CRITICAL ITEMS LIST (CIL)

No. 10-03-01-01/02

SYSTEM:	Space Shuttle RSRM 10	CRITICALITY CATEGORY:	1R
SUBSYSTEM:	Ignition Subsystem 10-03	PART NAME:	SRM Ignition Initiator (2)
ASSEMBLY:	SRM Ignition Initiator 10-03-01	PART NO.:	(See Table A-3)
FMEA ITEM NO.:	10-03-01-01 Rev M	PHASE(S):	Boost (BT)
CIL REV NO.:	M	QUANTITY:	(See Table A-3)
DATE:	31 Jul 2000	EFFECTIVITY:	(See Table 101-6)
SUPERSEDES PAGE:	406-1ff.	HAZARD REF.:	BI-03
DATED:	30 Jul 1999		
CIL ANALYST:	S. E. Rodgers		
APPROVED BY:		DATE:	

RELIABILITY ENGINEERING: K. G. Sanofsky 31 Jul 2000

ENGINEERING: S. R. Graves 31 Jul 2000

1.0 FAILURE CONDITION: Failure to operate (B)

2.0 FAILURE MODE: 2.0 Failure of both initiators to operate or provide required performance

3.0 FAILURE EFFECTS: No ignition or delay of ignition results in loss of the RSRM, SRB, crew, and vehicle

4.0 FAILURE CAUSES (FC):

FC NO.	DESCRIPTION	FAILURE CAUSE KEY
2.1	Improper charge	A
2.2	Insufficient charge	B
2.3	Open or short circuits	C
2.4	High resistance	D
2.5	Separation between bridge wire and charge	E
2.6	Contamination	F
2.7	Chemical decomposition due to aging or exposure to high temperature	G
2.8	Premature firing of SRM Ignition Initiator after installation	H

5.0 REDUNDANCY SCREENS:

SCREEN A: Fail--SIIs cannot be verified during mission turnaround.
SCREEN B: Fail--No provision made for failure detection by the crew.
SCREEN C: Pass--SIIs cannot be lost by a single credible cause.

6.0 DESCRIPTION:

1. Each RSRM igniter assembly has two SRM Ignition Initiators (SIIs). The SIIs have a unibody design, meaning the body is one piece. The sealing surface is built into the part. There is no sealing washer. Each SII is a small electro-explosive device (EED) that initiates the ignition process in the RSRM. It is shown in Figures 1 and 2. Materials are listed in Table 1.

TABLE 1. MATERIALS

Drawing No.	Name	Material	Specification	Quantity
SED26100107	Initiator, SRM Ignition (SII)	Inconel 718 Stainless Steel		2/Motor (Body Only)
1U77386	Barrier-Booster Assembly, S/A Device, Loaded			1/Motor

6.1 CHARACTERISTICS:

1. The SIIs are Government Furnished Equipment (GFE). They have a unibody design that allows greater flatness control. Ignition of the SIIs is the first step in the motor ignition process. They ignite the following in turn; pyrotechnic basket, initiator, igniter and finally the motor. The SII closure cup protects the SII from humidity prior to ignition and the header seals the SII after ignition.

7.0 FAILURE HISTORY/RELATED EXPERIENCE:

1. Current data on test failures, flight failures, unexplained failures, and other failures during RSRM ground processing activity can be found in the PRACA Database.

