ATK ALLIANT TECHSYSTEMS
THIOKOL PROPULSION

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-07R/01

SYSTEM:	Space Shuttle RSRM 10	CRITICALITY CATEGORY:	1
SUBSYSTEM:	Ignition Subsystem 10-03	PART NAME:	Redesigned Igniter Adapter-to-Igniter Chamber Joint, Metal Components (1)
ASSEMBLY:	Igniter Assembly 10-03-04		
FMEA ITEM NO.:	10-03-04-07R Rev N	PART NO.:	(See Table A-3)
CIL REV NO.:	N (DCN-562R1)	PHASE(S):	Boost (BT)
DATE:	05 Oct 2001	QUANTITY:	(See Table A-3)
SUPERSEDES PAGE:	437-1ff.	EFFECTIVITY:	(See Table 101-6)
DATED:	27 Jul 2001	HAZARD REF:	BI-02
CIL ANALYST:	D. J. McGough		
APPROVED BY:		DATE:	

RELIABILITY ENGINEERING: K. G. Sanofsky 05 Oct 2001

ENGINEERING: K. J. Speas 05 Oct 2001

1.0 FAILURE CONDITIONS: Failure during operation (D)

2.0 FAILURE MODE: 1.0 Leakage due to failure of metal components or insufficient compressive load on joint

3.0 FAILURE EFFECTS: Loss of sealing function allowing a gas path to the atmosphere through the Igniter Adapter, causing a thrust imbalance, a loss of RSRM, SRB, crew, and vehicle

4.0 FAILURE CAUSES (FC):

FC NO.	DESCRIPTION	FAILURE CAUSE KEY
1.1	Nonconforming materials or heat treatment	A
1.2	Corrosion	B
1.3	Stress corrosion	C
1.4	Shock and vibration	D
1.5	Cracks or other material defects	E
1.6	Nonconforming dimensions	F
1.7	Insufficient preload on joint	G
1.8	Improper installation of components	H
1.9	Damage to threads	I
1.10	Fatigue	J

5.0 REDUNDANCY SCREENS:

SCREEN A: N/A
SCREEN B: N/A
SCREEN C: N/A

6.0 ITEM DESCRIPTION:

1. Igniter Adapter-to-Igniter Chamber Joint, Metal Components. Materials are listed in Table 1.

TABLE 1. MATERIALS

Drawing No.	Name	Material	Specification	Quantity
1U77610	Segment, Rocket Motor, Forward	Composite of Various Components		1/motor
1U77499	Igniter Assembly	Composite of Various Components		1/motor
1U77371	Chamber Assembly, Igniter, Insulated	Composite of Various Components		1/motor
1U77538	Chamber, Igniter	D6AC Steel	STW4-2706	1/motor
1U78650	Forging, Chamber, Igniter	D6AC Steel	STW4-2706	1/Motor
1U77451	Adapter Assembly, Igniter, Insulated	Composite of Various Components		1/motor
1U77450	Adapter, Igniter	D6AC Steel	STW4-2706	1/motor
1U77462	Gasket--Inner	Seal-Fluorocarbon Rubber	MIL-R-83248, Type I, CL 1	1/motor
	Retainer--4130 Steel		MIL-S-18729	
1U75374 36/igniter	Packing with Retainer	Seal-Fluorocarbon Rubber	MIL-R-83248, Type I, Class 1	
	Retainer--4130 Steel Cadmium Plated		MIL-S-18729 QQ-P-416 Ty I, Cl 2	
1U77358	Bolt Inner, Igniter	MP159 High-strength Alloy	AMS 5842	32/motor
1U77356	Bolt, Special	MP159 High-strength Alloy	AMS 5842	4/motor
1U77824	Washer, Special	4130 Steel	MIL-S-18729 or MIL-S-6758	36/inner joint
		Heat Treat Cadmium Plated	MIL-H-6875 QQ-P-416 Cl 3, Ty II	
1U51916	Cartridge Assembly, Sealant/Adhesive	Lubricating Oil and Gelling Agent	STW5-2942	A/R
MS20995	Wire, Safety or Lock	302 or 304 Stainless Steel	ASTM-A-580	A/R
	Lubricant, Air Drying	Molykote 321R Lubricant Spray	STW4-2955	A/R
	Primer	Epoxy-Polyamide Primer	STW5-3226	A/R
	Paint (top coat)	Epoxy-Polyamide Paint	STW5-3225	A/R

6.1 CHARACTERISTICS:

1. The arrangement of parts is depicted in Figure 1. The Igniter shell is composed of the Igniter Chamber and the Igniter Adapter, which are refurbishable parts made of D6AC steel. The two parts are bolted together with high strength bolts, made of MP159, and Special Bolts (Figures 2, 3, 4), made of MP159, which are hollow to allow access of gas pressure to the pressure transducers. The inner gasket between the Igniter Adapter and the Igniter Chamber is a flat, circular steel retainer with redundant face seals bonded in grooves on each side (Figure 5), used to provide a high-pressure seal between flat mating surfaces. A Special Washer (Figure 6) and a bolt packing with retainer (Figure 7) are installed under each bolt head and serve as a backup or secondary seal.

