



CRITICAL ITEMS LIST (CIL)

No. 10-03-04-25R/01

| | | | |
|------------------|---------------------------|-----------------------|--|
| SYSTEM: | Space Shuttle RSRM 10 | CRITICALITY CATEGORY: | 1R |
| SUBSYSTEM: | Ignition Subsystem 10-03 | PART NAME: | Redesigned Igniter Adapter-to Igniter Chamber Joint, Special Bolt O-ring and Packing with Retainer (2) |
| ASSEMBLY: | Igniter Assembly 10-03-04 | PART NO.: | (See Table A-3) |
| FMEA ITEM NO.: | 10-03-04-25R Rev N | PHASE(S): | Boost (BT) |
| CIL REV NO.: | N (DCN-562R1) | QUANTITY: | (See Table A-3) |
| DATE: | 05 Oct 2001 | EFFECTIVITY: | (See Table 101-6) |
| SUPERSEDES PAGE: | 446-1ff. | HAZARD REF.: | BI-02 |
| DATED: | 31 Jul 2000 | | |
| 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 CONDITION: Failure during operation (D)
- 2.0 FAILURE MODE: 1.0 Leakage of the Special Bolt O-ring and packing with retainer
- 3.0 FAILURE EFFECTS: Failure of the Special Bolt O-ring and packing with retainers would result in hot gas flow through the joint, to the atmosphere causing burn-through, thrust imbalance and loss of RSRM, SRB, crew, and vehicle

4.0 FAILURE CAUSES (FC):

| FC NO. | DESCRIPTION | FAILURE CAUSE KEY |
|--------|---|-------------------|
| 1.1 | Nonconforming finish of sealing surfaces or contamination on sealing surfaces | A |
| 1.2 | Nonconforming material properties | B |
| 1.3 | Performance degradation due to aging | C |
| 1.4 | Damage to elastomers, threads, or sealing surfaces | D |
| 1.5 | Nonconforming dimensions | E |
| 1.6 | Improper installation of components (combined with 1.4) | F |
| 1.7 | Nonconforming surface or subsurface defects in elastomers | G |
| 1.8 | Cracks, corrosion, or other material defect | H |
| 1.9 | Moisture and/or fungus degradation of elastomer (combined with 1.1) | I |

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5.0 REDUNDANCY SCREENS:

- SCREEN A: Pass--The leak test procedure verifies the Special Bolt O-ring and packing with retainer.
- SCREEN B: Fail--No provision is made for failure detection by the crew.
- SCREEN C: Pass--The Special Bolt O-ring and packing with retainer cannot be lost by a single credible cause.

1. The Special Bolt O-ring and packing with retainer form part of a redundant seal system with the primary and secondary seals. The packing with retainer will not be pressurized because it is standby redundant to the Special Bolt O-ring. If the Special Bolt O-ring fails, the packing with retainer in addition to the primary and secondary seals will maintain a seal. If the Special Bolt O-ring and the leak check port plug fail, a leak path will exist and result in loss of vehicle and crew.

6.0 ITEM DESCRIPTION

1. Igniter Adapter-to-Igniter Chamber Joint, Special Bolt O-ring and packing with retainer. 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 |
| 1U77450 | Adapter, Igniter | D6AC Steel | STW4-2706 | 1/motor |
| 1U77538 | Chamber, Igniter | D6AC Steel | STW4-2706 | 1/motor |
| 1U78650 | Forging, Chamber, Igniter | D6AC Steel | STW4-2706 | 1/motor |
| 1U77356 | Bolt, Special | MP159 High-strength Alloy | AMS-5842 | 4/motor |
| 1U75374 | Packing with Retainer | Seal-Fluorocarbon Rubber | MIL-R-83248, Type I, Class 1 | 36/igniter |
| | | Retainer-4130 Steel | MIL-S-18729 | |
| 1U77824 | Washer, Special, Countersunk | Cadmium Plated 4130 Steel | QQ-P-416 Ty I, Cl 2 MIL-S-18729 or | 36/inner |
| | | | MIL-S-6758 | joint |
| | | Heat Treat | MIL-H-6875 | |
| 1U50228 | Packing, Pre-formed | Cadmium Plated Fluorocarbon Rubber | QQ-P-416 Cl 3, Ty II STW4-3339 | 4/joint (1/each of 4 special bolts) |
| 1U51916 | Cartridge Assembly Sealant/Adhesive | Lubricating Oil and Gelling Agent | STW5-2942 | A/R |
| MS20995 | Wire, Safety or Lock Lubricant, Air Drying | 302 or 304 Stainless Steel Molykote 321R Lubricant Spray | ASTM-A-580 STW4-2955 | A/R A/R |

6.1 CHARACTERISTICS:

1. The Special Bolt (Figures 4 and 5) is a part of the Transducer Assembly (Figure 1), and is located on the Igniter Adapter as part of the inner bolt circle (Figure 2) of the inner gasket.
2. The O-ring (Figure 3) is located at the bottom of the Special Bolt assembly in the Igniter Chamber area. The O-ring prevents hot gasses from leaking during ignition and boost.
3. The packing with retainer (Figure 6) is located under the Special Bolt head. The packing with retainer prevents hot gasses from leaking into the atmosphere during ignition and boost.



