ATK ALLIANT TECHSYSTEMS
THIOKOL PROPULSION

CRITICAL ITEMS LIST (CIL)

No. 10-02-01-06R/01

SYSTEM:	Space Shuttle RSRM 10	CRITICALITY CATEGORY:	1
SUBSYSTEM:	Nozzle Subsystem 10-02	PART NAME:	Fixed Housing Assembly (1)
ASSEMBLY:	Nozzle and Aft Exit Cone 10-02-01	PART NO.:	(See Section 6.0)
FMEA ITEM NO.:	10-02-01-06R Rev N	PHASE(S):	Boost (BT)
CIL REV NO.:	N (DCN-533)	QUANTITY:	(See Section 6.0)
DATE:	17 Jun 2002	EFFECTIVITY:	(See Table 101-6)
SUPERSEDES PAGE:	318-1ff.	HAZARD REF.:	BN-04
DATED:	10 Apr 2002		
CIL ANALYST:	B. A. Frandsen		
APPROVED BY:		DATE:	
RELIABILITY ENGINEERING:	K. G. Sanofsky	17 Jun 2002	
ENGINEERING:	P. M. McCluskey	17 Jun 2002	

1.0 FAILURE CONDITION: Failure during operation (D)

2.0 FAILURE MODE: 1.0 Thermal failure of carbon phenolic ablative liner or glass phenolic insulator components

3.0 FAILURE EFFECTS: Burn-through of fixed housing assembly, breakup and loss of nozzle causing loss of RSRM, SRB, crew, and vehicle

4.0 FAILURE CAUSES (FC):

FC NO.	DESCRIPTION	FAILURE CAUSE KEY
1.1	Carbon phenolic or glass phenolic material not manufactured to required thickness	A
1.2	Bond line failure of the glass phenolic-to-metal housing bond, glass phenolic-to-carbon phenolic bond, fixed housing insulator-to-inner boot ring bond, or inner boot ring-to-metal housing bond	
1.2.1	Bonding surfaces not properly prepared or adequately cleaned	B
1.2.2	Bonding material not properly mixed, applied, or cured	C
1.2.3	Contamination during processing	D
1.2.4	Processing environments detrimental to bond strength	E
1.2.5	Nonconforming material properties	F
1.2.6	Bond lines not to required thickness	G
1.3	Structural failure	
1.3.1	Improper ply angle orientation in phenolic components	H
1.3.2	Nonconforming raw material properties	I
1.3.3	Nonconforming manufacturing processes	J
1.3.4	Nonconforming dimensions	K

1.4	Improper thermal characteristics due to nonconforming raw material properties	L
1.5	Component degradation during assembly, handling, transportation, or storage	M
1.6	Temperature, humidity, vibration, and shock during boost phase	N
1.7	Porosity, voids, de-laminations, inclusions, or cracks	O

5.0 REDUNDANCY SCREENS:

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

6.0 ITEM DESCRIPTION:

Fixed housing assembly--Insulator and liner

1. The RSRM fixed housing assembly is one of a series of interconnected, modular nozzle components (Figure 1). The fixed housing assembly of the RSRM nozzle consists of a conical steel shell having its forward flange attached to the bearing assembly and its aft flange connected to the motor aft segment attachment flange. The fixed housing is approximately 19 inches from flange-to-flange with a small diameter of approximately 75 inches and a large diameter of approximately 108 inches. Figure 2 depicts a sectional view of the RSRM nozzle showing the fixed housing assembly.

2. The fixed housing assembly consists of a steel shell housing insulated with a thin layer of glass-cloth phenolic and a thicker layer of carbon-cloth phenolic (Figure 3). The glass phenolic layer is bonded to the steel shell with a two-part epoxy adhesive, and carbon phenolic is bonded to the glass phenolic with a phenolic resin. Materials are listed in Table 1.

