ATK ALLIANT TECHSYSTEMS
THIOKOL PROPULSION

CRITICAL ITEMS LIST (CIL)

No. 10-02-01-11R/02

SYSTEM:	Space Shuttle RSRM 10	CRITICALITY CATEGORY:	1R
SUBSYSTEM	Nozzle Subsystem 10-02	PART NAME:	Nose Inlet-to-Forward End Ring Joint, Thermal Protection System, (Sealant and Nose Inlet/Forward End Ring Metal Interface) (1)
ASSEMBLY:	Nozzle and Aft Exit Cone 10-02-01		
FMEA ITEM NO.:	10-02-01-11R Rev N		
CIL REV NO.:	N (DCN-533)		
DATE:	10 Apr 2002	PART NO.:	(See Section 6.0)
SUPERSEDES PAGE:	324-1ff.	PHASE(S):	Boost (BT)
DATED:	27 Jul 2001	QUANTITY:	(See Section 6.0)
CIL ANALYST:	B. A. Frandsen	EFFECTIVITY:	(See Table 101-6)
		HAZARD REF.:	BN-03
APPROVED BY:		DATE:	

RELIABILITY ENGINEERING: K. G. Sanofsky 10 Apr 2002

ENGINEERING: B. H. Prescott 10 Apr 2002

1.0 FAILURE CONDITION: Failure during operation (D)

2.0 FAILURE MODE: 1.0 Thermal failure

3.0 FAILURE EFFECTS: Burn-through of the primary and secondary O-rings. Burn-through of the metal housing and loss of nozzle, resulting in thrust imbalance between SRBs, causing loss of RSRM, SRB, crew, and vehicle.

4.0 FAILURE CAUSES (FC):

FC NO.	DESCRIPTION	FAILURE CAUSE KEY
1.1	Failure of sealant (bond line, voids, tears, cracks)	
1.1.1	Sealing compound surfaces not properly prepared or adequately cleaned	A
1.1.2	Primer and sealing compound not properly mixed, applied, or cured	B
1.1.3	Contamination	C
1.1.4	Process environments detrimental to bond strength	D
1.1.5	Nonconforming material properties	E
1.1.6	Sealing compound degradation during storage or transportation	F
1.2	Failure of the nose inlet/forward end ring metal interface	
1.2.1	Nonconforming dimensions	G
1.2.2	Improper assembly	H
1.2.3	Corrosion	I
1.2.4	Surface defects	J
1.2.5	Improper preload	K

5.0 REDUNDANCY SCREENS:

SCREEN A: Fail--The hardware is not capable of checkout during normal ground turnaround.
SCREEN B: Fail--Loss of the thermal protection system is not detectable during flight.
SCREEN C: Pass--Loss of all redundant items in the thermal protection system cannot be the result of a credible single failure cause.

6.0 ITEM DESCRIPTION:

1. Sealing compound provides thermal protection between the two nozzle assembly items at their phenolic surface interface. A gap is provided between the two phenolic surfaces for the following reasons:

   a. To allow for thermal expansion of the nozzle assembly parts during boost
   b. To allow for positive and full surface mating while providing for surface contour tolerances

2. The assembled joint is shown (Figures 1 and 2) for the nose-throat-bearing-cowl-housing assembly nozzle. Materials are listed in Table 1.

3. The Aluminum Nose Inlet Housing and Cowl Housing along with the steel Forward End Ring are a part of the Nose-Throat-Bearing-Cowl Assembly. They are assembled together with screws creating a metal-to-metal joint.