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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

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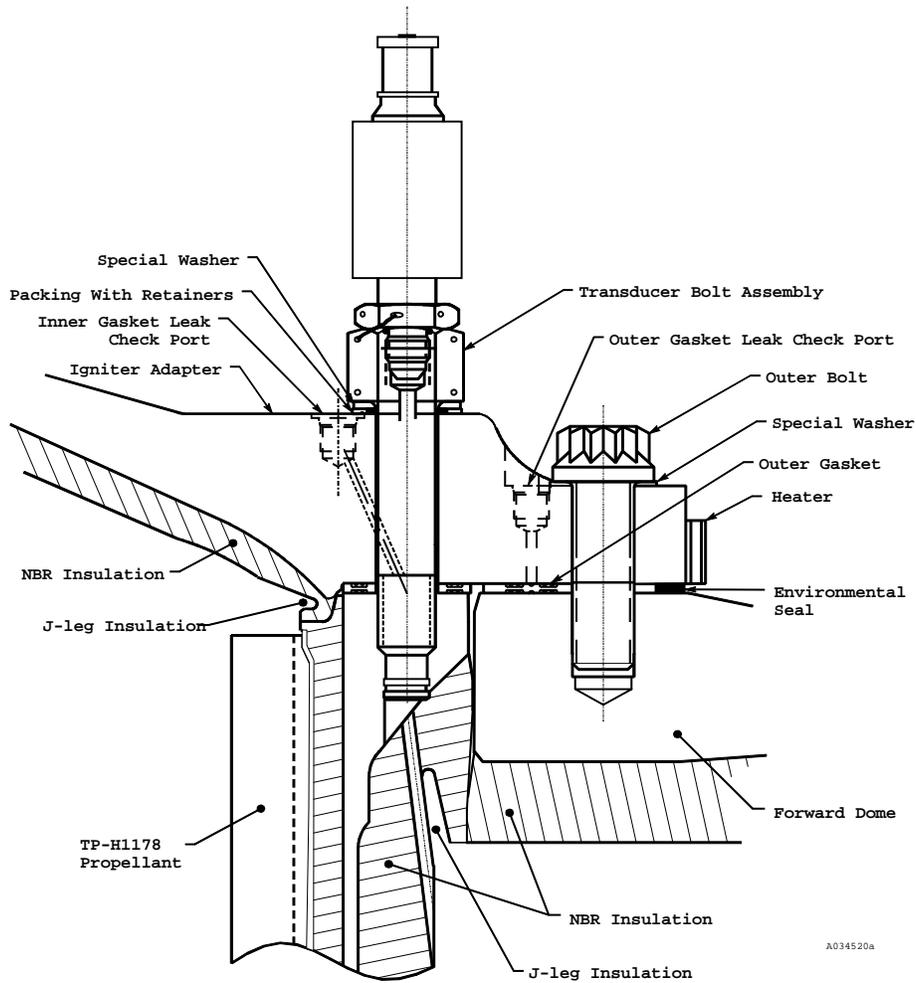