TABLE 1. MATERIALS

Drawing No.	Name	Material	Specification	Quantity
1U77640	Segment, Rocket Motor, Aft			1/motor
1U77660	Nozzle Assembly, Final			1/motor
1U79150	Housing Assembly, Nozzle Fixed			1/motor
1U79151	Housing and Boot Assembly, Nozzle			1/motor
5U77686	Fixed Housing Insulation			1/motor
	Fixed Housing Assembly (Test)	Product Specification	STW3-3456	A/R
	Ablative Liner	Carbon-Cloth Phenolic	STW5-3279	812 lbs.
	Insulation	Glass-Cloth Phenolic	STW5-2651	265 lbs.
	Tapes	Cloth Phenolic, Pre-impregnated	STW5-3621	A/R
	Resin, Phenolic Laminating	Thermosetting Phenolic	MIL-R-9299	A/R
	Adhesive, TIGA 321	Adhesive, Two-Part	STW5-9203	A/R
	Shims	Two-Part Epoxy	STW5-9203	A/R
	Shim Adhesive	Adhesive	STW5-9205	A/R
	Primer, Cyclohexane Silane	Silane Primer	STW5-9206	A/R

6.1 CHARACTERISTICS:

1. The fixed housing assembly extends from the aft dome to the flexible bearing aft end ring and is the primary support structure for the nozzle assembly. The fixed housing assembly is subjected to case pressure loads and axial compressive blowout loads and interfaces with the aft dome boss and provides for dual O-ring seals to ensure positive sealing of this critical surface. The fixed housing consists of a two-component liner

(glass phenolic insulator and carbon phenolic liner) bonded to a steel fixed housing.

2. Glass-cloth pre-impregnated with phenolic resin is used as an insulator next to the steel shell because of its low-thermal conductivity. It also provides structural support for ablative liner material next to it.

3. Carbon-cloth pre-impregnated with phenolic resin is used as ablative liner over glass phenolic and is bonded to the glass phenolic with laminating phenolic resin. Carbon-cloth phenolic material has a relative high-thermal conductivity as compared to glass phenolic thus aiding in heat protection.

4. Structural analyses for nozzle bondlines using adhesives EA946 and EA913NA do not include residual stresses. For this reason, RWW0548 has been approved to waive the requirements to include residual stress in ultimate combined load structural analyses for the current nozzle structural adhesives. New analyses techniques developed for TIGA adhesive may show a negative margin of safety if same analyses were applied to EA946 and EA913NA bondlines. Extensive testing and model validation was conducted for TIGA adhesive to address residual stresses, which have not been performed on EA946 and EA913NA adhesives. Therefore, inclusion of residual stresses in the structural analyses for EA946 and EA913NA bondlines is waived.

   Flight rational includes the following: 1. Nozzles are considered fully qualified with a demonstrated reliability of 0.996. 2. The 2.0 bond safety factor is meant to cover unknown conditions such as residual stress effects. 3. Process controls have been added to include monitoring and controlling of bond loads, monitoring Coeflex-shim differentials, controls on rounding forces, controls on flange mismatch, controls on transportation temperatures, improvements in grit blast, eliminated bond surface contact with black plastic, TCA-wipe prior to grit blast rather than after, and other process changes. 4. The use of improved materials include adding silane primer (adhesion promoter), virgin grit blast media for pre-bond grit blast, and incorporate the use of fresh adhesive for nozzle structural bonds.

   Future incorporation of TIGA 321 adhesive on RSRM-94 will eliminate the need for waiver RWW0548. Certification analyses will include residual stresses for TIGA 321 adhesive.