8.0 OPERATIONAL USE: N/A

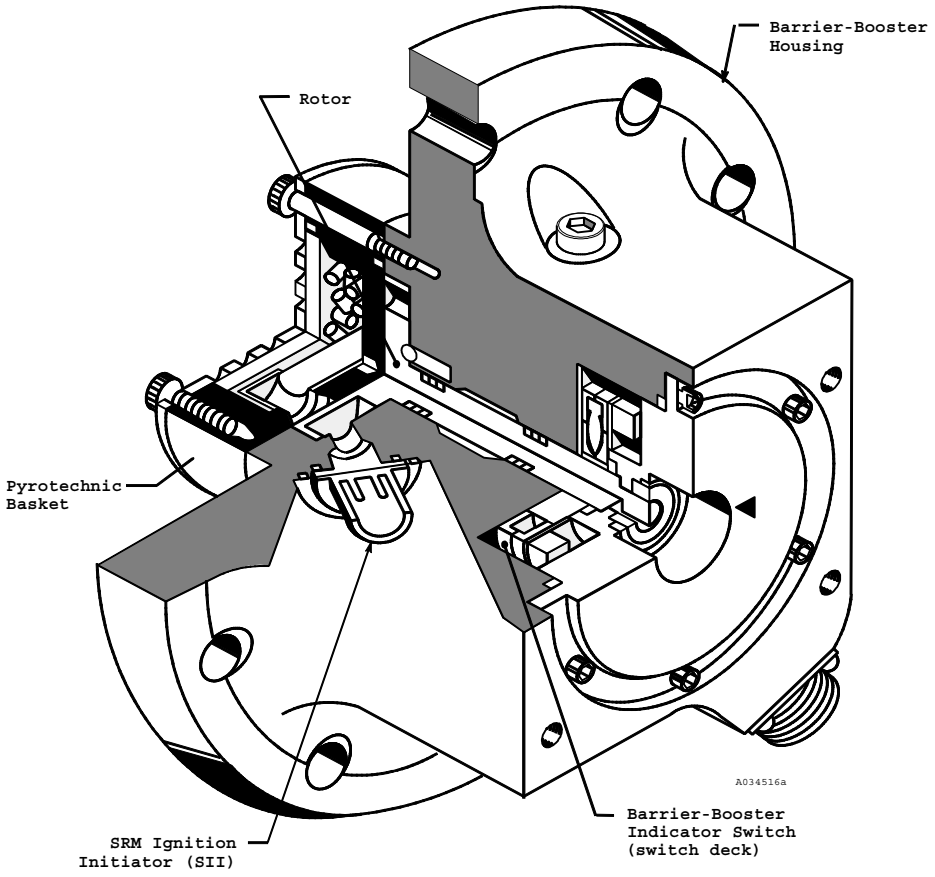

Figure 1. Barrier-Booster Assembly

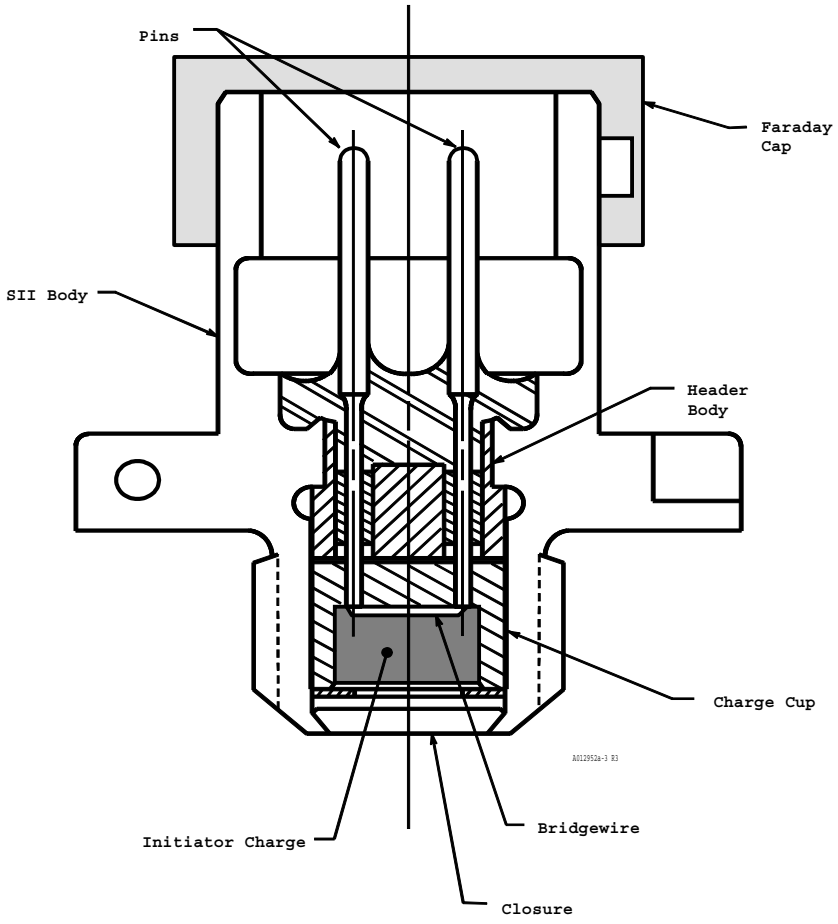

Figure 2. SRM Ignition Initiator (SII)