TABLE 1. MATERIALS

Drawing No.	Name	Material	Specification	Quantity
1U52834	Ring, Bearing Assembly, Forward			1/motor
1U52838	Housing Assembly, Cowl, Nozzle			1/motor
1U75398	Housing Assembly-Nose/Inlet, Nozzle			1/motor
1U77640	Segment, Rocket Motor, Aft Nozzle			1/motor
1U79146	Nose-Throat Assembly			1/motor
1U79149	Nose-Throat-Bearing-Cowl Assembly			1/motor
1U79151	Housing and Boot Assembly, Nozzle			1/motor
1U79153	Nose-Throat-Bearing-Cowl Housing Assembly, Nozzle			1/motor
1U79144	Nose-Throat-Bearing-Cowl Housing Assembly			1/motor
1U79324	Bearing Assembly, Nozzle Flexible			1/motor
1U79147	Nose-Throat-Bearing Assembly			1/motor
1U77777	Bolt, Aluminum Coated, Nozzle			60/motor
1U76609	Cowl, Flexible Boot			1/motor
	Insert, Helical Coil		MS12XXXX NASM12XXXX	A/R
	Primer (Adhesive-Sealant Silicone RTV)	A One-Part Dilute Solution of Reactive Materials in Solvent	STW4-3875	A/R
	Sealing Compound (Sealant Silicone, RTV)	A Two-part, Room Temperature Vulcanizing Silicone Rubber, High-Temperature Pressurized Sealing Compound and Ablative Thermal Barrier	STW5-2813	A/R

6.1 CHARACTERISTICS:

1. The interstice between the cowl and phenolic structure of the nose inlet assembly is filled with a silicone rubber sealing compound. Sealing compound fills the gap to a depth exceeding the maximum expected char line.

2. Silicone rubber sealing compound provides a high-temperature flexible thermal protection for phenolic layers that face together at the nose inlet-to-forward end ring joint. The function of sealant is to protect joint metal components from heat affect and the O-rings from erosion.

3. There are five main joints in the nozzle support structure. Included here is the nose inlet-to-forward end ring joint. Parts involved are the nose inlet housing, forward end ring, and cowl housing.

4. The metal interface of the nose inlet-to-forward end ring joint was added to the CIL as a contributor to the thermal protection of the joint per TWR-66503. Metal in the joint provides a heat sink that reduces temperature of hot gases if they pass the RTV per TWR-65953 and TWR-66146 ("Internal Nozzle Joint #2 Flow/Thermal Analysis" and "Nozzle Flange Flatness Requirements for Internal Nozzle Joints #2, #3, and #5").