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

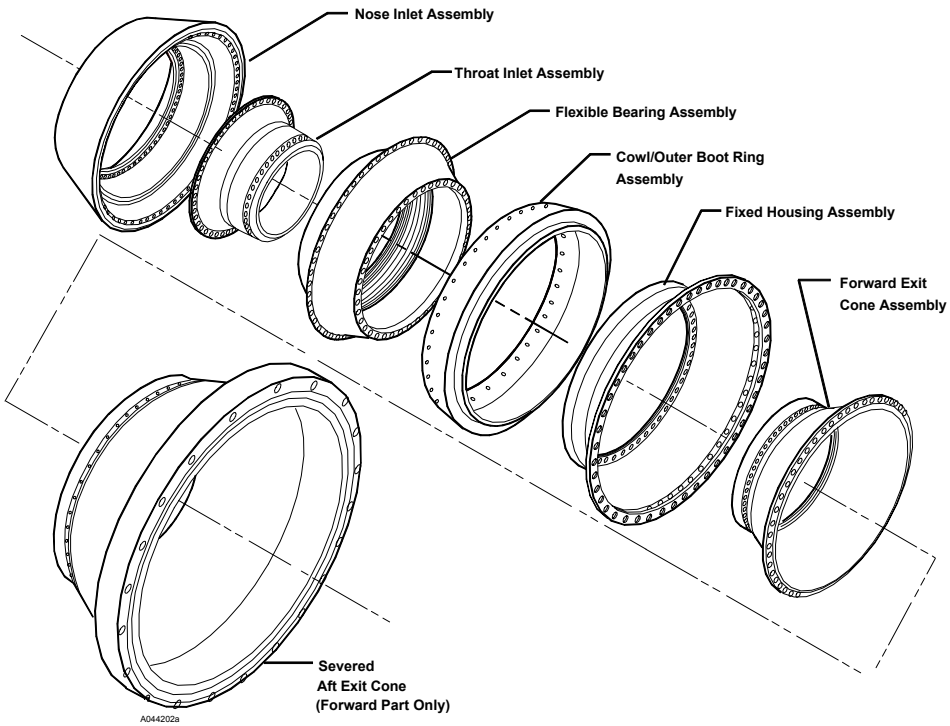

Figure 1. RSRM Nozzle Assembly Components

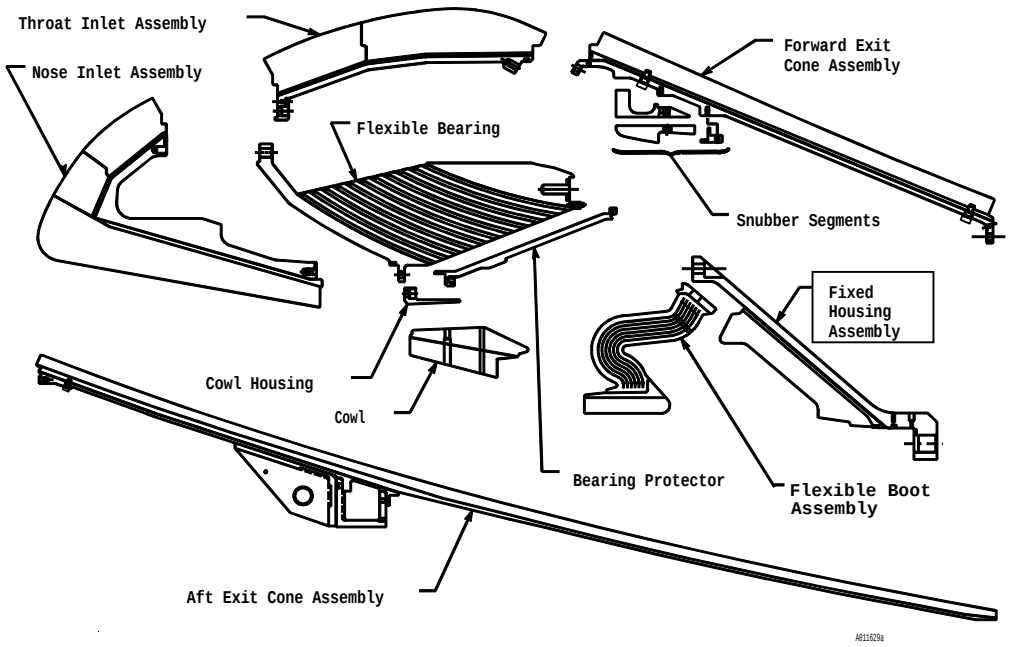

Figure 2. Exploded Section of Nozzle

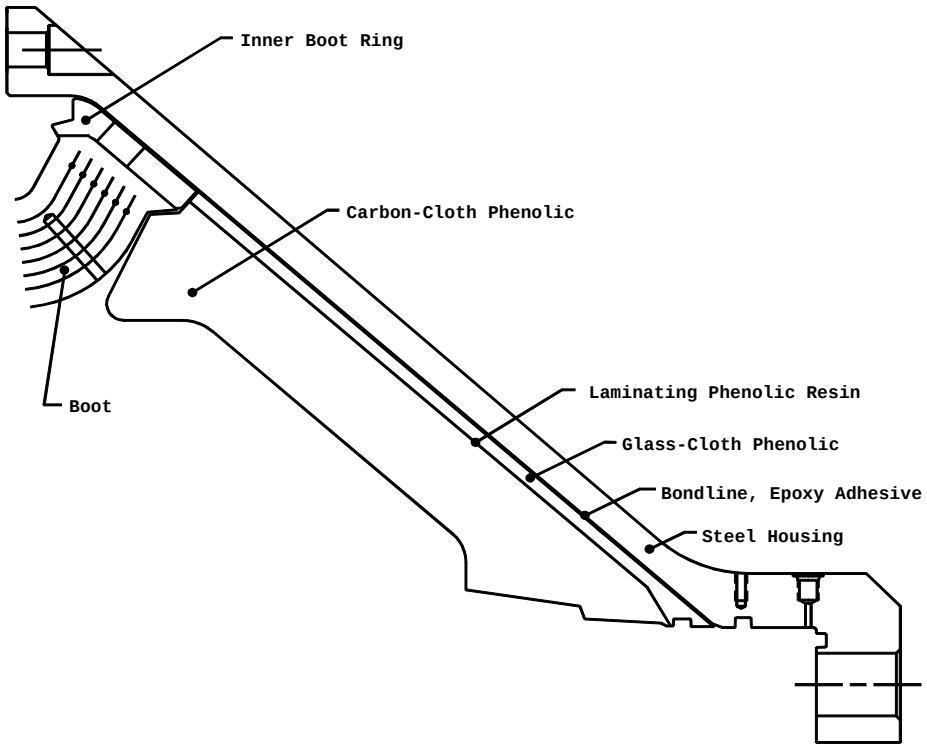

Figure 3. Fixed Housing Assembly

9.0 RATIONALE FOR RETENTION:

9.1 DESIGN:

DCN	FAILURE CAUSES	
A,K	1.	Thickness of carbon-cloth phenolic and glass-cloth phenolic is controlled by wrapping the phenolics on a mandrel envelope which is designed to generate the final contour of the fixed housing assembly. Phenolics are machined to referenced points per engineering drawings.
A,K	2.	The fixed housing assembly design is per engineering drawings.
A,K,M	3.	Pre-assembly mismatch causing bond line stresses was shown by analysis to be within allowable limits per TWR-16975.
A,B,C,D,E,F,G, H,I,J,K,,L,O,N	4.	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 fixed housing 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.
B,C,D,E,J	5.	Preparation and cleaning of 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. Conscan also verifies surface condition of bonding surfaces prior to bonding. Surface inspection type is per shop planning. Preparation, cleaning, and inspection methods for aft exit cone bond lines are identified as process critical planning.
B,D,E,J	6.	The recommended time limit between grit blasting and bonding operations on steel parts is six hours per shop planning. This is not an engineering requirement. However, if the six-hour recommendation is exceeded, manufacturing engineering is notified.
C	7.	The material description of epoxy adhesive is per TWR-15995 and engineering. Two-part epoxy adhesive is used to bond the phenolic insulator to the steel housing, the inner boot ring to the steel housing, and the phenolic insulator to the inner boot ring.
C	8.	Adhesive thickness compared to shim thickness used in the bonding process is per engineering.
C	9.	A material description of phenolic resin used in the over wrap of carbon-cloth phenolic liner to the glass-cloth phenolic insulator is per engineering The resulting structure is autoclave cured per shop planning.
C	10.	Adhesive Epoxy is screened onto the liner to a thickness that will assure adequate squeeze out. A wetting coat only is applied to the metal assembly. Bonding surfaces are forced together until the metal shell contacts the adhesive shims. Excess adhesive is removed at the interfacing surfaces.
C,M,O	11.	Ultrasonic testing and inspection to detect bond line voids is performed during post flight inspection for the fixed housing bond lines only.

