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SPACE SHUTTLE

Solid Rocket Motor
Thiokol Corporation

Final Postflight Hardware Evaluation Report 360T026 (RSRM-26, STS-47)

Includes Sections 1-6

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Final Postflight Hardware Evaluation Report 360T026 (RSRM-26, STS-47)

April 1993

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Case Design

Joints & Seals Design

Integration Design

Nozzle Design

Igniter / Instrumentation / Electrical Design

Thermal Insulation Design

Quality, Performance Evaluation

Systems Assurance

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List of Acronyms

Acronym	Definition
CCP	Carbon Cloth Phenolic
CEI	Contract End Item
CPT	Component Program Team
ET	External Tank
GCP	Glass Cloth Phenolic
ID	Inside Diameter
IFA	In-Flight Anomaly
KSC	Kennedy Space Center
LDI	Low Density Indication
LH	Left Hand
NASA	National Aeronautics and Space Administration
OD	Outside Diameter
PEEP	Postflight Engineering Evaluation Plan
PFAR	Postfire Anomaly Record
PFOR	Postfire Observation Record
RH	Right Hand
RSRM	Redesigned Solid Rocket Motor
RTV	Room Temperature Vulcanized (Rubber)
S&A	Safe and Arm Device
SCP	Silica Cloth Phenolic
SII	SRM Ignition Initiator
STS	Space Transportation System
TWR	Thiokol Wasatch Report

1.0 INTRODUCTION

This document is the final report for the Clearfield disassembly evaluation and a continuation of the KSC postflight assessment for the 360T026 (STS-47) RSRM flight set. All observed hardware conditions were documented on PFORs and are included in Appendices A, B, and C. Appendices D and E contain the measurements and safety factor data for the nozzle and insulation components. This report, along with the KSC Ten-Day Postflight Hardware Evaluation Report (TWR-64203), represents a summary of the 360T026 hardware evaluation. The as-flown hardware configuration is documented in TWR-60472. Disassembly evaluation photograph numbers are logged in TWA-1987.

The 360T026 flight set disassembly evaluations described in this document were performed at the RSRM Refurbishment Facility in Clearfield, Utah. The final factory joint demate occurred on 12 April 1993.

Detailed evaluations were performed in accordance with the Clearfield PEEP, TWR-50051, Revision A. All observations were compared against limits that are also defined in the PEEP. These limits outline the criteria for categorizing the observations as acceptable, reportable, or critical. Hardware conditions that were unexpected and/or determined to be reportable or critical were evaluated by the applicable CPT and tracked through the PFAR system.

Figure 1 shows the RSRM Case Configuration.

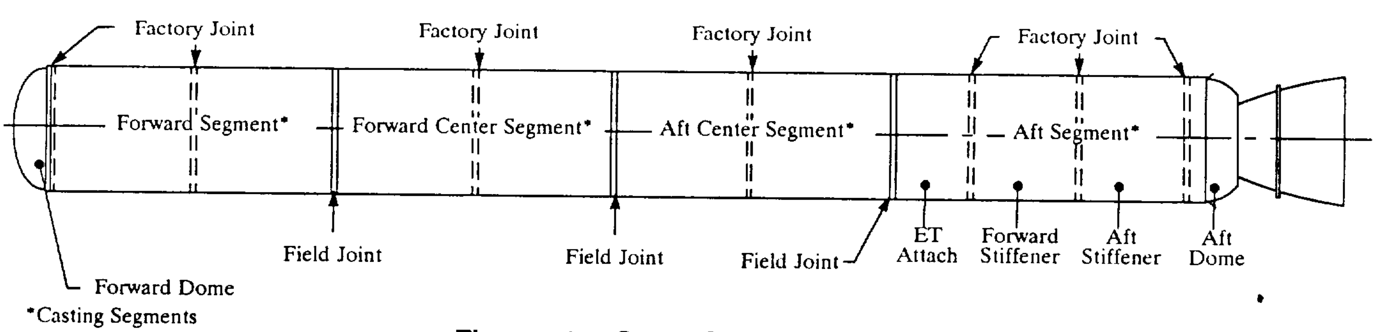

Figure 1. Case Configuration

2.0 REFERENCES

The following documents are referenced herein:

CPW1-3600A	Prime Equipment End Item Detail Specification, Part I of Two Parts; Performance, Design, and Verification Requirements, Space Shuttle Redesigned Solid Rocket Motor CPW1-3600 For Space Shuttle Solid Rocket Motor Project, Operational Flight Motors (RSRM-4 and subsequent)
TWA-1987	360T026, STS-47, Clearfield Postflight Photo Log
TWR-50050	KSC Postflight Engineering Evaluation Plan (PEEP)
TWR-50051	Clearfield Postflight Engineering Evaluation Plan (PEEP)
TWR-60472	STS-47, 360T026, KSC Processing Configuration and Data Report
TWR-64201	Postflight Hardware Special Issues, 360T026 (STS-47), Clearfield
TWR-64203	KSC Ten-Day Postflight Hardware Evaluation Report, 360T026 (STS-47)
TWR-60205	RSRM Hardware Assessment at KSC (Presentation of 360T026 PFARs to RPRB)

[redacted]

3.0 EVALUATION SUMMARY

Table 1 provides a summary of all postflight-related Squawks/Preliminary PFARs, PFARs, IFAs, and SPRs for 360T026.

Table 1. Summary of 360T026 Problems

	Squawks/Prelim. PFARs	PFARs	IFAs	SPRs
KSC	26	16	0	0
Clearfield	20	8	0	1
Total	**46**	**24**	**0**	**1**

A list of all 360T026 PFARs is included in Table 2. This includes Squawks (written at KSC) and Preliminary PFARs (written at Clearfield) that were written and not elevated to PFARs. Information relating to postflight Squawks can be found in TWR-64203.

3.1 CEI Specification Compliance

Based on hardware evaluations at KSC and Clearfield, as defined in the respective PEEPs (TWR-50050, Revision C and TWR-50051, Revision A), all CEI (CPW1-3600A) motor performance requirements were met.

Table 2. Problem Summary for 360T026

[illegible] PRELIM. PFAR NUMBER	TYPE	ELEVATED FROM	REFERENCE SPR NUMBER	REFERENCE IFA NUMBER	EVALUATION LOCATION	COMPONENT TEAM	RPRD DATE	DESCRIPTION
47-001	SQUAWK	N/A	N/A	N/A	KSC	CASE	09/15/92	UNBONDED PAINT AT 350-DEGREES OF CENTER FIELD JOINT AFT OF K5NA RUN
47-004	SQUAWK	N/A	N/A	N/A	KSC	JPS/TPS	09/15/92	MISSING K5NA AT 210-DEGREES ON THE AFT STIFFENER RING SPLICE PLATE
47-014	SQUAWK	N/A	N/A	N/A	KSC	JPS/TPS	09/16/92	MISSING PAINT ON CORK RUNS ADJACENT TO SYSTEMS TUNNEL OF FORWARD CENTER SEGMENT
47-022	SQUAWK	N/A	N/A	N/A	KSC	IGNITER	09/21/92	GRAYISH FOREIGN MATERIAL ON S&A GASKET RETAINER
47-024	SQUAWK	N/A	N/A	N/A	KSC	SEALS	09/21/92	FOREIGN (WHITEISH) MATERIAL ON NOZZLE-TO-CASE JOINT PACKINGS WITH RETAINERS
47-026	SQUAWK	N/A	N/A	N/A	KSC	SEALS	09/21/92	MACHINE MARKS ON NOZZLE-TO-CASE JOINT PACKING WITH RETAINERS
47-028	SQUAWK	N/A	N/A	N/A	KSC	SEAL SURF.	09/21/92	SCRATCHES ON SEAL SURFACE OF FIXED HOUSING RADIAL BOLT HOLE SPOTFACES
47-038	SQUAWK	N/A	N/A	N/A	KSC	CASE	09/25/92	UNBONDED PAINT ON CASE CENTER FIELD JOINT (CLEVIS)
47-039	SQUAWK	N/A	N/A	N/A	KSC	CASE	09/25/92	PITTING AT FORWARD FIELD JOINT HEATER SPOT BOND LOCATION
47-040	SQUAWK	N/A	N/A	N/A	KSC	CASE	09/25/92	PITTING AT AFT FIELD JOINT HEATER SPOT BOND LOCATION
47C-01	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	09/25/92	DAMAGED AREAS ON THE NOSE INLET ASSEMBLY PHENOLICS
47C-03	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	09/29/92	FOREIGN MATERIAL ON THE JOINT 4 PRIMARY SEAL SURFACE
47C-05	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	09/29/92	SLAG DAMAGE ON THE BEARING PROTECTOR
47C-06	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	09/30/92	BUBBLED PAINT ON THE FIXED HOUSING ID
47C-08	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	09/30/92	ADHESIVE AROUND SPRING PIN HOLES ON COWL HOUSING ID
47C-11	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	09/30/92	POSTBURN SEPARATION IN THROAT INLET RING FORWARD END
47C-12	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	10/01/92	HEAT AFFECTED PHENOLICS ON THE AFT END OF THE NOSE INLET ASSEMBLY AT THE GAS PATH AREA
47C-13	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	10/01/92	HEAT AFFECTED PHENOLICS ON THE COWL ASSEMBLY AT THE GAS PATH AREA
47C-16	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	10/02/92	ABNORMAL FIXED HOUSING BONDLINE FAILURE MODE
47C-17	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	10/07/92	RESIN GLAZE ON FIXED HOUSING
47C-18	PRELIM.	N/A	N/A	N/A	H-5/H-7	NOZZLE	10/07/92	RESIN GLAZE ON FIXED HOUSING
47C-20	PRELIM.	N/A	N/A	N/A	H-5/H-7	INSULATION	02/05/93	APPARENT COMPLIANCE SAFETY FACTOR VIOLATIONS OPEN, FOR AFT CENTER SEGMENT
360T026A-01	PFAR	47-002	N/A	N/A	KSC	JPS/TPS	10/14/92	VOID IN K5NA CLOSEOUT AT 30-DEGREE HAT BAND TRUNION CLOSEOUT ON FORWARD FIELD JOINT FJPS
360T026A-02	PFAR	47-013	N/A	N/A	KSC	JPS/TPS	10/14/92	MISSING PAINT ON CORK RUNS ADJACENT TO SYSTEM TUNNEL OF AFT SEGMENT
360T026A-03	PFAR	47-018	N/A	N/A	KSC	NOZZLE	10/14/92	FOREIGN MATERIAL (DARK FLUID) FROM AFT EXIT CONE FORWARD SHEAR PIN VENT HOLE
360T026A-04	PFAR	47-019	N/A	N/A	KSC	SEAL SURF.	10/14/92	PIT ON B-B FLANGE SECONDARY SEAL SURFACE
360T026B-05	PFAR	47-020	N/A	N/A	KSC	IGNITER	10/14/92	GREASE IN IGNITER ADAPTER S&A BOLT HOLES
360T026A-06	PFAR	47-021	N/A	N/A	KSC	IGNITER	10/14/92	CONTAMINATION ON S&A GASKET RETAINER
360T026A-07	PFAR	47-023	N/A	N/A	KSC	SEALS	10/14/92	FOREIGN (WHITE) MATERIAL ON NOZZLE-TO-CASE JOINT PACKINGS WITH RETAINERS
360T026A-08	PFAR	47-025	N/A	N/A	KSC	SEALS	10/14/92	CIRCUMFERENTIAL/TANGENTIAL ABRASIONS ON NOZZLE-TO-CASE JOINT PACKINGS WITH RETAINERS
360T026B-09	PFAR	47-027	N/A	N/A	KSC	NOZZLE	10/14/92	FOREIGN MATERIAL (METAL/FOIL) IN NOZZLE-TO-CASE JOINT POLYSULFIDE
360T026B-10	PFAR	47-030	N/A	N/A	KSC	CASE	10/14/92	FOREIGN MATERIAL ON FIELD JOINT CLOSURE PLUG & O-RING
360T026A-11	PFAR	47-035	N/A	N/A	KSC	JPS/TPS	10/14/92	PITTING AT FORWARD FIELD JOINT SPOT BOND LOCATIONS
360T026A-12	PFAR	47-036	N/A	N/A	KSC	SEAL SURF.	10/14/92	DIAGONAL SCRATCH ON IGNITER CHAMBER SEALING SURFACE
360T026A-13	PFAR	47-037	N/A	N/A	KSC	SEAL SURF.	10/14/92	IGNITER CHAMBER BLEND/REWORK ON OUTER SEALING/MATING SURFACE
360T026B-14	PFAR	47-041	N/A	N/A	KSC	IGNITER	10/14/92	BLUE AND WHITE FOREIGN MATERIAL IN IGNITER INNER JOINT
360T026B-15	PFAR	47-042	N/A	N/A	KSC	IGNITER	10/14/92	RED, BLUE AND GRAY/WHITE FOREIGN MATERIAL IN IGNITER OUTER JOINT
360T026B-16	PFAR	47-043	N/A	N/A	KSC	CASE	10/14/92	DAMAGED TANG FIELD JOINT ALIGNMENT SLOTS
360T026B-17	PFAR	47C-02	N/A	N/A	H-5/H-7	NOZZLE	10/14/92	DISCOLORATION AROUND THE FORWARD EXIT CONE AFT SHEAR PINS
360T026A-18	PFAR	47C-04	N/A	N/A	H-5/H-7	NOZZLE	10/14/92	FOREIGN MATERIAL (NYLOK) ON THE JOINT 5 PRIMARY O-RING
360T026A-19	PFAR	47C-07	N/A	N/A	H-5/H-7	NOZZLE	10/14/92	ADHESIVE AROUND SPRING PIN HOLES ON COWL HOUSING ID
360T026A-20	PFAR	47C-09	N/A	N/A	H-5/H-7	NOZZLE	10/14/92	BUBBLED PAINT ON FORWARD END RING OD
360T026B-21	PFAR	47C-10	N/A	N/A	H-5/H-7	NOZZLE	10/14/92	FOREIGN MATERIAL (WASHER) IN THE FLEX BEARING/THROAT CAVITY
360T026A-22	PFAR	47C-14	N/A	N/A	H-5/H-7	SEALS	10/14/92	CUT IN 306-DEGREE BARRIER-BOOSTER LEAK CHECK PLUG O-RING
360T026B-23	PFAR	47C-15	DR4-5/235	N/A	H-5/H-7	NOZZLE	10/14/92	ABNORMAL FIXED HOUSING BONDLINE FAILURE MODE
360T026A-24	PFAR	47C-19	N/A	N/A	H-5/H-7	NOZZLE	11/30/92	ABNORMAL AEC METAL-TO-ADHESIVE FAILURE MODE

4.0 COMPONENT EVALUATIONS

The following sections detail, by component, the hardware condition observed at Clearfield.

4.1 Insulation

Internal insulation evaluations of the igniters, case acreage, joints, and liners are summarized in the following sections. PFORs documenting the observations are found in Appendix A. Only the LH motor was evaluated as specified in the Clearfield PEEP.

4.1.1 Thermal Performance Evaluation

Summaries of the safety factors for the nozzle-to-case joint, field joint, factory joint, case acreage and igniter insulation are found in Table 3 through Table 7, respectively. All safety factors for these areas can be found in Appendix E, Tables E-1 through E-22. Note that all joint insulation regions, including factory joints, must meet a minimum safety factor of 2.0. A minimum safety factor of 1.5 is required in the acreage insulation regions.

The igniter insulation forward of the igniter nozzle insert (Station 5), requires a minimum remaining insulation thickness of 0.010 inch.

Preliminary PFAR 47C-20 was written for apparent CSF violations on the LH aft center segment (see Table 4). The apparent violations occurred at the factory joint (161.4 inch station) which has a history of providing inaccurate prefire data. The 161.4 inch station will be replaced by the 163.0 inch station effective RSRM-30. All other safety factors were within CEI specification limits. All thermal protection requirements were met.

4.1.2 Internal Insulation Samples

The Clearfield PEEP specified that removal of standard insulation samples was not required on 360T026.

Table 3. Summary of 360T026 Nozzle-to-Case Joint and Field Joint Insulation Safety Factors

Joint	Min. Compliance Safety Factor (CSF) *	Degree Location	Min. Actual Safety Factor (ASF) *	Degree Location
Nozzle-to-Case Joint, LH	3.6	0.0	4.1	0.0
Aft Field Joint, LH	6.0	90.0	6.2	90.0
Center Field Joint, LH	13.0	46.0	14.0	46.0
Forward Field Joint, LH	15.6	226.0	16.7	226.0

* Minimum required joint insulation safety factor is 2.0.

Table 4. Summary of 360T026 Factory Joint Insulation Safety Factors

Joint	Station (inches)	Min. Compliance Safety Factor (CSF) *	Degree Location	Min. Actual Safety Factor (ASF) *	Degree Location
Aft Dome/ Stiffener, LH	56.0	3.06	0.0	3.83	0.0
Stiffener/ Stiffener, LH	177.7	2.18	180.0	3.55	180.0
Stiffener/ET Attach, LH	299.1	2.86	180.0	4.68	180.0
Aft Center, LH	161.4	1.46**	90.0	4.22	90.0
Forward Center, LH	161.4	2.74	316.0	6.86	316.0
Forward Cylinder/ Cylinder, LH	162.0	3.99	286.0	5.35	286.0
Forward Dome/ Cylinder, LH	321.0	4.14	90.0	4.55	90.0

* Minimum required joint insulation safety factor is 2.0.

** Preliminary PFAR 47C-20 written on apparent CSF violations.

Table 5. Summary of 360T026 Case Acreage Insulation Safety Factors

Segment	Min. Compliance Safety Factor (CSF) *	Station (inches)	Degree Location	Min. Actual Safety Factor (ASF) *	Station (inches)	Degree Location
Aft Dome, LH	2.07	12.0	180.0	2.37	45.0	46.8
Aft, LH	2.25	133.0	0.0	2.32	145.5	0.0
Aft Center, LH	2.70	30.7	136.0	2.93	30.7	136.0
Forward Ctr., LH	3.10	178.0	0.0	3.89	71.5	316.0
Forward, LH	2.20	362.0	286.0	2.43	263.0	286.0

* Minimum required case acreage insulation safety factor is 1.5.

Table 6. Summary of 360T026 Igniter Insulation Safety Factors

	Min. Compliance Safety Factor (CSF) *	Station	Degree Location	Min. Actual Safety Factor (ASF) *	Station	Degree Location
LH Igniter Chamber OD	2.78	3	330.0	2.97	3	330.0
RH Igniter Chamber OD	2.52	3	0.0	2.73	3	0.0
LH Igniter Chamber ID	8.32	9	60.0	8.94	9	60.0
RH Igniter Chamber ID	9.98	7	180.0	10.94	7	180.0
LH Adapter	2.79	11	180.0	3.33	11	180.0
RH Adapter	3.32	11	180.0	3.97	11	180.0
LH Inner Joint	4.73	10	330.0	5.13	10	0.0
RH Inner Joint	9.58	10	90.0	10.76	10	90.0
LH Outer Joint	2.96	1	60.0	3.60	1	60.0
RH Outer Joint	3.13	1	330.0	3.73	1	330.0

* Minimum required safety factors are 1.5 for the chamber and adapter acreage and 2.0 for the igniter joints.

Table 7. Summary of 360T026 Igniter Insulation at Station 5

Igniter	Station	Minimum Postflight Thickness *	Degree Location
Igniter, LH	5	0.110	150.0
Igniter, RH	5	0.114	0.0

* Minimum required thickness is 0.010 inch at Station 5.

4.1.3 Liner

Detailed liner maps are included in Appendix A. The remaining liner patterns were typical of past flight motors.

4.1.4 Igniter Nozzle Insert

LH

The postflight igniter nozzle insert throat diameter measurements were 6.435 inches at 0 degrees, 6.421 inches at 60 degrees, and 6.438 inches at 120 degrees. Using the maximum postfire measurement provides a thermal factor of safety of 7.7.

RH

The postflight igniter nozzle insert throat diameter measurements were 6.372 inches at 0 degrees, 6.384 inches at 60 degrees, and 6.362 inches at 120 degrees. Using the maximum postfire measurement provides a thermal factor of safety of 8.9.

4.1.5 Results of Special Issues and Concerns (Insulation)

TWR-64201 identified areas for special evaluation for 360T026. A single insulation issue is listed below with the results.

1. Condition: Excess delay time occurred between the first liner mix and sling lining application during the liner application process of the RH aft center segment. No repair was made.

Reference: TWR-63082

Results: The RH center liner pattern was evaluated following low pressure rinse. The remaining liner pattern was normal and consistant with previous aft center segments. There were no anomalous conditions as a result of the time delay.

4.2 Case, Seals, and Joints

Seal and joint evaluations of the S&As, factory joints, internal nozzle joints, ports, and port plugs were performed. PFORs documenting the observations are found in Appendix B.

4.2.1 S&As

Figure 2 shows the Safe and Arm device (S&A) configuration. The S&As were disassembled on 1 October 1992 at the Clearfield H–5 facility. The following is a summary of the assessment observations.

Typical soot was observed up to, but not past, the forward primary rotor shaft O–ring of both S&As. No O–ring or other seal surface damage was observed.

4.2.2 Factory Joints

The factory joints were inspected by Quality Assurance at Clearfield. All fourteen factory joints were in good condition with no O–ring heat effect or erosion observed. The RH forward dome joints had small areas of heavy corrosion. The LH forward dome had minor fretting and small areas of medium corrosion. None of these conditions adversely affected the performance of the joint.

4.2.3 Internal Nozzle Joints

Details concerning the nozzle internal joint performance can be found in section 4.3.

4.2.4 Port Plugs and Port Plug Seals

S&As
One anomalous condition was observed. A scratch was observed on the LH S&A 306 degree leak check plug. Preliminary PFAR 47C–14 was written on this condition. The scratch was "V"–shaped and oriented in a radial direction. The cause or time of occurrence was unknown. Typical galling on the land between the SII port primary and secondary seal surfaces was observed on both S&As. No other O–ring, plug or seal surface damage was observed.

Factory Joints
No anomalous conditions were observed on any of the leak test ports, plugs or plug O–rings.

Internal Nozzle Joints
No anomalous conditions were observed on any of the internal nozzle joint leak test ports, plugs or plug O–rings.

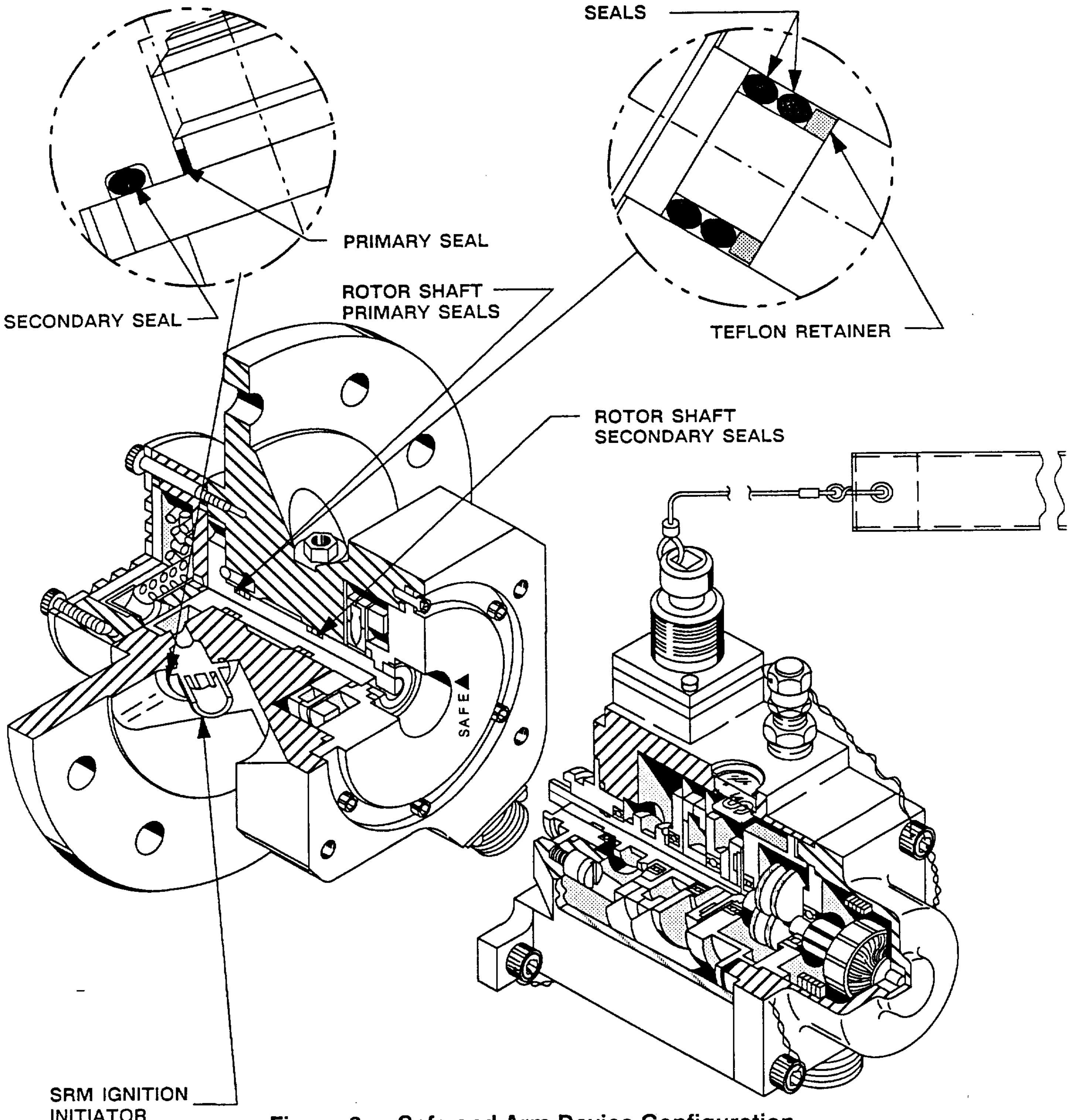

Figure 2. Safe and Arm Device Configuration

4.2.5 Results of Special Issues and Concerns (Case, Seals, and Joints)

TWR-64201 identified areas for special evaluation of 360T026 at Clearfield. The case, seals, and joints issues are listed below with their respective results.

1. Condition: Corrosion was observed on the rotor detent ball spring during postflight evaluation of the RSRM-21 LH barrier-booster device. The spring should have been a MS24585-C5 (stainless steel) spring, but was actually a MS24585-5 (non-corrosion resistant music wire) spring.

Reference: TWR-63082

Results: Discoloration was observed on the rotor detent ball spring of both S&As. The springs are being evaluated by M&P for evidence of corrosion.

2. Condition: A recent seals audit identified descrepancies between the Refurbishment and process finalization specifications (STW7-3434 and STW7-3450, respectively) and Engineering requirement drawings. The specifications do not provide adequate criteria for the throat support housing forward and aft seal surfaces of nozzle joints 3 and 4.

Reference: Nozzle CPT, RDW 0640R1 (Effective through RSRM-26), (Joint 3 only)

Results: Typical light-to-medium corrosion was observed on both the LH and RH throat support housing forward and aft faces. No seal surface damage was observed.

3. Condition: Both the LH and RH factory joints may have leak test plugs procured from Standard Press Steel. These plugs have a white locking device instead of the blue locking device that has been used on hardware procured from Nylock Fasteners, Inc.

Reference: DR 408903

Results: Several of the plugs had the white locking device. This did not affect the design or performance of the plug.

4.3 <u>Nozzle</u>

Figure 3 shows the internal nozzle joint nomenclature and details the internal nozzle joint configuration used in this report. The PFORs documenting the observations are contained in Appendix C.