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

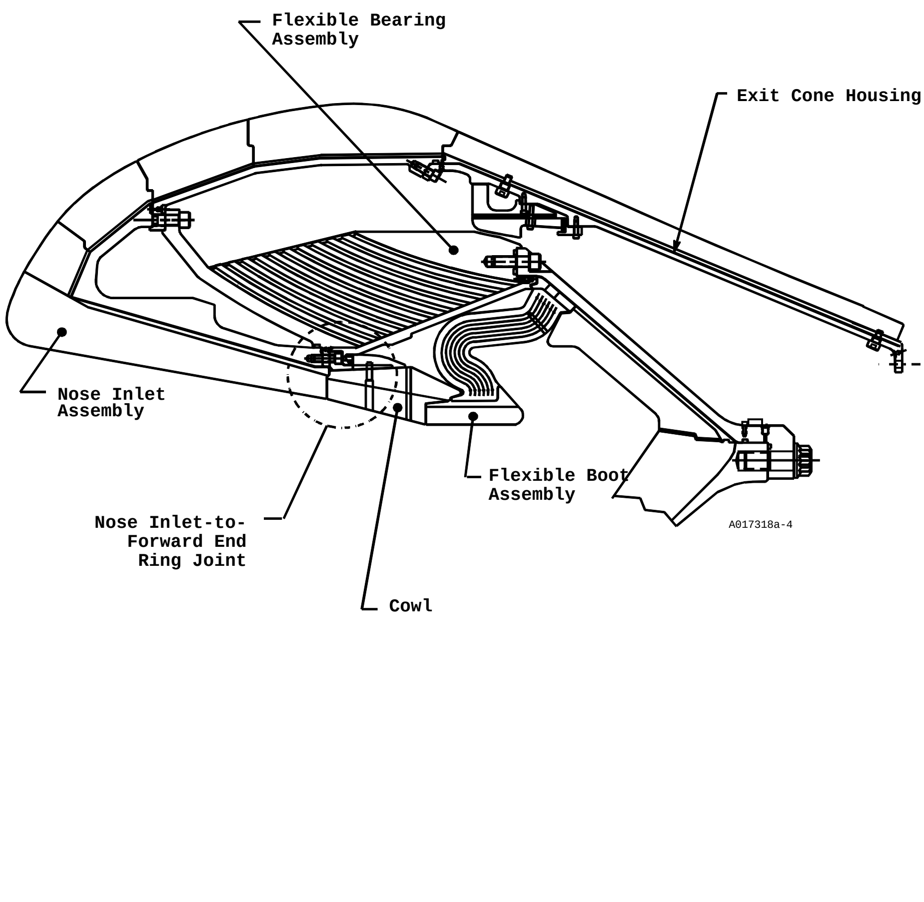

Figure 1. Nose Inlet Housing-to-Forward Eng Ring Joint Location

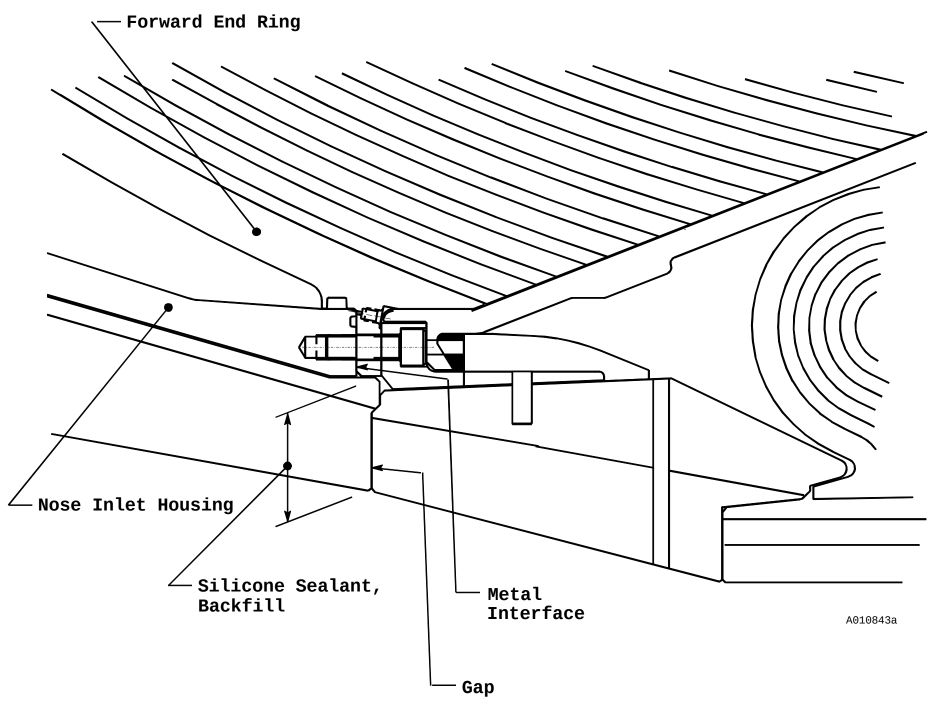

Figure 2. Nose Inlet Housing-to-Forward End Ring Joint Sealing Compound

9.0 RATIONALE FOR RETENTION:

9.1 DESIGN:

DCN FAILURE CAUSES		
A,C	1.	Preparation and cleaning methods for bonding surfaces are per shop planning. Cleanliness of bonding surfaces is determined by a combination of visual inspection and visual inspection aided by black light. The type of inspection required for each surface is per shop planning. Preparation, cleaning, and inspection methods for the aft exit cone bond lines are identified as process critical planning.
A,B,C,D,E,F	2.	The sealing compound and method of application were qualified through testing. Results of these tests are documented in TWR-18764-09.
B	3.	The two-part sealing compound mix ratio is controlled per engineering and mixing instructions per shop planning.
B	4.	Primer is prepared by the supplier per engineering.
C,D,I	5.	Contamination control requirements and procedures are described in TWR-16564.
C	6.	Primer is a one-component Room Temperature Vulcanization (RTV) silicone per engineering.
C	7.	Sealing compound is a two-part RTV silicone elastomer, supplied in separate sealed containers, per engineering.
C,D,I	8.	The nozzle manufacturing building is a controlled environment facility with temperature and humidity controls. There is controlled access to the building through a separate room with a card reader.
E	9.	Material properties for primer are controlled per engineering.
E	10.	Material properties for sealing compound are controlled per engineering.
E	11.	Sealing compound consists of a silicone rubber base and a catalyst. The supplier supplies the correct amount of each component material to achieve the proper mix ratio per engineering.
F	12.	Requirements for handling RSRM components during assembly and transportation are similar to those for previous and other current programs at Thiokol. Proof testing is required for all lifting and handling equipment per TWR-13880.
F	13.	Support equipment used to test, handle, transport, and assemble or disassemble the RSRM is certified and verified per TWR-15723.
F,G,J	14.	All components are inspected for handling damage after completion. Assembly and handling operations are controlled per shop planning and IHM 29.
F	15.	The nozzle assembly is shipped in the aft segment. Railcar transportation shock and vibration levels are monitored per engineering and applicable loads are derived by analysis. Monitoring records are evaluated by Thiokol to verify shock and vibration levels per MSFC specification SE-019-049-2H were not exceeded. TWR-16975 documents compliance of the nozzle with environments per MSFC specifications.