Figure 1. Installed Pressure Transducer and Special Bolt

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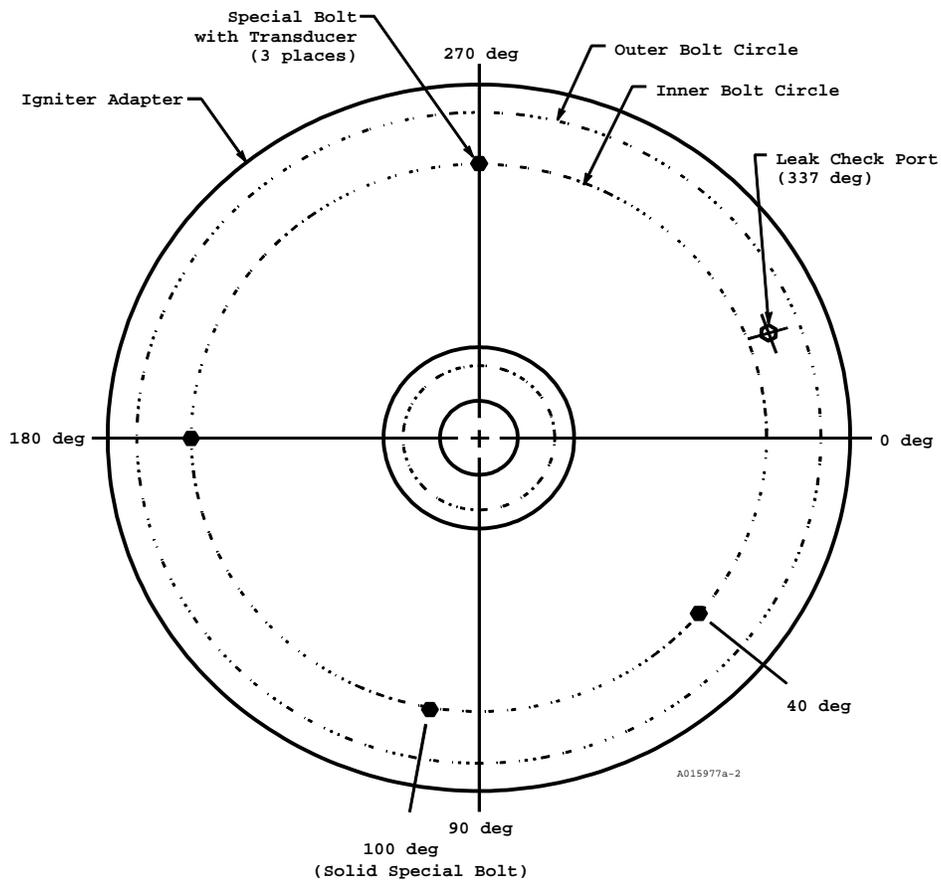
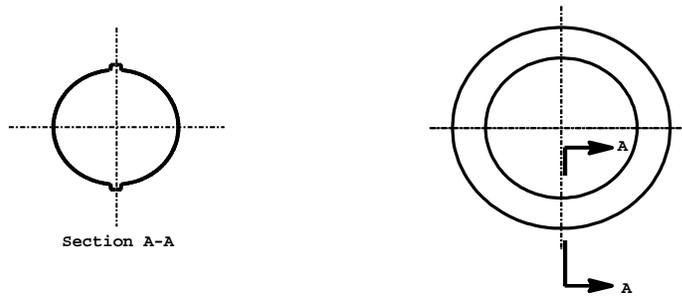


Figure 2. Special Bolt and Leak Check Port Location

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A024758a

Figure 3. O-ring

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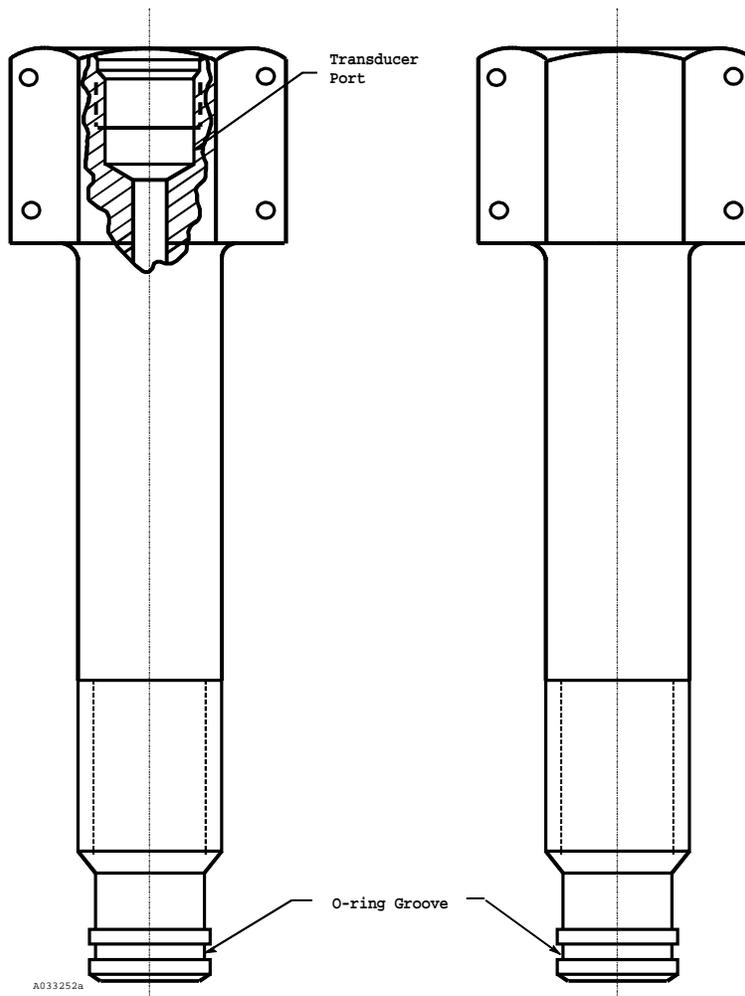