D,E	12.	Contamination control requirements and procedures are per TWR-16564.
D,E	13.	The nozzle manufacturing building is a controlled environment facility with temperature and humidity controls. There is controlled access to the facility through a separate room with a card reader.
F	14.	Material properties for epoxy adhesive are per engineering.
F	15.	Material properties for laminating phenolic resin are per government specifications for Resin, Phenolic Laminating.
G	16.	Bond line thickness between the insulator-to-housing, insulator-to-liner, inner boot ring-to-housing, and insulator-to-inner boot ring is per shop planning.
G	17.	Insulation-to-housing bond line thickness is per engineering drawings.
G	18.	The glass phenolic insulation-to-carbon phenolic liner bond line is a thin layer of resin per engineering drawings.
G	19.	Inner boot ring-to-fixed housing assembly (steel housing and insulator) bond gap is per engineering drawings and shop planning.
G	20.	Location and thickness of shims is determined by dry-fit of mating parts using Coe-flex impression compound per shop planning.
G	21.	Preparation methods for bond line thickness are per shop planning. Surface inspection type and the bonding process is per process critical planning.
H	22.	Bias-cut glass-cloth phenolic is wrapped on the tooling mandrel to required ply angles.
H	23.	Bias-cut carbon-cloth phenolic is wrapped over the glass-cloth phenolic to the required ply angle. The ply angle is per tooling and machine set up.
I,L	24.	Material properties affecting structural and thermal integrity are controlled per Thiokol or Government specifications for the following materials: a. Carbon-cloth phenolic b. Glass-cloth phenolic c. Resin, Phenolic Laminating d. Adhesive Epoxy
I,L	25.	Intermixing of equivalent materials from different suppliers within glass phenolic or carbon phenolic components is not permitted per engineering drawings.
J	26.	Fixed housing assembly manufacturing processes for carbon phenolic ablative liner and glass phenolic insulator components are per engineering drawings and shop planning.
J,O	27.	Manufacturing processes were demonstrated on development and qualification motors per TWR-18764-09.
M	28.	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.
M	29.	Handling and lifting requirements for SRM components are similar to those for previous and current programs conducted by Thiokol per TWR-13880.

M	30.	Transportation and handling of nozzle fixed housing assembly items by Thiokol is per IHM 29.
M	31.	The fixed housing assembly is covered with a protective cover and stored in a temperature controlled building until used as a part of a larger assembly.
M	32.	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 external environments at all times by either covers or shipping containers until assembled as part of the RSRM.
M	33.	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.
M	34.	Support equipment used to test, handle, transport, and assemble or disassemble the RSRM is certified and verified per TWR-15723.
M	35.	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.
M	36.	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.
M	37.	Thermal analyses were performed for RSRM components during in-plant transportation and storage to determine acceptable temperature and ambient environment exposure limits per TWR-50083. Component temperatures and exposure to ambient environments during in-plant transportation or storage are per engineering.
N	38.	Analysis is conducted by Thiokol engineering to assess dynamic, acoustic, and vibration response of RSRM nozzle operation during the boost phase per TWR-16975.
N	39.	Analysis of nozzle natural frequency and vibration response throughout motor burn is per TWR-16975.
N	40.	Environmental thermal conditions, similar to those occurring during the boost phase, were demonstrated on static firings and documented in TWR-18764-09.
O	41.	Fixed housing assembly manufacturing processes are per engineering drawings and shop planning.
O	42.	Surface and subsurface defect criteria rationale are per TWR-16340.
B	43.	A Spray-in-Air cleaning system is used to clean metal components as part of the bonding surface preparation processing sequence.
E,M,N	44.	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.