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

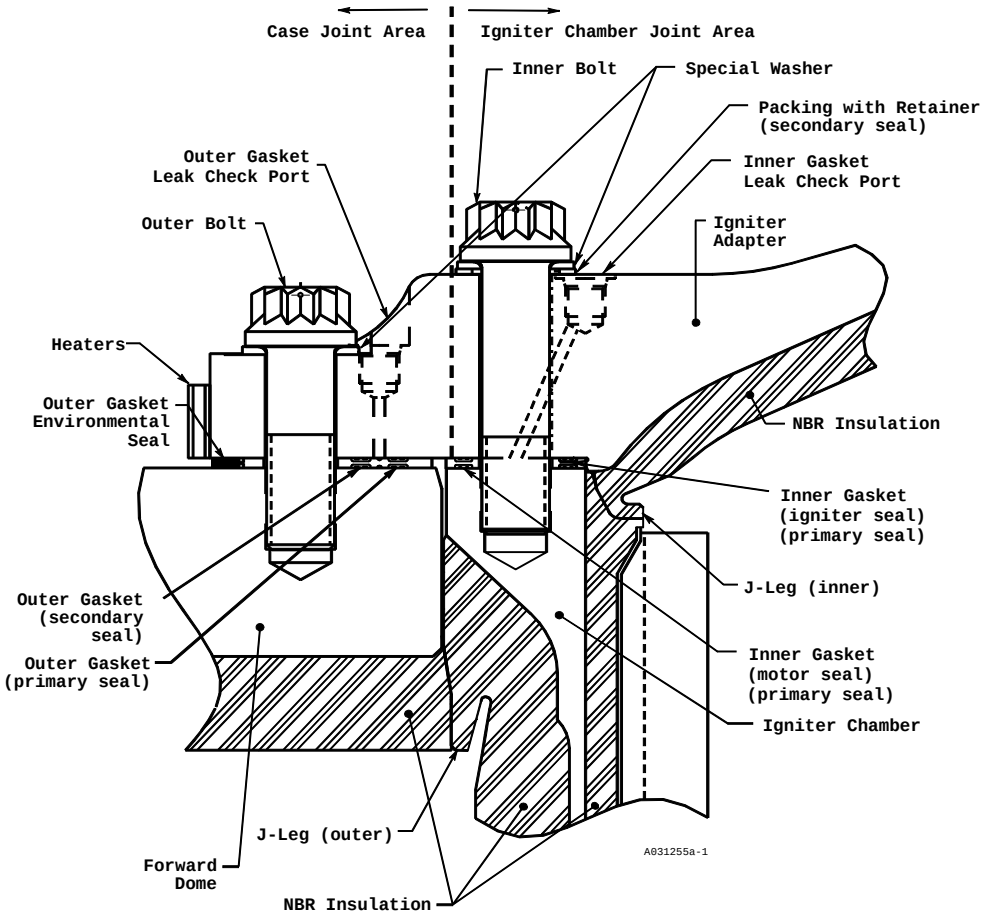

Figure 1. Igniter Adapter-to-Chamber Joint
and Igniter Adapter-to-Case Joint

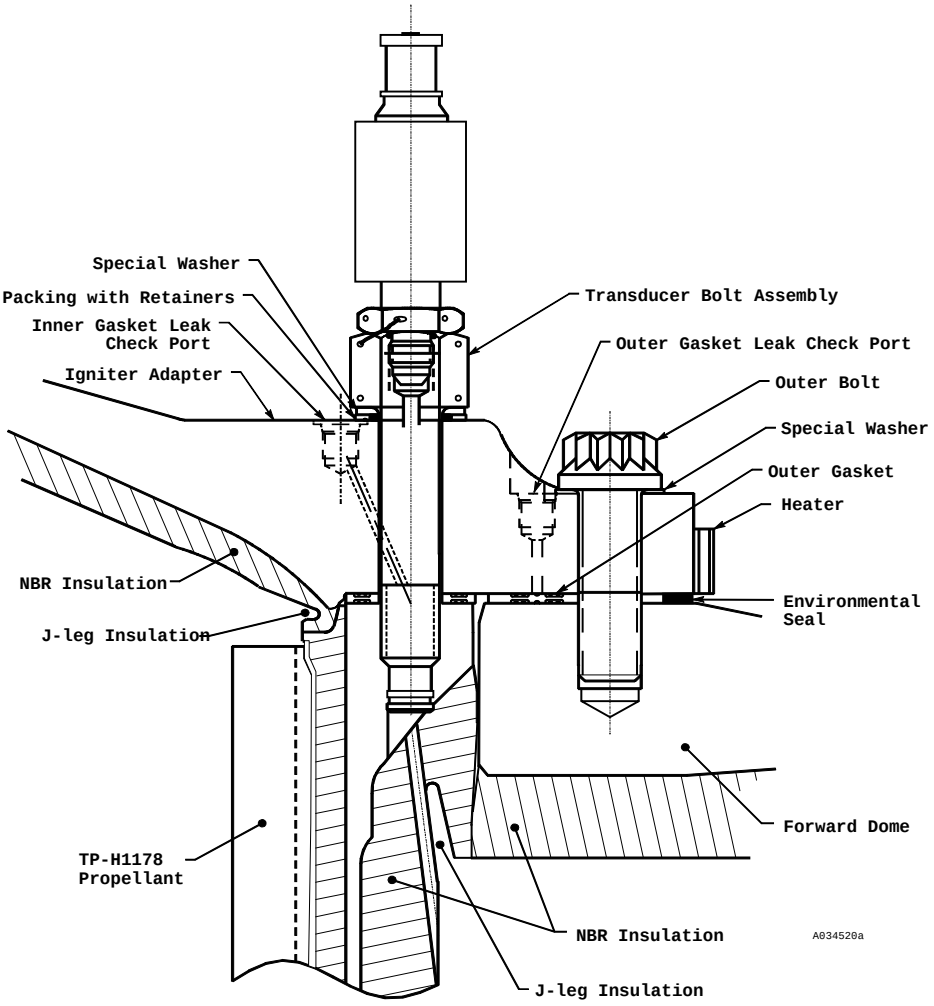

Figure 2. Installed Pressure Transducer and Special Bolt

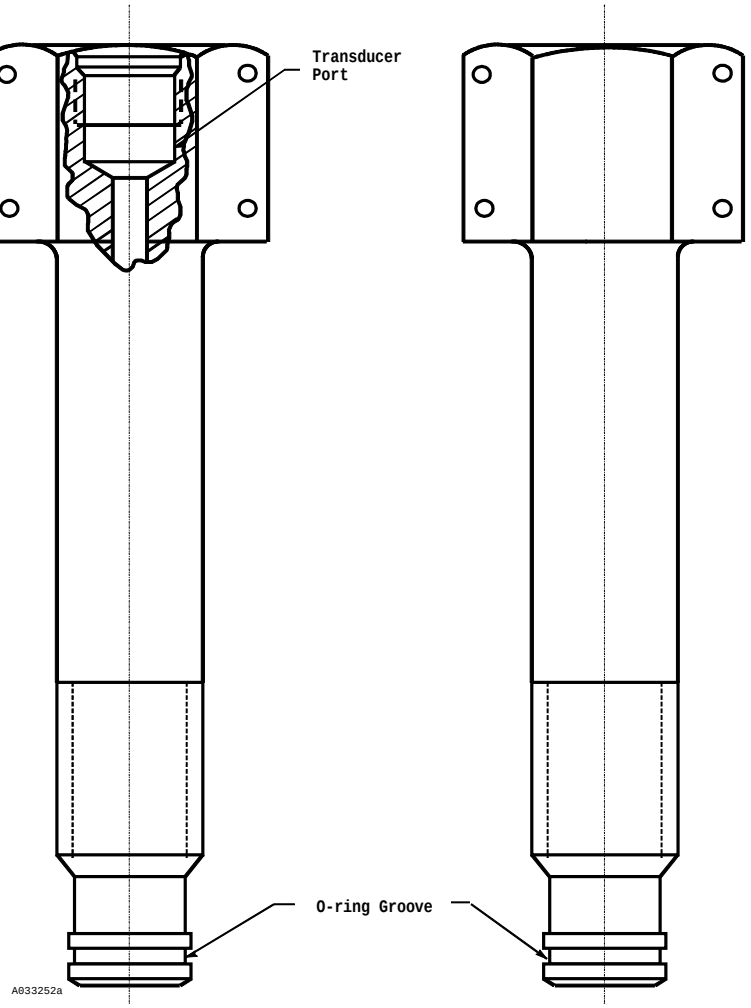

Figure 3. Special Bolt With Transducer Port and Solid Special Bolt

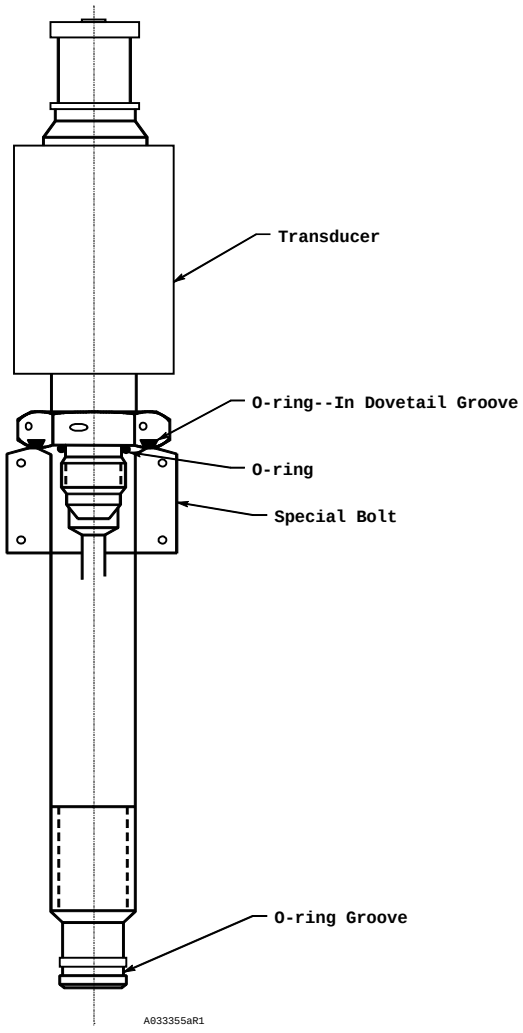

Figure 4. Transducer Bolt Assembly

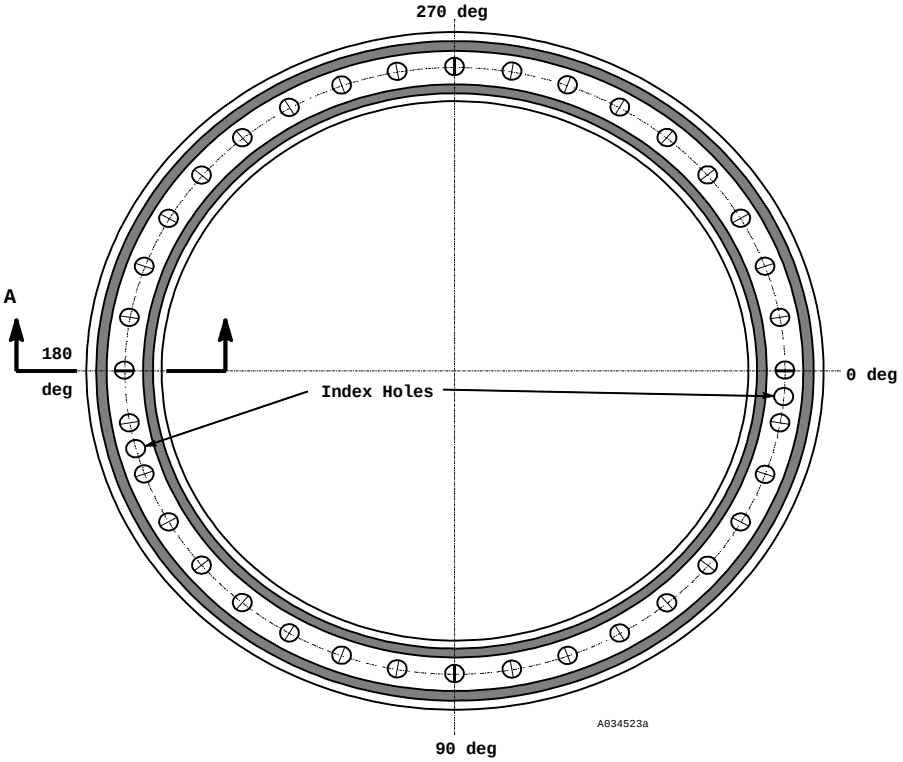

Figure 5. Inner Gasket

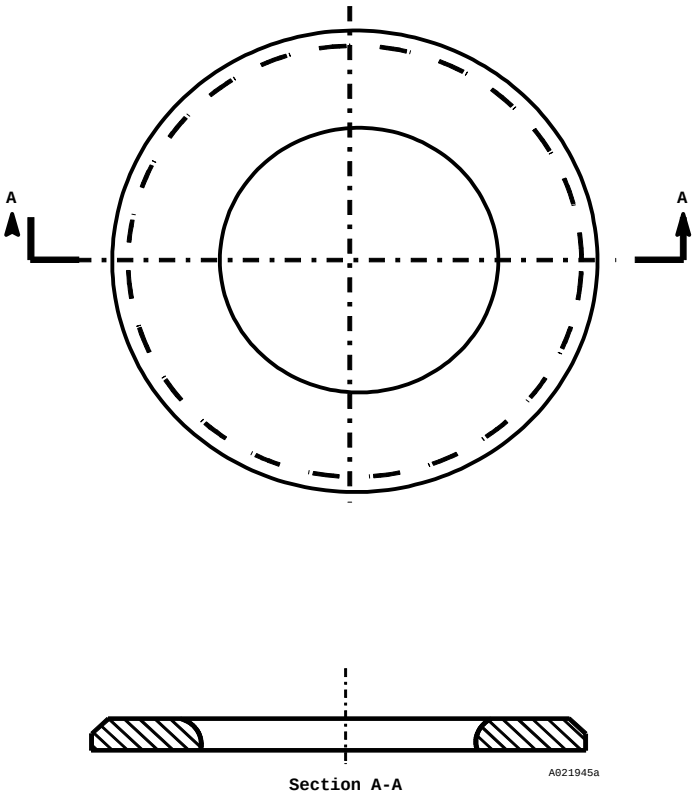

Figure 6. Special Washer

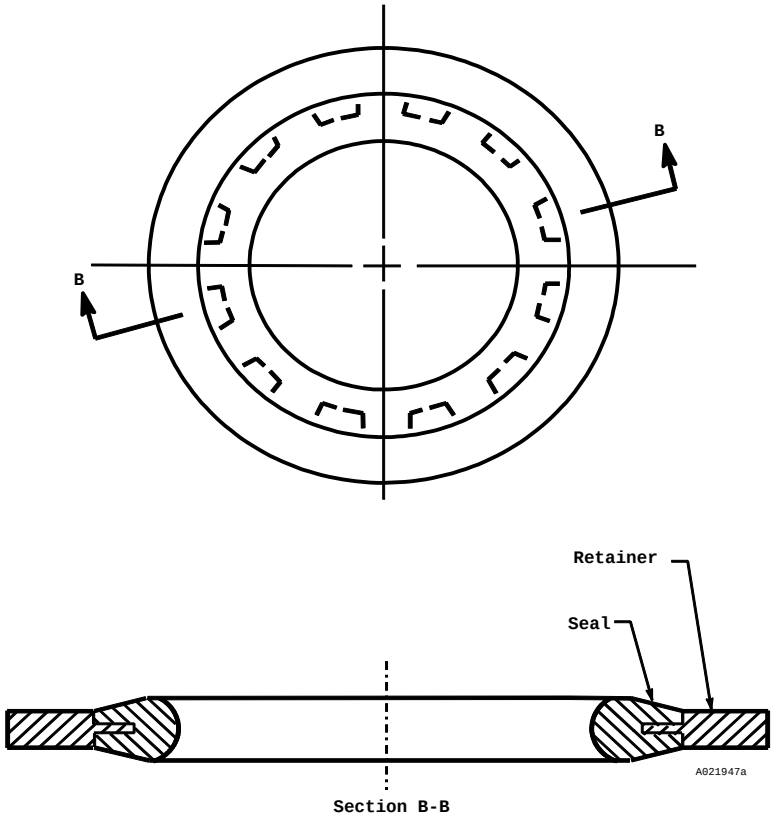

Figure 7. Packing with Retainer

9.0 RATIONALE FOR RETENTION:

9.1 DESIGN:

DCN FAILURE CAUSES

A,D,J,F 1. Structural analyses were performed for the present Ignition system, and margins of safety (at P=2159 psi max) for metal parts, based on a 1.4 factor of safety, are summarized below. Margins of safety of the Special Washer and packing were demonstrated by testing:

Item	Margin of Safety	Source
Igniter Chamber	Positive	TWR-61222 and TWR-17265
Chamber Bolt Thread	Positive	TWR-61222 and TWR-17265
Igniter Adapter	Positive	TWR-61222 and TWR-17265