Figure 4. Special Bolt With Transducer Port and Solid Special Bolt

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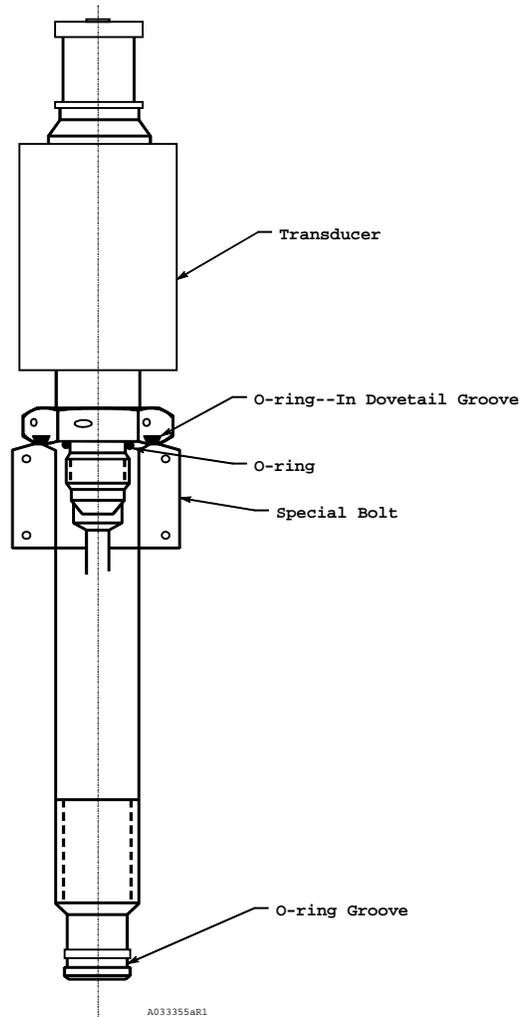


Figure 5. Transducer Bolt Assembly

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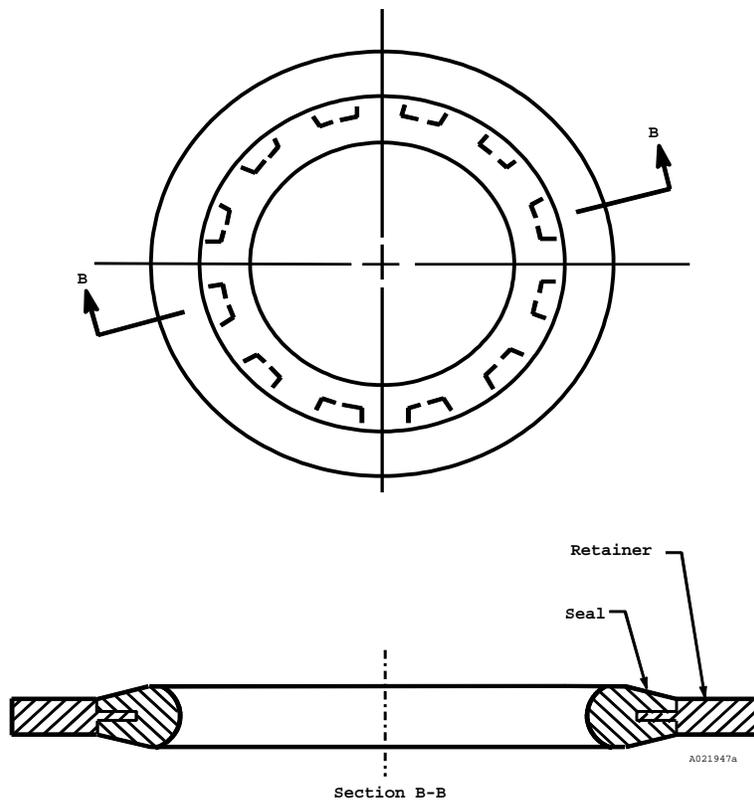


Figure 6. Packing with Retainer

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9.0 RATIONALE FOR RETENTION:

9.1 DESIGN:

DCN FAILURE CAUSES:

- | | | |
|-----------------|-----|--|
| A | 1. | Igniter Adapter sealing surface finish requirements are per engineering drawings: a. Refurbishment of the Igniter Adapter is performed per engineering. |
| A | 2. | Igniter Chamber surface finish requirements are per engineering drawings: a. Refurbishment of the Igniter Chamber is performed per engineering. |
| A | 3. | Special Bolt O-ring groove surface finish requirements are per engineering drawings. |
| A,G | 4. | Packing with retainer's surface quality conforms to engineering that establishes design requirements and fabrication details. The packing with retainer is a one-time-use item. |
| A,G | 5. | Small O-ring's surface quality conforms to engineering that establishes design requirements and fabrication details. The small O-ring is a one-time-use item. |
| A | 6. | Surface finish is controlled per engineering drawings and specifications. Surface finish testing was performed on O-ring sealing surfaces for the case and nozzle. Sealing surface finish requirements in igniter metal components are the same as the case and nozzle metal components. Results show considerable sealing margin in the current design, and more dependence on temperature than surface finish per TWR-17991. |
| A,B,D,E,F,G,H,I | 7. | Leak check test requirements and procedures are determined per TWR-17922 and TWR-19510. |
| A,D,F,G,H,I | 8. | Cleanliness of sealing surfaces to prevent contamination is controlled by shop planning, engineering, and TWR-16564. |
| A,D,F | 9. | All sealing surfaces of Igniter Assembly components must conform to engineering drawings and specifications or they are reworked to conformity per Standard Repair. |
| A,I | 10. | Small O-rings are individually packaged in an opaque, waterproof, grease-proof, and heat-sealed bag per engineering. |
| B | 11. | Small O-rings are high-temperature, low-compression set, fluid-resistant, black fluorocarbon rubber. The small O-ring is a one-time-use item. |
| B | 12. | Packing with retainer sealing material is high-temperature, low-compression set, fluid-resistant, fluorocarbon rubber. |
| B | 13. | Spray lubricant Molykote 321R material requirements are per engineering. |
| B | 14. | Filtered grease material requirements are per engineering. |
| B | 15. | Specific criteria for O-ring material properties were determined per TWR-17367. |
| B | 16. | Packing with retainer rubber is mechanically and adhesively bonded to the retainer. The mechanical bond is built into the design of the retainer. |

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- C 17. Fluorocarbon elastomer is suitable for periods of storage of up to 20 years (O-ring Handbook, ORD 5700, Copyright 1982, by Parker Seal Group, Lexington, KY). Environment and age are significant to useful seal life, both in storage and actual service.
- C 18. Aging studies of O-rings after 5 years installation life were performed. Test results are applicable to all RSRM fluorocarbon seals. Fluorocarbon maintained its tracking ability and resiliency and was certified to maintain its sealing capability over 5 years per TWR-65546.
- C 19. Grease is stored at warehouse ambient condition that is any condition of temperature and relative humidity experienced by the material when stored in an enclosed warehouse, in unopened containers or containers that were resealed after each use. Storage life under these conditions is per engineering.
- C 20. Aging studies to demonstrate characteristics of grease after 5 years installation life were performed on TEM-9. Results showed that grease provided adequate corrosion protection for D6AC steel, and that all chemical properties of grease remained intact per TWR-61408 and TWR-64397.
- C 21. Small O-ring time duration of supplier storage and total shelf life prior to installation is limited per engineering.
- C 22. Packing with retainer elastomer time duration of supplier storage and total shelf life prior to installation is per engineering.
- C 23. Small O-rings are packaged and stored to preclude deterioration from ozone, grease, ultraviolet light, and excessive temperature.
- D,F 24. Thiokol IHM 29 procedures describe the requirements for handling, packaging and transportation systems for the control of internal loads, stresses, or deflections preventing damage to elastomers or sealing surfaces.
- D,F 25. Igniter installation requirements are per engineering as follows:
- a. Igniter adapter, igniter chamber, inner gasket, special bolts, packing with retainer, special washers and igniter assembly mating surfaces are cleaned.
 - b. Filtered grease is applied to the underside of special bolt heads, special bolt O-rings, packing with retainers, igniter chamber and igniter adapter sealing surfaces prior to assembly.
 - c. Special washers, packing with retainer and O-rings are installed on the inner and special bolts.
 - d. Lubriant spray is applied to the threads of the special bolt.
- E 26. Packing with retainer conforms to engineering that establishes geometric dimensions and fabrication details. Packing with retainer is a one-time-use item.
- E 27. Small O-rings conform to engineering that establishes geometric dimensions and fabrication details. The small O-ring is a one-time-use item.
- E 28. Special Bolt dimensions are per engineering drawings.
- E 29. Special Washer dimensions are per engineering drawings. The Special Washer is a one-time-use item.
- E 30. Igniter Chamber dimensions are per engineering drawings:

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- a. Refurbishment of the Igniter Chamber is performed per engineering.
- E 31. Igniter Adapter dimensions are per engineering drawings:
 - a. Refurbishment of the Igniter Adapter is performed per engineering.
- G 32. Testing and analysis of elastomers that established criteria for acceptable abrasions, grind marks, scratches, cuts, inhomogeneities, splices, repairs, substandard material, surface voids and inclusions, and internal voids and inclusions are documented in TWR-17991.
- H 33. The Igniter Chamber and the Igniter Adapter are made of high strength D6AC steel and heat treated.
- H 34. Refurbished Igniter Chambers and Igniter Adapters are per engineering requirements.
- H 35. Analyses and testing to qualify the Igniter Chamber and Igniter Adapter are reported in TWR-10735, TWR-11559, TWR-17265, TWR-16874, and TWR-61222.
- H 36. Igniter Chambers and Igniter Adapters are hydroproof tested and then magnetic-particle inspected before every use.
- H 37. The Igniter Chamber and Igniter Adapter are included in TWR-16874. Fracture control analysis of the modified igniter presented in TWR-16104 and TWR-16874 shows that the Igniter Chamber and Igniter Adapter could be used eight times before a critical flaw would grow to a failure. The planned number of uses is four.
- H 38. A Material Use Agreement is required per MSFC requirements for D6AC steel.
- H 39. Other materials used in this assembly are listed in Table I of the MSFC specification that designates high resistance to stress corrosion cracking.
 - a. Special Bolts High-strength Alloy, MP159.
 - b. Special Washer 4130 Alloy steel, heat treated.
 - c. Packing with Retainer 4130 Alloy steel heat treated.
- H 40. 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 bolts, special washers, adapter flange, and igniter chamber interfaces after the bolts are installed and torqued.
- A,B,D,E,H 41. Igniter special bolts are acceptable for reuse if engineering requirements are met. The 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 eddy current inspection criteria.