F	16.	The RSRM and its component parts are protected per TWR-10299 and TWR-11325. The nozzle, which is shipped as part of the aft segment, is protected from the external environment at all times by either covers or shipping containers until assembled as part of the RSRM.
F	17.	Positive cradling or support devices and tie downs that conform to shape, size, weight, and contour of components to be transported are provided to support RSRM segments and other components. Shock mounting and other protective devices are used on trucks and dollies to move sensitive loads per TWR-13880.
F	18.	Age degradation of nozzle materials was shown to not be a concern. Full-scale testing of a six-year old nozzle showed that there was no performance degradation due to aging per TWR-63944. Tests on a fifteen-year old flex bearing also showed no degradation of flex bearing material properties per TWR-63806.
F	19.	Analysis is conducted by Thiokol engineering to assess vibration and shock load response of the RSRM nozzle during transportation and handling to assembly and launch sites per TWR-16975.
G	20.	Flex bearing forward end ring dimensions are per engineering drawings.
G	21.	Refurbished flex bearing forward end ring dimensions are per engineering drawings and specifications.
G	22.	Nose inlet housing dimensions are per engineering drawings.
G	23.	Refurbished nose inlet housing dimensions are per engineering.
G,K	24.	Bolt dimensions are per engineering drawings. This is a one-time-use item.
G	25.	Cowl housing dimensions are per engineering drawings.
G	26.	Refurbished cowl housing dimensions are per engineering drawings and specifications.
G,K	27.	Helical insert dimensions are per engineering.
I,K	28.	The flex bearing forward end ring is a heat treated D6AC alloy steel forging.
G,I,J	29.	Bare metal surfaces of the flex bearing forward end ring are protected from corrosion per engineering.
H,K	30.	The socket head cap screw joining the nose inlet assembly, forward end ring joint and cowl housing are tightened and torqued in sequence per shop planning.
I,K	31.	The nose inlet housing is a heat treated aluminum alloy forging with specific requirements for ultimate and yield strengths and elongation.
I,J	32.	Nose inlet housing material is resistant to stress-corrosion cracking as rated per MSFC standards.
G,I,J	33.	Bare metal surfaces of the nose inlet housing are protected from corrosion per engineering.
I,K	34.	The Housing Assembly, Cowl is an aluminum alloy forging and is heat treated per engineering.
I,J	35.	Housing Assembly, Cowl material is resistant to stress-corrosion cracking as rated

per MSFC design criteria specifications for controlling stress corrosion cracking.

G,I,J 36. Bare metal surfaces of the cowl housing are protected from corrosion per engineering.

G,I,J 37. Flex bearing assembly bare metal surfaces are protected from corrosion per engineering.

G,I,J,K 38. Nose Inlet Housing-to-Forward End Ring bolts are alloy steel per Federal Specifications and are aluminum coated per MIL specifications and engineering drawings.

H,K 39. Nose Inlet Housing-to-Forward End Ring bolts are self-locking per engineering drawings.

40. The possibility of stress corrosion or fatigue to these parts during their service life was considered as follows:

a. Nose inlet housing:

G,I,J,K 1) The heat treat specification prescribes a testing procedure to assure resistance to stress-corrosion cracking for heat treated aluminum alloy.

b. Cowl housing:

G,I,J,K 1) The part is refurbished per engineering.