Igniter Inner Bolts	Positive	TWR-61222 and TWR-17265
Special Bolts	Positive	TWR-61222 and TWR-17265
Inner Gasket Retainer	Positive	TWR-61222 and TWR-17265
Special Washer	Positive	TWR-61222

A,C 2. The Igniter Adapter and the Igniter Chamber are machined from D6AC steel forgings and heat treated. The present modified design has a positive margin of safety in the nozzle insert area per TWR-61222 and TWR-17265.

A,D,J 3. As documented in TWR-11559, three Igniter Chamber and Adapter assemblies as originally configured were fatigue-cycled to a total of 160 pressurization per test and then hydroburst. In two cases, the Chamber failed in the membrane area approximately 6 inches from the Chamber-Adapter interface at 4847 and 4730 psi. In the third case, the test was terminated by failure of a Special Bolt at 4570 psi. Based on Igniter Maximum Expected Operating Pressure (MEOP) and a factor of safety of 1.4 over ultimate, these results demonstrated actual positive margins of safety.

A,D,E,J 4. Analyses and testing to qualify the Igniter Chamber and Adapter are reported in TWR-10735, TWR-11559, TWR-17265, TWR-16874, and TWR-61222. Qualification testing of the redesign baseline Igniter, including the Chamber and Adapter, was performed on TEM-9 per TWR-17669 and on FSM-3 per TWR-63347. In a hydroproof test of the Igniter, it successfully withstood a pressure of 1.4 times MEOP, thereby demonstrating an actual factor of safety of 1.4 per TWR-61012.

A,C,E 5. TWR-16874 establishes pressure level requirements for proof testing of Igniter Chambers and Adapters and governs the Chamber, Adapter, and Special Bolt on the ignition system. Hydroproof tests for the Chamber and Adapter are performed per engineering.

A 6. Inner Bolt and Special Bolt material is MP159, having tensile ultimate strength and yield strength per engineering drawings and specifications.

A,E 7. The Special Washer and gasket retainer material is heat treated 4130 steel. The Special Washer is cadmium plated per engineering.

A,B,E 8. The packing retainer is alloy steel with cadmium plating per Federal Specifications. Specifications call for a chromate finish that provides additional corrosion protection over that of cadmium plating alone.

A,B 9. Cadmium plating on the Special Washers is per Federal Specifications. Specifications call for a chromate finish that provides additional corrosion

protection over that of cadmium plating alone.