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9.2 TEST AND INSPECTION

| DCN | FAILURE CAUSES and TESTS (T) | | CIL CODE |
|-----|------------------------------|--|----------------|
| | | 1. For New Segment, Rocket Motor, Forward, verify: | |
| | A,D,F,H,I | a. Special bolt O-ring is clean and free of visible contamination prior to installation | AEG411 |
| | A,D,F,H,I | b. Special bolts are clean and free of visible contamination prior to installation | AEG166 |
| | A,D,F,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 |
| | A,D,F,I | d. Packing with retainer is clean and free of visible contamination prior to installation | AEG382 |
| | A,D,F,I | e. Igniter adapter sealing and mating surfaces are clean and free of contamination and surface defects prior to installation | AEG168 |
| | A,D,F,H,I | f. Filtered grease is applied to the underside of the special bolt head before installation | AEG018 |
| | A,B,D,E, F,G,H,I (T) | g. Installed transducer bolt assemblies were leak tested at low and high pressures | AEG196,AEG195 |
| | C | h. Special bolt O-ring shelf life, and package container seal prior to installation | AEG160 |
| | C | i. Packing with retainer shelf life, and package container seal prior to installation | AEG161 |
| | C | j. Shelf life of filtered grease prior to application | AEG371 |
| | D,F | k. Igniter special washers are clean prior to installation | AEG339 |
| | D,F | l. Special bolts are installed, turned in until finger tight | AEG105 |
| | D,F | m. Special bolts are tightened with a snug torque and angle-of-twist in the proper sequence | AEG428 |
| 562 | D,F | n. Special bolts are lock/safety wired correctly using double twist method | AEG106 |
| | D,F | o. Igniter special washer is installed correctly with radius towards special bolt head | AEG192 |
| | D,F | p. Filtered grease is applied to the special bolt O-ring and O-ring groove | AEG243A,AEG243 |
| | D,F | q. Filtered grease is applied to the packing with retainer | AEG244 |
| | D,F | r. Molykote lubricant spray is applied to the threads of the special bolts and air dried before installation | AEG051A |
| | D,F | s. Filtered grease is applied to the igniter adapter sealing surfaces and bolt through holes | AEG112 |
| | H | t. Filtered grease is applied to all exposed bare metal surfaces of the igniter after installation | AEG028 |
| | | 2. For New Igniter Assembly verify: | |
| | A,D,F,I | a. Inner bolts are clean and free of visible contamination prior to installation per the installation specification | AEF048 |
| | A,I | b. Packing with retainer is clean and free of visible contamination prior to installation per the installation specification | CCC005 |
| | A,D,F,I | c. Special Washers are clean prior to installation per the installation specification | CCC006 |
| | A,D,F,H,I | 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 |
| | A,D,F,H,I | e. Igniter Adapter sealing and mating surfaces and threaded holes | |