The nozzles were off-loaded at Clearfield H-6 on 25 September 1992. The LH nozzle showed no transportation damage. The RH nozzle showed transport tie-down strap

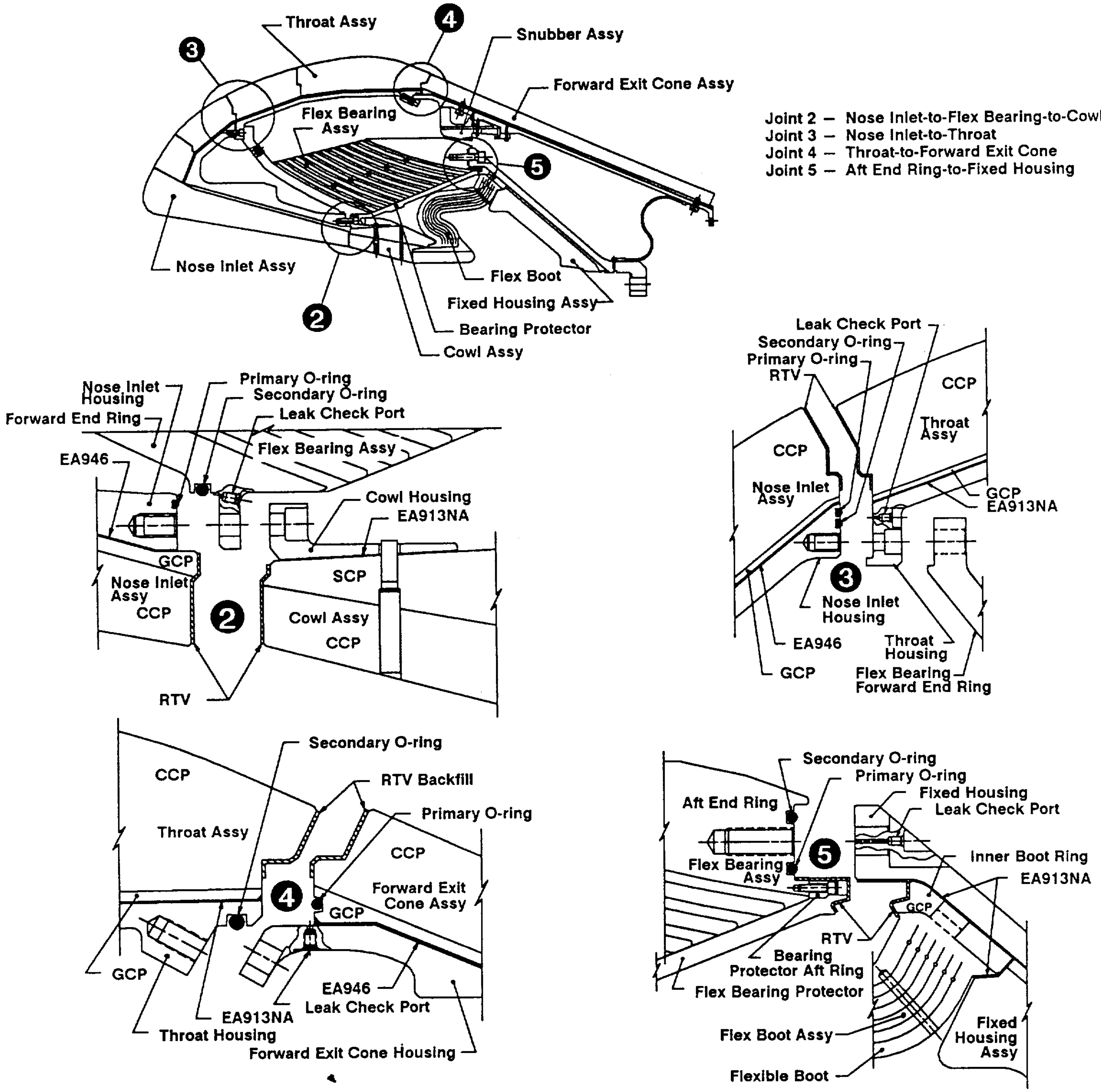

Figure 3. Internal Nozzle Joint Configuration

damaged phenolic liners at 352–0–5 degrees on the nose cap and forward end of the forward inlet ring. Preliminary PFAR 47C–01 was written on this condition. The RH nozzle forward exit cone showed foreign material around three of the aft end shear pin screws in the CCP/GCP interface. Samples were taken and Preliminary PFAR 47C–02 was written on this condition. Analysis of the foreign material shows it was grease.

The internal nozzle joints were disassembled on September 28–30, 1992 at the H–6 facility in Clearfield. The condition of the RSRM–26 nozzle joints was generally typical of previous flight nozzles. RTV was below the char line in all joints. The primary and secondary O–rings in all joints showed no signs of blowby, erosion, heat effects or disassembly damage. There was no significant metal hardware damage.

The following sections provide detailed assessments of nozzle internal joints, bondlines, char and erosion performance, flex boot and flex bearing condition, and throat erosion data. The outcome of special issues and concerns for this nozzle flight set is also presented.

4.3.1 Nose Inlet/Forward End Ring/Cowl (Joint 2)

LH

The forward end ring forward spherical surface had paint bubbles from 170–to–325 degrees extending from forward end to within one inch of secondary O–ring groove. Clear fluid was present inside paint bubbles. Samples were taken and Preliminary PFAR 47C–09 was written on this condition.

There was typical mixing of RTV and adhesive with the RTV reached below the char line over the complete circumference. Soot entered the joint between the layers of RTV and adhesive. Typical scalloped shaped soot was observed between the bolt holes on the nose inlet and forward end ring around the full circumference. Soot reached the primary O–ring intermittently from 195–to–345 degrees. No soot was observed past the primary O–ring.

Grease coverage on the joint metal surfaces was nominal. No excessive grease was found in the bolt holes. Light–to–medium corrosion was observed on the forward mounting face and ID of cowl housing and on forward side of flex bearing forward end ring flange intermittently around circumference. Typical burnishing was observed intermittently on the nose inlet secondary seal surface. No O–ring, seal surface or leak check plug damage was observed. The leak check port plug breakaway torque was 35 in–lb and the running torque was 20 in–lb.

There were no separations observed on the cowl assembly. The aft end of nose assembly had metal–to–adhesive separations intermittently around circumference a maximum radial width of 0.005 inch.

RH

A rusty 1.20 inch diameter washer was found in sand and splashdown debris of the throat/flex bearing cavity. Preliminary PFAR 47C–10 was written on this condition. Measurements and material test show the washer is not nozzle flight hardware. Sand in the cavity indicates the nozzle may have hit river bottom during towback operations and picked the washer up with the sand.

There was typical mixing of RTV and adhesive with the RTV reached below the char line over the complete circumference. Soot entered the joint between the layers of RTV and adhesive. A gas path through the RTV was observed at 350 degrees and extended circumferentially to 356 degrees within the RTV at the nose assembly GCP and the cowl assembly SCP interface. Typical scalloped shaped soot was observed between the bolt holes on the nose inlet and forward end ring, full circumference. Soot reached the primary O–ring intermittently from 290–0–40 degrees. No soot was observed past the primary O–ring. No heat effects were found in this area on the forward end ring or the cowl housing. The virgin CCP on both assemblies, the GCP on the nose cap and the SCP on the cowl showed shallow heat effects throughout the gas path. Preliminary PFAR's 47C–12 and 47C–13 were written on this condition.

Grease coverage on the joint metal surfaces was nominal. No excessive grease was found in the bolt holes. Light–to–medium corrosion was observed on the forward mounting face and ID of cowl housing and on forward side of flex bearing forward end ring flange intermittently around circumference. Typical burnishing was observed intermittently on the nose inlet secondary seal surface. No O–ring, seal surface, or leak check plug damage was observed. The leak check port plug breakaway torque was 34 in–lb and the running torque was 12 in–lb.

There were no separations observed on the cowl assembly. The aft end of nose assembly had metal–to–adhesive separations intermittently around circumference a maximum radial width of 0.005 inch.

4.3.2 Nose Inlet/Throat (Joint 3)

LH

The RTV reached below the char line over the complete circumference. Two RTV voids were observed at 85 and 238 degrees, but no gas paths were found in the joint. Grease did not interfere with the RTV fill in the joint.

Grease coverage on the joint metal surfaces was nominal. No excessive grease was found in the bolt holes. Light–to–medium corrosion was visible on in–board edge of the throat housing and GCP full circumference. Aluminum oxide corrosion was visible on the nose inlet housing in–board edge and GCP surface intermittently full circumference. No O–ring, seal surface, or leak check port plug damage was observed. The leak check port plug breakaway torque was 36 in–lb and the running torque was 23 in–lb.

The nose inlet assembly showed two areas of metal–to–adhesive separations with a maximum radial width of 0.005 inch. The throat assembly forward end was separated intermittently around circumference at metal–to–adhesive with a maximum radial width of 0.015 inch.

RH

The RTV reached below the char line over the complete circumference. Grease did not interfere with the RTV fill in the joint. No gas paths were found in the joint.

Grease coverage on the joint metal surfaces was nominal. No excessive grease was found in the bolt holes. Light–to–medium corrosion was visible on inboard edge of the throat housing and GCP full circumference. Aluminum oxide corrosion was visible on the nose inlet housing in–board edge and GCP surface intermittently full circumference. No O–ring, seal surface, or leak check port plug damage was observed. The leak check port plug breakaway torque was 33 in–lb and the running torque was 11 in–lb.

The nose inlet assembly showed three areas of metal–to–adhesive separations with a maximum radial width of 0.005 inch. The throat assembly forward end was separated intermittently around circumference at metal–to–adhesive with a maximum radial width of 0.020 inch. The throat inlet ring also showed a separation within the CCP from 48–to–138 degrees with a maximum radial width of 0.058 inch. The separation extended through to the flow surface along the ply angle. Sharp edges around the separation flow surface indicate postburn occurrence. Preliminary PFAR 47C–11 was written on this because it was thought to be a first time occurrence. Further examination of our postfire database shows this was not a first time occurrence. Postfire virgin CCP separations is an acceptable condition.

4.3.3 Throat/Forward Exit Cone (Joint 4)

LH

Foreign material was observed on the primary seal surface of both the throat housing and forward exit cone at 28 and 30 degrees. Preliminary PFAR 47C–03 was written on the condition. The soot–like material, black and flaky, appeared to have been pressed into the O–ring groove by the primary O–ring from 23–to–30 degrees. Slag–like material was observed on the primary O–ring from 28–to–30 degrees. Loose, black material was also observed in the primary O–ring groove and on the mating surface of the throat housing intermittently, full circumference. The black material appeared to be from disassembly.

The RTV reached below the char line over the complete circumference of the joint with no gas paths. RTV did not reach the primary O–ring. Grease did not interfere with the RTV fill in the joint.

Grease coverage on the joint metal surface was nominal. Medium corrosion was observed at the throat housing and adhesive interface intermittently around the circumference. No other metal damage was observed. No O-ring, seal surface, or leak check port plug damage was observed. The leak check port plug breakaway torque was 28 in-lb and the running torque was 15 in-lb.

The FEC forward end showed full circumference metal-to-adhesive separation with a maximum radial width of 0.080 inch. Three adhesive-to-GCP separations with a maximum radial width of 0.060 inch were observed on the FEC forward end. The aft end of the throat assembly exhibited a separation full circumference with a maximum radial width of 0.050 inch.

RH

The RTV reached below the char line over the complete circumference of the joint. RTV extended to the primary O-ring from 0-to-184 and 260-to-350 degrees, but not past O-ring. No gas paths were present in the RTV. Grease did not interfere with the RTV fill in the joint.

Grease coverage on the joint metal surface was nominal. Typical medium corrosion was observed in the metal-to-adhesive separations. No other metal damage was observed. No O-ring, seal surface, or leak check port plug damage was observed. The leak check port plug breakaway torque was not obtained and the running torque was 24 in-lb.

Metal-to-adhesive separations with a maximum radial width of 0.019 inch were observed intermittently around circumference on the forward exit cone assembly. Two adhesive-to-GCP separations were also observed on the FEC with a maximum radial width of 0.011 inch. Metal-to-adhesive separations were also observed intermittently around circumference on the throat assembly with a maximum radial width of 0.015 inch.

4.3.4 Flex Bearing/Fixed Housing (Joint 5)

LH

Nylon material from the Nylok locking device of the bolts was observed on the downstream edge of the primary O-ring at 235 degrees. Preliminary PFAR 47C-04 was written on this condition. The Nylon did not completely bridge the O-ring footprint. All 72 Packing with Retainers had typical disassembly damage to the elastomer. No O-ring, seal surface, or leak check port plug damage was observed. Light corrosion was observed on the underside of the leak check port plug outboard of the O-ring. The leak check port plug breakaway torque was 39 in-lb and the running torque was 12 in-lb.

The RTV coverage was nominal with intermittent encapsulated voids due to assembly process. The RTV extended forward intermittently around the full circumference on the ID of bearing protector inner ring to the flex bearing aft end ring bearing protector interface.

Grease coverage on the joint metal surfaces was nominal with no excess grease in the bolt holes. Intermittent light–to–medium corrosion observed on the ID and OD of aft tip of the aft end ring intermittently around the circumference. There was medium–to–heavy corrosion on the ID forward tip of the fixed housing intermittently around the circumference. The fixed housing ID surface showed bubbled paint on the aft flange and on the chamfer surface from 340–0–110 degrees. There was also bubbled paint in a 6.00 inch axial wide area 5.00 inches from aft end from 47–to–83 degrees. Paint in these areas did not appear to be heat affected. No corrosion was found on metal surface under paint bubbles. Preliminary PFAR 47C–06 was written on this unbonded paint condition.

Typical even sooting was present on the bearing protector OD and the flexible boot ID.

No separations were observed between the inner boot ring and the fixed housing.

RH

The RTV coverage was nominal with intermittent encapsulated voids due to assembly process. The RTV extended forward intermittently around the full circumference on the ID of bearing protector inner ring to the flex bearing aft end ring flange surface.

Sixty–nine of the 72 Packings with Retainers had typical disassembly damage to the elastomer. No O–ring, seal surface, or leak check port plug damage was observed. The leak check port plug breakaway torque was 40 in–lb and the running torque was 11 in–lb.

Grease coverage on the joint metal surfaces was nominal with no excess grease in the bolt holes. Intermittent light–to–medium corrosion observed on the ID and OD of aft tip of the aft end ring and on the ID forward tip of the fixed housing intermittently around the circumference. The fixed housing showed bubbled paint on the ID surface sixteen inches from aft end from 90–to–180 degrees. Paint in this area did not appear to be heat affected.

Typical even sooting was present on the bearing protector OD and the flexible boot ID.

No separations were observed between the inner boot ring and the fixed housing.

4.3.5 Aft Exit Cone Assembly Bondlines

LH

The primary mode of separation was 85 percent within the GCP and 15 percent metal–to–adhesive. The secondary mode of separation was 94 percent adhesive–to–GCP, 5 percent metal–to–adhesive and 1 percent within adhesive. The bulk of the metal–to–adhesive separation occurred from 292–0–47 degrees. Preliminary PFAR 47C–19 was written because the total metal–to–adhesive separation exceeded 20 percent. Light–to–medium corrosion was observed in the areas of metal–to–adhesive. Four adhesive voids has a diameter greater than 0.5 inch. Intermittent small voids (0.2 inch diameter maximum were seen throughout the polysulfide. No voids extended the full axial length of the groove.

RH

The primary mode of separation was 2 percent metal-to-adhesive and 98 percent within GCP. The secondary mode was 1 percent metal-to-adhesive and 99 percent adhesive-to-GCP. No corrosion was observed. One adhesive void had a diameter greater than 0.5 inch. Intermittent small voids (0.1 inch diameter maximum) were seen throughout the polysulfide. No voids extended the full axial length of the groove.

4.3.6 Forward Exit Cone Assembly Bondlines

LH

Mode of separation was 52 percent metal-to-adhesive, 9 percent within adhesive and 39 percent adhesive-to-GCP. Medium-to-heavy corrosion observed on the aft 10.0 inches. Light-to-medium corrosion was present 5.0 inches aft of the forward shear pins in a band approximately 7.0 inches wide. Eight adhesive voids had a diameter greater than 0.5 inch.

RH

Mode of separation was 62 percent metal-to-adhesive, 37 percent adhesive-to-GCP and 1 percent within the adhesive. Medium-to-heavy corrosion observed in areas of adhesive-to-metal separation. Five adhesive voids had a diameter greater than 0.5 inch.

4.3.7 Throat Assembly Bondlines

LH

The throat inlet ring and throat ring mode of separation was 99 percent metal-to-adhesive and 1 percent adhesive-to-GCP. Medium-to-heavy corrosion was present. Three adhesive voids had a diameter greater than 0.5 inch.

RH

The throat inlet ring and throat ring mode of separation was 100 percent metal-to-adhesive. Medium-to-heavy corrosion present the full axial length of throat support housing and full circumference. Six adhesive voids had a diameter greater than 0.5 inch.

4.3.8 Nose Inlet Rings Bondlines

LH

The mode of separation was 98 percent metal–to–adhesive, 1 percent within the adhesive, and 1 percent adhesive–to–GCP. Two adhesive voids had a diameter greater than 0.5 inch. Light–to–medium corrosion was present in the areas of adhesive–to–metal separation except from 0–to–25 and 155–to–205 degrees on the aft 4.0 inches of the aft inlet ring bonding surface.

RH

The mode of separation was 91 percent metal–to–adhesive and 9 percent adhesive–to–GCP. Two adhesive voids had a diameter greater than 0.5 inch. Light–to–heavy corrosion was present in the areas of adhesive–to–metal separation except from 60–to–80 and 230–to–285 degrees on the forward 4.2 inches of the aft inlet ring bonding surface. The areas of heavy corrosion did not have any pitting that exceeded the 0.050 inch limit.

4.3.9 Nose Cap Bondlines

LH

The primary mode of separation was 95 percent CCP–to–GCP and 5 percent within GCP. The secondary mode of separation was 75 percent adhesive–to–GCP and 25 percent metal–to–adhesive. One adhesive void had a diameter greater than 0.5 inch. Light–to–medium corrosion was found in the metal–to–adhesive separation on the aft 2.0–to–3.0 inches and on the forward 0.25–to–1.5 inches.

RH

The mode of separation was 95 percent CCP–to–GCP and 5 percent within GCP. The secondary mode of separation was 96 percent adhesive–to–GCP and 4 percent metal–to–adhesive. Eight adhesive voids had a diameter greater than 0.5 inch. Light–to–medium corrosion was found in the metal–to–adhesive separation on the aft 1.0–to–4.5 inches and on the forward 0.5–to–1.5 inches

4.3.10 Cowl Bondlines

LH

The mode of separation was 100 percent metal–to–adhesive. Ten adhesive voids had a diameter greater than 0.5 inch. Light–to–medium corrosion was observed on the bonding surface around the full circumference.

RH

The mode of separation was 100 percent metal–to–adhesive. Three adhesive voids had a diameter greater than 0.5 inch. Light–to–medium corrosion was observed on the bonding surface around the full circumference.

4.3.11 Fixed Housing Assembly Bondlines

LH

The mode of separation was 64 percent metal–to–adhesive, 1 percent within the GCP, and 35 percent adhesive–to–GCP. Preliminary PFAR 47C–16 was written because the metal–to–adhesive separation exceeded 15 percent and was not elevated to a PFAR. Ultrasonic inspection did detect unbonds and are detailed in section 5.3.12. Stains were observed on the housing marking the location of the unbonds. Hardness checks were performed on the housing and found no sign of heat affects.

Resin glaze was observed at the GCP–to–adhesive interface. Preliminary PFAR 47C–17 was written because of this condition. One adhesive void had a diameter greater than 0.5 inch. Intermittent adhesive voids with diameters of 0.30 inch or smaller were observed around the circumference. No corrosion was observed on the housing

There were no signs of gas paths or heat affects on the inner boot ring–to–fixed housing interface. The bondline separation mode between the IBR and the Fixed Housing insulation was 85 percent IBR–to–adhesive, 10 percent virgin CCP–to–adhesive and 5 percent within adhesive. The bondline separation mode between the NBR rubber and the fixed housing insulation was 73 percent within NBR, 9 percent virgin CCP–to–adhesive, 7 percent within IBR GCP (aft corner), 7 percent within char CCP and 5 percent within adhesive.

The IBR–to–Fixed Housing bondline was assessed. The primary separation mode was 28 percent metal–to–adhesive, 22 percent adhesive–to–GCP, 32 percent within GCP and 18 percent within adhesive. The secondary mode was 96 percent adhesive–to–GCP and 4 percent metal–to–adhesive.

RH

The mode of separation was 95 percent metal–to–adhesive and 5 percent adhesive–to–GCP. Preliminary PFAR 47C–15 was written because the metal–to–adhesive separation exceeded 15 percent. Ultrasonic inspection did detect unbonds and are detailed in section 5.3.12. Stains were observed on the adhesive and housing marking the location of the unbonds. Hardness checks were performed on the housing and no sign of heat effects were found.

Resin glaze was observed at the GCP–to–adhesive interface. One adhesive void had a diameter greater than 0.5 inch. Intermittent adhesive voids with diameters of 0.30 inch or smaller were observed around the circumference. No corrosion was observed on the housing.

There were no signs of gas paths or heat effects on the inner boot ring–to–fixed housing bondline. The bondline separation mode between the IBR and the Fixed Housing insulation was 86 percent IBR–to–adhesive, 5 percent virgin CCP–to–adhesive and 9 percent within adhesive. The bondline separation mode between the NBR rubber and the Fixed Housing insulation was 6 percent within NBR, 62 percent virgin CCP–to–adhesive, 1 percent within IBR GCP (aft corner), 28 percent within char CCP and 3 percent within adhesive.

The IBR–to–Fixed Housing bondline was assessed. The primary separation mode was 66 percent metal–to–adhesive, 15 percent adhesive–to–GCP, 6 percent within GCP and 13 percent within adhesive. The secondary mode was 100 percent adhesive–to–GCP. Intermittent light–to–medium corrosion was observed in the areas of metal–to–adhesive.

4.3.12 Ultrasonic Inspection of Fixed Housing Assemblies

Unbonds that ran the full circumference were detected by ultrasonic inspection on the forward end of both fixed housings. The widest areas on the left–hand were 6.0 inches from 0–to–90 degrees and 8.5–to–11.0 inches from 90–to–270 degrees. The widest areas on the 6.0 inches and broken into several smaller distinct bands in several locations.

4.3.13 Char and Erosion Performance

Char and erosion margins of safety are summarized in Table 8. The char and erosion data tables for each component liner can be found in Appendix D. Measurement stations that contain an "N/A" means that data was not available due to missing material. The RH aft exit cone liner was not recovered and therefore is not included. Three large LH aft exit cone fragments were recovered from inside the motor at the KSC Hangar AF. Each fragment was sectioned in two places and evaluated. No plylifting or axial orientation features were present on the fragments. Therefore, erosion and char calculations could not be made. All stations showed positive margins of safety. The measurement stations can be found in Figure 1 of Appendix D.

4.3.14 Flex Boot Performance

The performance of both flex boots was nominal. The LH hand flex boot had a minimum of 3.0 NBR plies intact and the RH flex boot had a minimum of 3.4 NBR plies intact. Positive margins of safety were achieved at all measurement stations. The flex boot performance margins of safety are summarized in Table 9.

Table 8. 360T026 Nozzle Char and Erosion Minimum Margins of Safety

Hardware	Stations*												
Forward Exit Cone Assembly, LH	**1**	**4**	**4.6**	**8**	**12**	**16**	**20**	**24**	**28**	**32**	**32.9**	**34**	
	0.25	0.27	0.24	0.20	N/A	N/A	N/A	N/A	0.11	0.13	0.22	0.26	
Forward Exit Cone Assembly, RH	**1**	**4**	**4.6**	**8**	**12**	**16**	**20**	**24**	**28**	**32**	**32.9**	**34**	
	0.29	0.32	0.30	0.24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Throat Assembly, LH	**1**	**2**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**23**
	0.15	0.15	0.10	0.07	0.06	0.16	0.20	0.27	0.32	0.40	0.46	0.37	0.23
Throat Assembly, RH	**1**	**2**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**23**
	0.20	0.21	0.19	0.14	0.09	0.20	0.26	0.32	0.39	0.43	0.49	0.43	0.22
Nose Inlet Rings (-503, -504), LH	**28**	**30**	**32**	**34**	**36**	**38**	**39**						
	0.23	0.34	0.15	0.39	0.37	0.18	0.15						
Nose Inlet Rings (-503, -504), RH	**28**	**30**	**32**	**34**	**36**	**38**	**39**						
	0.18	0.32	0.16	0.42	0.35	0.20	0.14						
Nose Cap, LH	**1.5**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**	**26**
	N/A	0.50	0.74	0.74	0.89	0.84	0.81	0.69	0.67	0.58	0.19	0.08	0.12
Nose Cap, RH	**1.5**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**	**26**
	0.24	0.44	0.48	0.63	0.72	0.75	0.77	0.59	0.62	0.51	0.20	0.10	0.21
Cowl/OBR, LH	**0.3**	**1**	**2**	**3**	**4**	**5**	**6**	**6.8**	**8**	**9**	**10**	**11.3**	
	0.38	0.33	0.28	0.29	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Cowl/OBR, RH	**0.3**	**1**	**2**	**3**	**4**	**5**	**6**	**6.8**	**8**	**9**	**10**	**11.3**	
	0.15	0.20	0.24	0.24	0.27	N/A	N/A	N/A	N/A	0.07	0.05	0.02	
Fixed Housing Assembly, LH	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10.75**		
	1.76	0.75	0.64	0.60	0.68	0.66	0.68	0.75	0.85	1.50	0.48		
Fixed Housing Assembly, RH	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10.75**		
	1.86	0.75	0.79	0.85	0.79	0.83	0.85	0.83	1.04	1.61	0.53		

* Station locations are shown in bold with the margin of safety shown below.

4.3.15 Bearing Protector Performance

Close examination showed both of the bearing protectors performed as expected during flight. Both of the protectors were evenly sooted around the circumference and showed typically greater erosion in line with the cowl vent holes. There was no evidence of heat effect on the flex bearing side of either bearing protector. PFOR C-9 in Appendix C shows the postflight bearing protector thickness measurements every 10 degrees. On the forward third of the RH bearing protector, fluid was observed coming out of the cracks. This condition was observed on past bearing protectors and found to be the by-product of the thermal degradation of the bearing protector material.

Table 9. 360T026 Flex Boot Margins of Safety

	Left Hand			Right Hand		
Degree Location	Remaining Plies	Max. Material Affected Depth (in.)	Perform-ance Margin of Safety	Remaining Plies	Max. Material Affected Depth (in.)	Perform-ance Margin of Safety
0	3.5	1.24	0.34	3.8	1.14	0.46
90	3.0	1.40	0.19	3.4	1.27	0.31
180	3.6	1.21	0.38	3.8	1.14	0.46
270	3.9	1.11	0.50	3.4	1.27	0.31

* Minimum flex boot overall prefire thickness is 2.5 inches.

4.3.16 Cowl Insulation Segments

Both nozzles segments performed as expected during flight. No abnormal heat effects were observed and no soot was found at the cowl housing interface. Adhesive that retains the silica plugs in the cowl phenolics, flowed into the cowl housing-to-insulation segments bondline around all 36 spring pins on both nozzles. Preliminary PFAR 47C-07 was written on this first time occurrence.

The mode of separation from the cowl housing for the LH segments was 1 percent within the rubber, 90 percent rubber-to-adhesive and 9 percent within the adhesive. The RH separation mode was 3 percent within the rubber, 85 percent rubber-to-adhesive and 12 percent within the adhesive.

4.3.17 Flex Bearing Performance

LH

The flex bearing performance during flight was acceptable. There were no anomalies associated with flight or splashdown. Examination of the flex bearing revealed no damage, soot, heat effect, or flow indications. Typical paint scrape marks, caused by contact with snubbers at splashdown, were observed on ID of aft end ring from 155-to-305 degrees with a maximum axial width of 7.00 inches at 150 degrees. Light corrosion was present on exposed metal surfaces.