E,M,N

45. Structural analysis documented in TWR-16975 show that nozzle phenolic-to-metal bondlines have positive margins of safety based on a safety factor of 2.0. These analyses used standard conditions as allowed by the CEI specification.

9.2 TEST AND INSPECTION:

DCN	FAILURE CAUSES and TESTS (T)			CIL CODES
		1.	For New Fixed Housing Insulation verify:	
A,K		a.	Current vertical boring machine (VBM) re-calibration date	AHN008
A,H,J,K		b.	Mandrel used for phenolic wrap is as specified in planning (first and second wrap)	AHN059,AHN063
A,J,K		c.	Line profile of phenolic parts	AGN025,AHN026,AHN035,AHN036
B,J		d.	Phenolic surface is clean prior to resin application	AHN012
B,D,E,J		e.	Contaminant material, shiny appearance and gloss is removed from bonding surface after grit blast	ADS049
C,E,G,J		f.	That a thin uniform coat of resin is applied to the glass-cloth phenolic billet prior to over wrapping	AHN002
C,E,J		g.	Autoclave cure of phenolic (glass and carbon) is complete and acceptable per planning requirements	AHN004,AHN006
C,I,L		h.	Phenolic resin is from one-supplier-source only	AHN049
D,E,J,O	(T)	i.	Phenolic components have been radiographic inspected	ADS077
I,J,L		j.	No intermixing of equivalent materials (carbon and glass cloth)	AHN031,AHN033
I,J,L		k.	Phenolic cloth shelf life is not exceeded	AHN050,AHN052
J		l.	Phenolic tape wrap is complete and acceptable per planning requirements	AHN010,AHN013
J		m.	Mandrel is cleaned and prepared per planning requirements	AHN011
J		n.	Material is glass or carbon-cloth phenolic per engineering	AHN027,AHN030
J		o.	Current recycle on mandrel	AHN039
J		p.	Alcohol wipe of phenolic surface after final machine (glass and carbon)	AHN000,AHN001
		2.	For New Housing Assembly, Nozzle Fixed verify:	
B		a.	Bonding fixture is cleaned and air dried per planning requirements	ADS027
B,D,E,J		b.	Housing bonding surfaces are cleaned and free from unacceptable contamination per planning requirements	ADS024
B,D,E,J		c.	Phenolic bonding surfaces are cleaned and free from grease and contamination using black light	ADS068
B,D,E,J		d.	Grit blast of housing is complete and acceptable	ADS053
B,C,D,E,J		e.	Per CONSCAN that steel housing bonding surfaces are free of unacceptable contamination prior to bonding	ABA005
B,C,D,E,J		f.	Primer application begins within specified time limit after CONSCAN	ABA006
B,C,E,J		g.	Silane primer application on bond surfaces with minimum overlap	ADS001
B		h.	Liner bonding surfaces are air dried per planning requirements	ADS003
B,C,D,E,F I,J,L	(T)	i.	Witness panel results for adhesive integrity	BQM001
C,E,G		j.	Adhesive is applied evenly on bonding surface in a thin uniform layer	ADS074
C,F,I,L	(T)	k.	Cure cup hardness and adhesive per engineering	AOE006
C		l.	Billet is seated within pot life of adhesive	ADS011
C,E,J		m.	Adhesive is cured per planning requirements	ADS009
C		n.	Adhesive (Two-part Epoxy) is mixed per planning requirements	AOE000
C,E,J		o.	Proper cure of silane primer	ADS000
E		p.	Temperature of housing bonding surface per planning requirements	ADS016
G		q.	Bond line thickness from Coe-flex impressions	ADS017
G		r.	Gap is established using pre-cured shims bonded in place with adhesive per planning requirements	ADS044
G,J		s.	Shim size and location from dry-fit of mating parts	ADS043
G,J		t.	Bonding of insulation to housing using adhesive is complete and acceptable	ADS015