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| | | are clean and free of contamination and surface defects prior to installation per the igniter process finalization and installation preparation specifications | AEF218 |
| A,D,F | f. | Filtered grease is applied to the underside of the inner bolt head before installation per the installation specification | AEF026 |
| A,D,F | g. | Filtered grease is applied to the packing with retainer (both sides and through hole of rubber element only) per the installation specification | CCC014 |
| A,D,F,H | h. | Filtered grease is applied to the Chamber sealing surface per the installation preparation specification | CCC016 |
| A,D,F,H | i. | Filtered grease is applied to the Adapter sealing surfaces and bolt through holes per the installation preparation specification | CCC017 |
| A,D,F | j. | Inner bolts are installed correctly per the installation specification | CCC033 |
| A,D,F | k. | Packing with retainer is installed correctly per the installation specification | CCC020 |
| A,D,F | l. | Special Washer is installed correctly with radius towards inner bolt head | AEF138 |
| D,F,H (T) | m. | Inner gasket and inner bolt redundant seals are leak tested with an acceptable leak rate per the leak check specification | AEF108, AEF120 |
| D,F | n. | Inner gasket is free of contamination, corrosion and excess grease prior to installation per the installation preparation specification | AEF071 |
| D,F | o. | Inner bolts are tightened with a snug torque and angle-of-twist in the proper sequence | AEF281 |
| 562 D,F | p. | Inner bolts are lock/safety wired correctly using double-twist method per the applicable specification | AEF063 |
| D,F,H (T) | q. | Packing with retainer seals are bubble tested after bolt loading per the leak test specification | AEF120A |
| 3. For New Igniter Chamber, verify: | | | |
| A | a. | Flatness and parallelism of sealing surface | AEC087,AEC092 |
| A,H (T) | b. | Magnetic-particle inspection | AEC139,AEC156 |
| A,H (T) | c. | Proof test | AEC206,AEC207 |
| A | d. | Surface finish for top sealing surface (Datum-A-) | AEC230 |
| A,D,E,F | e. | Supplier records are complete and acceptable | AEC280 |
| D,F | f. | Threaded holes for inner bolts | AEC261 |
| D,E,F | g. | Threaded holes for Special Bolts | AEC262 |
| E,H | h. | Inside diameter in flange area | RAA117 |
| H (T) | i. | Heat treatment | AEC110,AEC115 |
| H (T) | j. | Mechanical properties | AEC245,RAA048 |
| H (T) | k. | Ultrasonic testing | AEC265,AEC274 |
| 4. For Refurbished Igniter Chamber, verify: | | | |
| A,H (T) | a. | Hydroproof successful | AEC117 |
| A,H (T) | b. | Magnetic-particle after hydroproof test and all indications are recorded | AEC143 |
| A,D,F | c. | No unacceptable scratches, gouges, or pitting in sealing surfaces | AEC173 |
| A,D,E,F | d. | Surface finish for top sealing surface | AEC291 |
| D,F | e. | Threaded holes conform to gauging requirements | AEC035 |
| D,E,F | f. | Threaded holes are free from contamination, damage, and surface defects | AEC098 |
| 5. For New Igniter Adapter, verify: | | | |
| A,H (T) | a. | Proof test | AAS198A |
| A,H (T) | b. | Magnetic-particle inspection after proof test is complete and acceptable | AAS313A |
| A,E,H | c. | Supplier records are complete and acceptable | AAS550 |

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| A,D,F | | d. | Surface finish on inner bolt circle for packing with retainer | RAA108 |
| E | | e. | Flange thickness at inner bolt circle | AAS006,RAA105 |
| E | | f. | Diameter of inner bolt through holes | AAS076,AAS077 |
| H | (T) | g. | Chemical analysis | AAS029,AAS323 |
| H | (T) | h. | Mechanical properties | AAS404,RAA044 |
| H | (T) | i. | Metallurgical characteristics | AAS404C,RAA045 |
| H | (T) | j. | Heat treatment | AAS175,AAS177 |
| H | | k. | Material is D6AC steel | AAS029A |
| H | | l. | No obvious shipping or handling damage | AAS343 |
| H | (T) | m. | Ultrasonic testing complete and acceptable | AAS541,RAA001 |

6. For Refurbished Igniter Adapter, verify:

| | | | | |
|-------|-----|----|---|---------|
| A,H | | a. | Sealing and mating surfaces for surface defects and surface finish | AAS107 |
| A,H | (T) | b. | Magnetic-particle after hydroproof test | AAS301 |
| A,D,F | | c. | No surface defects on top of bolt holes | AAS417 |
| E | | d. | Flange thickness | AAS061A |
| E | | e. | Flatness and parallelism of sealing and mating surfaces | AAS136 |
| E | | f. | Threaded holes conform to gauging requirements after hydroproof testing | AAS491 |
| E | | g. | Diameter of inner bolt through holes | AAS505 |
| H | (T) | h. | Hydroproof successful | AAN008 |
| H | | i. | Threaded holes for surface contamination, damage, surface irregularities, raised metal and scratches after hydroproof testing | AAS123 |

7. For New Bolt, Special, verify:

| | | | | |
|-------|-----|----|---|--------|
| A,H | (T) | a. | No surface discontinuities detected by dye penetrant inspection | ACC107 |
| A,E,H | | b. | Certificate of Conformance is complete and acceptable | ACC009 |
| A | | c. | Surface finish of O-ring groove | AAU001 |
| A | | d. | Surface finish of shank and bolt head bottom surface | ACC114 |
| D,F,H | (T) | e. | Eddy-current inspection is acceptable | CCC055 |
| E | | f. | Bolt length | ACC004 |
| E | | g. | Length, shoulder-to-thread end | ACC062 |
| E | | h. | Grip length | ACC000 |
| E | | i. | Shank diameter | ACC102 |
| E | | j. | Shank fillet radius | ACC104 |
| E,H | | k. | External threads are per engineering | ACC130 |
| E | | l. | Perpendicularity of bolt axis-to-bolt shoulder | ACC093 |
| E | | m. | Head length | ACC002 |
| E | | n. | Head width | ACC003 |
| E | | o. | Inside diameter of O-ring groove | ACC059 |
| E | | p. | Outside diameter of O-ring groove | ACC060 |
| E | | q. | Width of O-ring groove | ACC089 |
| H | (T) | r. | Material - tensile ultimate strength, tensile yield strength, and alloy | RAA086 |
| H | (T) | s. | Ultrasonic inspection is acceptable | RAA087 |
| H | | t. | No shipping or handling damage | ACC076 |