RH

The flex bearing performance during flight was acceptable, with no anomalies reported. Examination of the flex bearing revealed no damage, soot, heat effect, or flow indications.

Typical paint scrape marks, caused by contact with snubbers at splashdown, were observed on ID of aft end ring from 165–to–290 degrees with a maximum axial width of 2.00 inches. Light–to–medium corrosion was present on exposed metal surfaces.

4.3.18 Throat Diameter

The average LH nozzle postfire throat diameter was 55.934 inches (erosion rate of 8.63 mils/sec based on an action time of 120.1 sec). The average RH nozzle postfire throat diameter was 55.888 inches (erosion rate of 8.36 mils/sec based on an action time of 121.3 sec). RSRM postfire throat diameters have ranged from 55.787 to 56.072 inches.

4.3.19 Results of Special Issues and Concerns (Nozzle)

TWR–64201 identified areas for special evaluation of 360T026 at Clearfield. The nozzle issues are listed below with their respective results.

1. **Condition:** Both the LH and RH forward exit cone snubber support rings and snubber shim retainer bolts and bolt hole threads were damaged.

   Reference: DRs (LH) 110496–01 & –03, 407068–01 & –02
   (RH) 172373–01 & –02, 407152–01 & –02

   Results: The LH and RH forward exit cone housings snubber support ring threaded bolt holes and the shim retainer threaded bolt holes showed no damage.

2. **Condition:** Three voids exist on the RH flexible boot rubber aft side at 180 degrees, 0.95 inch from the inner boot ring interface.

   Reference: DR 408970–01

   Results: The RH flexible boot showed no unusual erosion or char on the forward or aft side at 180 degrees.

3. **Condition:** An area of discoloration exists on the RH flexible boot rubber aft side at 140 degrees, 8.5 inches from the inner boot ring interface. The area measures 6.50 inches circumferentially and 0.75 inch radially.

   Reference: DR 411227–01

   Results: The RH flexible boot showed no unusual erosion or char on the forward or aft sides at 140 degrees. There was 3.8 boot piles remaining at this location which was the maximum thickness of the five measured sections.

4. Condition: Adhesive shims were added to the aft surface of the throat housing to guide the throat ring into the housing as it was installed. This change was incorporated to improve the bondline quality because the throat ring tends to scrape the adhesive and create voids during installation.

Reference: PFAR FSM03-09

Results: The adhesive shims added to the aft bondline surface of the throat housing appear to have improved the distribution of adhesive and reduced adhesive voids considerably on the LH and RH throat assemblies

5. Condition: Bent and broken flex bearing protector forward ring screws have been observed on flight and static test motors. Exact cause of the damage is under investigation.

Reference: SPR DR4-5/228, PFAR 360L022A-19

Results: No bend or broken screws were found on the LH or RH flex bearing protector forward GCP ring.

6. Condition: During the KSC evaluation a brown material was found on the LH aft exit cone OD at the 321 degree shear pin location. The substance seemed to originate from the 321 degrees shear pin and extended in a counterclockwise direction to 195 degrees.

Reference: RSRM-26 KSC Postflight Evaluation Team

Results: No obvious foreign material was found in the bondline at 321 degrees. A large metal-to-adhesive bondline failure was observed at 305-0-34 degrees on the forward half of the AEC housing. Heavy corrosion with dark stains was present throughout this area. This indicates sea water mixed with postburn nozzle substances trapped in this separation would leak out any open pin hole. The only open pin hole occurred at 321 degrees.

TWR-64204

Space Shuttle
Solid Rocket Motor
Thiokol Corporation

Appendix A
Insulation PFORs

Final Postflight Hardware Evaluation Report 360T026 (RSRM-26, STS-47)

April 1993

Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

Contract No.	NAS8-38100
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Thiokol CORPORATION
SPACE OPERATIONS

P.O. Box 707, Brigham City, Utah 84302-0707 (801) 863-3511

INSULATION REQUIRED PFOR LIST

PFOR #	Title	Side	Joint or Location	Final Report Page Number
A-1	Postfire Insulation CPI Log Numbers	Left	N/A	A-1
A-2	Segment Internal Insulation Condition	Left	Forward Segment	A-2
A-2	Segment Internal Insulation Condition	Left	Forward Center Segment	A-3
A-2	Segment Internal Insulation Condition	Left	Aft Center Segment	A-4
A-2	Segment Internal Insulation Condition	Left	Aft Segment	A-5
A-8	Igniter Nozzle Insert Throat Diameter Measurements	Left	Igniter Nozzle Insert	A-6
A-3	Forward Segment Liner Pattern	Left	Forward Segment	A-7
A-4	Forward Center Segment Liner Pattern	Left	Forward Center Segment	A-8
A-5	Aft Center Segment Liner Pattern	Left	Aft Center Segment	A-9
A-6	Aft Segment Liner Pattern	Left	Aft Segment	A-10
A-5	Aft Center Segment Liner Pattern	Right	Aft Segment	A-11
A-8	Igniter Nozzle Insert Throat Diameter Measurements	Right	Igniter Nozzle Insert	A-12

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) A-1
Postfire Insulation Common Planning Index (CPI) Log Numbers

Motor No.: 360T026	Side: Left (A)	Date: 11 MARCH 93

Assessment Engineer(s)/Inspector(s): BILL LESKO

Record CPI Log and Postfire Part and Serial Numbers Below:

	P/N	PPC No.	Serial No.	CPI Log No.
A. Igniter Chamber	1U75161-01	918	5	4CFSN
B. Igniter Adapter	1U77457-01	903	5	4CIBH
C. Forward Segment	1U76790-05	904	10	4CGXF
D. Forward Center Segment	1U76791-01	903	23	4CFWM
E. Aft Center Segment	1U76791-01	903	22	4CFWM
F. Aft Segment	1U76957-03	(904)	0000011	4CGXH

Notes / Comments

RH IGNITER CHAMBER	1U75161-01	918	6	4CFSN
RH IGNITER ADAPTER	1U77457-01	903	6	4CIBH

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) A-2
Segment Internal Insulation Condition (After Low Pressure Rinse)

Motor No.: 360T026	Side: Left (A)	Date: Dec 10, 1992

Assessment Engineer(s)/Inspector(s): Rex Mackley

Segment: Forward

Segment Internal Insulation Observations:	Yes	No	Comment #
A. Abnormal Erosion?		✓	
B. Gas Paths?		✓	
C. Ply Separations?		✓	
D. Abnormal Blisters?		✓	
E. Abnormal Cuts or Gouges?		✓	
F. Foreign Material Within Insulation?		✓	
G. Non-Uniformities in the Eleven Point Burn-out Pattern? (Forward Segment Only)		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ______ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ______ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) A-2
Segment Internal Insulation Condition (After Low Pressure Rinse)

Motor No.: 360T026	Side: Left (A)	Date: 3/4/93
Assessment Engineer(s)/Inspector(s): Rex Mackley		
Segment: Forward Center		

Segment Internal Insulation Observations:	Yes	No	Comment #
A. Abnormal Erosion?		✓	
B. Gas Paths?		✓	
C. Ply Separations?		✓	
D. Abnormal Blisters?		✓	
E. Abnormal Cuts or Gouges?		✓	
F. Foreign Material Within Insulation?		✓	
G. Liner Completely Missing? (Center Segments Only)		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes __✓__ No Preliminary PFAR Number(s): ____________

Clarification Form(s)? ______ Yes __✓__ No Clarification Form Page No.(s): ____________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) A-2
Segment Internal Insulation Condition (After Low Pressure Rinse)

Motor No.: 360T026	Side: Left (A)	Date: 2-5-93

Assessment Engineer(s)/Inspector(s): Reo Mackley

Segment: Aft Center

Segment Internal Insulation Observations:	Yes	No	Comment #
A. Abnormal Erosion?		✓	
B. Gas Paths?		✓	
C. Ply Separations?		✓	
D. Abnormal Blisters?		✓	
E. Abnormal Cuts or Gouges?		✓	
F. Foreign Material Within Insulation?		✓	
G. Liner Completely Missing? (Center Segments Only)		✓	

Notes / Comments

Preliminary PFAR(s)? ✓ Yes ____ No   Preliminary PFAR Number(s): 47C-20

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) A-2
Segment Internal Insulation Condition (After Low Pressure Rinse)

Motor No.: 360T026	Side: Left (A)	Date: 11/16/92
Assessment Engineer(s)/Inspector(s): Rio Markley		
Segment: Aft		

Segment Internal Insulation Observations:	Yes	No	Comment #
A. Abnormal Erosion?		✓	
B. Gas Paths?		✓	
C. Ply Separations?		✓	
D. Abnormal Blisters?		✓	
E. Abnormal Cuts or Gouges?		✓	
F. Foreign Material Within Insulation?		✓	
G. NBR Under the CF/EPDM Exposed in the Aft Dome?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ____________

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ____________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) A-8

Igniter Nozzle Insert Throat Diameter Measurements (Data Collection Only)

Motor No.: 360T026	Side: Left (A)	Date: 2/23/93
Assessment Engineer(s)/Inspector(s): B BAUGH		

Record the Igniter Nozzle Insert Throat Diameter Measurements Below:

Degree Location	Diameter Measurement (inches)
0	6.435
60	6.421
120	6.438

Notes / Comments

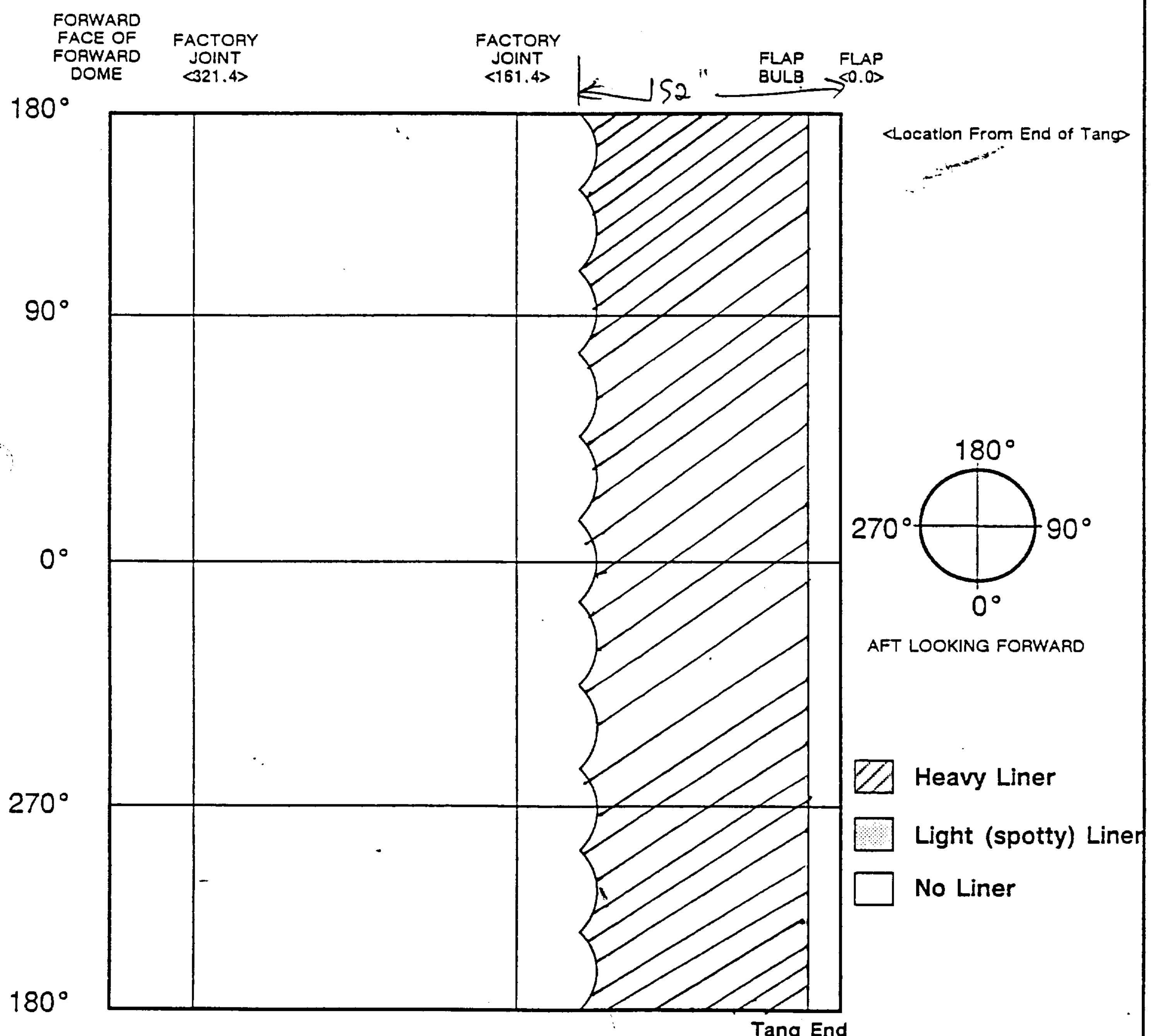
Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) A-3
Forward Segment Liner Pattern (Data Collection Only)

Motor No.: 360T026	Side: Left (A)	Date: 12-04-92
Assessment Engineer(s)/Inspector(s): Rex Markley		

Sketch Forward Segment Liner Pattern Observations Below:



Clarification Form(s)? ______ Yes __✓__ No   Clarification Form Page No.(s): NONE

REVISION ____

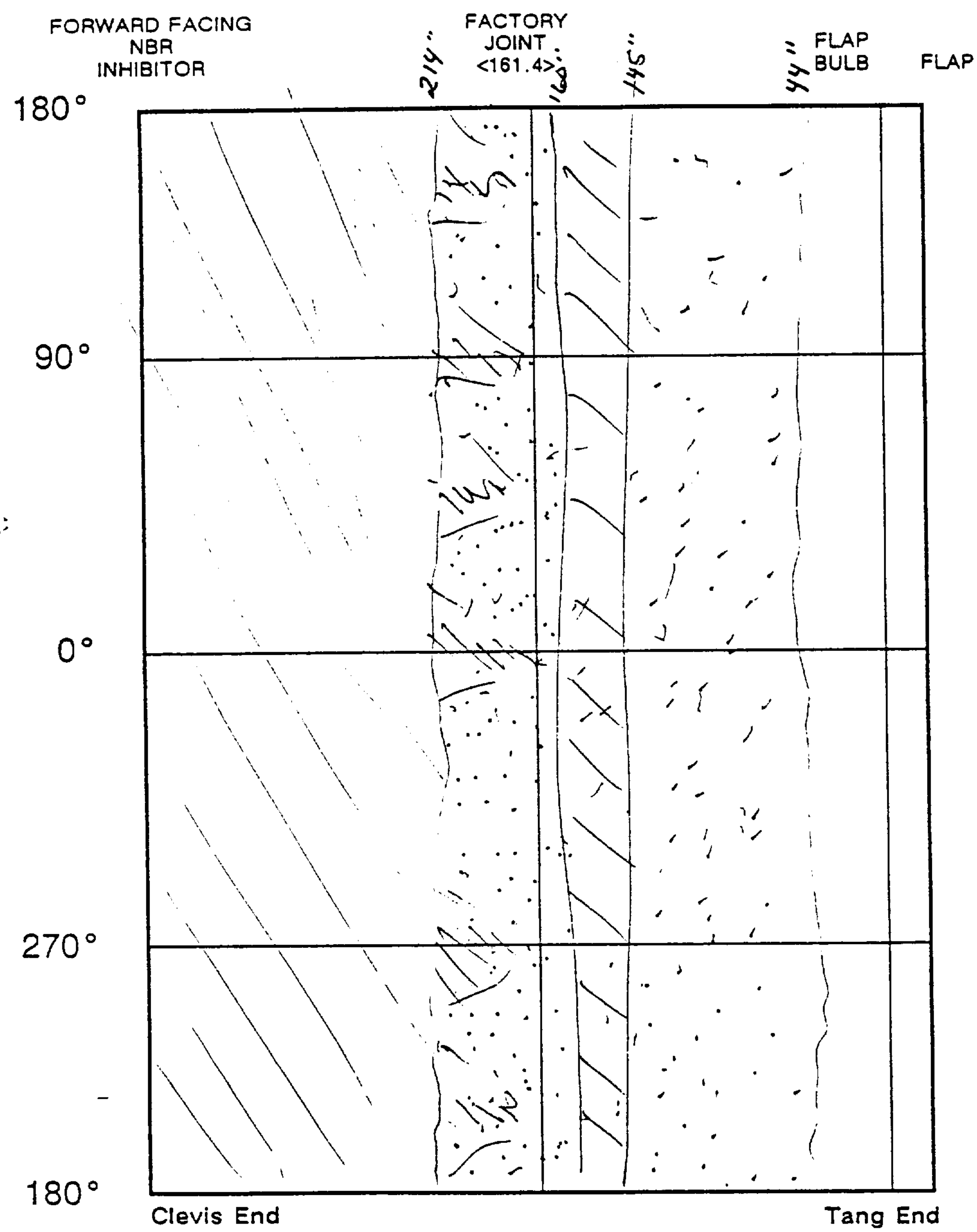
Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) A-4

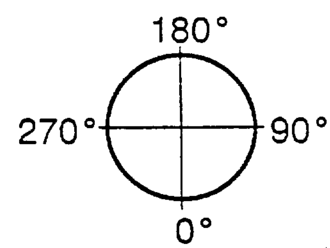
Forward Center Segment Liner Pattern (Data Collection Only)

Motor No.: 360T026	Side: Left (A)	Date: 3-3-93
Assessment Engineer(s)/Inspector(s): Thalman		

Sketch Forward Center Segment Liner Pattern Observations Below:



<Location From End of Tang>



AFT LOOKING FORWARD

- Heavy Liner
- Light (spotty) Liner
- No Liner

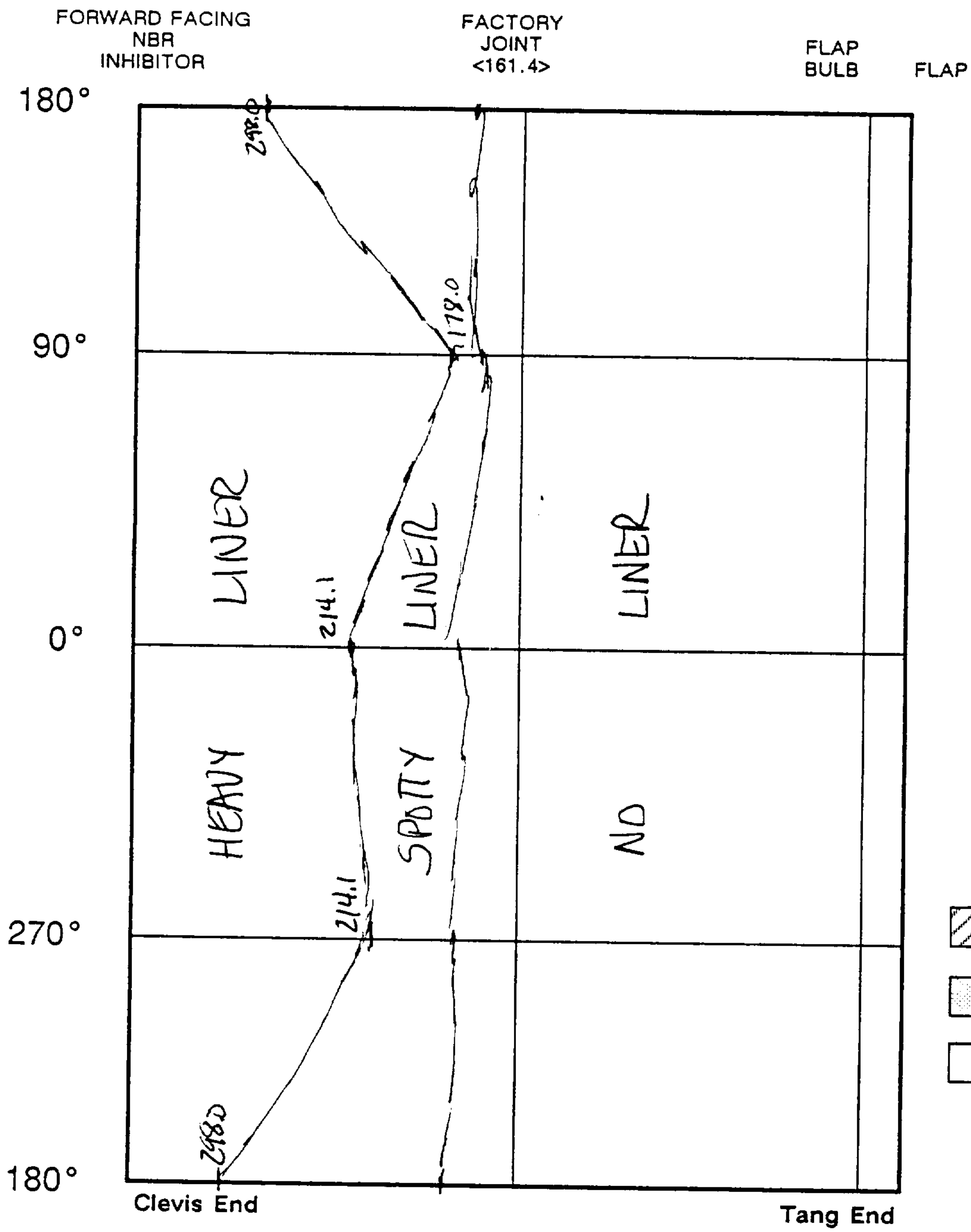
Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

REVISION ____

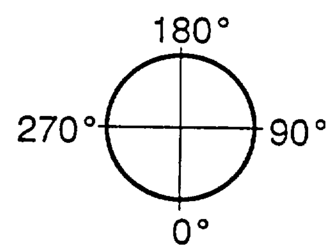
POSTFLIGHT OBSERVATION RECORD (PFOR) A-5
Aft Center Segment Liner Pattern (Data Collection Only)

Motor No.: 360T026	Side: Left (A)	Date: FEB, 2, 93
Assessment Engineer(s)/Inspector(s): M. NEVAREZ		

Sketch Aft Center Segment Liner Pattern Observations Below:



<Location From End of Tang>



AFT LOOKING FORWARD

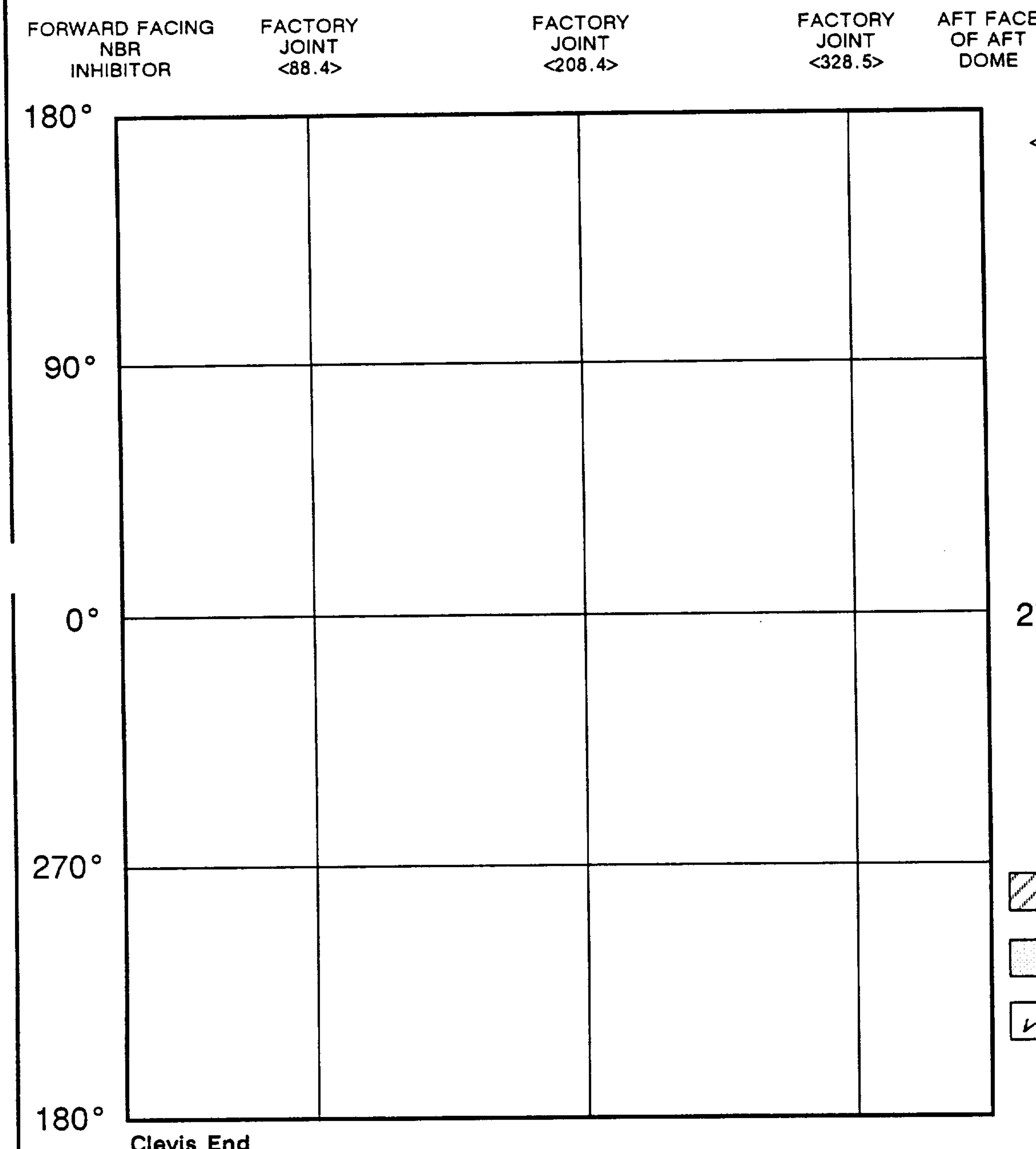
- Heavy Liner
- Light (spotty) Liner
- No Liner

Clarification Form(s)? ______ Yes __✓__ No Clarification Form Page No.(s): ____________

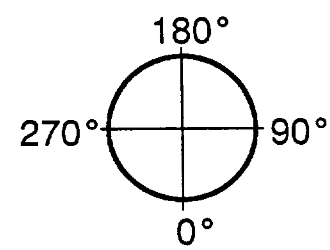
POSTFLIGHT OBSERVATION RECORD (PFOR) A-6
Aft Segment Liner Pattern (Data Collection Only)

Motor No.: 360T026	Side: Left (A)	Date: 11-11-92
Assessment Engineer(s)/Inspector(s):		

Sketch Aft Segment Liner Pattern Observations Below:



<Location From End of Clevis>



AFT LOOKING FORWARD

- Heavy Liner
- Light (spotty) Liner
- ✓ No Liner

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): N/A

Thiokol CORPORATION
SPACE OPERATIONS

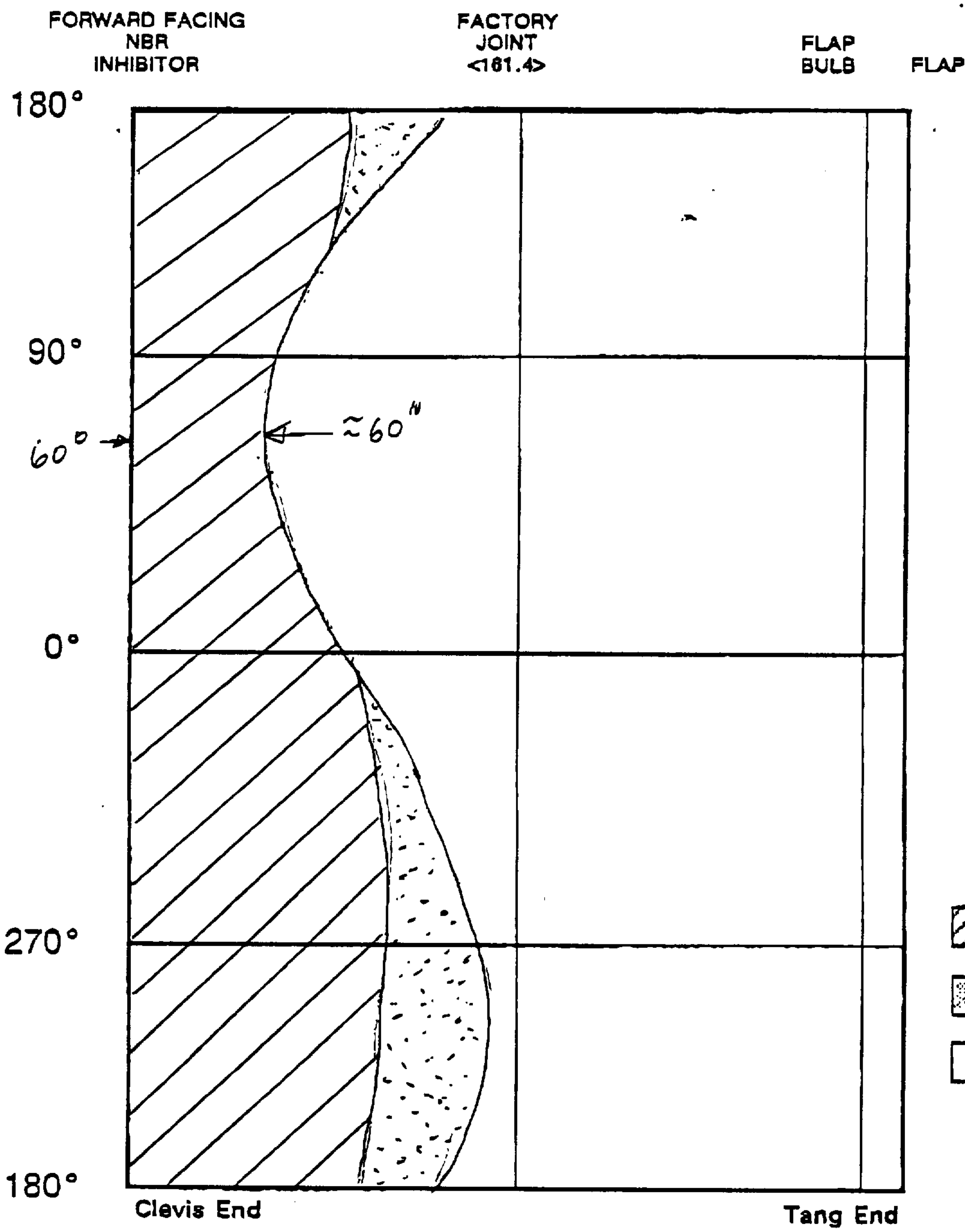
TWR-50051
Revision A

POSTFLIGHT OBSERVATION RECORD (PFOR) A-5
Aft Center Segment Liner Pattern (Data Collection Only)

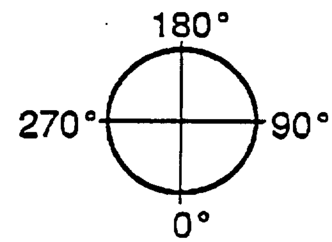
Motor No.: RSRM-26 | Side: ☐ Left (A) ☒ Right (B) | Date: April 6, 1993

Assessment Engineer(s)/Inspector(s): Reo Mackley

Sketch Aft Center Segment Liner Pattern Observations Below: * RESULTS OF SPECIAL ISSUE 3.1.1.1



<Location From End of Tang>



AFT LOOKING FORWARD

Heavy Liner

Light (spotty) Liner

No Liner

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ________

REVISION ____

POSTFLIGHT OBSERVATION RECORD (PFOR) A-8
Igniter Nozzle Insert Throat Diameter Measurements (Data Collection Only)

Motor No.: 360T026	Side: Right (B)	Date: 10/20/93

Assessment Engineer(s)/Inspector(s): Carnell Johnson

Record the Igniter Nozzle Insert Throat Diameter Measurements Below:

Degree Location	Diameter Measurement (inches)
0	6.435
60	6.421
120	6.438

Notes / Comments
None

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

TWR-64204

Space Shuttle
Solid Rocket Motor
Thiokol Corporation

Appendix B
Case, Seals, and Joints PFORs

Final Postflight Hardware Evaluation Report
360T026 (RSRM-26, STS-47)

April 1993

Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

Contract No.	NAS8-38100
DR No.	4-23
WBS No.	4C601-04-01
ECS No.	SS4769

Thiokol CORPORATION
SPACE OPERATIONS

P.O. Box 707, Brigham City, Utah 84302-0707 (801) 863-3511

CASE, SEALS, AND JOINTS REQUIRED PFOR LIST

PFOR #	Title	Side	Joint or Location	Final Report Page Number
B-2	S&A Device (Barrier-Booster and Environmental Seal Region) Condition	Left	S&A	B-1
B-7	S&A Rotor Shaft O-ring Condition (Detailed)	Left	S&A	B-2
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Left	S&A 126°	B-3
B-4	Leak Check Plug/SII Condition (Detailed)	Left	S&A 126°	B-4
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Left	S&A 126°	B-5
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Left	S&A 306°	B-6
B-4	Leak Check Plug/SII Condition (Detailed)	Left	S&A 306°	B-7
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Left	S&A 306°	B-8
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Left	18° SII	B-9
B-4	Leak Check Plug/SII Condition (Detailed)	Left	18° SII	B-10
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Left	18° SII	B-11
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Left	198° SII	B-12
B-4	Leak Check Plug/SII Condition (Detailed)	Left	198° SII	B-13
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Left	198° SII	B-14

(Note: Clarification forms will be inserted after the required PFOR in the Final Report. The clarification form page number will be the same as the required PFOR Final Report page number appended by a sequential alphabetic extension.)

CASE, SEALS, AND JOINTS REQUIRED LIST (Cont.)

PFOR #	Title	Side	Joint or Location	Final Report Page Number
B-3	Internal Nozzle Joint Condition	Left	Nozzle Joint #2	B-15
B-5	Large Diameter (Joint) O-ring Condition (Detailed)	Left	Nozzle Joint #2	B-16
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Left	Nozzle Joint #2	B-17
B-4	Leak Check Plug/SII Condition (Detailed)	Left	Nozzle Joint #2	B-18
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Left	Nozzle Joint #2	B-19
B-3	Internal Nozzle Joint Condition	Left	Nozzle Joint #3	B-20
B-5	Large Diameter (Joint) O-ring Condition (Detailed)	Left	Nozzle Joint #3	B-21
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Left	Nozzle Joint #3	B-22
B-4	Leak Check Plug/SII Condition (Detailed)	Left	Nozzle Joint #3	B-23
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Left	Nozzle Joint #3	B-24
B-3	Internal Nozzle Joint Condition	Left	Nozzle Joint #4	B-25
B-5	Large Diameter (Joint) O-ring Condition (Detailed)	Left	Nozzle Joint #4	B-26
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Left	Nozzle Joint #4	B-27
B-4	Leak Check Plug/SII Condition (Detailed)	Left	Nozzle Joint #4	B-28
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Left	Nozzle Joint #4	B-29

(Note: Clarification forms will be inserted after the required PFOR in the Final Report. The clarification form page number will be the same as the required PFOR Final Report page number appended by a sequential alphabetic extension.)

CASE, SEALS, AND JOINTS REQUIRED LIST (Cont.)

PFOR #	Title	Side	Joint or Location	Final Report Page Number
B-3	Internal Nozzle Joint Condition	Left	Nozzle Joint #5	B-30
B-5	Large Diameter (Joint) O-ring Condition (Detailed)	Left	Nozzle Joint #5	B-31
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Left	Nozzle Joint #5	B-32
B-4	Leak Check Plug/SII Condition (Detailed)	Left	Nozzle Joint #5	B-33
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Left	Nozzle Joint #5	B-34
B-8	Packing With Retainer Condition (Detailed)	Left	Nozzle Fixed Housing	B-35
B-9	Case Factory Joint Condition	Left	Forward Dome	B-36
B-9	Case Factory Joint Condition	Left	Forward	B-37
B-9	Case Factory Joint Condition	Left	Forward Center	B-38
B-9	Case Factory Joint Condition	Left	Aft Center	B-39
B-9	Case Factory Joint Condition	Left	ET Attach/ Stiffener	B-40
B-9	Case Factory Joint Condition	Left	Stiffener/ Stiffener	B-41
B-9	Case Factory Joint Condition	Left	Aft Dome	B-42

(Note: Clarification forms will be inserted after the required PFOR in the Final Report. The clarification form page number will be the same as the required PFOR Final Report page number appended by a sequential alphabetic extension.)

CASE, SEALS, AND JOINTS REQUIRED LIST (Cont.)

PFOR #	Title	Side	Joint or Location	Final Report Page Number
B-2	S&A Device (Barrier-Booster and Environmental Seal Region) Condition	Right	S&A	B-43
B-7	S&A Rotor Shaft O-ring Condition (Detailed)	Right	S&A	B-44
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Right	S&A 126°	B-45
B-4	Leak Check Plug/SII Condition (Detailed)	Right	S&A 126°	B-46
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Right	S&A 126°	B-47
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Right	S&A 306°	B-48
B-4	Leak Check Plug/SII Condition (Detailed)	Right	S&A 306°	B-49
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Right	S&A 306°	B-50
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Right	18° SII	B-51
B-4	Leak Check Plug/SII Condition (Detailed)	Right	18° SII	B-52
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Right	18° SII	B-53
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Right	198° SII	B-54
B-4	Leak Check Plug/SII Condition (Detailed)	Right	198° SII	B-55
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Right	198° SII	B-56

(Note: Clarification forms will be inserted after the required PFOR in the Final Report. The clarification form page number will be the same as the required PFOR Final Report page number appended by a sequential alphabetic extension.)

CASE, SEALS, AND JOINTS REQUIRED LIST (Cont.)

PFOR #	Title	Side	Joint or Location	Final Report Page Number
B-3	Internal Nozzle Joint Condition	Right	Nozzle Joint #2	B-57
B-5	Large Diameter (Joint) O-ring Condition (Detailed)	Right	Nozzle Joint #2	B-58
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Right	Nozzle Joint #2	B-59
B-4	Leak Check Plug/SII Condition (Detailed)	Right	Nozzle Joint #2	B-60
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Right	Nozzle Joint #2	B-61
B-3	Internal Nozzle Joint Condition	Right	Nozzle Joint #3	B-62
B-5	Large Diameter (Joint) O-ring Condition (Detailed)	Right	Nozzle Joint #3	B-63
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Right	Nozzle Joint #3	B-64
B-4	Leak Check Plug/SII Condition (Detailed)	Right	Nozzle Joint #3	B-65
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Right	Nozzle Joint #3	B-66
B-3	Internal Nozzle Joint Condition	Right	Nozzle Joint #4	B-67
B-5	Large Diameter (Joint) O-ring Condition (Detailed)	Right	Nozzle Joint #4	B-68
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Right	Nozzle Joint #4	B-69
B-4	Leak Check Plug/SII Condition (Detailed)	Right	Nozzle Joint #4	B-70
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Right	Nozzle Joint #4	B-71

(Note: Clarification forms will be inserted after the required PFOR in the Final Report. The clarification form page number will be the same as the required PFOR Final Report page number appended by a sequential alphabetic extension.)

CASE, SEALS, AND JOINTS REQUIRED LIST (Cont.)

PFOR #	Title	Side	Joint or Location	Final Report Page Number
B-3	Internal Nozzle Joint Condition	Right	Nozzle Joint #5	B-72
B-5	Large Diameter (Joint) O-ring Condition (Detailed)	Right	Nozzle Joint #5	B-73
B-1	Leak Check Plug/SII and Port Condition (At Removal)	Right	Nozzle Joint #5	B-74
B-4	Leak Check Plug/SII Condition (Detailed)	Right	Nozzle Joint #5	B-75
B-6	Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)	Right	Nozzle Joint #5	B-76
B-8	Packing With Retainer Condition (Detailed)	Right	Nozzle Fixed Housing	B-77
B-9	Case Factory Joint Condition	Right	Forward Dome	B-78
B-9	Case Factory Joint Condition	Right	Forward	B-79
B-9	Case Factory Joint Condition	Right	Forward Center	B-80
B-9	Case Factory Joint Condition	Right	Aft Center	B-81
B-9	Case Factory Joint Condition	Right	ET Attach/ Stiffener	B-82
B-9	Case Factory Joint Condition	Right	Stiffener/ Stiffener	B-83
B-9	Case Factory Joint Condition	Right	Aft Dome	B-84

(Note: Clarification forms will be inserted after the required PFOR in the Final Report. The clarification form page number will be the same as the required PFOR Final Report page number appended by a sequential alphabetic extension.)

POSTFLIGHT OBSERVATION RECORD (PFOR) B-2
S&A Device (Barrier-Booster and Environmental Seal Regions) Condition

Motor No.: 360T026	Side: Left (A)	Date: 10-1-92
Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Bullard		

Barrier-Booster Bore and Rotor Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring (In Groove)?		✓	
B. Soot To or Past O-rings?	✓		1
C. Heat Affected Metal?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Metal Damage?		✓	
F. Excessive or No Grease?		✓	
G. Corrosion?		✓	
H. Foreign Material?		✓	
I. Teflon Retainer Damage?		✓	
Environmental Seal Region Observations:			
J. Environmental O-ring Assembly Damage (Visible Without Magnification)?		✓	
K. Foreign Material?		✓	

Notes / Comments

Special Issues 3.2.3.1

1) Soot up to but not past the Fwd Rotor Primary O-ring.

Note: Special Issues 3.2.3.1 — Barrier-Booster rotor detent ball spring is being evaluated for corrosion by M&P.

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-7
S&A Rotor Shaft O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Bullard, D. Barecht

Location: S&A Device Barrier-Booster Rotor Shaft

	Yes	No	Comment #
Forward Primary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		√	
B. O-ring Defects/Damage?		√	
Aft Primary O-ring Observations:			
C. Heat Affected or Eroded O-ring?		√	
D. O-ring Defects/Damage?		√	
Forward Secondary O-ring Observations:			
E. Heat Affected or Eroded O-ring?		√	
F. O-ring Defects/Damage?		√	
Aft Secondary O-ring Observations:			
G. Heat Affected or Eroded O-ring?		√	
H. O-ring Defects/Damage?		√	

Notes / Comments

Preliminary PFAR(s)? ______ Yes √ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes √ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Left (A)	Date: 1 oct 92

Assessment Engineer(s)/Inspector(s): Robert Briggs, Phil Albright, MARV Lyon, Doug Bullard

Location: 126-Degree Barrier-Booster Bore

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	
Leak Check Port Observations:			
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ____________

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ____________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/Sll Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 1 oct 92

Assessment Engineer(s)/Inspector(s): Robert Briggs, MARV Lyon, Doug Bullard, Diane Garrett

Location: 126-Degree Barrier-Booster Bore

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date:

Assessment Engineer(s)/Inspector(s): Robert Briggs, MARV Lyon, Doug Bullard, Diane Garecht

Location: 126-Degree Barrier-Booster Bore

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Left (A)	Date: 1 oct 92

Assessment Engineer(s)/Inspector(s): Robert Briggs, MARV Lyon, Doug Bullard, Diane Garecht

Location: 306-Degree Barrier-Booster Flange

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	
Leak Check Port Observations:			
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 1 Oct 92

Assessment Engineer(s)/Inspector(s): Robert Briggs, Marv Lyon, Doug Bullard, Diane Gerecht

Location: 306-Degree Barrier-Booster Flange

Leak Check Plug Observations:

	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 1 Oct 92

Assessment Engineer(s)/Inspector(s): Robert Briggs, MARV Lyon, Doug Bullard, D.O. Garacht

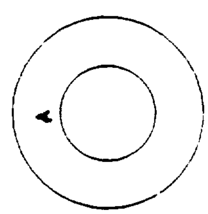
Location: 306-Degree Barrier-Booster Flange

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?	✓		1

Notes / Comments

1) A scratch observed on the 306° O-ring.
Cut measured: Depth = undetermined.
Width = 0.025 inch approximately

Photo # 130563-1



Preliminary PFAR(s)? ✓ Yes ___ No   Preliminary PFAR Number(s): 47C-14

Clarification Form(s)? ___ Yes ✓ No   Clarification Form Page No.(s): ___

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026 | Side: Left (A) | Date: 1 Oct 92

Assessment Engineer(s)/Inspector(s): Robert Briggs, MARV Lyon, Doug Bullard, Diane Sprecht

Location: 18-Degree SII

SII Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?	✓		#1
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on SII?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	
SII Port Observations:			
J. Sooted Metal Surfaces?	✓		#1
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	2
O. Heat Affected Metal?		✓	
P. Obstructed Leak Check Through Hole?		✓	

Notes / Comments

1) Soot on the tip of the plug.

2) Typical galling on land between primary and secondary seal surfaces.

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 1 Oct 92

Assessment Engineer(s)/Inspector(s): MARV Lyon, Robert Briggs, Doug Bullard, Diane Gorecki

Location: 18-Degree SII

SII Observations:

	Yes	No	Comment #
A. Foreign Material Between the O-ring and SII?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 1 Oct 92

Assessment Engineer(s)/Inspector(s): Robert Briggs, Marv Lyon, Doug Bullard, Diane Garecht

Location: 18-Degree SII

Primary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	
Secondary O-ring Observations:			
C. Heat Affected or Eroded O-ring?		✓	
D. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Left (A)	Date: 1 Oct 92
Assessment Engineer(s)/Inspector(s): Robert Briggs, MARV Lyon, Doug Bullard, Diane Garecht		
Location: 198-Degree SII		

SII Observations:

	Yes	No	Comment #
A. Sooted Metal Surfaces?	✓		#1
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on SII?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	

SII Port Observations:

	Yes	No	Comment #
J. Sooted Metal Surfaces?	✓		#1
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	2
O. Heat Affected Metal?		✓	
P. Obstructed Leak Check Through Hole?		✓	

Notes / Comments

1) Soot on the tip of the plug.

2) Typical galling on land between primary and secondary seal surfaces.

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 1 OCT 92

Assessment Engineer(s)/Inspector(s): Robert Briggs, MARV Lyon, Doug Bullard, Diane Garecht

Location: 198-Degree SII

SII Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and SII?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes __✓__ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes __✓__ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6

Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 1 oct 92

Assessment Engineer(s)/Inspector(s): Robert Briggs, MARV Lyon, Doug Bullard, Diane Garrett

Location: 198-Degree SII

	Yes	No	Comment #
Primary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	
Secondary O-ring Observations:			
C. Heat Affected or Eroded O-ring?		✓	
D. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-3
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, D. Bartelt

Joint: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Soot To or Past O-rings?	✓		1
B. Heat Affected Metal?		✓	
C. Foreign Material?		✓	
D. RTV in Contact With or Past the Primary O-ring?		✓	
E. O-ring Damage (In Groove)?		✓	
F. Heat Affected or Eroded O-rings (In Groove)?		✓	
G. Excessive or No Grease?		✓	
H. Corrosion?	✓	~~✓~~	3
I. Metal Damage?		✓	

Notes / Comments

① Typical scalloped shaped soot between boltholes on nose inlet & forward end ring. Soot reached primary O-ring intermittently from 195° to 345°

② Typical Burnishing on nose inlet secondary seal surface intermittently.

③ Light-to-medium corrosion in the scalloped soot region of the forward end ring intermittently.

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ________

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-5
Large Diameter (Joint) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, D. Bartell.

Joint: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)

	Yes	No	Comment #
Primary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	
Secondary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026 | Side: Left (A) | Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, D. Bartelt

Location: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	
Leak Check Port Observations:			
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Break away 35 in. lbs
Running 20 in. lbs

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/Sll Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): W. Sperry, D. Bartelt		
Location: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)		

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes __✓__ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes __✓__ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): W. Sperry, D. Bartelt		
Location: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)		

<u>Secondary O-ring Observations:</u>

	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes __✓__ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes __✓__ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-3
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons

Joint: Nose Inlet-to-Throat (Joint #3)

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Soot To or Past O-rings?		✓	
B. Heat Affected Metal?		✓	
C. Foreign Material?		✓	
D. RTV in Contact With or Past the Primary O-ring?		✓	
E. O-ring Damage (In Groove)?		✓	
F. Heat Affected or Eroded O-rings (In Groove)?		✓	
G. Excessive or No Grease?		✓	
H. Corrosion?	✓		1
I. Metal Damage?		✓	

Notes / Comments

Special Issues 3.2.3.2

No seal surface metal damage or atypical corrosion found.

① Typical light-to-medium corrosion upstream of primary O-ring intermittent full circumference.

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-5
Large Diameter (Joint) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons		
Joint: Nose Inlet-to-Throat (Joint #3)		

	Yes	No	Comment #
Primary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	
Secondary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026 | Side: Left (A) | Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons

Location: Nose Inlet-to-Throat (Joint #3)

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	

Leak Check Port Observations:	Yes	No	Comment #
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Breakaway 36 in. lbs

Running 23 in. lbs

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition: (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons

Location: Nose Inlet-to-Throat (Joint #3)

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons		
Location: Nose Inlet-to-Throat (Joint #3)		

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

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Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-3
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): A. Marriott, D. Bartelt		
Joint: Throat-to-Forward Exit Cone (Joint #4)		

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Soot To or Past O-rings?		✓	
B. Heat Affected Metal?		✓	
C. Foreign Material?	✓		1
D. RTV in Contact With or Past the Primary O-ring?		✓	
E. O-ring Damage (In Groove)?		✓	
F. Heat Affected or Eroded O-rings (In Groove)?		✓	
G. Excessive or No Grease?		✓	
H. Corrosion?	✓		2
I. Metal Damage?		✓	

Notes / Comments

~~Special Issues 3.2.3.2~~ N/A

1. Foreign material on primary seal surface of both mating surfaces. The foreign material on the F.E.C. is black and flaky. It appears to have been pressed into the groove by the O-ring at 23-30°. The material resembles soot. Loose black material was seen in the groove intermittently full circumference. The loose material is believed to be do to disassembly/splashdown.
The mating surfaces on the throat primary seal surface had the black material ~~and slag like material~~ intermittently full circumference. Slag-like material was seen on the primary at 28° & 30°

2. Medium corrosion was observed on secondary seal surface and between primary and secondary seals intermittently 235-270° on the F.E.C. and mating surface of the throat. Medium corrosion was also observed inboard of primary seal on the throat housing int. full circum.
Light corrosion between primary and secondary seals full circumference on ~~mating~~ metal surfaces

Special Issue: 3.2.3.2: No metal damage was observed on the seal surfaces and corrosion was typical as described in comment #2.

Preliminary PFAR(s)? ✓ Yes ___ No Preliminary PFAR Number(s): 47C-03

Clarification Form(s)? ___ Yes ✓ No Clarification Form Page No.(s): ___

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-5
Large Diameter (Joint) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 9-29-92

Assessment Engineer(s)/Inspector(s): A. Marriott / D. Bartlett

Joint: Throat-to-Forward Exit Cone (Joint #4)

	Yes	No	Comment #
Primary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	
Secondary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ____________

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ____________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Left (A)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): A. Merritt, D. Burtett		
Location: Throat-to-Forward Exit Cone (Joint #4)		

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	
Leak Check Port Observations:			
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Break torque: 28 ft-lbs
Running torque: 15 ft-lbs

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 9-29-92

Assessment Engineer(s)/Inspector(s): A. Marriott D Bartlett

Location: Throat-to-Forward Exit Cone (Joint #4)

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 9-29-92

Assessment Engineer(s)/Inspector(s): A. Merritt, D. Bartlett

Location: Throat-to-Forward Exit Cone (Joint #4)

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-3
Internal Nozzle Joint Condition

Motor No.: 360T026 | Side: Left (A) | Date: 9-29-92

Assessment Engineer(s)/Inspector(s): A. Marcott, M. Lyon

Joint: Aft End Ring-to-Fixed Housing (Joint #5)

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Soot To or Past O-rings?		✓	
B. Heat Affected Metal?		✓	
C. Foreign Material?	✓		1
D. RTV in Contact With or Past the Primary O-ring?		✓	
E. O-ring Damage (In Groove)?		✓	
F. Heat Affected or Eroded O-rings (In Groove)?		✓	
G. Excessive or No Grease?		✓	
H. Corrosion?	✓		2
I. Metal Damage?		✓	

Notes / Comments

1. Nylok on primary O-ring. Nylok was on downstream edge of O-ring. The Nylok is a foreign material on the O-ring. The foreign material did not bridge the footprint. A PFAR was written. Pictures were taken. The time of occurence could not be identified. The location of the Nylok was 235°.
2. Heavy to medium corrosion on the aft end ring flange intermittently full circumference. Medium corrosion on the mating surface of the fixed housing.

Medium corrosion inboard of the secondary seal surface intermittently full circumference on the aft end ring and fixed housing.

Preliminary PFAR(s)? ✓ Yes ___ No   Preliminary PFAR Number(s): 47C-04

Clarification Form(s)? ___ Yes ✓ No   Clarification Form Page No.(s): ______

REVISION ___

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-5
Large Diameter (Joint) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 29 Sept. 1992
Assessment Engineer(s)/Inspector(s): ART MARRIOT, MARVIN LYON		
Joint: Aft End Ring-to-Fixed Housing (Joint #5)		

Primary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	
Secondary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Left (A)	Date: 29 Sept 1992

Assessment Engineer(s)/Inspector(s): ART MARRIOT, MARVIN LYON

Location: Aft End Ring-to-Fixed Housing (Joint #5)

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	
Leak Check Port Observations:			
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?	✓		1
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Break Torque 39 ft-lbs
Running Torque 12 ft-lbs.

#1. Light corrosion on plug outside of O-ring.

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

REVISION ____

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 29 Sept 1992

Assessment Engineer(s)/Inspector(s): ART MARRIOT, MERVIN LYON

Location: Aft End Ring-to-Fixed Housing (Joint #5)

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6

Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 29 Sept 1992

Assessment Engineer(s)/Inspector(s): ART MARRIOT, MARVIN LYON

Location: Aft End Ring-to-Fixed Housing (Joint #5)

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-8
Packing With Retainer Condition (Detailed)

Motor No.: 360T026	Side: Left (A)	Date: 29 Sept 1992
Assessment Engineer(s)/Inspector(s): ART MARRiot, Dave Bartelt		
Joint: Aft End Ring-to-Fixed Housing (Joint #5)		

Packing With Retainer Observations:	Yes	No	Comment #
A. Heat Affected or Eroded Seal or Retainer?		✓	
B. Seal or Retainer Damage/Defects?	✓		1
C. Corrosion?		✓	

Notes / Comments

#1 72 of 72 packing with Retainers had seal damage.

Preliminary PFAR(s)? ______ Yes __✓__ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes __✓__ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 1-22-93

Assessment Engineer(s)/Inspector(s): HENRY ZAREMBA

Factory Joint: Forward Dome

Case Factory Joint Observations:	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		X	
B. Heavy Corrosion in Joint?	X		1
C. Heavy Corrosion in Leak Check Port?		X	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.1 Leak test plug was nominal

#1 FRETTING AND ~~HEAVY~~ MEDIUM CORROSION ON FWD DOME TANG AND AFT OF SECONDARY ON CLEVIS 214°- 230°

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 1-22-93
Assessment Engineer(s)/Inspector(s): HENRY ZAREMBA		
Factory Joint: Forward		

Case Factory Joint Observations:

	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		X	
B. Heavy Corrosion in Joint?		X	
C. Heavy Corrosion in Leak Check Port?		X	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3

Leak test plug was removed

Preliminary PFAR(s)? ______ Yes ______ No Preliminary PFAR Number(s): ____________

Clarification Form(s)? ______ Yes ______ No Clarification Form Page No.(s): ____________

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 4-8-93
Assessment Engineer(s)/Inspector(s): GARY W. ASPER (Q.A)		
Factory Joint: Forward Center		

<u>Case Factory Joint Observations:</u>

	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		✓	
B. Heavy Corrosion in Joint?		✓	
C. Heavy Corrosion in Leak Check Port?		✓	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3 The Leak test plug was nominal.