J		u.	Line profile from Datum B and A is within tolerance from points E to F	ADS073
J		v.	Line profile to Datum B and C is within tolerance from points A to C	ADS047
J		w.	Line profile to Datum C and D is within tolerance from points A to B	ADS046
M		x.	Clean protective cover is installed and stored per planning requirements	ADS087
M		y.	Component temperatures and exposure to ambient environments during in-plant transportation or storage are per engineering	BAA035
O		z.	Alcohol wipe of carbon and glass is per engineering	ADS005

3. For New Fixed Housing Assembly (Test) verify:

J	(T)	a.	Compressive strength (carbon and glass)	AHN015,AHN017
J	(T)	b.	Residual volatiles (carbon and glass)	AHN042,AHN044
J	(T)	c.	Resin content (carbon and glass)	AHN046,AHN048
J	(T)	d.	Specific gravity (carbon and glass)	AHN054,AHN056

4. For New Housing and Boot Assembly, Nozzle verify:

B,C,D,E,J		a.	Primer application begins within specified time limit after CONSCAN	ABA008
B,J		b.	Cleaning of bonding surfaces is performed per planning requirements	ABW014,ABW015
B,C,D,E,J		c.	CONSCAN of the steel housing bonding surfaces prior to bonding	ABA007
B,E,G,J		d.	Silane primer application on bond surfaces with minimum overlap	ABW004
B		e.	Bonding surface of inner boot ring is free from contamination (Black light)	ABW021
B,D,E		f.	Grit blast of housing is complete and acceptable	ABW035
B,D,E,J		g.	Fixed housing bonding surfaces are free from unacceptable contamination per planning requirements (Black light)	ABW040
B		h.	Bonding surfaces of fixed housing insulation are free from unacceptable contamination (Black light)	ADS030
B,C,D,E, F,I,J,L	(T)	i.	Witness panel results for adhesive integrity	SAA036
C,E,J		j.	Proper cure of silane primer	ABW001
C,E,J		k.	Cure is complete and acceptable per planning requirements	ABW024
C		l.	Parts are seated within pot life of adhesive	ABW045
C		m.	Adhesive (Two-part Epoxy) is mixed per planning requirements	AOE005
C,E,G		n.	Adhesive is applied to bonding surface per planning requirements	ABW000
C,F,I,L	(T)	o.	Cure cup hardness for process finalization of inner boot ring to fixed housing	AOE008
E		p.	Temperature of bonding surfaces per planning requirements	ABW012
G,J		q.	Bonding of inner boot ring to fixed housing using adhesive, epoxy is complete and acceptable	ABW009
G		r.	Bond line thickness by Coe-flex impressions	ABW007
G		s.	Gap is established using pre-cured shims bonded in place with adhesive per planning requirements	ABW029
G		t.	Shim size and location from dry-fit of mating parts	ABW058
I,L		u.	Storage life of epoxy adhesive	AOE059
C,D,E,F	(T)	v.	Witness panel tests for radial bond lines	AOE072

585 5. For New Approved Solvent, verify:

B,D		a.	Certificate of Conformance is complete and acceptable	AJJ007A

6. For New Primer, Adhesive (Silane) verify:

C		a.	Adhesive primer is properly mixed	AET002
C,F,I,L	(T)	b.	Infrared identification	ANY022
C,F,I,L	(T)	c.	Bond strength and durability	ANY000
C,F,I,L	(T)	d.	Acidity	ANY001