562	A	10.	Lock/safety wire composition and properties are per engineering.
	A	11.	Properties of grease are per engineering.
	A	12.	The air drying lubricant, Molykote 321R, is a molybdenum disulfide spray lubricant. The cured lubricant film is controlled by engineering.
	A,B,D,E,F,G,H,I,J	13.	Leak checking may indicate improper assembly of joint components, loss of compressive load and seal in the joint due to thread failure, and faulty joint preload. Leak testing also provides a secondary means of detecting surface corrosion, surface cracks, defects in metal sealing surfaces, or weaknesses due to shock or fatigue of refurbished or reused parts. Igniter leak test requirements and procedures were developed per ETP-0182 and ETP-0266, and reported in TWR-17922. Leak tests are performed per engineering.
	A,B,C,D,E, F,G,H,I,J	14.	Leak check test requirements and procedures are determined per TWR-17922 and TWR-19510.
	A,B,E	15.	All sealing surfaces of the Igniter assembly components must conform to engineering drawings and specifications.
	B,C	16.	The Igniter Chamber and Adapter are made of high strength D6AC steel. Because they are made of this material they are defined as susceptible to corrosion per MSFC Specifications, and are included in the Material Use Agreement. Surfaces are provided with corrosion protection during storage or delays in manufacturing per engineering.
	C	17.	Sustained tensile stresses in the Igniter Chamber and Adapter in a corrosive environment are below the stress corrosion cracking threshold per SRM-MUA-005 and TWR-16104.
	B	18.	New and refurbished igniter chambers and igniter adapters are cleaned by degreasing and grit blasted per engineering to remove corrosion prior to further processing. Sufficient margin of safety per TWR-17265 and TWR-61222 exists to permit subsequent refurbish cycles without excessive loss of material due to grit blasting. A minimum acceptable wall thickness is verified in key areas after each refurbishment per engineering. The outer surface of the igniter insulated adapter is finished with primer paint and top coat paint for corrosion protection per engineering. The assembled igniter is stored in an airtight container or exposed metal surfaces remaining are coated with filtered grease.
562	B	19.	The inner bolt, special bolt, (MP159) and lock/safety wire (302 or 304 stainless) are inherently resistant to corrosion by virtue of the composition of the parent material.
	B	20.	Filtered grease is applied to the underside of bolt heads before they are installed. After bolts are torqued, additional grease is applied at the interface of the bolts and igniter special washers with the igniter adapter flange, and along the outer edge of the inner gasket. Filtered grease must pass a qualification test for corrosion protection.
	C,D,E,J	21.	The Igniter Chamber and Adapter are refurbishable parts subject to requirements of engineering, and are included in TWR-16874. Fracture control analysis of the modified Igniter presented in TWR-16874 shows that the Igniter Chamber and Adapter comply with the requirement of ensuring a minimum of four missions after proof test.

C 22. Other materials used in this assembly are alloys with high resistance to stress-corrosion cracking:

a.	Inner bolts	High-Strength Alloy, MP159
b.	Special Bolts	High-Strength Alloy, MP159
c.	Special Washers	4130 alloy steel, heat treated to yield per spec.
d.	Inner gasket retainer	4130 alloy steel, heat treated to ultimate per spec.
e.	Bolt packing retainer	4130 alloy steel, heat treated

C 23. The inherent resistance to corrosion and stress corrosion cracking of metal parts is augmented by the use of filtered grease. Filtered grease is applied to the underside of the bolt heads when the bolts and igniter special washers are pre-assembled and to the bolts, igniter special washers, adapter flange, and igniter chamber interfaces after the bolts are installed and torqued.

C 24. Sustained stresses due to railcar transportation are per MSFC Specifications. Railcar transportation vibration levels for the Igniter Chamber and Adapter are monitored to identify transportation loads that fall outside the MSFC specification database. Thiokol evaluates monitoring records to verify that shock and vibration levels per MSFC specifications were not exceeded.

D,J 25. Components of the Igniter experience peak shock loads during burning of the Igniter grain, when the internal pressure reaches approximately 1900-2150 psi. Igniter design criteria for shock and vibration are per MSFC specifications.

562 D,J 26. Inner bolts and Special Bolts are installed by procedures that mitigate loosening due to shock and vibration. They are coated with lubricant and then installed per engineering. They are preloaded per engineering and lock/safety wired in place. Preload values were selected on the basis of manufacturer recommendations and testing documented in TWR-61222.

D,J 27. Igniter inner bolts are acceptable for reuse per TWR-66014 provided they meet the refurbishment criteria per engineering.

D,I,J 28. Igniter Chamber threads for new Chambers are per engineering drawings. Refurbished Chambers satisfy thread requirements per engineering.

D,J 29. Special Bolts have a margin of safety greater than one (above the factor of safety of 1.4) per TWR-61222, TWR-17265, and TWR-61739.

D,E,J 30. The igniter inner gasket retainer is magnetic-particle inspected.

D,J 31. Thiokol IHM 29 gives requirements for handling, packaging, and transportation systems for control of shock loads while at Thiokol.

E 32. Inner Bolt and Special Bolt material is MP159. Limits on grain size are specified, and forgings must have substantially uniform macrostructure and grain flow per engineering.

E 33. The Special Washers and Inner Gasket Retainer are made of alloy steel per MIL specifications. Limits on grain size are specified.

E 34. Each Inner bolt and Special Bolt is dye penetrant inspected after forming the head and prior to threading.

F 35. Dimensions of the metal parts in the Igniter Chamber-to-Adapter joint are defined per engineering.