N/A

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): N/A

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): N/A

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 3-15-93
Assessment Engineer(s)/Inspector(s): G. Rich		
Factory Joint: Aft Center		

Case Factory Joint Observations:

	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		✓	
B. Heavy Corrosion in Joint?		✓	
C. Heavy Corrosion in Leak Check Port?		✓	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3

Leak test plug was removed

Preliminary PFAR(s)? ____ Yes __✓__ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ____ Yes __✓__ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 10 FEB 1993
Assessment Engineer(s)/Inspector(s): Schenck		
Factory Joint: ET Attach/Stiffener		

Case Factory Joint Observations:	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		✓	
B. Heavy Corrosion in Joint?		✓	
C. Heavy Corrosion in Leak Check Port?		✓	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3

LEAK TEST PLUG WAS NOMINAL

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9

Case Factory Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 10 FEB 1993

Assessment Engineer(s)/Inspector(s): Schenck

Factory Joint: Stiffener/Stiffener

Case Factory Joint Observations:	Yes	* No	Comment #
A. Heat Affected or Eroded Joint O-ring?		✓	
B. Heavy Corrosion in Joint?		✓	
C. Heavy Corrosion in Leak Check Port?		✓	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3

LEAK TEST PLUG WAS NOMINAL

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 10 FEB 1993
Assessment Engineer(s)/Inspector(s): Schenck		
*Factory Joint: Aft Dome		

Case Factory Joint Observations:

	Yes	No	*Comment #
A. Heat Affected or Eroded Joint O-ring?		✓	
B. Heavy Corrosion in Joint?		✓	
C. Heavy Corrosion in Leak Check Port?		✓	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3

NO BLUE PATCH WAS NOTED. ON LEAK TEST PLUG.

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-2
S&A Device (Barrier-Booster and Environmental Seal Regions) Condition

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, M. Lyon, R. Briggs, G. Neilson, D. Bullard,

Barrier-Booster Bore and Rotor Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring (In Groove)?		✓	
B. Soot To or Past O-rings?	✓	~~✓~~	1
C. Heat Affected Metal?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Metal Damage?		✓	
F. Excessive or No Grease?		✓	
G. Corrosion?		✓	
H. Foreign Material?		✓	
I. Teflon Retainer Damage?		✓	
Environmental Seal Region Observations:			
J. Environmental O-ring Assembly Damage (Visible Without Magnification)?		✓	
K. Foreign Material?		✓	

Notes / Comments

Special Issues 3.2.3.1 – Barrier-Booster rotor detent ball spring is being evaluated for corrosion by M&P

1- Soot up to but not past the forward rotor primary O-ring.

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-7
S&A Rotor Shaft O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, R. Briggs, M. Lyon, G. Neilson, D. Bartelt, D. Bullard

Location: S&A Device Barrier-Booster Rotor Shaft

	Yes	No	Comment #
Forward Primary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	
Aft Primary O-ring Observations:			
C. Heat Affected or Eroded O-ring?		✓	
D. O-ring Defects/Damage?		✓	
Forward Secondary O-ring Observations:			
E. Heat Affected or Eroded O-ring?		✓	
F. O-ring Defects/Damage?		✓	
Aft Secondary O-ring Observations:			
G. Heat Affected or Eroded O-ring?		✓	
H. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Bullard,

Location: 126-Degree Barrier-Booster Bore

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	

Leak Check Port Observations:	Yes	No	Comment #
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Bullard,

Location: 126-Degree Barrier-Booster Bore

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6

Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92
Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Bullard,		
Location: 126-Degree Barrier-Booster Bore		

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Bullard

Location: 306-Degree Barrier-Booster Flange

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	

Leak Check Port Observations:	Yes	No	Comment #
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Bullard,

Location: 306-Degree Barrier-Booster Flange

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ____________

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ____________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Bullard,

Location: 306-Degree Barrier-Booster Flange

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92
Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Bullard		
Location: 18-Degree SII		

SII Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?	✓		1
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on SII?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	

SII Port Observations:	Yes	No	Comment #
J. Sooted Metal Surfaces?	✓		1
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	2
O. Heat Affected Metal?		✓	
P. Obstructed Leak Check Through Hole?		✓	

Notes / Comments

1) Soot on tip of SII.

2) Typical galling on land between primary and secondary seal surfaces.

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Ballard

Location: 18-Degree SII

SII Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and SII?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Ballard

Location: 18-Degree SII

Primary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	
Secondary O-ring Observations:			
C. Heat Affected or Eroded O-ring?		✓	
D. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92
Assessment Engineer(s)/Inspector(s): R. Albright, D. Bartell, G. Neilson, D. Bullard		
Location: 198-Degree SII		

SII Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?	✓		1
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on SII?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	

SII Port Observations:	Yes	No	Comment #
J. Sooted Metal Surfaces?	✓		1
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	2
O. Heat Affected Metal?		✓	
P. Obstructed Leak Check Through Hole?		✓	

Notes / Comments

1) Soot on the tip of SII.

2) Typical galling on land between primary and secondary seal surfaces.

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

REVISION ____

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92
Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Bullard.		
Location: 198-Degree SII		

SII Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and SII?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): P. Albright, D. Bartelt, G. Neilson, D. Ballard

Location: 198-Degree SII

	Yes	No	Comment #
Primary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	
Secondary O-ring Observations:			
C. Heat Affected or Eroded O-ring?		✓	
D. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

REVISION ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-3
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): W. Sperry, D. Bartelt		
Joint: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)		

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Soot To or Past O-rings?	✓		1
B. Heat Affected Metal?		✓	
C. Foreign Material?		✓	
D. RTV in Contact With or Past the Primary O-ring?		✓	
E. O-ring Damage (In Groove)?		✓	
F. Heat Affected or Eroded O-rings (In Groove)?		✓	
G. Excessive or No Grease?		✓	
H. Corrosion?	✓		2
I. Metal Damage?		✓	

Notes / Comments

1. Typical scalloped shaped ~~soot~~ ~~on of~~ Between boltholes on Nose inlet and forward end ring. Soot reached primary O-ring ~~2~~ intermittently 290° - 0° - 40°.
2. Light-to-medium corrosion intermittently in the scalloped soot region of both the forward end ring and Nose inlet.
3. Typical light burnishing intermittently on Nose inlet secondary seal surface.

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[illegible signature]

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ________

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-5
Large Diameter (Joint) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons, C. Walker

Joint: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)

	Yes	No	Comment #
Primary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	
Secondary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/Sll and Port Condition (At Removal)

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, Marv Lyons

Location: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	
Leak Check Port Observations:			
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Breakaway 34 in. lbs
Running 12 in. lbs

Preliminary PFAR(s)? ______ Yes __✓__ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes __✓__ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons

Location: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons.

Location: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-3
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons

Joint: Nose Inlet-to-Throat (Joint #3)

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Soot To or Past O-rings?		✓	
B. Heat Affected Metal?		✓	
C. Foreign Material?		✓	
D. RTV in Contact With or Past the Primary O-ring?		✓	
E. O-ring Damage (In Groove)?		✓	
F. Heat Affected or Eroded O-rings (In Groove)?		✓	
G. Excessive or No Grease?		✓	
H. Corrosion?	✓		1
I. Metal Damage?		✓	

Notes / Comments

Special Issues 3.2.3.2

No seal surface metal damage or atypical corrosion found.

① Typical Light-to-medium corrosion upstream of primary O-ring intermittent full circumference.

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

REVISION ____

POSTFLIGHT OBSERVATION RECORD (PFOR) B-5
Large Diameter (Joint) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons

Joint: Nose Inlet-to-Throat (Joint #3)

Primary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	
Secondary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/Sil and Port Condition (At Removal)

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons

Location: Nose Inlet-to-Throat (Joint #3)

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	
Leak Check Port Observations:			
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Breakaway 33 in.-lbs.
Running 11 in. lbs.

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

REVISION ____

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/Sll Conditions (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons		
Location: Nose Inlet-to-Throat (Joint #3)		

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): W. Sperry, M. Lyons

Location: Nose Inlet-to-Throat (Joint #3)

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes __✓__ No Preliminary PFAR Number(s): ________

Clarification Form(s)? ______ Yes __✓__ No Clarification Form Page No.(s): ________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-3
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 9-28-92
Assessment Engineer(s)/Inspector(s): A. Merritt, M. Lyon		
Joint: Throat-to-Forward Exit Cone (Joint #4)		

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Soot To or Past O-rings?		✓	
B. Heat Affected Metal?		✓	
C. Foreign Material?		✓	
D. RTV in Contact With or Past the Primary O-ring?	✓		1
E. O-ring Damage (In Groove)?		✓	
F. Heat Affected or Eroded O-rings (In Groove)?		✓	
G. Excessive or No Grease?		✓	3
H. Corrosion?	✓		2
I. Metal Damage?		✓	

Notes / Comments

~~Special Issues 3.2.3.2~~ N/A

1. RTV to primary O-ring intermittently full circumference
2. Medium corrosion inboard of primary seal surface on throat intermittently full circumference.
   Light corrosion on secondary seal and between primary and secondary seal surfaces on the forward exit cone and mating surfaces intermittently full circumference.
3. Typical medium grease coverage on the primary seal and mating metal surface.

Special Issue 3.2.3.2: No metal damage was seen on the sealing surfaces and corrosion was typical as described in comment #2

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-5
Large Diameter (Joint) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-28-92
Assessment Engineer(s)/Inspector(s): A. Merrill, M. Lyon		
Joint: Throat-to-Forward Exit Cone (Joint #4)		

Primary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	
Secondary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ____________

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ____________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Right (B)	Date: 9-28-92

Assessment Engineer(s)/Inspector(s): A. Marriott, M. Lyon

Location: Throat-to-Forward Exit Cone (Joint #4)

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	

Leak Check Port Observations:	Yes	No	Comment #
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Break Torque: Not obtained
Running Torque : 24

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-28-92
Assessment Engineer(s)/Inspector(s): A. Marriott, M. Lyon		
Location: Throat-to-Forward Exit Cone (Joint #4)		

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-28-92

Assessment Engineer(s)/Inspector(s): A. Marcroft, M. Lyon

Location: Throat-to-Forward Exit Cone (Joint #4)

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-3
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): A. Merrill, D. Bartell, C. Walker		
Joint: Aft End Ring-to-Fixed Housing (Joint #5)		

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Soot To or Past O-rings?		✓	
B. Heat Affected Metal?		✓	
C. Foreign Material?		✓	
D. RTV in Contact With or Past the Primary O-ring?		✓	
E. O-ring Damage (In Groove)?		✓	
F. Heat Affected or Eroded O-rings (In Groove)?		✓	
G. Excessive or No Grease?		✓	
H. Corrosion?	✓		1
I. Metal Damage?		✓	

Notes / Comments

1. Water droplets and light-medium corrosion observed inboard of secondary seal int. full circumference on mating surfaces. Medium corrosion was also observed on the aft end ring flange ID and mating surface on the fixed housing

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-5
Large Diameter (Joint) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-29-92

Assessment Engineer(s)/Inspector(s): A. Marritt, D. Bartelt, C. Walker

Joint: Aft End Ring-to-Fixed Housing (Joint #5)

	Yes	No	Comment #
Primary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	
Secondary O-ring Observations:			
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Damage/Defects?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-1
Leak Check Plug/SII and Port Condition (At Removal)

Motor No.: 360T026	Side: Right (B)	Date: 9-29-92

Assessment Engineer(s)/Inspector(s): A. Merritt, D. Bartell

Location: Aft End Ring-to-Fixed Housing (Joint #5)

Leak Check Plug Observations:	Yes	No	Comment #
A. Sooted Metal Surfaces?		✓	
B. Soot To or Past O-ring?		✓	
C. Foreign Material?		✓	
D. O-ring Damage (In Groove)?		✓	
E. Heat Affected or Eroded O-ring (In Groove)?		✓	
F. Excessive or No Grease on O-ring?		✓	
G. Excessive Grease on Plug?		✓	
H. Corrosion?		✓	
I. Thread Damage (Visible at Removal)?		✓	
Leak Check Port Observations:			
J. Sooted Metal Surfaces?		✓	
K. Foreign Material?		✓	
L. Excessive Grease?		✓	
M. Corrosion?		✓	
N. Metal Damage?		✓	
O. Heat Affected Metal?		✓	
P. Obstructed Through Hole?		✓	

Notes / Comments

Break Torque: 40 ft-lbs
Running Tor 11 ft-lbs

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-4
Leak Check Plug/SII Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): D. Bartelt, A. Merritt		
Location: Aft End Ring-to-Fixed Housing (Joint #5)		

Leak Check Plug Observations:	Yes	No	Comment #
A. Foreign Material Between the O-ring and Plug?		✓	
B. Heat Affected Metal?		✓	
C. Seal Surface/Thread Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ______ Yes __✓__ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes __✓__ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-6
Small Diameter (Leak Check Plug/SII) O-ring Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-29-92

Assessment Engineer(s)/Inspector(s): A. Marriott, D. Bartolf, C. Walker

Location: Aft End Ring-to-Fixed Housing (Joint #5)

Secondary O-ring Observations:	Yes	No	Comment #
A. Heat Affected or Eroded O-ring?		✓	
B. O-ring Defects/Damage?		✓	

Notes / Comments

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-8
Packing With Retainer Condition (Detailed)

Motor No.: 360T026	Side: Right (B)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): D. Bartelt, A. Merritt		
Joint: Aft End Ring-to-Fixed Housing (Joint #5)		

Packing With Retainer Observations:	Yes	No	Comment #
A. Heat Affected or Eroded Seal or Retainer?		✓	
B. Seal or Retainer Damage/Defects?	✓		1
C. Corrosion?		✓	

Notes / Comments

1. 3/72 packings did not have damage
15/72 had typical metal flaking-off the retainer

Preliminary PFAR(s)? ______ Yes __✓__ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes __✓__ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 1-4-93

Assessment Engineer(s)/Inspector(s): H. ZAREMBA

Factory Joint: Forward Dome

Case Factory Joint Observations:	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		X	
B. Heavy Corrosion in Joint?	X		#1
C. Heavy Corrosion in Leak Check Port?		X	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3 Leak test plug was normal

#1 HEAVY CORROSION ON LAND FWD OF PRIMARY O-RING, AND ON LAND AND ON SEC. AFT WALL OUTBOARD EDGE LOCATION AT 202°, ON CYL ALSO ON TANG AT 202° ON FWD DOME

HEAVY CORROSION AT 180° FWD OF PRI. O-RING

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 1-4-93
Assessment Engineer(s)/Inspector(s): H. ZAREMBA		
Factory Joint: Forward		

Case Factory Joint Observations:

	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		X	
B. Heavy Corrosion in Joint?		X	
C. Heavy Corrosion in Leak Check Port?		X	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3 Leak test plug was nominal

Preliminary PFAR(s)? ______ Yes ___√___ No Preliminary PFAR Number(s): ______________

Clarification Form(s)? ______ Yes ___√___ No Clarification Form Page No.(s): ______________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 4-28-93

Assessment Engineer(s)/Inspector(s): G. RICH

Factory Joint: Forward Center

Case Factory Joint Observations:

	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		✓	
B. Heavy Corrosion in Joint?		✓	
C. Heavy Corrosion in Leak Check Port?		✓	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3

The leak test plug was removed

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

REVISION ____

To: Bryan Neilson
640

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 4-12-93
Assessment Engineer(s)/Inspector(s): GARY W. ASPER 640		
Factory Joint: Aft Center		

Case Factory Joint Observations:

	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		✓	
B. Heavy Corrosion in Joint?		✓	
C. Heavy Corrosion in Leak Check Port?		✓	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3
The leak test plug was [illegible]

N/A

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): N/A

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): N/A

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 14 JAN 1993
Assessment Engineer(s)/Inspector(s): Birch		
Factory Joint: ET Attach/Stiffener		

Case Factory Joint Observations:	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		✓	
B. Heavy Corrosion in Joint?		✓	
C. Heavy Corrosion in Leak Check Port?		✓	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3 This Leak Test Plug Has The Blue Locking Device Still Visible On The Threads. No Anomalous Condition Was Noted.

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 14 JAN 1993
Assessment Engineer(s)/Inspector(s): Birch		
Factory Joint: Stiffener/Stiffener		

Case Factory Joint Observations:

	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		✓	
B. Heavy Corrosion in Joint?		✓	
C. Heavy Corrosion in Leak Check Port?		✓	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3 Leak test plug was normal

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) B-9
Case Factory Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 01-13-93

Assessment Engineer(s)/Inspector(s): ERic HAY

Factory Joint: Aft Dome

Case Factory Joint Observations:	Yes	No	Comment #
A. Heat Affected or Eroded Joint O-ring?		✓	
B. Heavy Corrosion in Joint?		✓	
C. Heavy Corrosion in Leak Check Port?		✓	

Note: Heavy corrosion is defined as corrosion that causes pitting. It may be necessary to remove corrosion to determine if pitting has occurred; however, care should be taken not to damage the hardware. A cloth dampened with solvent or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.

Notes / Comments

Special Issues 3.2.3.3 Leak test plug was nominal

Preliminary PFAR(s)? ______ Yes __X__ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes __X__ No Clarification Form Page No.(s): ______

TWR-64204

Appendix C
Nozzle PFORs

Final Postflight Hardware Evaluation Report
360T026 (RSRM-26, STS-47)

April 1993

Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

Contract No.	NAS8-38100
DR No.	4-23
WBS No.	4C601-04-01
ECS No.	SS4769

Thiokol CORPORATION
SPACE OPERATIONS

P.O. Box 707, Brigham City, Utah 84302-0707 (801) 863-3511

NOZZLE REQUIRED EVALUATION FORMS LIST

PFOR #	Title	Side	Joint, Part, or Location	Final Report Page Number
C-1	Nozzle Assembly Quick-look Condition	Left	N/A	C-1
C-2	Nozzle Joint Condition	Left	Joint #2	C-2
C-3	Nose Inlet-to-Flex Bearing-to-Cowl Joint Condition Drawing Worksheet	Left	Joint #2	C-3
C-2	Nozzle Joint Condition	Left	Joint #3	C-4
C-4	Nose Inlet-to-Throat Joint Condition Drawing Worksheet	Left	Joint #3	C-5
C-2	Nozzle Joint Condition	Left	Joint #4	C-6
C-5	Throat-to-Forward Exit Cone Joint Condition Drawing Worksheet	Left	Joint #4	C-7
C-2	Nozzle Joint Condition	Left	Joint #5	C-8
C-6	Aft End Ring-to-Fixed Housing Joint Condition Drawing Worksheet	Left	Joint #5	C-9
C-7	Cowl Insulation Segment Condition	Left	Cowl	C-10
C-8	Flexible Bearing, Flexible Bearing Protector, and Flexible Boot Condition	Left	Flexible Bearing, Protector, & Boot	C-11
C-9	Flexible Bearing Protector Thickness Measurements	Left	Flexible Bearing Protector	C-12
C-10	Throat Diameter Measurements	Left	Throat	C-13

(Note: Clarification PFORs will be inserted after the applicable required PFOR in the Final Report and will have the same page number as the required PFOR appended by a sequential alphabetic extension.)

NOZZLE REQUIRED EVALUATION FORMS LIST (Cont.)

PFOR #	Title	Side	Joint, Part, or Location	Final Report Page Number
C-11	Outer Boot Ring Char and Erosion Measurements and Flexible Boot Condition	Left	Outer Boot Ring & Flexible Boot	C-14
C-12	Nozzle Subassembly Phenolic Bondline Condition	Left	Aft Exit Cone	C-15
C-12	Nozzle Subassembly Phenolic Bondline Condition	Left	Forward Exit Cone	C-16
C-12	Nozzle Subassembly Phenolic Bondline Condition	Left	Throat	C-17
C-12	Nozzle Subassembly Phenolic Bondline Condition	Left	Forward Nose & Aft Inlet Rings	C-18
C-12	Nozzle Subassembly Phenolic Bondline Condition	Left	Nose Cap	C-19
C-12	Nozzle Subassembly Phenolic Bondline Condition	Left	Cowl	C-20
C-12	Nozzle Subassembly Phenolic Bondline Condition	Left	Fixed Housing	C-21
C-13	Cowl Ring Phenolic (SCP) Section Condition	Left	Cowl	C-22
C-14	Forward Exit Cone Phenolic (CCP) Section Condition	Left	Forward Exit Cone	C-23
C-15	Fixed Housing Phenolic (CCP) Section Condition	Left	Fixed Housing	C-24
C-16	Throat Inlet Assembly Phenolic (CCP) Section Condition	Left	Throat	C-25
C-17	Nose Cap Phenolic (CCP) Section Condition	Left	Nose Cap	C-26
C-18	Forward Nose Ring and Aft Inlet Ring Phenolic (CCP) Section Condition	Left	Forward Nose & Aft Inlet Rings	C-27

(Note: Clarification PFORs will be inserted after the applicable required PFOR in the Final Report and will have the same page number as the required PFOR appended by a sequential alphabetic extension.)

NOZZLE REQUIRED EVALUATION FORMS LIST (Cont.)

PFOR #	Title	Side	Joint, Part, or Location	Final Report Page Number
C-1	Nozzle Assembly Quick-look Condition	Right	N/A	C-28
C-2	Nozzle Joint Condition	Right	Joint #2	C-29
C-3	Nose Inlet-to-Flex Bearing-to-Cowl Joint Condition Drawing Worksheet	Right	Joint #2	C-30
C-2	Nozzle Joint Condition	Right	Joint #3	C-31
C-4	Nose Inlet-to-Throat Joint Condition Drawing Worksheet	Right	Joint #3	C-32
C-2	Nozzle Joint Condition	Right	Joint #4	C-33
C-5	Throat-to-Forward Exit Cone Joint Condition Drawing Worksheet	Right	Joint #4	C-34
C-2	Nozzle Joint Condition	Right	Joint #5	C-35
C-6	Aft End Ring-to-Fixed Housing Joint Condition Drawing Worksheet	Right	Joint #5	C-36
C-7	Cowl Insulation Segment Condition	Right	Cowl	C-37
C-8	Flexible Bearing, Flexible Bearing Protector, and Flexible Boot Condition	Right	Flexible Bearing, Protector, & Boot	C-38
C-9	Flexible Bearing Protector Thickness Measurements	Right	Flexible Bearing Protector	C-39
C-10	Throat Diameter Measurements	Right	Throat	C-40

(Note: Clarification PFORs will be inserted after the applicable required PFOR in the Final Report and will have the same page number as the required PFOR appended by a sequential alphabetic extension.)

NOZZLE REQUIRED EVALUATION FORMS LIST (Cont.)

PFOR #	Title	Side	Joint, Part, or Location	Final Report Page Number
C–11	Outer Boot Ring Char and Erosion Measurements and Flexible Boot Condition	Right	Outer Boot Ring & Flexible Boot	C–41
C–12	Nozzle Subassembly Phenolic Bondline Condition	Right	Aft Exit Cone	C–42
C–12	Nozzle Subassembly Phenolic Bondline Condition	Right	Forward Exit Cone	C–43
C–12	Nozzle Subassembly Phenolic Bondline Condition	Right	Throat	C–44
C–12	Nozzle Subassembly Phenolic Bondline Condition	Right	Forward Nose & Aft Inlet Rings	C–45
C–12	Nozzle Subassembly Phenolic Bondline Condition	Right	Nose Cap	C–46
C–12	Nozzle Subassembly Phenolic Bondline Condition	Right	Cowl	C–47
C–12	Nozzle Subassembly Phenolic Bondline Condition	Right	Fixed Housing	C–48
C–13	Cowl Ring Phenolic (SCP) Section Condition	Right	Cowl	C–49
C–14	Forward Exit Cone Phenolic (CCP) Section Condition	Right	Forward Exit Cone	C–50
C–15	Fixed Housing Phenolic (CCP) Section Condition	Right	Fixed Housing	C–51
C–16	Throat Inlet Assembly Phenolic (CCP) Section Condition	Right	Throat	C–52
C–17	Nose Cap Phenolic (CCP) Section Condition	Right	Nose Cap	C–53
C–18	Forward Nose Ring and Aft Inlet Ring Phenolic (CCP) Section Condition	Right	Forward Nose & Aft Inlet Rings	C–54

(Note: Clarification PFORs will be inserted after the applicable required PFOR in the Final Report and will have the same page number as the required PFOR appended by a sequential alphabetic extension.)