C,F,I,L		e.	Workmanship	ANY013
C,F,I,L		f.	Color	POG001
		6.	For New Primer, Cyclohexane Silane verify:	
C,F,I,L	(T)	a.	Percent solids	AMZ004,AMZ006
C,F,I,L	(T)	b.	Specific gravity	AMZ008,AMZ010
C,F,I,L	(T)	c.	Viscosity	AMZ012,AMZ014
C,F,I,L	(T)	d.	Infrared spectrum	AMZ002
		7.	For New Adhesive, Epoxy verify:	
F,I,L		a.	Pot life (adhesive)	AOE043,AOE046
F,I,L	(T)	b.	Epoxy paste viscosity	AOE083,AOE086
F,I,L	(T)	c.	Amine as nitrogen (curing agent)	AOE096,SAA045
F,I,L	(T)	d.	Epoxide equivalent (epoxy paste)	SAA044,SAA046
F,I,L	(T)	e.	Fracture toughness (adhesive)	AOE015
F,I,L	(T)	f.	Average molecular weight (epoxy paste)	AOE020
F,I,L	(T)	g.	Ingredient percentages	AOE023,AOE028
F,I,L	(T)	h.	Tensile adhesion strength	AOE062
F,I,L		i.	Visual examination (workmanship)	AOE099
		8.	For New Resin, Phenolic Laminating verify:	
F,I,L	(T)	a.	Specific gravity	AJG006
F,I,L		b.	Data pack is complete and acceptable	AJG022
F,I,L	(T)	c.	Viscosity	AJG037
		9.	For New Carbon-Cloth Phenolic verify:	
I,L	(T)	a.	Cloth content--uncured	AOD017
I,L	(T)	b.	Compressive strength--cured	AOD027
I,L	(T)	c.	Density--cured	AOD058
I,L	(T)	d.	Dry resin solids--uncured	AOD067
I,L	(T)	e.	Inter-laminar shear--cured	AOD075
I,L	(T)	f.	Resin content--cured	AOD112
I,L	(T)	g.	Resin flow--uncured	AOD140
I,L	(T)	h.	Sodium content--uncured	AOD164
I,L		i.	Supplier data pack is acceptable and complete	AOD206
I,L	(T)	j.	Volatile content--uncured	AOD222
I,L	(T)	k.	Carbon filler content--uncured	AOF000
		10.	For Retest Carbon-Cloth Phenolic verify:	
I,L	(T)	a.	Resin flow	AOD131
I,L	(T)	b.	Volatile content	AOD236
		11.	For New Glass-Cloth Phenolic verify:	
I,L	(T)	a.	Cloth content--uncured	AMN007
I,L	(T)	b.	Compressive strength--cured	AMN014
I,L	(T)	c.	Density--cured	AMN038
I,L	(T)	d.	Dry resin solids--uncured	AMN048
I,L	(T)	e.	Inter-laminar shear strength--cured	AMN057
I,L	(T)	f.	Resin content--cured	AMN088
I,L	(T)	g.	Resin flow--uncured	AMN121
I,L	(T)	h.	Volatile content--uncured	AMN195
I,L		i.	Supplier data pack is complete and acceptable	AMN172

			12.	For Retest Glass-Cloth Phenolic verify:	
	I,L	(T)	a.	Resin flow	AMN103
	I,L	(T)	b.	Volatile content	AMN178
			13.	For Retest Phenolic Slit Tape verify:	
	I,L	(T)	a.	Resin flow	AMN103A,AOD131A
	I,L	(T)	b.	Volatile content	AMN178A,AOD236A
			14.	For New Segment Assembly, Rocket Motor, verify:	
	M		a.	Nozzle assembly for handling damage and that protective cover is cleaned and in place	AGJ167
585	M		b.	Approved solvent wipe	AGJ029
	M		c.	Component environments during in-plant transportation or storage	BAA030
			15.	For New Nozzle Assembly, Final verify:	
	M		a.	Alcohol wipe test of nozzle insulation prior to shipment to nozzle installation operation	ADI014
			16.	For Nozzle Assembly, Structural Bond line Requirements For verify:	
	B,C,D,E, F,I,J,L	(T)	a.	Phenolic-to-adhesive interface checks meet specification requirements	PPC001