9.0 RATIONALE FOR RETENTION:

9.1 DESIGN:

DCN	FAILURE CAUSES	
A,B,C,D E,F,G,H	1.	The SII is GFE. Its design is controlled by JSC, and specific design characteristics that minimize the probability of failures related to the cause are addressed in the JSC Critical Items List.
A,B,C,D E,F,G,H	2.	Qualification of the SII is controlled by JSC, and qualification testing and/or analysis related to the failure causes is addressed in the JSC Critical Items List.
A,B	3.	The amount and type of material that constitutes the charge is per JSC engineering.
C,D,F,H	4.	The SII is hermetically sealed per JSC engineering.
C,D,F	5.	The Faraday cap must remain on the SII except during installation to the Barrier-Booster Assembly. The cap is removed for flight during ordnance connection and pad closeout.
C,D,E	6.	The SII will ignite per performance requirements of JSC engineering.
E	7.	Shock and vibration environments, including pre-launch random vibration, to which the SII will be exposed are the same as for the S&A device, and are per engineering.
E	8.	Shock and vibration levels to which the SII will be exposed are lower than the SII design and qualification shock and vibration level per TWR-13220.
F	9.	All SII and Faraday cap surfaces are required to be clean and free of loose particles and oxidation per JSC Specifications.
G	10.	The SII has a storage life per JSC engineering. During storage, temperature is required to be held between temperature limits. SIIs are stored in temperature-controlled buildings at Thiokol.
G	11.	The loaded Barrier-Booster Assembly, including the SII, is packaged and stored per engineering drawings. The S&A device is packaged, sealed, and stored per engineering drawings in temperature controlled buildings at Thiokol.
H	12.	The SII is required to withstand a model lightning flash without jeopardizing the strength or function to safely continue the mission per JSC Specifications. The SII is electrically bonded to the RSRM structure through the Barrier-Booster Assembly and Igniter Adapter.
H	13.	The SII will withstand an electrostatic discharge per JSC engineering.
H	14.	Electromagnetic control measures are per MSFC Drawing 16A00100.
H	15.	The SII will not ignite when the bridge wire is subjected to a specified current or power within temperature constraints per JSC engineering.
H	16.	A continuous metallic path is provided by electrical bonding from the RSRM to the facility grounding system to ensure electrical resistance across the mating surfaces is

within specified limits per JSC specifications.

H 17. The SII is capable of withstanding high temperatures without auto ignition per JSC engineering.

B 18. The S&A Device is included in life verification.

9.2 TEST AND INSPECTION:

DCN	FAILURE CAUSES and TESTS (T)			CIL CODES
A,B,C,D E,F,G,H	1.	Vendor inspections of this GFE item which minimize the probability of failures related to the causes listed above are controlled by JSC, and should be addressed in the JSC Critical Items List.		
	2.	For New SRM Ignition Initiator (SII), verify:		
A,B,C,D E,F,G,H		a.	Lot of SIIs was flight-certified	RAA040
F,H		b.	SII is free of obvious shipping or handling damage	AKP001
F,H		c.	Sealing surface is free of damage such as nicks, dings, scratches, or raised metal	RAA128
	3.	For New Barrier-Booster Assembly, Loaded, verify:		
F,H		a.	Initiators are free of damage and contamination prior to installation	ADA048
C,D,F,H		b.	Faraday cap installed properly on SII after installation of SII into Barrier Booster	ADA157
G		c.	SII shelf life is within limits of time at installation	AKP005
	4.	KSC verifies:		
A,B,C,D,E,F,G		a.	SIIs were flight-certified by JSC per OMRSD File V, Vol I, B000FL.002	OMD021
C,D (T)		b.	By PIC test the proper connection of SII and live ordnance (S&A device) on pad per OMRSD File II, Vol I, S00000.410	OMD003
C,D,E,F,H (T)		c.	The S&A device for the following per OMRSD File V, Vol I, B000FL.001 1. Bridge wire resistance test results are acceptable 2. Insulation-resistance test are acceptable 3. General condition including Faraday caps for damage and absence of contamination	OMD020
C,D (T)		d.	GO PIC test with live ordnance (S&A device) during launch countdown per OMRSD File II, Vol I, S00FA0.015	OMD009
F,G		e.	Life requirements for the expected launch schedule are met per OMRSD File II, Vol III, C00CA0.030	OMD019
H (T)		f.	Power "ON" stray voltage tests per OMRSD File II, Vol I, S00000.140	OMD001
A,B,C,H (T)		g.	Power "OFF" stray voltage tests per OMRSD File II, Vol I, S00GEN.635	OMD002
H		h.	S&A device to igniter adapter electrical bonding tests per OMRSD File V, Vol I, B47SA0.100	OMD071