Test: N-ray and X-ray films are inspected by certified vendor personnel and verified by USBI personnel. Ambient temperature electrical checkout and cycle tests are witnessed one hundred percent by USBI Quality Assurance and Contractor Quality Assurance per: (All Failure Causes) CN 035
  - o USBI Quality Assurance
    - USBI SIP 1485
  - o Contractor Quality Assurance
    - SDI Acceptance Test Procedure 106521 CN 035
- O Lot review and certification per USBI Plan 10PLN-0049. CN 035

KSC RELATED INSPECTION

- O Receiving Inspection per OMRSD File V, Vol. 1, requirement number B000FL.004.
  - o Visual indication of rotor position vs. circuit position indicator verifies proper mechanical operation during electrical verification of S&A operation. (All Failure Causes) CN 035
- O Verify functional operation of S&A device per OMRSD File V, Vol. 1, requirement no. B55SAO.010. (Open Circuit/Locked Rotor) CN 035
- O Verify S&A device command response per OMRSD File II, Vol. 1, requirement no. S00000.400. (Open Circuit, Locked Rotor) CN 035
- D. FAILURE HISTORY
  - O Failure Histories may be obtained from the PRACA database.
- E. OPERATIONAL USE
  - o Not applicable to this failure mode.