

SRB CRITICAL ITEMS LIST

SUBSYSTEM: RANGE SAFETY COMMAND DESTRUCT  
ITEM NAME: Safe and Arm Assembly  
PART NO.: 10311-0003-801 FM CODE: A12  
ITEM CODE: 70-13 REVISION: Basic  
CRITICALITY CATEGORY: IR REACTION TIME: Immediate  
NO. REQUIRED: 1 DATE: March 28, 2000  
CRITICAL PHASES: Boost SUPERCEDES: None  
FMEA PAGE NO.: F-50C ANALYST: P. Rapplogie/Jim McFarland/  
K.C. Finch

SHEET 1 OF 4

APPROVED: P. Kalia

FAILURE MODE AND CAUSES:

- {1} RSS S&A fails to reach the Arm position when commanded to transfer from Safe to Arm AND  
{2} Erroneous Arm indication for RSS S&A caused by:

- o Wire fails open
  - o Mechanical binding
  - o Broken roll pin
  - o Torque motor fails to rotate
  - o Craters and pitting in race bearing
- AND
- o Armed position switch fails shorted

FAILURE EFFECT SUMMARY

Loss of ability of the Range Safety System to transfer firing energy to the destruct mechanisms when commanded, resulting in potential injury/loss of life to the public. Critical effects happen only if extremely tight timing of both failures occur. Failure of Arm command must occur after rotation to Arm has begun and before Arm position has been reached.

REDUNDANCY SCREENS AND MEASUREMENTS

- 1) Pass - Reading can be verified during ground turnaround operations.
- 2) Fail - Erroneous RSS Safe and Arm Assembly ARM indication is not detectable.
- 3) Pass

Supersedes:

DRD 1.4.2.1-b

## RATIONALE FOR RETENTION:

## A. DESIGN

## O Design specification USA SRBE 10SPC-0230 (All failure causes)

- Selection of parts, materials, and processes per applicable AN and MS standards.
- Material selection per 10PRC-0380, MSFC-SPEC-522 and NSTS 08060 para. 3.3.
- EEE parts selected per 10REQ-0036
- Electric wire per 40M39513 or MIL-W-22759
- Soldering per NHB 5300.4 (3A-1)
- Torque motor performance per para. 3.3.6
- Design and construction details provide for maximum reliability, safety, and operating efficiency. Alignment and fit of parts and mating surfaces ensures proper functioning within the specified environmental extremes.

## O Qualification

S&A Assembly 10311-0003-801 is qualified per SDI QTR107190-2022 (Connectors) and SDI RFT-106521 Volume I-IV (Includes (NTS) Test Report 8971 (CC-16837-14) Volumes I-IV. (COQ A-PYR-6135). (1 Mission - SRB) (All failure causes)

## O Qualification Test (All failure causes)

- Life cycle test (1000 cycles of 90 degrees rotation)
- Vibration
- Shock
- Thermal Shock
- Salt Fog
- Ambient Temp. Electrical
- Temp/Humidity
- Rotate at Temperature
- X-ray
- Leak Test
- Low Temp. Fire Safed
- High Temp. Fire Armed
- Eight Foot Drop
- Disassembly and Inspection

## B. TESTING

## O Lot acceptance test per SDI ATP Procedure 106521 (All failure causes)

- Witness temperature cycle and ambient temperature-electrical checkout
- Witness vibration test of destructive lot samples
- Witness acceptance vibration test of entire lot
- Witness ambient functional checkout
- Witness leak check

Supersedes:

DRD 1.4.2.1-b

## C. INSPECTION:

## VENDOR RELATED INSPECTION

Installation of S&A components are inspected by Contractor's Quality Assurance and verified by USASRBE per: (all failure causes)

- USA SRBE Quality Assurance
    - USA SRBE SIP 1485 (Mechanical binding, broken roll pin, torque motor fails to rotate, and craters and pitting in race bearing)
      - Verify Shaft Barrier Assembly
      - Verify Switch Assembly
      - Verify Circuit Subassembly
      - Verify Rotor Assembly
  - Contractor Quality Assurance
    - SDI Manufacturing and Inspection Plan/Drawing 106521 (Mechanical binding, broken roll pin, torque motor fails to rotate, and craters and pitting in race bearing)
- O Assembly Operation: Final assembly is verified by Contractor Quality Assurance & this inspection is verified by USASRBE per:
- o USA SRBE Quality Assurance (All failure causes)
    - USA SRBE SIP 1485
      - Witness Rotating assembly break away torque
      - Inspect Solder joints
      - Verify Resistance checks
      - Verify Acceptance test data
  - o Contractor Quality Assurance (All failure causes)
    - SDI Manufacturing and Inspection Plan/Drawing T106521
    - SDI Acceptance Test Procedures ATP 106521
      - N ray & X ray films are inspected by contractor QA and verified by USASRBE per SIP 1485.  
(Broken roll pin, wire fails open, mechanical binding, and Armed position switch fails short)
    - Lot review and certification per USA SRBE plan 10 SPC-0230 to receiving inspection records of piece parts, manufacturing records, rework/inspection records, supplier and contractor specification and drawings, engineering changes, radiographs, and item shelf life expiration, deviation/waivers (all failure causes)
    - Critical Processes/Inspections/Operations:  
Nray per JSC 2043/X ray per MIL STD-453  
Solder joints per NHB 5300.4(3A-1)

Supersedes:

DRD 1.4.2.1-b

## KSC RELATED INSPECTION

- Receiving Inspections per OMRSD File V, Vol. I, requirement number B000FL004.

Visual indication of rotor position vs. circuit position indicator safe monitor circuit continuity verifies proper mechanical operation during electrical verification of S&A operation. It verifies any indication of degraded performance. ( Wire fails open, Mechanical binding, Broken roll pin, Torque motor fails to rotate AND Armed position switch fails shorted)

- Verify functional operation of S&A device per OMRSD File V, Vol. I, requirement no. B55SA0.010.  
( Wire fails open, Mechanical binding, Broken roll pin, Torque motor fails to rotate AND Armed position switch fails shorted)

- Verify S&A device command response per OMRSD File II, Vol. I, requirement no. S00000.400.  
(Wire fails open, Mechanical binding, Broken roll pin, Torque motor fails to rotate AND Armed position switch fails shorted)

## D. FAILURE HISTORY

- Failure Histories may be obtained from the PRACA database.

## E. OPERATIONAL USE

- Not applicable to this failure mode.

Supersedes:

DRD 1.4.2.1-b