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-2
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): M. Clark, J. Walker, R. Lange, T. Freston

Joint: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Gas Penetration in the RTV (Terminated, Through)?	✓		1
B. RTV Not Below Char Line?		✓	
C. RTV To the Primary O-ring?		✓	
D. RTV Past the Primary O-ring?		✓	
E. Uncured RTV?		✓	
F. Voids Within RTV?		✓	
G. Foreign Material?		✓	
H. Heat Affected or Eroded Virgin CCP, GCP/SCP, or adhesive?		✓	
I. Damaged Phenolics?		✓	
J. Bondline Edge Separations? Use Clarification Form.	✓		2
K. Phenolics Axially Displaced From Housing?		✓	
L. Heat Affected Metal?		✓	
M. Unbonded or Blistered Paint?	✓		3
N. Corrosion?	✓		4
O. Excessive Grease in Threaded Bolt Holes?		✓	
P. Bolt Hole Damage (Through, Threaded/Helical Coil Insert)?		✓	
Q. Bent or Broken Bolts?		✓	
R. Metal Damage (Joints or Housings)?		✓	

Notes / Comments

1) Soot in joint and reached primary o-ring at 190°-345°. No gaspath into joint. Soot entered thru intermixed RTV.
2) Reference page C-2A
3) Bubbled paint on OD of forward end ring at 170°-325°
Preliminary PFAR has been written.
4) Reference page C-3 for locations

Preliminary PFAR(s)? ✓ Yes ____ No   Preliminary PFAR Number(s): 47C-09

Clarification Form(s)? ✓ Yes ____ No   Clarification Form Page No.(s): C-2A

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Interface Separation Clarification Form

Motor No.: 360T026	Side: ☑ Left (A) ☐ Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): M. Clark, R. Lange

Part:
- ☐ Forward Exit Cone (Forward End)
- ☐ Throat Ring (Aft End)
- ☐ Throat Inlet Ring (Forward End)
- ☐ Aft Inlet Ring (Aft End)
- ☑ Nose Cap (Aft End)
- ☐ Cowl (Forward End)*
- ☐ Inner Boot Ring (Forward End)

Interface Separation Types:
- A. Metal-to-Adhesive
- B. Within Adhesive
- C. Adhesive-to-GCP
- D. Within GCP
- E. GCP-to-CCP
- F. Within CCP
- *G. Adhesive-to-SCP
- *H. Within SCP
- *I. SCP-to-CCP

Circumferential Location	Separation Type	Maximum Radial Width
0-360 intermittent	A	.005

Corresponding Comment Number(s): 2

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-3

Nose Inlet-to-Flex Bearing-to-Cowl Joint (Joint #2) Condition Drawing Worksheet

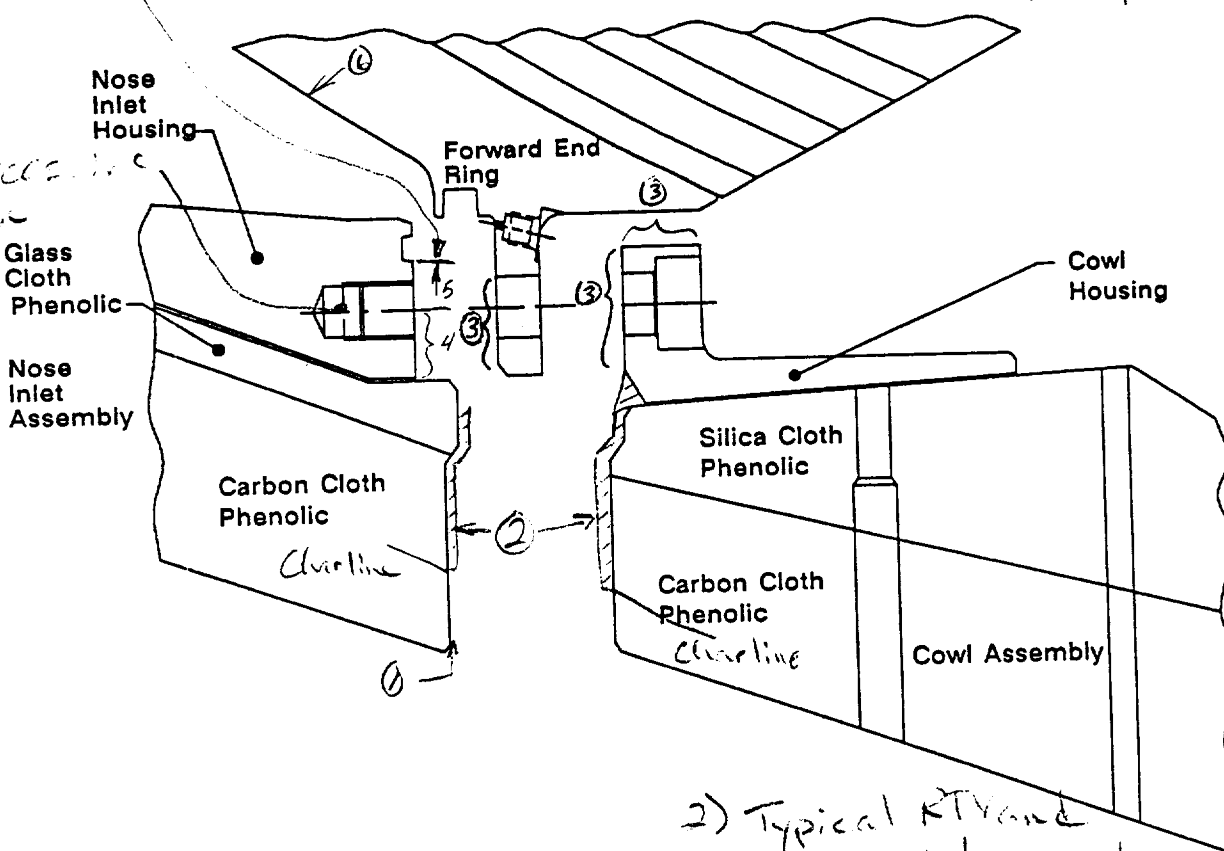
Motor No.: 360T026	Side: Left (A)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): M. Clark, J. Walker, R. Lange, T. Freston		

Sketch Observations Below (include locations and sizes of sketched features):

6) Intermittent bubbled paint on fwd end ring O.D. surface at 170°-325°
Bubble extends from fwd end to within 1" of SECONDARY o-ring groove, Clear fluid in bubbles, sample taken

Soot to Primary O-ring 190°-345° intermittently
No Distinct gas path

No Excessive Grease



2) Typical RTV and Adhesive intermixed with soot entering between layers.

1) Pry Bar used at 5° and 110° to facilitate separation

3) Light-to-medium corrosion intermittent 0°-360°
4) TYP SOOTING, LIGHT/MEDIUM CORROSION 0°-360°
5) TYP SOOTING, LIGHT/MED CORROSION TO PRI O-RING

Clarification Form(s)? ____ Yes __✓__ No   Clarification Form Page No.(s): ________

POSTFLIGHT OBSERVATION RECORD (PFOR) C-2

Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): R. Quick		
Joint: Nose Inlet-to-Throat (Joint #3)		

Internal Nozzle Joint Observations:

	Yes	No	Comment #
A. Gas Penetration in the RTV (Terminated, Through)?		✓	
B. RTV Not Below Char Line?		✓	
C. RTV To the Primary O-ring?		✓	
D. RTV Past the Primary O-ring?		✓	
E. Uncured RTV?		✓	
F. Voids Within RTV?	✓		1
G. Grease Inhibiting RTV Backfill?		✓	
H. Foreign Material?		✓	
I. Heat Affected or Eroded Virgin CCP, GCP/SCP, or adhesive?		✓	
J. Damaged Phenolics?		✓	
K. Bondline Edge Separations? Use Clarification Form.	✓		3
L. Phenolics Axially Displaced From Housing?		✓	
M. Heat Affected Metal?		✓	
N. Unbonded or Blistered Paint?		✓	
O. Corrosion?	✓		2
P. Alignment Pin Damage?		N/A	
Q. Excessive Grease in Threaded Bolt Holes?		✓	
R. Bolt Hole Damage (Through, Threaded/Helical Coil Insert)?		✓	
S. Bent or Broken Bolts?		✓	
T. Metal Damage (Joints or Housings)?		✓	

Notes / Comments

Special Issues 3.2.3.2 – NO SEAL SURFACE DAMAGE OR TYPICAL CORROSION FOUND

1-2 VOIDS IN RTV AT 85° AND 238° BEYOND CHAR LINE

2. TYPICAL LIGHT TO MEDIUM CORROSION UPSTREAM OF PRIMARY O-RING INTERMITTENT 360° ON NOSE INLET HOUSING

3 – SEE PAGE C-4A AND C-4B.

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ✓ Yes ____ No Clarification Form Page No.(s): C-4A & C-4B

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Interface Separation Clarification Form

Motor No.: 360T026 | Side: ☒ Left (A) ☐ Right (B) | Date: 9-30-92

Assessment Engineer(s)/Inspector(s): R. Quick

Part:
- ☐ Forward Exit Cone (Forward End)
- ☐ Throat Ring (Aft End)
- ☒ Throat Inlet Ring (Forward End)
- ☐ Aft Inlet Ring (Aft End)
- ☐ Nose Cap (Aft End)
- ☐ Cowl (Forward End)*
- ☐ Inner Boot Ring (Forward End)

Interface Separation Types:
- A. Metal-to-Adhesive
- B. Within Adhesive
- C. Adhesive-to-GCP
- D. Within GCP
- E. GCP-to-CCP
- F. Within CCP
- *G. Adhesive-to-SCP
- *H. Within SCP
- *I. SCP-to-CCP

Circumferential Location	Separation Type	Maximum Radial Width
5°-90°	A	.003
100°-160°	A	.015
225°-250°	A	.015
270°-350°	A	.010

Corresponding Comment Number(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Interface Separation Clarification Form

Motor No.: 360T026 | Side: ☒ Left (A) ☐ Right (B) | Date: 9-30-92

Assessment Engineer(s)/Inspector(s): R. GUICK

Part:
- ☐ Forward Exit Cone (Forward End)
- ☐ Throat Ring (Aft End)
- ☐ Throat Inlet Ring (Forward End)
- ☒ Aft Inlet Ring (Aft End)
- ☐ Nose Cap (Aft End)
- ☐ Cowl (Forward End)*
- ☐ Inner Boot Ring (Forward End)

Interface Separation Types:
- A. Metal-to-Adhesive
- B. Within Adhesive
- C. Adhesive-to-GCP
- D. Within GCP
- E. GCP-to-CCP
- F. Within CCP
- *G. Adhesive-to-SCP
- *H. Within SCP
- *I. SCP-to-CCP

Circumferential Location	Separation Type	Maximum Radial Width
65-100°	A	.005
[illegible]	A	[illegible]

Corresponding Comment Number(s): ______

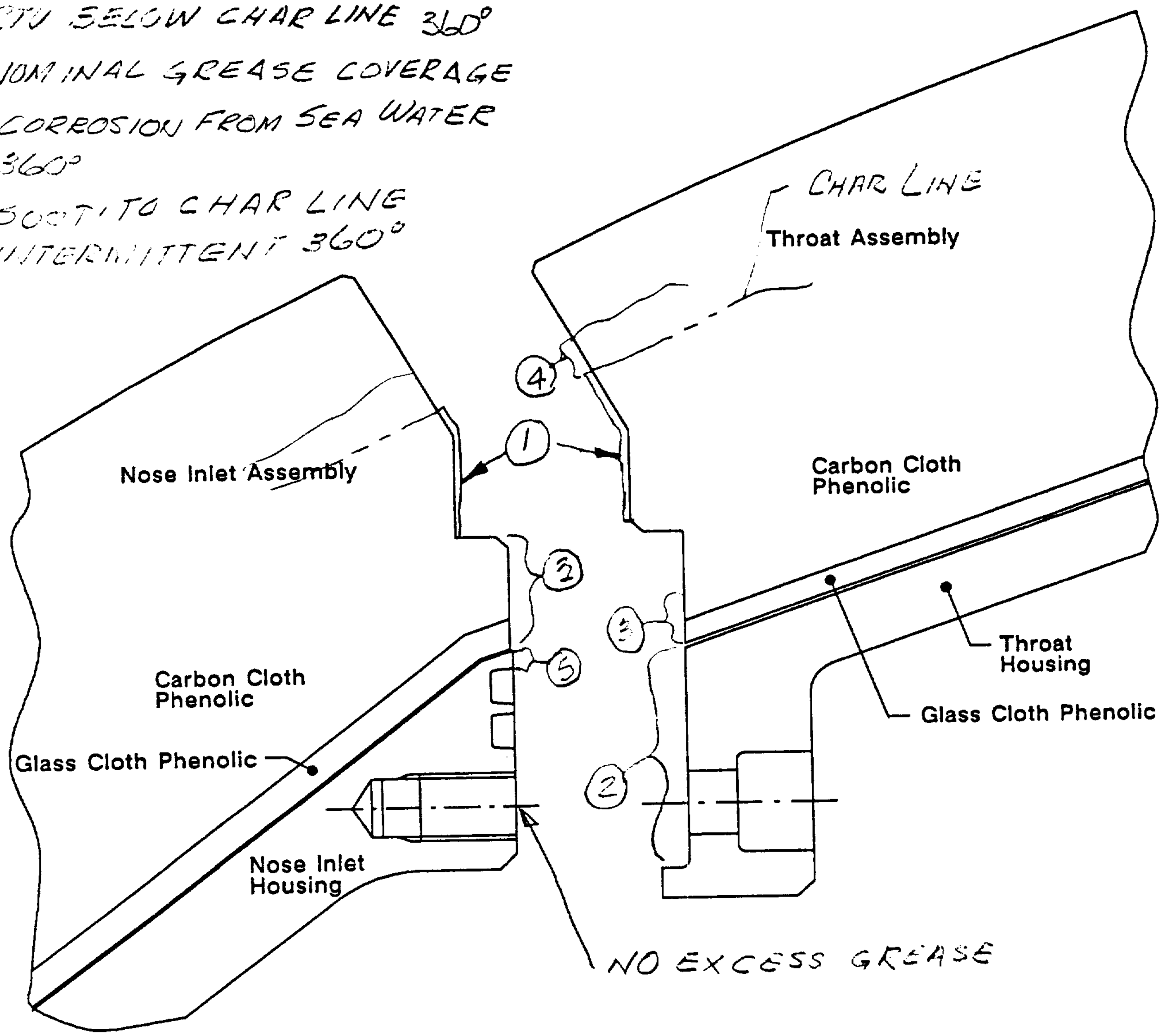
POSTFLIGHT OBSERVATION RECORD (PFOR) C-4

Nose Inlet-to-Throat Joint (Joint #3) Condition Drawing Worksheet

Motor No.: 360T026	Side: Left (A)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): R. QUICK		

Sketch Observations Below (include locations and sizes of sketched features):

① RTV BELOW CHAR LINE 360°
② NOMINAL GREASE COVERAGE
③ CORROSION FROM SEA WATER 360°
④ SOOT TO CHAR LINE INTERMITTENT 360°



⑤ SEE SHEET C-4

arification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-2
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): M.E. Clark, T. Freston		
Joint: Throat-to-Forward Exit Cone (Joint #4)		

Internal Nozzle Joint Observations:

	Yes	No	Comment #
A. Gas Penetration in the RTV (Terminated, Through)?		✓	
B. RTV Not Below Char Line?		✓	
C. RTV To the Primary O-ring?		✓	
D. RTV Past the Primary O-ring?		✓	
E. Uncured RTV?		✓	
F. Voids Within RTV?		✓	
G. Grease Inhibiting RTV Backfill?		✓	
H. Foreign Material?	✓		1
I. Heat Affected or Eroded Virgin CCP, GCP/SCP, or adhesive?		✓	
J. Damaged Phenolics?		✓	
K. Bondline Edge Separations? Use Clarification Form.	✓		2
L. Phenolics Axially Displaced From Housing?		✓	
M. Heat Affected Metal?		✓	
N. Unbonded or Blistered Paint?		✓	
O. Corrosion?	✓		3
P. Alignment Pin Damage?		✓	
Q. Excessive Grease in Threaded Bolt Holes?		✓	
R. Bolt Hole Damage (Through, Threaded/Helical Coil Insert)?		✓	
S. Bent or Broken Bolts?		✓	
T. Metal Damage (Joints or Housings)?		✓	

Notes / Comments

Special Issues 3.3.1, No sign of damage to bolts or threaded holes

1) Foreign Material in joint area. Reference page C-7 for locations. A PFAR was written by Joints and seals

2) Reference pages C-6A and C-6B

3) Reference page C-7 for location

SPECIAL ISSUE 3.2.3.2 NO METAL DAMAGE WAS OBSERVED ON THE SEAL SURFACE AND CORROSION WAS TYPICAL

Preliminary PFAR(s)? ✓ Yes ___ No   Preliminary PFAR Number(s): 47C-03

Clarification Form(s)? ✓ Yes ___ No   Clarification Form Page No.(s): C-6A & C-6B

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Interface Separation Clarification Form

Motor No.: 360T026	Side: ☒ Left (A) ☐ Right (B)	Date: 9-29-92

Assessment Engineer(s)/Inspector(s): M. E. Clark

Part:
- ☐ Forward Exit Cone (Forward End)
- ☒ Throat Ring (Aft End)
- ☐ Throat Inlet Ring (Forward End)
- ☐ Aft Inlet Ring (Aft End)
- ☐ Nose Cap (Aft End)
- ☐ Cowl (Forward End)*
- ☐ Inner Boot Ring (Forward End)

Interface Separation Types:
- A. Metal-to-Adhesive
- B. Within Adhesive
- C. Adhesive-to-GCP
- D. Within GCP
- E. GCP-to-CCP
- F. Within CCP
- *G. Adhesive-to-SCP
- *H. Within SCP
- *I. SCP-to-CCP

Circumferential Location	Separation Type	Maximum Radial Width
0-360	A	0.05

Corresponding Comment Number(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Interface Separation Clarification Form

Motor No.: 360T026	Side: [x] Left (A) [ ] Right (B)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): M. E. Clark		

Part:
- [x] Forward Exit Cone (Forward End)
- [ ] Throat Ring (Aft End)
- [ ] Throat Inlet Ring (Forward End)
- [ ] Aft Inlet Ring (Aft End)
- [ ] Nose Cap (Aft End)
- [ ] Cowl (Forward End)*
- [ ] Inner Boot Ring (Forward End)

Interface Separation Types:

A. Metal-to-Adhesive	D. Within GCP	*G. Adhesive-to-SCP
B. Within Adhesive	E. GCP-to-CCP	*H. Within SCP
C. Adhesive-to-GCP	F. Within CCP	*I. SCP-to-CCP

Circumferential Location	Separation Type	Maximum Radial Width
0-360	A	0.08
170-180	C	0.03
240-242	C	0.05
61-73	C	0.06

Corresponding Comment Number(s): ____

REVISION ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-5

Throat-to-Forward Exit Cone Joint (Joint #4) Condition Drawing Worksheet

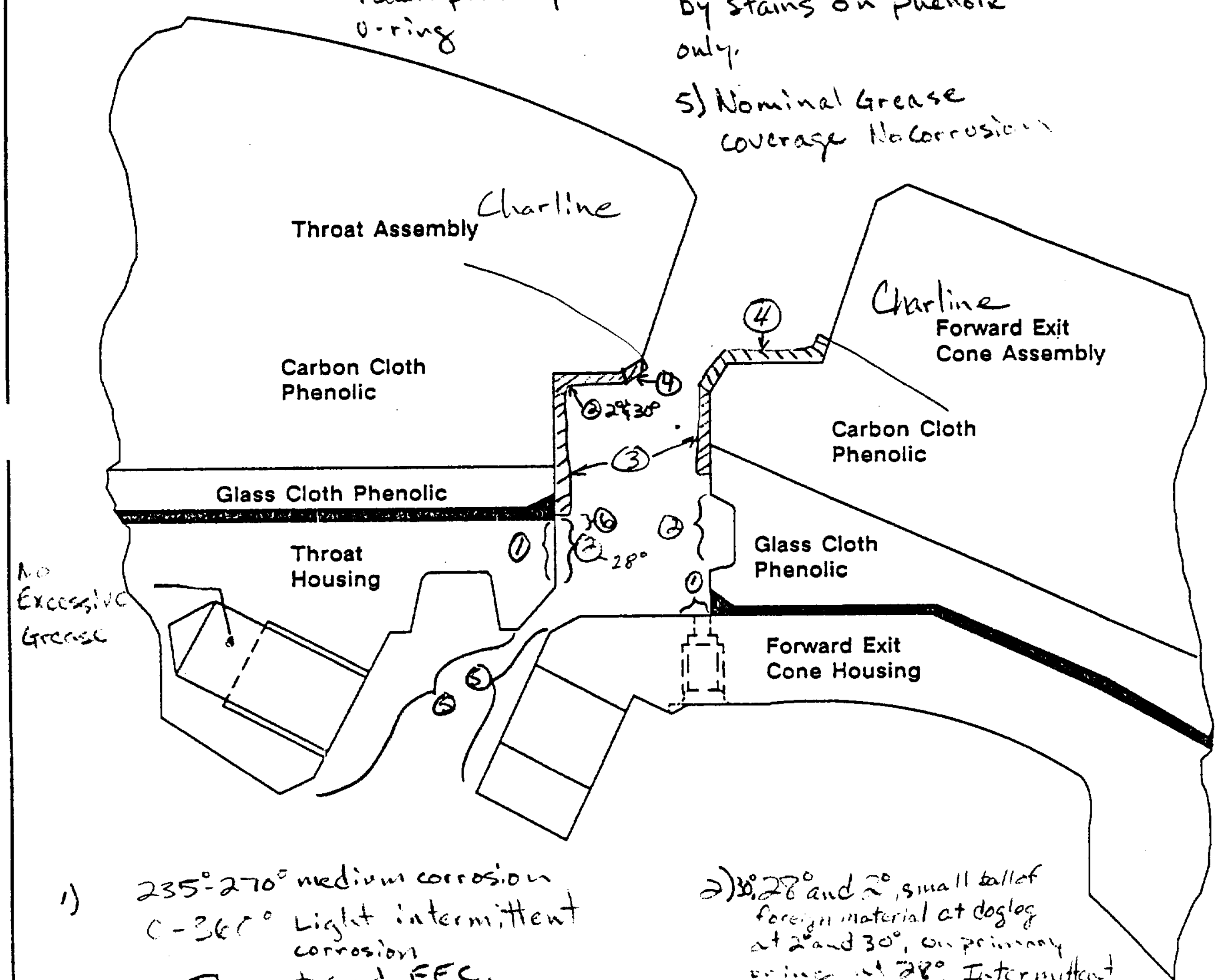
Motor No.: 360T026	Side: Left (A)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): M.E Clark, T. Freston		

Sketch Observations Below (include locations and sizes of sketched features):

3) RTV Below charline 0°-360°. RTV did not reach primary O-ring

4) RTV reached to this point at 0°-90°. RTV detected by stains on phenolic only.

5) Nominal Grease coverage No Corrosion



1) 235°-270° medium corrosion
0-360° Light intermittent corrosion
on Throat and FEC.

6) Medium corrosion in-board of o-ring footprint

2) 30°, 28° and 2°, small ball of foreign material at dogleg at 2° and 30°, on primary o-ring at 28°. Intermittent black material on Throat seal surface and FEC primary o-ring groove heaviest at 7.5°, 23°-30°. No sign of gaspath into the joint. Materal is flakey on the sealing area

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-2
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Left (A)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): M.E. Clark T. Freston		
Joint: Aft End Ring-to-Fixed Housing (Joint #5)		

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Gas Penetration in the RTV (Terminated, Through)?		✓	
B. RTV Not Below Char Line?		✓	
C. RTV To the Primary O-ring?		✓	
D. RTV Past the Primary O-ring?		✓	
E. Uncured RTV?		✓	
F. Voids Within RTV?	✓		1
G. Foreign Material?	✓		2
H. Heat Affected or Eroded Virgin CCP, GCP/SCP, or adhesive?		✓	
I. Damaged Phenolics?		✓	
J. Bondline Edge Separations? Use Clarification Form.		✓	
K. Phenolics Axially Displaced From Housing?		✓	
L. Heat Affected Metal?		✓	
M. Unbonded or Blistered Paint?	✓		4
N. Corrosion?	✓		3
O. Alignment Pin Damage?		✓	
P. Excessive Grease in Threaded Bolt Holes?		✓	
Q. Bolt Hole Damage (Through, Threaded/Helical Coil Insert)?		✓	
R. Bent or Broken Bolts?		✓	
S. Metal Damage (Joints or Housings)?		✓	

Notes / Comments

1- TYPICAL ENCAPSULATED VOIDS DUE TO ASSEMBLY

2- FOREIGN MATERIAL AT BOLT HOLE (235°) SEALS GROUP
[illegible] PRELIMINARY PFAR 47C-04.

3- CORROSION DOCUMENTED ON PAGE C-9

4- AREA OF PAINT THAT HAS SMALL BUBBLES FROM 50°-80° ON ID OF HOUSING 6.0 IN. FROM AFT FACE OF MOUNTING FLANGE. NO HEAT [illegible]. PRELIMINARY PFAR 47C-06.

Preliminary PFAR(s)? ✓ Yes ___ No Preliminary PFAR Number(s): 47C-04, 47C-06

Clarification Form(s)? ___ Yes ✓ No Clarification Form Page No.(s): ______

REVISION ___

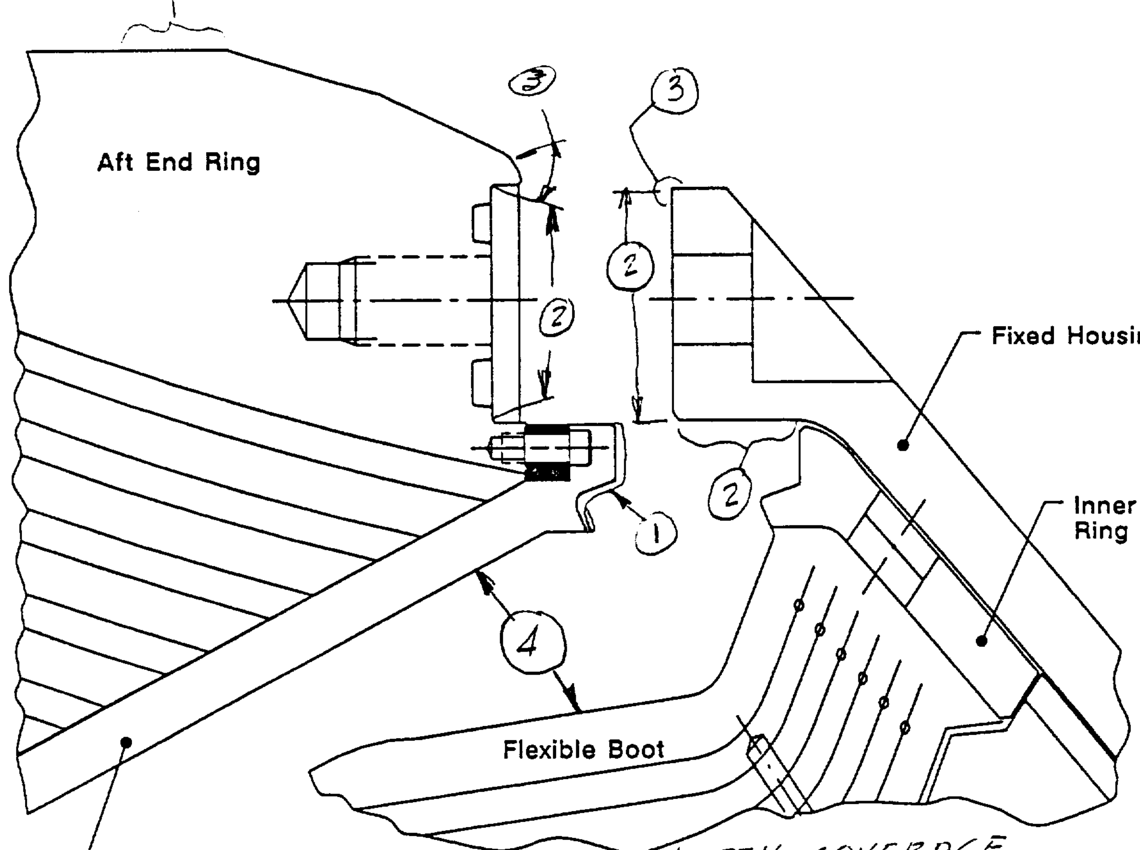
Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-6
Aft End Ring-to-Fixed Housing Joint (Joint #5) Condition Drawing Worksheet

Motor No.: 360T026	Side: Left (A)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): R. QUICK R. TELLERS		REVISED ZEW 10-2-92

Sketch Observations Below (include locations and sizes of sketched features):

SCRAPE MARKS FROM SPLASH DOWN FROM 155° THRU 305° 7.0" AXIAL AT LOC. 150° LIGHT CORROSION ON SCRAPE MARKS.



④ TYPICAL SOOTING ON BOOT & BRG PROTECTOR

① TYPICAL RTV COVERAGE AND CONDITION WAS NOMINAL WITH TYPICAL ENCAPSULATED VOIDS FROM ASSEMBLY

② NOMINAL GREASE COVERAGE NO EXCESS GREASE IN BOLT HOLES

③ LIGHT TO MEDIUM CORROSION INTERMITTENT 360°

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-7

Cowl Insulation Segment Condition

Motor No.: 360T026	Side: Left (A)	Date: 9/29/92 (REVISED 4-6-93 L. WILKES)

Assessment Engineer(s)/Inspector(s): E. QUICK R. TELLERS

Cowl Insulation Segment Observations:	Yes	No	Comment #
A. Spring Pin Holes Completely Through the Cowl Segment?		✓	
B. Abnormal Heat Effects or Erosion?		✓	
C. Soot Between the Cowl Segment and Cowl Housing?		✓	2
D. Bondline Failure Mode? Data Collection Only.	N/A	N/A	1

Notes / Comments

(1) 1% WITHIN SEGMENT
90% RUBBER TO ADHESIVE FAILURE
9% Co ADHESIVE FAILURE

(2) ADHESIVE THAT RETAINS THE SILICA PLUGS IN THE COWL PHENOLICS FLOWED INTO THE COWL HOUSING/COWL INSULATION SEGMENTS BONDLINE AROUND ALL 36 SPRING PINS. THE LARGEST AREA MEASURED ONE INCH DIAMETER AROUND THE 230 DEGREE PIN. PRELIMINARY PFAR 47C-07 WAS WRITTEN ON THIS FIRST TIME OCCURRENCE OBSERVATION.