8. For New Small O-ring verify:

| | | | | |
|---------|-----|----|---------------------------------|-----------------------------|
| A,D,F,G | | a. | Surface quality | AAQ234,AAQ233 |
| B | | b. | Material is fluorocarbon rubber | AAQ157,AAQ117 |
| B | (T) | c. | Shore A hardness | LAA001,LAA006,LAA011,LAA016 |
| B | (T) | d. | Tensile strength | LAA002,LAA007,LAA012,LAA017 |
| B | (T) | e. | Ultimate elongation | LAA003,LAA008,LAA013,LAA018 |
| B | (T) | f. | Compression-set | LAA004,LAA009,LAA014,LAA019 |
| B | (T) | g. | Tear strength | LAA005,LAA010,LAA015,LAA020 |
| C | | h. | Time from cure date to shipment | AAQ251 |

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| | | | |
|---|----|---|---------------|
| C | i. | Individually packaged and sealed in opaque bags, material conforming is per engineering | AAQ211 |
| E | j. | Inside diameter "A" | AAQ002,AAQ003 |
| E | k. | Cross-sectional dimension "W" | AAQ004,AAQ062 |
| E | l. | Flash dimensions | AAQ111,AAQ112 |

9. For New Packing with Retainer verify:

| | | | |
|---------|----|--|-----------------------------|
| A,E | a. | Certificate of Conformance complete and acceptable | AFC004 |
| A,D,F,G | b. | Surface quality | AFC068 |
| B | c. | Seal material is fluorocarbon rubber | AFC028 |
| B | d. | Rubber is adhesively bonded to each retainer | LAA042 |
| B (T) | e. | Shore A hardness of rubber | AJF013,LAA021,AJF012,LAA025 |
| B (T) | f. | Tensile strength of rubber | AJF015,LAA022,AJF014,LAA026 |
| B (T) | g. | Percent elongation of rubber | AJF017,LAA023,AJF016,LAA027 |
| B (T) | h. | Compression-set of rubber | AJF002,LAA024,AJF001,LAA028 |
| C | i. | Age limit at time of shipment was not exceeded | AFC048 |
| E | j. | Diameter "A" | AFC014 |
| E | k. | Diameter "C" | AFC015 |
| E | l. | Seal thickness dimension "D" | AFC063 |
| E | m. | Retainer thickness dimension "E" | AFC052 |

10. For New Washer, Special, verify:

| | | | |
|---|----|---|--------|
| E | a. | Certificate of Conformance is complete and acceptable | RAA131 |
| E | b. | Outside diameter | RAA137 |
| E | c. | Thickness | RAA138 |
| E | d. | Inside diameter | RAA134 |

11. For New Grease verify:

| | | | |
|-------|----|--------------------|--------|
| B (T) | a. | Penetration | LAA037 |
| B (T) | b. | Dropping point | ANO042 |
| B (T) | c. | Zinc concentration | LAA038 |

12. For New Filtered Grease verify:

| | | | |
|---|----|---------------|--------|
| B | a. | Contamination | ANO064 |
|---|----|---------------|--------|

13. For New Lubricant Molykote 321R verify:

| | | | |
|-------|----|---------------------|--------|
| B (T) | a. | Nonvolatile content | AMB007 |
|-------|----|---------------------|--------|

| 562

14. For New Lock/Safety Wire verify:

| | | | |
|-----|----|--|--------|
| B | a. | Certificate of Conformance complete and acceptable | AJV000 |
| B,E | b. | Diameter | AJV005 |

15. For Refurbished Special Bolt verify:

| | | | |
|-----------|----|--|--------|
| A,B,D,E,H | a. | Surface finish of O-ring groove | LHA901 |
| A,B,D,E,H | b. | Surface finish of shank and bolt head bottom surface | LHA902 |
| A,B,D,E,H | c. | External threads | LHA903 |
| A,B,D,E,H | d. | Port threads | LHA904 |
| A,B,D,E,H | e. | Surface finish of sealing surfaces in port area | LHA905 |
| A,B,D,E,H | f. | Eddy current inspection is acceptable | LHA906 |

16. For New Igniter Chamber Forging, verify:



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|-----------|--------------------------|-----------------|
| 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 |

17. KSC verifies:

562 D,F

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