G,I,J,K 2) The heat treat specification prescribes a testing procedure to assure resistance to stress-corrosion cracking for heat treated aluminum alloy.

c. Bolts:

I,J,K 1) Bolts are NAS standard alloy steel which has high resistance to stress-corrosion cracking. These items are not reused.

d. Forward end ring:

I,J,K 1) TWR-16875 includes this part since its design was controlled by cyclic or repeated load conditions. Fatigue analysis was performed for low-cycle fatigue, high-cycle fatigue, and fracture mechanics. Results indicate that forward end ring design substantially exceeds the service life requirement.

I,J,K 2) The forging was evaluated per JSC Specification requirements and the results reported in TWR-10713. The report states the micro-cleanliness examination revealed the material meets all engineering requirements. Macro-structure examination showed that the forging process produced a part essentially free from re-entrant or sharply folded flaw lines and that all mechanical properties met or exceeded design requirements.

H,I,J,K 41. Socket head cap screws must meet cleanliness requirements prior to installation per shop planning.

G,I 42. Helical inserts are corrosion resistant steel (AMS 7245). These are one-time-use items.

H,I,K 43. Helical inserts are coated prior to installation using Federal Specification primer.

G,H,I,J 44. Filtered grease is applied to all bare metal interfacing surfaces and all holes on the nose-throat-bearing-cowl assembly to prevent corrosion.

G	45.	Structural analysis documented in TWR-16975 show that all metal components of the joint have a positive margin of safety based on factors of safety of 1.4 on ultimate and 1.1 on yield.
I,J,K	46.	Hydrogen is inherent to the process of cadmium plating bolts. Baking is required to relieve the bolts of hydrogen to preclude hydrogen embrittlement. The IVD aluminum bolt coating process does not introduce hydrogen into the bolts.
I,J	47.	D6AC has low-to-moderate resistance to stress corrosion as rated in the MSFC standards. It meets approval per Material Use Agreement.
	48.	Assembly stresses are minimized as follows:
G,H,J,K		a. Mating surface flatness is controlled by inspection of machining operations.
H,I,J,K		b. Threads are cleaned and lubricated prior to assembly.
H,K		c. Assembly bolts are torqued in a prearranged sequence to preload values.
G,H,I,J	49.	A coating of filtered grease is applied to all metal interfaces, helical-coil inserts, holes and underside of screw heads prior to installation of socket head cap screws per engineering drawings.
H,K	50.	Socket head cap screw torque is per engineering drawings.
I	51.	Grease is filtered to remove unwanted contamination and then loaded into a cartridge for application.
H,J,K	52.	During assembly, care is taken to assure that threaded inserts are not damaged. Damaged inserts are replaced per engineering.
G,H,I,J	53.	Defects discovered in nozzle metal hardware at Thiokol during receiving inspection, processing, and assembly are addressed per engineering.
G,H,J,K	54.	Bolt preload holds joint metal parts together to form a face contact interface. The joint is a closing joint upon pressurization. Gaps within the joint metal interface are the result of flatness conditions and localized surface defects that are controlled within engineering limits. Temperature of the gas entering the joint is reduced as it comes in contact with the metal. Temperature reduction is a function of quantity and velocity of the gas entering the joint versus the surface area, path shape, and thermal conductivity of the metal the gas contacts in the joint.
G,H,J,K	55.	Analyses per TWR-65953 and TWR-66146 covers the joint during pressurization and heating within the joint due to the entrance of chamber gases by way of postulated single or double leak paths through the joint's RTV. Maximum surface temperatures of the joint steel and aluminum housings ahead of the O-rings are well below the critical temperature for the joint, but may be above the design/reuse temperature resulting in localized heat affect/degradation of the metal. The nose inlet-to-forward end ring joint was found to have the best metal heat sink due to the greatest length of metal ahead of the primary O-ring of any of the nozzle internal joints. O-ring temperatures were well below the ablation temperature, resulting in no seal erosion. Features of the component metal interface surfaces ahead of the primary and secondary O-rings are controlled per engineering drawings, which are verified for new and refurbished hardware.
D,F	56.	Analysis of carbon-cloth phenolic ply angle changes for the nozzle was performed. Results show that redesigned nozzle phenolic components have a reduced in-plane fiber strain and wedge-out potential per TWR-16975. New loads that were driven by the Performance Enhancement (PE) Program were addressed in TWR-