Preliminary PFAR(s)? ✓ Yes ___ No   Preliminary PFAR Number(s): 47C-07

Clarification Form(s)? ___ Yes ✓ No   Clarification Form Page No.(s): ___

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-7
Cowl Insulation Segment Condition

Motor No.: 360T026	Side: Left (A)	Date: 9/29/92

Assessment Engineer(s)/Inspector(s): R. QUICK / R. TELLERS ([illegible])

Cowl Insulation Segment Observations:

	Yes	No	Comment #
A. Spring Pin Holes Completely Through the Cowl Segment?		✓	
B. Abnormal Heat Effects or Erosion?		✓	
C. Soot Between the Cowl Segment and Cowl Housing?		✓	2
D. Bondline Failure Mode? Data Collection Only.	N/A	N/A	1

Notes / Comments

① ~~1% WITHIN SEGMENT~~
~~90% RUBBER TO ADHESIVE FAILURE~~
~~9% CO ADHESIVE FAILURE~~

② ~~[illegible]~~

Preliminary PFAR(s)? ✓ Yes ___ No Preliminary PFAR Number(s): 470-07

Clarification Form(s)? ___ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-8

Flexible Bearing, Flexible Bearing Protector, and Flexible Boot Condition

Motor No.: 360T026	Side: Left (A)	Date: 9-29-92

Assessment Engineer(s)/Inspector(s): R. QUICK R TELLERS

Flexible Bearing, Bearing Protector, and Boot Observations:	Yes	No	Comment #
A. Bearing Protector Burn-Through?		✓	
B. Cracks Through the Bearing Protector?		✓	
C. Bearing Protector Heat Effects or Erosion Other Than at Cowl Vent Hole Locations?		✓	
D. Soot Between the Bearing Protector and Flexible Bearing?		✓	
E. Heat Effects to the Flexible Bearing?		✓	
F. Bent or Broken Bearing Protector Bolts?		✓	
G. Flexible Boot Burn-Through?		✓	
H. Abnormal Heat Effects or Erosion to Flexible Boot ID?		✓	
I. Foreign Material in Boot Cavity?		✓	

Notes / Comments

Special Issues 3.3.5 NO BENT OR BROKEN BOLTS

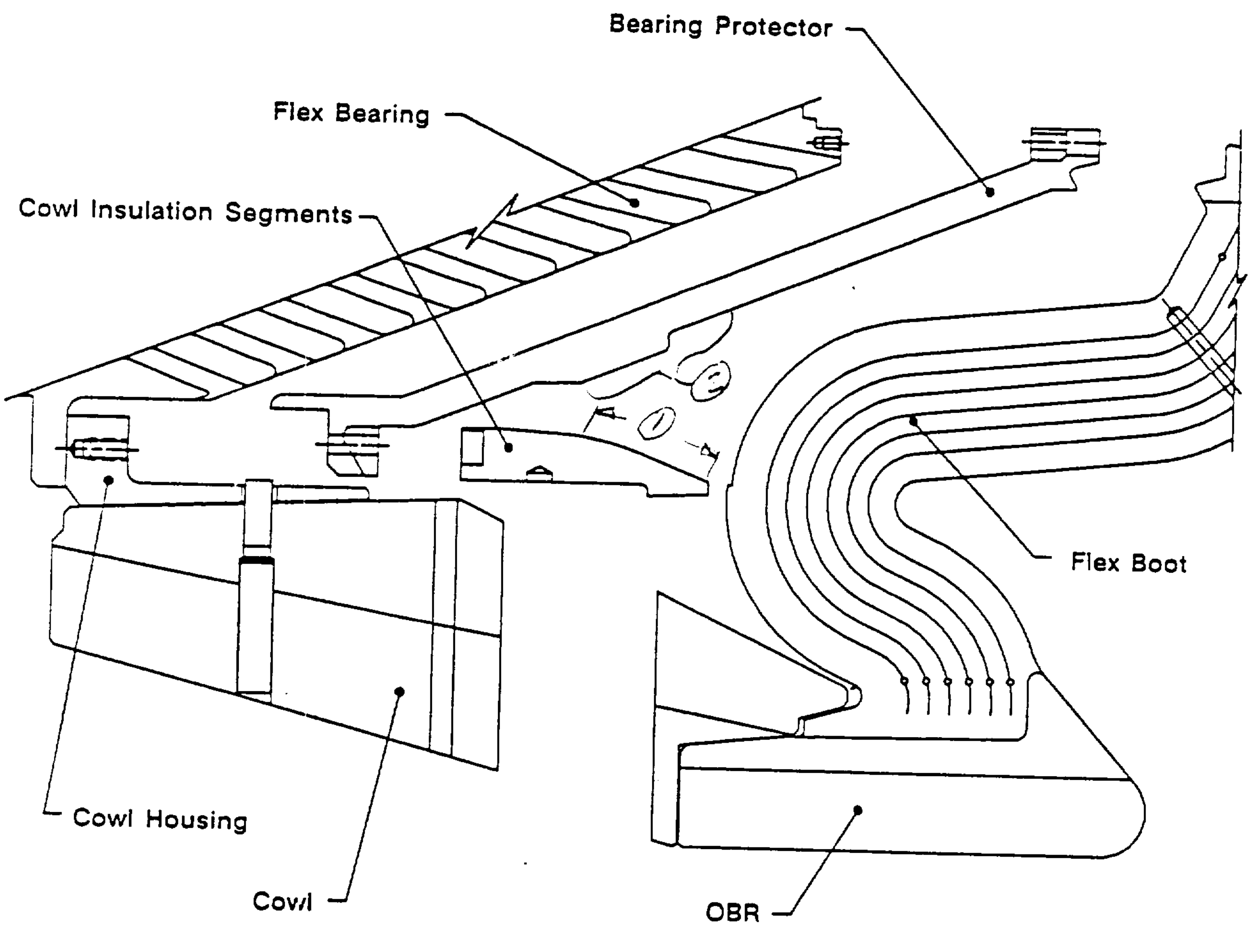
Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ✓ Yes ____ No Clarification Form Page No.(s): C-11A

Flexible Boot Cavity Clarification Form

Motor No.:	Side: ☒ Left (A) ☐ Right (B)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): R QUICK - R TELLERS		
Description: FLEX BOOT CAVITY OBSERVATIONS		

Sketch Observations Below (include locations and sizes of sketched features):



① NO BUBBLES ON INSULATION SEGMENTS

② HEAVY SOOTING 360 WHICH IS NORMAL

③ CAVITY BETWEEN BRG PROTECTOR & COWL INSUL SEGMENTS WAS FULL OF WATER

Corresponding Comment Number(s): NA

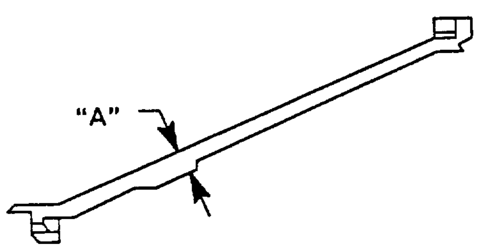
POSTFLIGHT OBSERVATION RECORD (PFOR) C-9
Flexible Bearing Protector Thickness Measurements

Motor No.: 360T026	Side: Left (A)	Date: 10-14-92

Assessment Engineer(s)/Inspector(s): D. Turnbull, R.R. Gallegos

Record the Flexible Bearing Protector Gas Impingement Area Thickness Measurements (see figure) Below:

Degree Location	Thickness Measurement "A"* (inches)	Degree Location	Thickness Measurement "A"* (inches)	Degree Location	Thickness Measurement "A"* (inches)
0	.673"	120	.655"	240	.650"
10	.695"	130	.654"	250	.668"
20	.685"	140	.647"	260	.653"
30	.680"	150	.655"	270	.650"
40	.690"	160	.654"	280	.702"
50	.685"	170	.665"	290	.689"
60	.670"	180	.645"	300	.684"
70	.671"	190	.667"	310	.660"
80	.685"	200	.680"	320	.667"
90	.674"	210	.675"	330	.670"
100	692"	220	.675"	340	.670"
110	.655"	230	.661"	350	.685"



* "A" is the minimum thickness of the bearing protector in-line with the cowl vent holes. It corresponds to the deepest gas impingement location.

Notes / Comments

SC-47230

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-10
Throat Diameter Measurements (Data Collection Only)

Motor No.: 360T026	Side: Left (A)	Date: 11-1-92
Assessment Engineer(s)/Inspector(s):		

Record the Nozzle Throat Diameter Measurements Below:

Degree Location	Diameter Measurement (inches)
0	55.916
45	55.945
90	55.945
135	55.935

Notes / Comments

arification Form(s)? ______ Yes ___✓___ No Clarification Form Page No.(s): ____________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-11
Outer Boot Ring Char and Erosion Measurements and Flexible Boot Condition

Motor No.: 360T026	Side: Left (A)	Date: 12-24-92
Assessment Engineer(s)/Inspector(s): WILKES		

Flexible Boot/Outer Boot Ring Separation Observations:

	Yes	No	Comment #
A. Heat Effects in Boot/OBR Separation?		✓	

Record the Outer Boot Ring Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
8.0	N/A *		N/A *		N/A *		N/A *	
9.0								
10.0								
11.3								

Negative Margin of Safety? ____ Yes ✓ No Station: ____ Degree: ____

Record the Number of Plies Remaining on the Flexible Boot:

Degree Location	Plies Remaining
0	3.5
90	3.0
180	3.6
270	3.9

Negative Margin of Safety? ____ Yes ✓ No Degree: ____

Notes / Comments

* THE FORWARD HALF OF THE OUTER BOOT RING OVERWRAP WAS LOST AT MOTOR SPLASHDOWN. MOST OF THE AFT HALF WAS LOST IN [illegible] WASHOUT OPERATIONS AT CLEARFIELD.

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

arification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-10

Throat Diameter Measurements (Data Collection Only)

Motor No.: 360T026	Side: Left (A)	Date: 11-1-92

Assessment Engineer(s)/Inspector(s):

Record the Nozzle Throat Diameter Measurements Below:

Degree Location	Diameter Measurement (inches)
0	55.946
45	55.945
90	55.945
135	55.935

Notes / Comments

Clarification Form(s)? ______ Yes ✓ ______ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026	Side: Left (A)	Date: 10-12-92

Assessment Engineer(s)/Inspector(s): L. WILKES / T. FRESTON

Phenolic Subassembly: Aft Exit Cone Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	4-70	70-143	143-215	215-275	275-0-4			total
Metal-to-Adhesive	20 *	7	3	4	40 *			15
Within Adhesive								
Adhesive-to-GCP								
Within GCP	80	93	97	96	60			85
GCP-to-CCP								
Within CCP								

* SEE CLARIFICATION FORM PAGE C-15B AND PFAR NO. 47C-19.

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

	4-70	70-143	143-215	215-275	275-0-4			
Metal-to-Adhesive		1	15	1	3			
Within Adhesive					1			
Adhesive-to-GCP	100	99	85	99	96			

Phenolic Removal Method: VERY DIFFICULT WEDGE & PEEL

Metal Housing Bondline Surface Observations:	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?	✓		3
D. Foreign Material?		✓	
E. Voids in Polysulfide (Aft Exit Cone Polysulfide Groove)?		✓	4

Notes / Comments ① SEE CLARFICATION FORM PAGE C-15A
⑤ Adhesive in contact with tip of shear pins and GCP.
② Special Issues 3.3.6— NO FOREIGN MATERIAL WAS FOUND. A VERY LARGE METAL-TO-ADHESIVE SEPARATION WITH CORROSION WAS OBSERVED OVER THIS AREA. SEE CLARIFICATION FORM PAGE C-15B.
③ LIGHT-TO-MEDIUM CORROSION OBSERVED IN 2 LARGE METAL-TO-ADHESIVE SEPARATIONS. SEE CLARIFICATION FORM PAGE C-15B.
④ NO LARGE POLYSULFIDE VOIDS, 0.20 INCH DIAMETER MINIMUM, WERE OBSERVED.

Preliminary PFAR(s)? ✓ Yes ____ No Preliminary PFAR Number(s): 47C-19

Clarification Form(s)? ✓ Yes ____ No Clarification Form Page No.(s): C-15A, C-15B, C-15C

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026	Side: Left (A)	Date: 10-12-92

Assessment Engineer(s)/Inspector(s): L. WILKES / T. FRESTON

Phenolic Subassembly: Aft Exit Cone Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location	4-70	70-143	143-215	215-275	275-0-4			total
Metal-to-Adhesive	20*	7	3	4	40*			15
Within Adhesive								
Adhesive-to-GCP								
Within GCP	80	93	97	96	60			85
GCP-to-CCP								
Within CCP								

* SEE CLARIFICATION FORM PAGE C-15B AND PFAR NO. 47C-19.

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location	4-70	70-143	143-215	215-275	275-0-4			
Metal-to-Adhesive		1	15	1	3			
Within Adhesive					1			
Adhesive-to-GCP	100	99	85	99	96			

Phenolic Removal Method: VERY DIFFICULT WEDGE & PEEL

Metal Housing Bondline Surface Observations:

	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?	✓		3
D. Foreign Material?		✓	
E. Voids in Polysulfide (Aft Exit Cone Polysulfide Groove)?		✓	4

Notes / Comments ① SEE CLARIFICATION FORM PAGE C-15A
⑤ Adhesive in contact with tip of shear pins and GCP.
② Special Issues 3.3.6— NO FOREIGN MATERIAL WAS FOUND. A VERY LARGE METAL-TO-ADHESIVE SEPARATION WITH CORROSION WAS OBSERVED OVER THIS AREA. SEE CLARIFICATION FORM PAGE C-15B.
③ LIGHT-TO-MEDIUM CORROSION OBSERVED IN 2 LARGE METAL-TO-ADHESIVE SEPARATIONS. SEE CLARIFICATION FORM PAGE C-15B.
④ NO LARGE POLYSULFIDE VOIDS, 0.20 INCH DIAMETER MINIMUM, WERE OBSERVED.

Preliminary PFAR(s)? ✓ Yes ___ No Preliminary PFAR Number(s): 47C-19

Clarification Form(s)? ✓ Yes ___ No Clarification Form Page No.(s): C-15A C-15B, C-15C

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026 | Side: ☑ Left (A) ☐ Right (B) | Date: 10-12-92

Assessment Engineer(s)/Inspector(s): L. WILKES / T. FRESTON

Nozzle Subassembly: AFT EXIT CONE ASSEMBLY

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size Axial	Void Size Circ.	Location on Bonding Surface Distance From Fwd	Location on Bonding Surface Distance From Aft
215	2.00	0.65	1.40	
107	0.70	0.40	4.25	
78°	3.10	0.80	1.90	
11°	1.35	0.55	10.20	

Notes / Comments: VERY FEW SMALL ADHESIVE VOIDS, 0.30 DIAMETER MAXIMUM, WERE OBSERVED

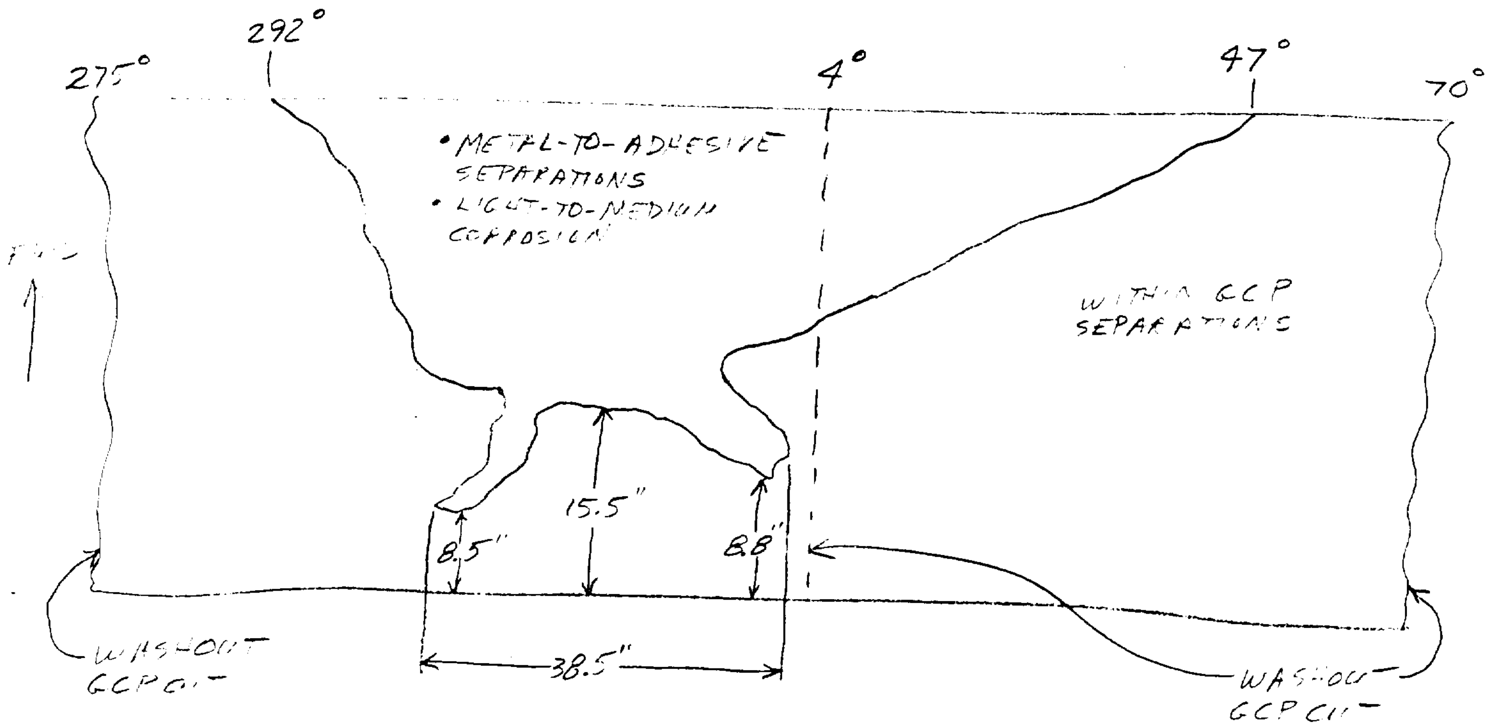
Corresponding Comment Number(s): ______

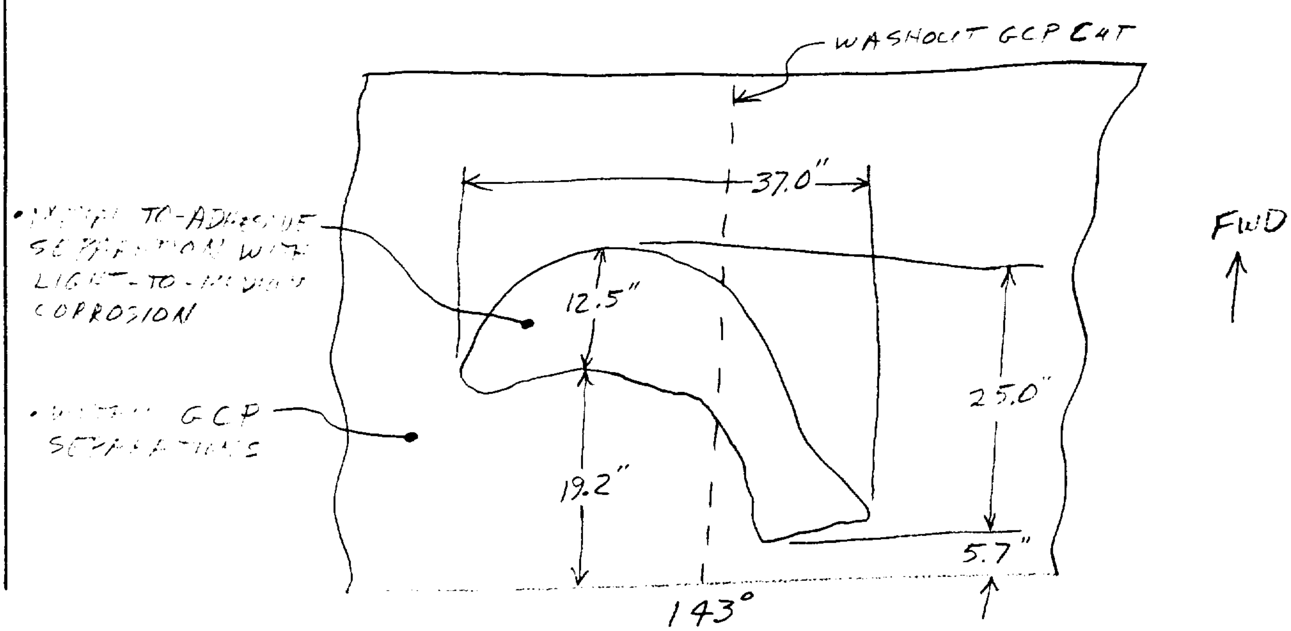
Thiokol CORPORATION
SPACE OPERATIONS

General Hardware Clarification Form

Motor No.: 360T026	Side: ☑ Left (A) ☐ Right (B)	Date: 10-12-92
Assessment Engineer(s)/Inspector(s): L. WILKES / T. FRESTON		
Description: AFT EXIT CONE ASSEMBLY.		

Sketch Observations Below (include locations and sizes of sketched features):





Corresponding Comment Number(s): ______

REVISION ____

General Hardware Clarification Form

Motor No.: 360T026	Side: ☑ Left (A) ☐ Right (B)	Date: 3-12-93
Assessment Engineer(s)/Inspector(s): L. WILKES		
Description: NOZZLE AFT EXIT CONE LINER FRAGMENTS		

Sketch Observations Below (include locations and sizes of sketched features):

THREE LARGE AEC CCP LINER FRAGMENTS WERE RECOVERED FROM INSIDE MOTOR AT KSC HANGAR AF. FRAGMENTS RANGED IN SIZE FROM FIVE INCHES TO APPROXIMATELY 15 INCHES AND WERE APPROXIMATELY 160 DEGREES CIRCUMFERENTIAL. NO AXIAL ORIENTATION FEATURES WERE PRESENT, THEREFORE EROSION AND CHAR CALCULATIONS COULD NOT BE DONE. EACH FRAGMENT WAS SECTIONED IN TWO PLACES APPROXIMATELY 45 DEGREES APART AND EVALUATED. NO PLYLIFTING WAS OBSERVED ON ANY OF THE SECTIONS. NO OTHER ANOMALIOUS CONDITION WAS OBSERVED.

Corresponding Comment Number(s): ________

Thiokol CORPORATION
SPACE OPERATIONS

General Hardware Clarification Form

Motor No.: 360T026	Side: ☑ Left (A) ☐ Right (B)	Date: 3-12-93
Assessment Engineer(s)/Inspector(s): L. WILKES		
Description: NOZZLE AFT EXIT CONE LINER FRAGMENTS		

Sketch Observations Below (include locations and sizes of sketched features):

THREE LARGE AEC CCP LINER FRAGMENTS WERE RECOVERED FROM INSIDE MOTOR AT KSC HANGAR AF. FRAGMENTS RANGED IN SIZE FROM FIVE INCHES TO APPPROXIMATELY 15 INCHES AND WERE APPROXIMATELY 160 DEGREES CIRCUMFERENTIAL. NO AXIAL ORIENTATION FEATURES WERE PRESENT, THEREFORE EROSION AND CHAR CALCULATIONS COULD NOT BE DONE. EACH FRAGMENT WAS SECTIONED IN TWO PLACES APPROXIMATELY 45 DEGREES APART AND EVALUATED. NO PLYLIFTING WAS OBSERVED ON ANY OF THE SECTIONS. NO OTHER ANOMALIOUS CONDITION WAS OBSERVED.

Corresponding Comment Number(s): ____

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Left (A) | Date: 10-6-92

Assessment Engineer(s)/Inspector(s): R. Quick, R. Tellers, J. Walker, R. Lange

Phenolic Subassembly: Forward Exit Cone Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0-45	45-90	90-135	135-180	180-225	225-270	270-315	315-0
Metal-to-Adhesive	60%	75%	50%	20%	20%	65%	65%	60%
Within Adhesive	5%	5%	10%	15%	15%	5%	10%	5%
Adhesive-to-GCP	35%	20%	40%	65%	65%	30%	25%	35%
Within GCP								
GCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

N/A

Degree Location

Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								

Phenolic Removal Method: ______

Metal Housing Bondline Surface Observations:

	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		SEE PG C-16A
C. Corrosion?	✓		1
D. Foreign Material?		✓	

Notes / Comments 1- MEDIUM TO HEAVY CORROSION ON AFT 10.0 INCHES
LIGHT TO MEDIUM CORROSION 5.0 AFT OF SHEAR PINS AND
BAND IS APPROX 7.0 INCHES WIDE

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ✓ Yes ____ No Clarification Form Page No.(s): C-16A

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026 | Side: ☒ Left (A) ☐ Right (B) | Date:

Assessment Engineer(s)/Inspector(s): QUICK-WALKER-TELLERS-LANGE

Nozzle Subassembly: FWD EXIT CONE

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size Axial	Void Size Circ.	Location on Bonding Surface Distance From Fwd	Location on Bonding Surface Distance From Aft
50°	1.0	.60		9.1
225°	1.5	.70		6.4
230°	1.9	1.1	0.0	
235°	1.2	1.0	2.08	
238°	.50	.30		11.3
265°	1.10	1.70		11.4
285°	1.3	1.3	1.3	
287°	2.0	.9	11.7	

Notes / Comments

Corresponding Comment Number(s): ______

REVISION ___

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Left (A) | Date: 10-5-92

Assessment Engineer(s)/Inspector(s): R. QUICK T. FRESTON

Phenolic Subassembly: Throat Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0-45	45-90	90-135	135-180	180-225	225-270	270-315 ~~225-270~~	315-0
Metal-to-Adhesive	100%	100%	100%	100%	97%	100%	100%	100%
Within Adhesive								
Adhesive-to-GCP					3%			
Within GCP								
GCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

NA

Degree Location

Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								

Phenolic Removal Method: ______

Metal Housing Bondline Surface Observations:

	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		SEE Pg C-17A
C. Corrosion?	✓		1
D. Foreign Material?		✓	

Notes / Comments

Special Issues 3.3.4 AFT SHIMS IMPROVED THE DISTRIBUTION OF ADHESIVE AND REDUCED THE VOIDS GREATLY

1. MEDIUM TO HEAVY CORROSION FULL CIRCUMFERENCE

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): C-17A

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026 | Side: ☒ Left (A) ☐ Right (B) | Date: 10-5-92

Assessment Engineer(s)/Inspector(s): R. QUICK T. FREESTON

Nozzle Subassembly: THROAT ASSEMBLY

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size Axial	Void Size Circ.	Location on Bonding Surface Distance From Fwd	Location on Bonding Surface Distance From Aft
50°	1.0	.28		12.0
310°	.80	.25		17.9
311°	.60	.22		17.9

Notes / Comments

Corresponding Comment Number(s): ____

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Left (A) | Date: 10-5-92

Assessment Engineer(s)/Inspector(s): WILKES / MILLER

Phenolic Subassembly: Aft Inlet/Forward Nose Rings

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

	Degree Location							
	45-135	135-225	225-315	315-360				
Metal-to-Adhesive	100	99	100	97				
Within Adhesive		1						
Adhesive-to-GCP				3				
Within GCP								
GCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

N/A

	Degree Location							
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								

Phenolic Removal Method: NYLON WEDGE & HAMMER

Metal Housing Bondline Surface Observations:

	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?	✓		2
D. Foreign Material?		✓	

Notes / Comments ① SEE CLARIFICATION FORM PAGE C-18A
② LIGHT-TO-MEDIUM CORROSION OVER AXIAL LENGTH & CIRCUMFERENCE EXCEPT TWO PLACES ON AFT TO MID 4.00 INCHES OF AFT INLET RING (-504) INTERFACE AT 0°-25° AND 155°-205° SHOWED NO CORROSION

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

Clarification Form(s)? ✓ Yes ____ No   Clarification Form Page No.(s): C-18A

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026 | Side: ☑ Left (A) ☐ Right (B) | Date: 10-5-92

Assessment Engineer(s)/Inspector(s): WILKES / MILLER

Nozzle Subassembly: AFT INLET & FORWARD NOSE RINGS

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size Axial	Void Size Circ.	Location on Bonding Surface: Distance From Fwd	Location on Bonding Surface: Distance From Aft
175	0.80	0.50	1.30	
224	0.40	0.30	1.80	

Notes / Comments VERY FEW SMALL VOIDS, 0.30 INCH DIAMETER MAXIMUM, WERE OBSERVED.