	F	36. Threads, thread length, and other dimensions are per engineering drawings.
	F	37. A Special Washer is used with the igniter inner bolt and also the Special Bolt. The washer has a countersunk surface that matches the fillet between the bolt head and shank. The bore of the Special Washer must fit closely to the bolt shank diameter to provide effective control of the sealing portion of the bolt packing. Bolt holes in the Igniter Adapter must have a controlled fit to properly retain the packing seal.
	F	38. The Igniter Chamber is made with close tolerances on bolt holes and internal screw threads to mate with the close-fitting holes of the Adapter flange and provide high bolt preload.
	F	39. A special tool (inspection aid) was developed to visually inspect the seal foot print around the entire circumference of each new inner gasket.
	F	40. Tolerances for the redesigned Igniter baseline design are established per TWR-63258.
	G	41. Materials were selected for suitability in the intended application. Developed yield strengths as previously cited provide sufficient margin from working loads to preclude plastic deformation of components per TWR-61222 and TWR-17265.
	G	42. Inner bolt and Special Bolt torque values were selected on the basis of testing and historical data as documented in TWR-75936.
	G	43. Inner bolt and Special Bolt preload is obtained by using a snug torque and angle-of-twist bolt loading method per engineering. The bolt loading method was qualified per TWR-66132 and TWR-66738. The certified angle-of-twist preload method used a hand wrench and was improved with the implementation of the motorized wrench that reduced variation and produced preloads within the certified range as documented in TWR-75936.
562	G	44. Cleaning, greasing, and installing the igniter adapter and igniter chamber joint metal components are per engineering. Inner bolt and special bolt threads are coated with lubricant spray, and the underside of each bolt head is coated with filtered grease. They are installed, torqued, and lock/safety wired per engineering. Torque values were selected on the basis of testing and historical data documented per TWR-75936.
	G	45. Tests for sealing of the Igniter gaskets with joint deflection were performed as outlined and reported in TWR-61388 and TWR-61400. The tests showed the sealing function is maintained for worst-case compression set under maximum extremes of temperature and maximum deflections.
	H	46. Bolt installation requirements are per engineering as follows: a. Installation preparation requires cleaning of the through holes of the adapter and the threaded holes in the igniter chamber flange before assembly. b. Application of lubricant spray to bolt threads and air drying, none allowed on shank in packing with retainer contact area or under bolt heads. c. Application of filtered grease to the underside of bolt heads before special washers are installed. d. Installation of the special washer with radius side toward bolt head. e. Safety wiring of bolts per double-twist method.
	G,H	47. Bolt loading procedures are per engineering. A specially designed deep socket

and split collar are used for loading the Special Bolt assemblies to avoid contact with adjacent bolts which could lead to incorrect reading of the Special Bolt torque. A Special Bolt assembly is placed in its hole and threaded in by hand--care is taken not to damage the torque paint on the assembly. A split collar is placed around the Special Bolt and then the special socket is placed over the split collar and the bolt is torqued to the required snug torque, and then to the appropriate angle per engineering.

I	48.	The Igniter Chamber is proof tested per engineering. Chamber threads are loaded in this test. The Chamber will pass this proof test before further processing.
I	49.	Igniter Chambers are reused and accepted if the Chamber meets engineering. Threads are visually inspected for surface contamination, damage, and surface defects. Threads will have no damage or defects greater than called out in engineering. Threads are inspected after proof testing.
I	50.	Bolt threads are controlled per engineering drawings.
A,B,C,D,E,F,J	51.	Igniter special bolts are acceptable for reuse if engineering requirements are met. Special bolts are considered a fracture control item per TWR-16874. The bolts are made from a high strength multiphase alloy with high fracture toughness and resistance to stress corrosion per TWR-66014. After refurbishment, the special bolts must meet the eddy current inspection criteria.

9.2 TEST AND INSPECTION:

DCN	FAILURE CAUSES and TESTS (T)			CIL CODES
		1.	For New Segment, Rocket Motor, Forward, verify:	
	B,D,G,H,J	a.	Filtered grease is applied to the underside of the special bolt head before installation	AEG018
	B,E,G,H,I	b.	Special bolts are clean and free of visible contamination prior to installation	AEG166
	B,E,G,H,I	c.	Special bolt hole threads and sealing surface in the igniter chamber are clean and free of contamination and defects prior to special bolt installation	AEG092
	B,H	d.	Igniter special washer is installed correctly with radius towards special bolt head	AEG192
	B,C	e.	Filtered grease is applied to all exposed bare metal surfaces of the igniter after installation	AEG028
	A,B,C,D,E F,G,H,I,J (T)	f.	Installed transducer bolt assemblies have been leak tested at low and high pressures	AEG196,AEG195
	D,G,H,J	g.	Molykote lubricant spray is applied to the threads of the special bolts and air dried before installation	AEG051A
	B,D,G,H,J	h.	Special bolts are installed, turned in until finger tight	AEG105
	B,D,G,H,J	i.	Special bolts are tightened with a snug torque and angle-of-twist in the proper sequence	AEG428
562	B,D,G,H,J	j.	Special bolts are lock/safety wired correctly using double twist method	AEG106
	G	k.	Filtered grease is applied to the igniter adapter sealing surfaces and bolt thru holes	AEG112
	G	l.	Igniter special washers are clean prior to installation	AEG339
	G	m.	Packing with retainer is clean and free of visible contamination prior to installation	AEG382
	G	n	Igniter adapter sealing and mating surfaces are clean and free of contamination and surface defects prior to installation	AEG168
	H	o.	Filtered grease is applied to the packing with retainer	AEG244
		2.	For New Igniter Assembly verify:	
	B,E,G,H	a.	Inner bolts are clean and free of visible contamination prior to installation per the installation specification	AEF048
	B,H	b.	Inner gasket is free of contamination, corrosion and excess grease prior to installation per the installation preparation specification	AEF071
	B,H	c.	Special Washers are clean prior to installation per the installation specification	CCC006
	B,G,H	d.	Igniter Chamber sealing and mating surfaces and threaded holes are clean and free of contamination and surface defects prior to installation per the igniter process finalization and installation preparation specifications	AEF224
	B,G,H	e.	Igniter Adapter sealing and mating surfaces and threaded holes are clean and free of contamination and surface defects prior to installation per the igniter process finalization and installation preparation specifications process specifications	AEF218
	B,G,H	f.	Filtered grease is applied to the underside of the inner bolt head before installation per the installation specification	AEF026
	B,H	g.	Filtered grease is applied to the Chamber sealing surface per the installation preparation specification	CCC016
	B,H	h.	Filtered grease is applied to the Adapter sealing surfaces and	

			bolt thru holes per the installation preparation specification	CCC017
	B,G,H	i.	Inner bolts are installed correctly per the installation specification	CCC033
	B	j.	Packing with retainer is installed correctly per the installation specification	CCC020
	B,H	k.	Special Washer is installed correctly with radius towards inner bolt head	AEF138
562	D,G,H,J	l.	Inner bolts are lock/safety wired correctly using double-twist method per the applicable specification	AEF063
	G,H	m.	Spray lubricant is applied to the threads of the inner bolts and air dried before installation per the installation specification	AEF022
	H	n.	Proper alignment of holes, correct holes left open for special bolt assemblies	AEF196
	G,H	o.	Inner bolts are tightened with a snug torque and angle-of-twist in the proper sequence	AEF281
	H	p.	Inner gasket and inner bolt redundant seals are leak tested with an acceptable leak rate per the leak check specification	AEF108,AEF120