73984. No significant effects on the performance of the RSRM nozzle were identified due to PE.

533 D,F

57. Thermal analysis per TWR-17219 shows the nozzle phenolic meets the new performance factor equation based on the remaining virgin material after boost phase is complete. This performance factor will be equal to or greater than a safety factor of 1.4 for the nose inlet assembly per TWR-74238 and TWR-75135. (Carbon phenolic-to-glass interface, bondline temperature and metal housing temperatures were all taken into consideration). The new performance factor will insure that the CEI requirements will be met which requires that the bond between carbon and glass will not exceed 600 degree F, bondline of glass-to-metal remains at ambient temperature during boost phase, and the metal will not be heat affected at splashdown.

A

58. The joint gap at nozzle joint 2 is established/controlled by the machining profiles of phenolic components per engineering drawings. Following joint assembly, the surface C (cowl carbon phenolic to nose cap carbon phenolic) gap is verified by feeler gauge. Surface C feeler gauge inspection and sub-assembly machining profiles confirm acceptability of the remaining internal joint gap dimensions.

9.2 TEST AND INSPECTION:

DCN	FAILURE CAUSES and TESTS	(T)			CIL CODE
			1.	For New Nose-Throat-Bearing-Cowl Assembly verify:	
	A		a.	Drying time prior to primer application of interfacing surfaces of nose cap to cowl	ADQ062
	A		b.	Backfill/mating surfaces of cowl are solvent wiped prior to primer application	ADQ235
	A		c.	Backfill/mating surfaces of nose cap are solvent wiped prior to primer application	ADQ238
	B		d.	Application of silicone sealing compound to joint per shop planning	ADN016A
	B		e.	Tape pressure dam is installed per planning requirements	ADN017A
	B		f.	Cured sealing compound is blended to adjacent contour	ADN032A
	B		g.	Phenolic surfaces are cleaned per planning requirements prior to taping backfill dam	ADN035A
	B		h.	Loading of silicone sealing compound into cartridges per planning requirements	ADN113A
	B		i.	Joint sealing compound is free of cracks, inclusions, separations, uncured material, and voids	ADQ086A
	B		j.	Points A-to-B and C-to-D, (cowl & nose cap) primer is dried per planning prior to application of sealing compound (Sealant, Silicone)	ADQ153A
	B		k.	Points A-to-B and C-to-D, (cowl & nose cap) are primed with Adhesive-Sealant, Silicone RTV prior to application of sealing compound (Sealant, Silicone)	ADQ156A
	B		l.	Pot life of sealing compound has not exceeded at time of application	ADQ158A
	B		m.	Sealing compound cure per shop planning	ADQ193A
	B		n.	Sealing compound (Sealant, Silicone, Two-part, RTV) is mixed per planning requirements	ADQ198A
	B		o.	Shelf life of primer has not been exceeded at time of application for backfill material	ADQ216A
	B		p.	Shelf life of silicone sealing compound has not been exceeded at time of application	ADQ217A
	B,E	(T)	q.	Shore A hardness (cure cup samples) achieve design values for backfill material	ADQ224A
	B		r.	Stock and lot number of primer (RTV Sealant) at time of application for backfill joint	ADQ243A
	B		s.	Stock and lot number of silicone sealing compound at time of application	ADQ255A
	B		t.	Unbond repairs in RTV used to bond cowl segments are complete and acceptable	AMM025
	B		u.	Joint sealing compound is assembled per shop planning (nose cap to cowl)	ADQ197
	C		v.	Interfacing surfaces of nose cap to cowl are free from contamination prior to primer application	ADQ033
	D		w.	Temperature of bonding surfaces is within specified limits prior to sealing compound application	ADQ258A
	H,K		x.	Socket head cap screws are torqued in sequence per planning requirements, cowl assembly	ADP012
	H,K		y.	Socket head cap screws are torqued to proper value, cowl assembly	ADP013
	H,K		z.	Each socket head cap screw locking device is in place and acceptable	ADP027
	G,H,I,J,K		aa.	Interfacing surfaces of cowl housing are free from contamination and corrosion	ADP040
	G,H,I,J,K		ab.	Interfacing surfaces free of contamination and corrosion on nose-throat-bearing assembly	AOR001A