3. For New Igniter Chamber, verify:

A,C,D, E,I,J	(T)	a.	Heat treatment	AEC110,AEC115
A,B,C,D E,I,J	(T)	b.	Magnetic-particle inspection	AEC139,AEC156
A,E(T)		c.	Mechanical properties	AEC245,RAA048
A,B,D, E,I,J	(T)	d.	Proof test	AEC206,AEC207
A,B,C,D,E,F,I,J		e.	Supplier records are complete and acceptable	AEC280
B,C,D, E,I,J	(T)	f.	Ultrasonic testing	AEC265,AEC274
F		g.	8.550 dimension of view "B"	AEC001
F		h.	11.100 dimension of view "B"	AEC001A
F		i.	9.250 dimension of view "B"	AEC001B
F		j.	Circular run out in view "B"	AEC001C
F		k.	1.20 dimension of view "B"	AEC001D
F		l.	.510 dimension of view "B"	AEC001E
F		m.	Bolt hole thru diameter	AEC004
F,G,I		n.	Tap drill depth of threaded holes	AEC049, AEC049A
F		o.	Flatness and parallelism of sealing surface	AEC087
F		p.	Outside diameter of sealing surface	AEC191
F,G,I		q.	Threaded holes for inner bolts	AEC261
F,G,I		r.	Threaded holes for Special Bolts	AEC262
F,I		s.	True position threaded holes	AEC264
F		t.	Wall thickness--membrane area stamp VIP item number	AEC288
F		u.	Inside diameter in flange area	RAA117

4. For Refurbished Igniter Chamber, verify:

A,B,C,D, E,I,J	(T)	a.	Hydroproof successful	AEC117
A,B,C,D, E,I,J	(T)	b.	Magnetic-particle after hydroproof test and all indications are recorded	AEC143
F,I		c.	Threaded holes conform to gauging requirements	AEC035
F		d.	Flatness and parallelism of mating surfaces	AEC086
F		e.	Wall thickness membrane area after hydroproof test	AEC287
I		f.	Threaded holes are free from contamination, damage, and surface defects	AEC098

5. For New Igniter Adapter, verify:

A,C,D,E,J	(T)	a.	Chemical analysis	AAS029,AAS323
A,C,D,E,J	(T)	b.	Mechanical properties	AAS404,RAA044
A,C,D,E,J	(T)	c.	Metallurgical characteristics	AAS404C,RAA045
A,C,D, E,I,J	(T)	d.	Heat treatment	AAS175,AAS177
A,B,C,D, E,I,J	(T)	e.	Proof test	AAS198A
A,B,C,D E,I,J	(T)	f.	Magnetic-particle inspection after proof test is complete and acceptable	AAS313A
A,B,C,D,E,I,J		g.	Material is D6AC steel	AAS029A
A,B,C,D,E,F,I,J		h.	Supplier records are complete and acceptable	AAS550
B,C,D, E,I,J	(T)	i.	Ultrasonic testing complete and acceptable	AAS541,RAA001
F,G		j.	Flange thickness at inner bolt circle	AAS006,RAA105
F		k.	Inner leak check port spot face depth	AAS075
F		l.	Diameter of inner bolt thru holes	AAS076,AAS077
F		m.	Inner leak check port per MS16142 except as shown on drawing	AAS229
F		n.	Inner leak check port spot face diameter	AAS376
F		o.	True position of inner bolt thru holes	RAA096,RAA101
F		p.	Flatness and parallelism of bottom surface (Datum -C-)	RAA109,AAS138
F		q.	Outside diameter of alignment lip	RAA115
F		r.	Height of alignment lip	RAA116
G		s.	Flange thickness at outer bolt circle	AAS005,AAS420

6. For Refurbished Igniter Adapter, verify:

A,B,C,D, E,I,J	(T)	a.	Hydroproof successful	AAN008
A,B,C,D, E,I,J	(T)	b.	Magnetic-particle after hydroproof test	AAS301
E,I		c.	Sealing and mating surfaces for surface defects and surface finish	AAS107
E,I		d.	Threaded holes for surface contamination, damage, surface irregularities, raised metal and scratches after hydroproof testing	AAS123
F		e.	Flatness and parallelism of sealing and mating surfaces	AAS136
F,I		f.	Threaded holes conform to gauging requirements after hydroproof testing	AAS491
F		g.	Diameter of inner bolt thru holes	AAS505
F		h.	Flange thickness	AAS061A

7. For New Igniter Inner Gasket, verify:

A,C	(T)	a.	Chemical composition of metal retainer	ACS028A,ACS028B
A	(T)	b.	Grain size of metal retainer	ACS101A,ACS101B
A	(T)	c.	Decarburization of metal retainer	ACS072A,ACS072B
A	(T)	d.	Hardness of metal retainer	ACS104A,ACS104B
A	(T)	e.	Tensile strength of metal retainer	ACS203A,ACS203B
A	(T)	f.	Yield strength of metal retainer	ACS219A,ACS219B
A	(T)	g.	Minimum elongation, percent of, metal retainer	ACS132A,ACS132B
A	(T)	h.	Bending of metal retainer	ACS001A,ACS001B
A,C	(T)	i.	Heat treat of metal retainer	ACS000,ACS000B
A,B,C, D,E,J	(T)	j.	Magnetic particle testing	ACS118,ACS110
A,D,E,F,G,J		k.	Supplier records are complete and acceptable	ACS034
B,E		l.	Voids, circumferential scratches and radial scratches in metal retainer do not exceed acceptable conditions	CCC096,ACS074