H,I,K		ac.	Socket head cap screws free from contamination prior to installation	AOR006
G,H,I,J		ad.	Finalization of parts with defects from shipping/handling damage during processing	ADP033
B	(T)	ae.	Radiographic examination of bond lines and thermal barrier is acceptable	BBB001

2. For New Nose-Throat-Bearing Assembly verify:

A,C	a.	Points A to B and C to D (Nose glass to forward end ring) are free from contamination prior to primer application (black light)	SAA047
A,D	b.	Drying time prior to primer application of points A to B and C to D (nose glass to forward end ring)	SAA048
A,D	c.	Points A to B and C to D (Nose glass to forward end ring interface) primer is dried per planning prior to application of the sealing compound, (Sealant, Silicone)	SAA050
A,C	d.	Points A to B and C to D (Nose glass to forward end ring interface) are solvent wiped prior to primer application	SAA052
B	e.	Points A to B and C to D (Nose glass to forward end ring interface) are primed with Adhesive-Sealant, Silicone RTV prior to application of the sealing compound (Sealant, Silicone)	SAA049
E	f.	Shelf life of primer has not been exceeded at time of application for backfill joint	SAA051
E	g.	Stock and lot number of primer (Adhesive-Sealant, Silicone RTV) at time of application	SAA053
G,H,I,J	h.	Application of filtered grease	ADO027
G,H,I,J,K	i.	Free of contamination and corrosion	AOQ002
H,I,K	j.	Cap screws are free of visible and obvious contamination	ADO056
H,K	k.	Tightening sequence of cap screws	ADO057
H,K	l.	Torque of cap screws	ADO058

3. For New Nose-Throat-Bearing-Cowl Housing Assembly, Nozzle verify:

B		a.	Pot life of silicone sealing compound is not exceeded at time parts are seated	ADQ158
B		b.	Sealing compound (Sealant, Silicone, Two-part, RTV) is mixed per planning requirements	ADQ198
B		c.	Shelf life of primer is not exceeded at time of application	ADQ216
B		d.	Shelf life of silicone sealing compound has not been exceeded prior to start of mix	ADQ217
B		e.	Cure is complete and acceptable per planning requirements for silicone sealant	ADQ055
B		f.	Stock and lot number of primer (RTV Sealant) at time of application	ADQ253
B		g.	Stock and lot number of silicone sealing compound at time of application	ADQ255
B	(T)	h.	Shore A hardness (cure cup samples) achieve design value for silane primer	ADQ224
D		i.	Temperature of bonding surfaces is within specified limits prior to sealing compound application	ADQ258

4. For New Nose-Throat Assembly, Nozzle verify:

B	a.	Cured sealing compound is blended to adjacent contour	ADN032

5. For New Adhesive-Sealant Silicone RTV verify:

C	a.	Containers for shipping and handling damage	ADQ220
C	b.	Contains no foreign matter	AIY002
C	c.	Material is homogeneous	AIY004

E		d.	Primer color	AIY001
E	(T)	e.	Specific gravity	AIY007
E	(T)	f.	Total solids content	AIY015

6. For New Sealant, Silicone, RTV verify:

C		a.	Shipping and handling damage	ADQ223
E	(T)	b.	Elongation	ANF000,ANF002,ANF004
E	(T)	c.	Flow	ANF011,ANF013
E	(T)	d.	Shore A hardness	ANF021,ANF023,SAA042
E	(T)	e.	Specific gravity	ANF029,ANF031,SAA043
E	(T)	f.	Tensile strength	ANF037,ANF039,ANF040
C		g.	Workmanship is uniform in appearance, quality, and color	ANF045

7. For New Segment Assembly, Rocket Motor, verify:

F		a.	Nozzle assembly for handling damage and protective cover is cleaned and in place	AGJ167