B,E	m.	Absence of corrosion on the metal retainer	CCC099,CCC049
B,E	n.	No shipping/handling damage	RAA120
F	o.	Total variation in retainer thickness	ACS206
F	p.	The primary and secondary seals for crown height	ACS054
F	q.	Diameter of index pin thru hole	ACS079B
F	r.	Diameter of bolt thru holes	ACS079
F	s.	True position of bolt thru holes	ACS079A
F,G	t.	Metal retainer thickness	ACS109

8. For Refurbished Igniter Inner Gasket, verify:

A,D,E,F,G,J	a.	Supplier records are complete and acceptable	ACS034A
B,E	b.	Voids, circumferential scratches and radial scratches in metal retainer do not exceed acceptable conditions	CCC096A,ACS074A
B,E	c.	Absence of corrosion on the metal retainer	CCC099A,CCC049A
B,E	d.	No shipping/handling damage	RAA120A
F	e.	The primary and secondary seals for crown height	ACS054A

9. For New Bolt, Igniter, Inner verify:

A,B,C, D,E,J (T)	a.	Material--tensile ultimate strength, tensile yield strength, and alloy	RAA074
A,B,C,D, E,F,G,I,J	b.	Certificate of Conformance is complete and acceptable	AHD006
B,D,E,G,I,J	c.	No surface discontinuities detected by dye penetrant inspection	AHD019
B,C,D,E,J (T)	d.	Ultrasonic inspection is acceptable	RAA075
E,F,I	e.	Threads per engineering	AHD061
E,I	f.	No shipping or handling damage	RAA094
F,G,I	g.	Bolt length	AHD035
F,G,I	h.	Grip length	AHD029
F,G,I	i.	Grip diameter	AHD025
F,G	j.	Fillet radius	AHD022
F,G,I	k.	Perpendicularity of bolt axis-to-bolt shoulder	AHD051
F,G	l.	Head diameter	RAA077
F	m.	Dimension "F"	RAA078

10. For Refurbished Bolt, Igniter, Inner verify:

D,E,F,G,I,J	a.	Threads are acceptable	LHA001
D,E,F,G,I,J	b.	No unacceptable surface defects	LHA002

11. For New Bolt, Special, verify:

A,B,C,D,E,J	a.	Material--tensile ultimate strength, tensile yield strength, and alloy	RAA086
A,B,C,D, E,F,G,I,J	b.	Certificate of Conformance is complete and acceptable	ACC009
B,D,E,G,I,J	c.	No surface discontinuities detected by dye penetrant inspection	ACC107
B,C,D,E,J (T)	d.	Ultrasonic inspection is acceptable	RAA087
E,I (T)	e.	Eddy-current inspection is acceptable	CCC055
E,I	f.	No shipping or handling damage	ACC076
E,F,G,I	g.	External threads are per engineering	ACC130
F,G,I	h.	Bolt length	ACC004
F,G,I	i.	Length, shoulder-to-thread end	ACC062
F,G,I	j.	Grip length	ACC000
F,G,I	k.	Shank diameter	ACC102
F,G,I	l.	Shank fillet radius	ACC104
F,G,I	m.	Perpendicularity of bolt axis-to-bolt shoulder	ACC093
F,G	n.	Head length	ACC002

F		o.	Head width	ACC003
F		p.	Inside diameter of O-ring groove	ACC059
F		q.	Outside diameter of O-ring groove	ACC060
F		r.	Width of O-ring groove	ACC089
F,G		s.	Port depth	ACC007
F,G,I		t.	Port is per engineering	ACC094

12. For New Washer, Special, Countersunk, verify:

A,B,E		a.	Certificate of Conformance is complete and acceptable	RAA131
A,B,E		b.	Cadmium plate	RAA133
C,G		c.	Material is 4130 steel	RAA129
C,G	(T)	d.	Heat treat	RAA130
E		e.	No shipping or handling damage	RAA132
F,G		f.	Thickness (by lot sample)	RAA138
F		g.	Outside diameter of countersink (by lot sample)	RAA135
F		h.	Inside diameter (by lot sample)	RAA134

13. For New Packing with Retainer verify:

A,C,E		a.	Certificate of Conformance complete and acceptable	AFC004
F,G		b.	Seal thickness dimension "D"	AFC063
F		c.	Diameter "A"	AFC014

562 14. For New Lock/Safety Wire, verify:

A		a.	Certificate of Conformance complete and acceptable	AJV000
A,F		b.	Diameter	AJV005

15. For New Lubricant Molykote 321R verify:

A	(T)	a.	Nonvolatile content	AMB007

16. For New Grease verify:

A	(T)	a.	Penetration	LAA037
A	(T)	b.	Dropping point	ANO042
A	(T)	c.	Zinc concentration	LAA038

17. For New Filtered Grease verify:

A	(T)	a.	Contamination	ANO064

18. For New Chamber Assembly-Igniter, Insulation, verify:

B		a.	Corrosion before applying insulation to Chamber	AED000

19. For New Adapter Assembly, Igniter Insulated verify:

A,C		a.	Surface preparation is complete and acceptable on surfaces to be primed, painted	AEF100

20. For Refurbished Special Bolt verify:

A,B,C,D,E,F,J		a.	Surface finish of O-ring groove	LHA901
A,B,C,D,E,F,J		b.	Surface finish of shank and bolt head bottom surface	LHA902
A,B,C,D,E,F,J		c.	External threads	LHA903
A,B,C,D,E,F,J		d.	Port threads	LHA904

A,B,C,D,E,F,J		e.	Surface finish of sealing surfaces in port area	LHA905
A,B,C,D,E,F,J		f.	Eddy current inspection is acceptable	LHA906

21. For New Igniter Chamber Forging, verify:

A,B,E	(T)	a.	Chemical analysis	AEC018,RAA047
A,B,C,E		b.	D6AC steel	AEC041
A,B,E	(T)	c.	Mechanical properties	AEC245A,RAA048A

22. KSC verifies:

562	D,G,H,J	a.	Lock/safety wire on the igniter adapter inner and outer bolt circles, the OPTs, and the RSRM Port Plugs (leak check port plug for lock/safety wire) to be unbroken prior to forward skirt closeout per OMRSD File V, Vol. I, B47IG0.040.	OMD045