8. For New Ring, Bearing Assembly, Forward verify:

G		a.	Diameter dimension	ADF006,ADF009,ADF007,ADF010
G		b.	Thickness	ADF018,ADF019
G		c.	Height	ADF023,ADF024
G		d.	Flatness	ADF025,ADF026
G		e.	Run out	ADF060,ADF061,ADF065,ADF066,ADF068,ADF069
G		f.	True position	ADF086A,ADF086,ADF087A,ADF087
G,I,J		g.	Corrosion protection is per specification	ADF034
J	(T)	h.	Ultrasonic inspection	ADF092,ADF090
J	(T)	i.	Magnetic-particle	ADF046,ADF044
K		j.	Heat treat	ADF033
K	(T)	k.	Ultimate strength	ADF052
K	(T)	l.	Yield strength	ADF052A
K	(T)	m.	Elongation	ADF052B
K	(T)	n.	Reduction of area	ADF052C
K	(T)	o.	K_{IC} (fracture toughness)	ADF052D

9. For Refurbished Ring, Bearing Assembly, Forward verify:

G		a.	Height	ADF022
G		b.	Diameter dimension	ADJ066,ADJ068
G		c.	Roundness	ADJ067,ADJ069
J	(T)	d.	Magnetic particle	ADF039

10. For New Housing Assembly-Nose/Inlet, Nozzle verify:

G		a.	Flatness	AFE008,AFE012
G		b.	Diameter	AFE016,AFE021,AFE025,AFE017,AFE022,AFE026
G		c.	Height	AFE049,AFE050
G		d.	Profile	AFE123,AFE126
G		e.	True position	AFE160,AFE160A,AFE161,AFE161A
G		f.	Flatness	AFE009,AFE013
G		g.	Run out	AFE136,AFE135
I,J	(T)	h.	Ultrasonic	AFE166
I,J		i.	Dye penetrant	AFE051
K	(T)	j.	Elongation	AFE083B
K		k.	Heat treat	AFE065
K	(T)	l.	Ultimate strength	AFE083

K	(T)	m.	Yield strength	AFE083A
I,K	(T)	n.	Electrical conductivity	AFE039
I,K		o.	Material composition	AFE080

11. For Refurbished Housing Assembly-Nose/Inlet Nozzle verify:

G		a.	Wall thickness	AFE168
G		b.	Height	AFE048
G		c.	Roundness	AFE130,AFE132
G		d.	Diameter	AFE015
G		e.	Straightness	AFE101,AFE103,AFE105,AFE107,AFE152
G		f.	Flatness	AFE154,AFE156
J		g.	Dye penetrant	AFE033

12. For New Housing Assembly, Cowl, Nozzle verify:

G		a.	Inside diameter	ADH009,ADH008
G		b.	Diameter through holes	ADH011,ADH011A,ADH010,ADH010A
G		c.	Diameter threaded holes	ADH011B,ADH010B
G		d.	Position of the through holes to Datums A and B	ADH045,ADH044
G		e.	Position to Datum A and Datum B	ADH044A,ADH044B,ADH045A,ADH045B
G		f.	Wall thickness	ADH054,ADH053
G		g.	Perpendicularity to Datum A of Datum B	SAA028,SAA030
I,K	(T)	h.	Electrical conductivity	ADH017
K	(T)	i.	Tensile strength	AKT007
K	(T)	j.	Yield strength	AKT007A
K	(T)	k.	Elongation	AKT007B
J		l.	Dye penetrant after machining	ADH012
J		m.	Ultrasonic test before final machining	ADH046
K		n.	Heat treat	AKT003

13. For Refurbished Housing Assembly, Cowl, Nozzle verify:

G		a.	Wall thickness	ADH055
G		b.	Flange and housing ID roundness	ADH026

14. For New Bolt, Aluminum Coated, Nozzle, verify:

G,K		a.	By lot sample, critical dimensions	ABQ008,ABQ009,ABQ010,ABQ011
G,I,K		b.	Parts are manufactured from specified material	ABQ004
J,K		c.	Parts are 100% magnetic particle inspected	ABQ005
K	(T)	d.	Tensile properties	ABQ002
H,I,K		e.	Parts are aluminum coated	ABQ001
H,K		f.	Lubricant application per MIL specification	ABQ006
H,K		g.	Locking element is per specification	ABQ007
G,K		h.	Screw lot number	ABQ003

15. For New Insert, Helical Coil, verify:

H,I,K		a.	Material is corrosion resistant steel	RHB001

16. For New Bearing Assembly, Nozzle Flexible verify:

H,I,J		a.	Corrosion-preventive compound (grease) is properly applied to designated areas	ADJ035E