Corresponding Comment Number(s): 1

REVISION ____

DOC NO. TWR-64204 VOL
SEC PAGE C-18A

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Left (A) | Date: 10-5-92

Assessment Engineer(s)/Inspector(s): WILKES/ MILLER

Phenolic Subassembly: Nose Cap

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0-360							
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								
Within GCP	5							
GCP-to-CCP	95							
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

	45-135	135-225	225-315	315-360				
Metal-to-Adhesive	30	25	25	20				
Within Adhesive								
Adhesive-to-GCP	70	75	75	80				

Phenolic Removal Method: ______

Metal Housing Bondline Surface Observations:	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?	✓		2
D. Foreign Material?		✓	

Notes / Comments ① SEE CLARIFICATION FORM PAGE C-19A.
② LIGHT-TO-MEDIUM ON FORWARD 0.25-1.50 INCHES AND AFT 2.00-3.00 INCHES AROUND FULL CIRCUMFERENCE.

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ✓ Yes ____ No   Clarification Form Page No.(s): C-19A

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026	Side: ☑ Left (A) ☐ Right (B)	Date: 10-5-92
Assessment Engineer(s)/Inspector(s): WILKES / MILLER		
Nozzle Subassembly: NOSE CAP		

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size Axial	Void Size Circ.	Location on Bonding Surface Distance From Fwd	Location on Bonding Surface Distance From Aft
358	0.50	0.30	10.10	

Notes / Comments VERY FEW SMALL VOIDS, 0.30 INCH DIAMETER MAXIMUM, WERE OBSERVED

Corresponding Comment Number(s): 1

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Left (A) | Date: 10-6-92

Assessment Engineer(s)/Inspector(s): R. QUICK T. FREESTON

Phenolic Subassembly: Cowl Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

	Degree Location							
	0-45	45-90	90-135	135-180	180-225	225-270	270-315	315-0
Metal-to-Adhesive	100%	100%	100%	100%	100%	100%	100%	100%
Within Adhesive								
Adhesive-to-SCP								
Within SCP								
SCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

N/A

	Degree Location							
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-SCP								

Phenolic Removal Method: __________

Metal Housing Bondline Surface Observations:

	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		SEE PG C-20A
C. Corrosion?	✓		1
D. Foreign Material?		✓	

Notes / Comments 1-LIGHT TO MEDIUM CORROSION 360

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ________

Clarification Form(s)? ✓ Yes ____ No Clarification Form Page No.(s): C-20A

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026 | Side: ☒ Left (A) ☐ Right (B) | Date: 10-6-92

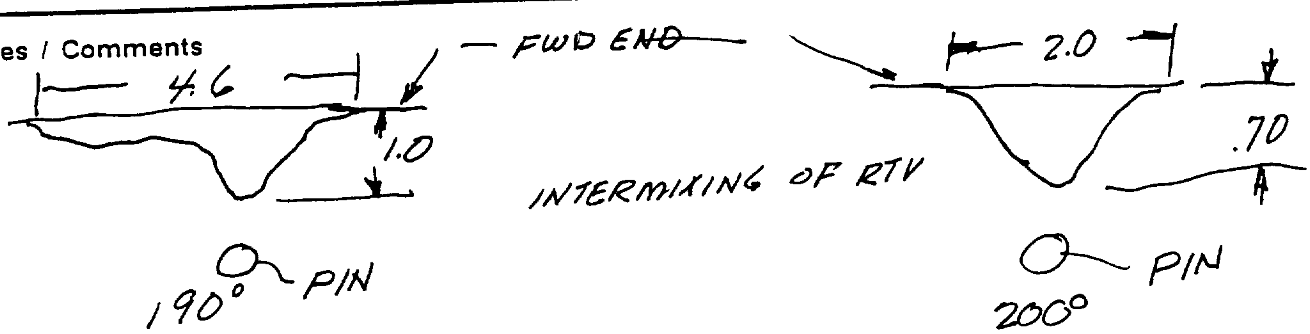
Assessment Engineer(s)/Inspector(s): R. Quick T. FRESTON

Nozzle Subassembly: COWL ASSEMBLY

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size		Location on Bonding Surface	
	Axial	Circ.	Distance From Fwd	Distance From Aft
0°	1.2	.06	1.3	
1°	.75	.20	1.2	
40°	1.1	.03	1.2	
60°	1.75	.12	.7	
80°	1.8	.20	.8	
140°	1.8	.14	.8	
240°	.98	.18	1.7	
280°	2.1	.08	2.7	

Notes / Comments



Corresponding Comment Number(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026	Side: Left (A)	Date: 10-2-92

Assessment Engineer(s)/Inspector(s): WILKES / FRESTON

Phenolic Subassembly: Fixed Housing Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

	Degree Location								
	0-45	45-90	90-135	135-180	180-225	225-270	270-315	315-360	AVG.
Metal-to-Adhesive	75	49	25	40	65	95	80	85	64
Within Adhesive									
Adhesive-to-GCP	25	50	74	60	35	5	20	15	35
Within GCP		1	1						1
GCP-to-CCP									
Within CCP									

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

N/A

	Degree Location							
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								

Phenolic Removal Method: LARGE HAMMER, NYLON WEDGES

Metal Housing Bondline Surface Observations:	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?		✓	
D. Foreign Material?		✓	

Notes / Comments (1) SEE CLARIFICATION FORM PAGE C-21A
(2) Resin glaze on ID side of GCP on aft end intermittently. largest area is at 70°-150° with axial width of 7.0" max. Several small areas on fwd end. Largest at 95°-135° with an axial width of 3.5" max
(3) IBR removed on 10-9-92, Reference C-21D.
(4) After removal of remaining adhesive, stain where unbond occurred remained on housing.

Preliminary PFAR(s)? ✓ Yes ___ No Preliminary PFAR Number(s): 47C-77, 47C-16

Clarification Form(s)? ✓ Yes ___ No Clarification Form Page No.(s): C-21A, B, C, D, E

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026	Side: Left (A)	Date: 10-2-92
Assessment Engineer(s)/Inspector(s): WILKES / FRESTON		
Phenolic Subassembly: Fixed Housing Assembly		

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0-45	45-90	90-135	135-180	180-225	225-270	270-315	315-360	AVG.
Metal-to-Adhesive	75	49	25	40	65	95	80	85	64
Within Adhesive									
Adhesive-to-GCP	25	50	74	60	35	5	20	15	35
Within GCP		1	1						1
GCP-to-CCP									
Within CCP									

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

N/A

Degree Location

Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								

Phenolic Removal Method: LARGE HAMMER, NYLON WEDGES

Metal Housing Bondline Surface Observations:

	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?		✓	
D. Foreign Material?		✓	

Notes / Comments (1) SEE CLARIFICATION FORM PAGE C-21A
(2) Resin glaze [illegible] ID [illegible] of GCP on aft end intermittently, largest area with axial width of 7.0" max. is at [illegible]0-150°. A [illegible] on [illegible] at [illegible] 135° with an axial width of 3.5" max
(3) IBK removed on 10-9-92, Reference C-21D.
(4) After removal of remaining adhesive, stain where unbond occured remained on housing.

Preliminary PFAR(s)? ✓ Yes ____ No Preliminary PFAR Number(s): 47C-97, 47C-16

Clarification Form(s)? ✓ Yes ____ No Clarification Form Page No.(s): C-21A, B, C, D, E

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026 | Side: ☑ Left (A) ☐ Right (B) | Date: 10-2-92

Assessment Engineer(s)/Inspector(s): WILKES / FRESTON

Nozzle Subassembly: FIXED HOUSING ASSEMBLY

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size - Axial	Void Size - Circ.	Location on Bonding Surface - Distance From Fwd	Location on Bonding Surface - Distance From Aft
65°	0.58	0.25		3.00

Notes / Comments TYPICAL SMALL VOIDS (0.30" DIA MAX) WERE OBSERVED OVER FULL AXIAL WIDTH AND CIRCUMFERENCE.

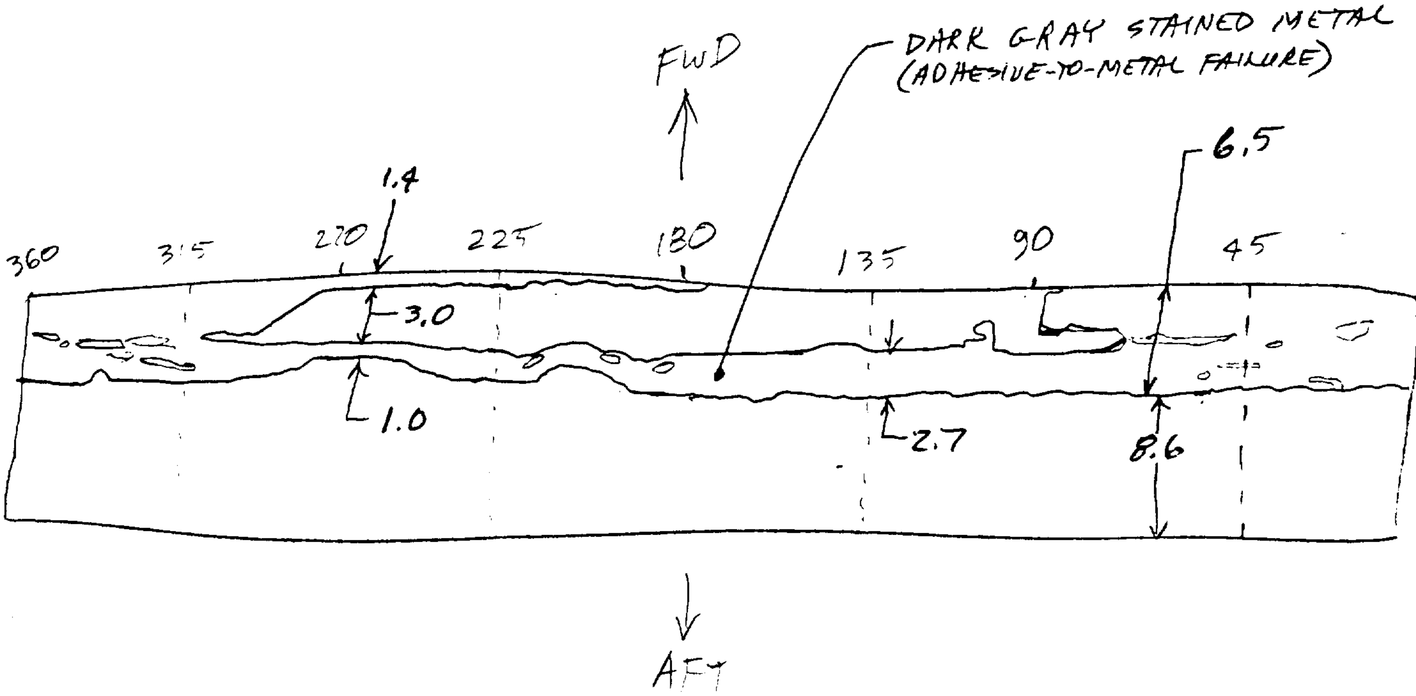
Corresponding Comment Number(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

General Hardware Clarification Form

Motor No.: 360T026	Side: ☑ Left (A) ☐ Right (B)	Date: 10-2-92
Assessment Engineer(s)/Inspector(s): WILKES		
Description: FIXED HOUSING BONDLINE ADHESIVE STAIN MAP		

Sketch Observations Below (include locations and sizes of sketched features):



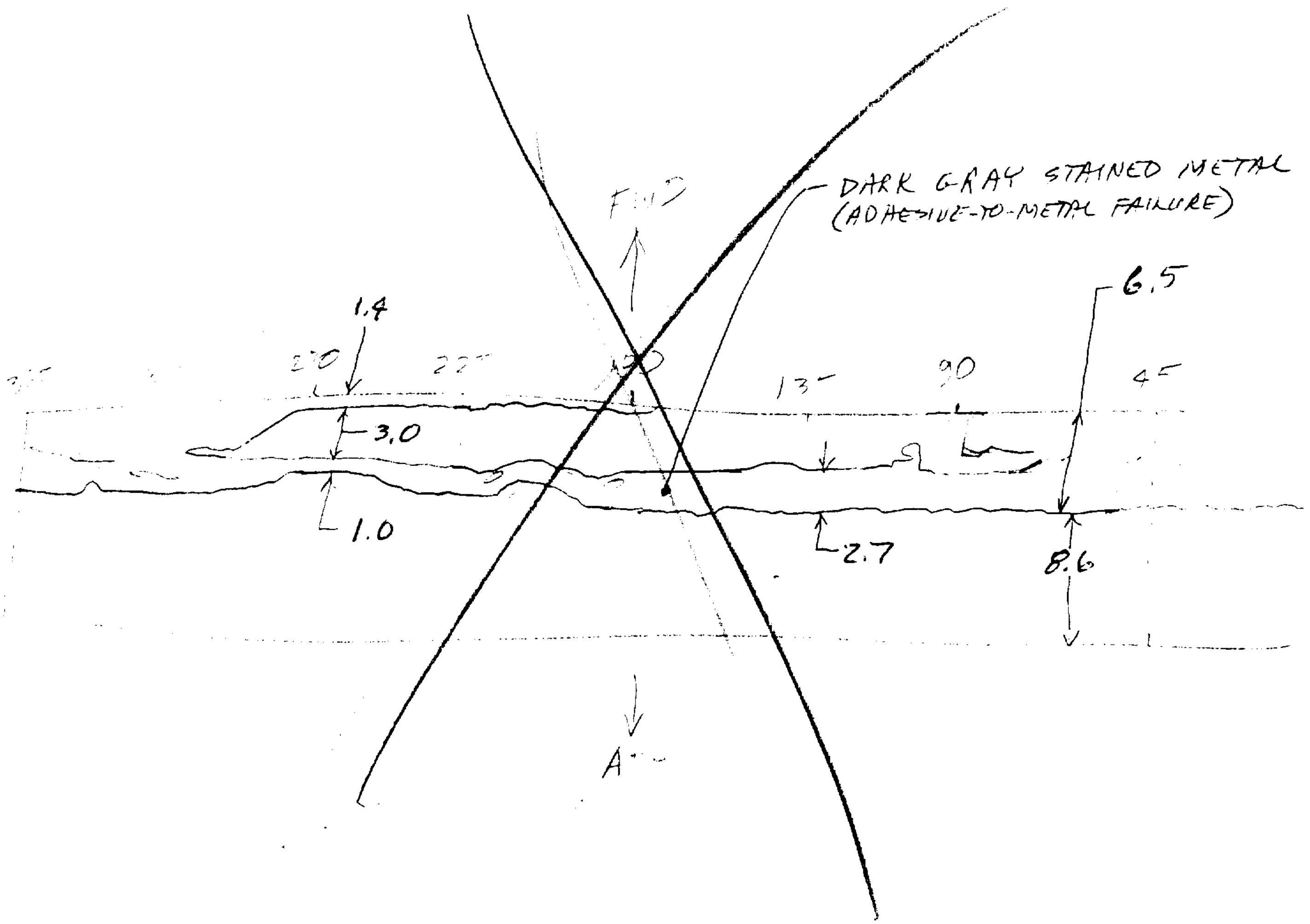
Corresponding Comment Number(s): ____________

Thiokol CORPORATION
SPACE OPERATIONS

General Hardware Clarification Form

Motor No.: 360T026	Side: ☑ Left (A) ☐ Right (B)	Date: 10-2-92
Assessment Engineer(s)/Inspector(s): WILKES		
Description: FIXED HOUSING BONDLINE ADHESIVE STAIN MAP		

Sketch Observations Below (include locations and sizes of sketched features):



Corresponding Comment Number(s): ______

REVISION ____

Thiokol CORPORATION
SPACE OPERATIONS

General Hardware Clarification Form

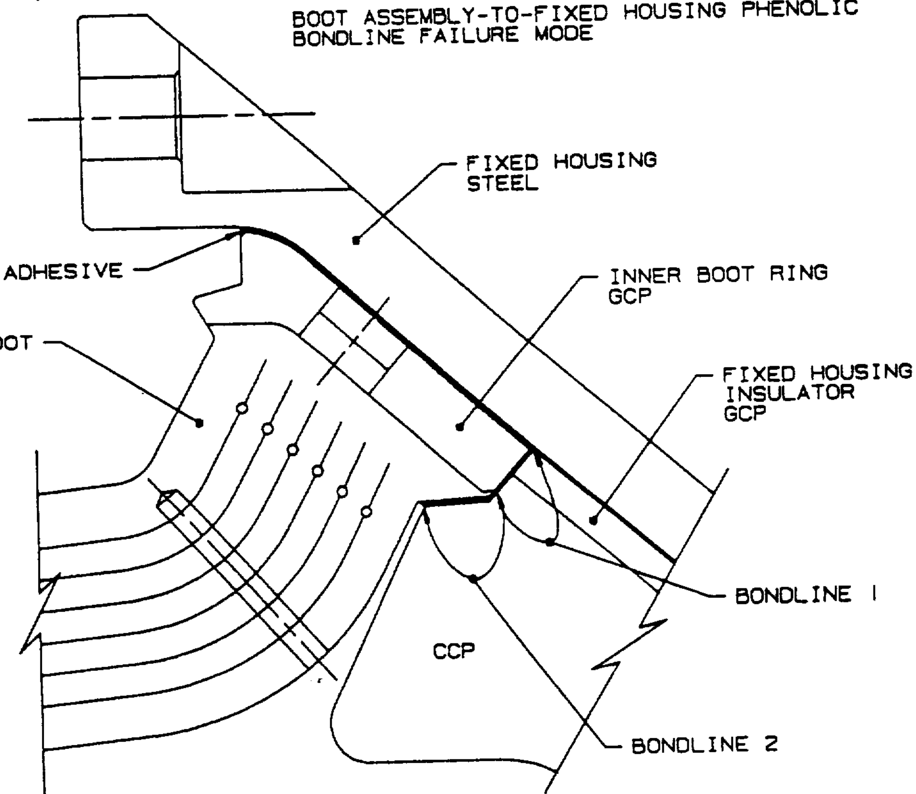
Motor No.: 360T026	Side: ☑ Left (A) ☐ Right (B)	Date: 10-5-92

Assessment Engineer(s)/Inspector(s): L.E. WILKES

Description: BOOT ASSEMBLY-TO-FIXED HOUSING PHENOLIC BONDLINE

Sketch Observations Below (include locations and sizes of sketched features):

BOOT ASSEMBLY-TO-FIXED HOUSING PHENOLIC BONDLINE FAILURE MODE



RSRM-26A NOZZLE

BONDLINE 1 FAILURE MODE IBR-TO-FIXED HSG PHENOLICS	PERCENT OF CIRCUMFERENCE
FIXED HSG-TO-ADHESIVE	10
WITHIN ADHESIVE	5
IBR-TO- ADHESIVE	85

BONDLINE 2 FAILURE MODE FLEX BOOT-TO-FIXED HSG CCP	PERCENT OF CIRCUMFERENCE
WITHIN FIXED HSG CHARRED CCP	7
WITHIN INNER BOOT RING GCP	7
WITHIN FLEXIBLE BOOT NBR	73
ADHESIVE-TO-FIXED HSG CCP	9
WITHIN ADHESIVE	4

Corresponding Comment Number(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Left (A) | Date: 10-9-92

Assessment Engineer(s)/Inspector(s): M. Clark, T. Freston

Phenolic Subassembly: IBR

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	315-45	45-135	135-225	225-315				Total
Metal-to-Adhesive	30	25	5	50				28
Within Adhesive	15	30	15	15				18
Adhesive-to-GCP	20	25	40	5				22
Within GCP	35	20	40	30				32
GCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

	315-45	45-135	135-225	225-315				Total
Metal-to-Adhesive		2	5	10				4
Within Adhesive								
Adhesive-to-GCP	100	98	95	90				96

Phenolic Removal Method: hand & Wedges

Metal Housing Bondline Surface Observations:

	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?	✓		2
D. Foreign Material?		✓	

Notes / Comments
1) Intermittent small voids with diameters of 0.30" or smaller
2) Light-to-medium corrosion intermittently in areas of metal-to-adhesive separations
3) Bulk of metal-to-adhesive separations occured on aft end of bondline
4) The fixed housing insulation was removed 1 week ago (10/2/92)

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

General Hardware Clarification Form

Motor No.: 360T026	Side: ☑ Left (A) ☐ Right (B)	Date: 10-5-92

Assessment Engineer(s)/Inspector(s): T. FRESTON / L. WILKES

Description: FIXED HOUSING BONDLINE METAL SURFACE HARDNESS

Sketch Observations Below (include locations and sizes of sketched features):

ROCKWELL-C HARDNESS MEASUREMENTS

AXIAL LOCATIONS	ANGULAR LOCATIONS			
ADJACENT TO IBR	40°	170°	200°	240°
HARDNESS *	48 48 50 49		47 47 47 45	
IN STAINED AREA				
HARDNESS *	47 50 50 48	48 47 47 47		46 46 48 48
CLEAN SURFACE AREA				
HARDNESS *	46 49 50 48	45 48 46 47		46 47 47 46

* HARDNESS MEASUREMENTS TAKEN AT APPROXMATELY EQUAL DISTANCES APART OVER AXIAL LENGTH OF SURFACE CONDITION.

Corresponding Comment Number(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-13
Cowl Ring Phenolic (CCP) Section Condition

Motor No.: 360T026	Side: Left (A)	Date: 3-1-93
Assessment Engineer(s)/Inspector(s): WILKES		

Cowl Phenolic Section Observations:

	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Cowl Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
0.3	.17	.70	.21	.60	.19	.66	.20	.64
1.0	.21	.67	.25	.59	.23	.62	.23	.67
2.0	.28	.67	.28	.62	.28	.59	.27	.62
3.0	.31	.66	.31	.62	.28	.65	.28	.65
4.0	NA	.98*	NA	.93*	.31	.66	.25	.71
5.0	NA	.96*	NA	.97*	.29	.67	NA	.93*
6.0	NA	NA	NA	NA	.18	.81	NA	.95*
6.8	NA	NA	NA	NA	.15	.87	NA	1.01*

Negative Margin of Safety? ______ Yes ✓ No Station: ______ Degree: ______

Notes / Comments * TOTAL EROSION AND CHAR DEPTH.

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-14
Forward Exit Cone Phenolic (CCP) Section Condition

Motor No.: 360T026	Side: Left (A)	Date: 3-1-93
Assessment Engineer(s)/Inspector(s): WILKES		

Forward Exit Cone Phenolic Section Observations:	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Forward Exit Cone Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
1.0	.38	.71	.38	.80	.37	.76	.37	.75
4.0	.37	.70	.37	.73	.35	.72	.35	.68
4.6	.37	.70	.35	.77	.34	.71	.35	.69
8.0	.40	.68	.39	.70	.28	.73	.39	.68
12.0	NA	NA	NA	NA	NA	NA	NA	NA
16.0								
20.0								
24.0								
28.0	.27	.72	.26	.71	.28	.72	.25	.73
32.0	.26	.74	.27	.75	.23	.70	.21	.71
32.9	.21	.75	.21	.76	.17	.74	.21	.69
34.0	.18	.80	.21	.76	NA	NA	.17	.70

Negative Margin of Safety? ______ Yes ✓ No Station: ______ Degree: ______

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) C-15
Fixed Housing Phenolic (CCP) Section Condition

Motor No.: 360T026	Side: Left (A)	Date: 3-3-93
Assessment Engineer(s)/Inspector(s): WILKES		

Fixed Housing Phenolic Section Observations:

	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Fixed Housing Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
0.0	.11	1.16	.09	1.01	.07	1.14	.07	1.07
1.0	.06	1.07	.06	1.06	.06	1.05	.03	1.03
2.0	.01	1.08	.00	1.04	.00	1.01	.02	1.07
3.0	.02	1.07		1.02		1.04	.01	1.12
4.0	.02	1.03		1.03		1.01	.00	1.09
5.0	.01	1.04		1.00		.98		1.10
6.0	.01	1.01		1.01		.95		1.09
7.0	.00	1.02		.93		.96		1.05
8.0	.00	.85	.00	.90		.91		.99
9.0	.00	.87	.01	.78	.00	.83	.00	.97
10.75	.12	1.82	.17	1.65	.05	1.69	.13	1.73

Negative Margin of Safety? ____ Yes ✓ No Station: ____ Degree: ____

Notes / Comments

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-16
Throat Inlet Assembly Phenolic (CCP) Section Condition

Motor No.: 360T026	Side: Left (A)	Date: 3-2-93
Assessment Engineer(s)/Inspector(s): WILKES		

Throat Inlet Assembly Phenolic Section Observations:

	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Throat Inlet Ring and Throat Ring Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
1.0	1.09	.62	1.07	.55	1.02	.63	1.06	.60
2.0	1.13	.60	1.02	.57	1.06	.66	1.01	.60
4.0	1.20	.65	1.18	.63	1.10	.66	1.15	.64
6.0	1.23	.66	1.21	.61	1.16	.67	1.20	.69
8.0	1.26	.52	1.25	.51	1.19	.52	1.26	.53
10.0	1.19	.54	1.20	.57	1.13	.52	1.17	.51
12.0	1.16	.54	1.19	.58	1.14	.48	1.12	.52
14.0	1.14	.53	1.13	.63	1.12	.51	1.11	.50
16.0	1.07	.59	1.09	.68	1.06	.60	1.06	.55
18.0	.93	.67	.93	.70	.88	.66	.91	.65
20.0	.73	.76	.75	.72	.72	.73	.73	.73
22.0	.51	.82	.55	.78	.50	.86	.45	.86
23.0	.41	.81	.44	.84	.39	.89	.37	.89

Negative Margin of Safety? ______ Yes ✓ No Station: ______ Degree: ______

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-17
Nose Cap Phenolic (CCP) Section Condition

Motor No.: 360T026 | Side: Left (A) | Date: 3-3-93

Assessment Engineer(s)/Inspector(s): WILKES

Nose Cap Phenolic Section Observations:

	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Nose Cap Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
1.5	NA	.93 *	NA	.87 *	NA	.83 *	NA	.88 *
4.0	.33	.60	.25	.62	.33	.53	.36	.64
6.0	.35	.59	.34	.57	.33	.50	.31	.57
8.0	.35	.60	.44	.53	.35	.50	.40	.60
10.0	.38	.63	.41	.58	.37	.50	.43	.57
12.0	.50	.56	.47	.53	.43	.51	.48	.50
14.0	.57	.57	.55	.43	.50	.51	.51	.49
16.0	.73	.49	.59	.43	.64	.55	.61	.55
18.0	.80	.50	.71	.42	.73	.53	.72	.46
20.0	1.07	.42	.98	.44	.94	.55	.92	.48
22.0	1.65	.67	1.49	.72	1.46	.62	1.50	.65
24.0	1.84	.65	1.67	.75	1.59	.68	1.75	.68
26.0	1.28	.71	1.18	.71	1.05	.77	1.31	.87

Negative Margin of Safety? ____ Yes ✓ No Station: ____ Degree: ____

Notes / Comments * TOTAL DEPTH, EROSION PLUS CHAR

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-18

Forward Nose Ring and Aft Inlet Ring Phenolic (CCP) Section Condition

Motor No.: 360T026	Side: Left (A)	Date: 3-2-93

Assessment Engineer(s)/Inspector(s): WILKES

Forward Nose and Aft Inlet Ring Phenolic Section Observations:	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Forward Nose Ring (-503) Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
28.0	1.14	.62	1.12	.55	1.05	.71	1.01	.72
30.0	.89	.69	.91	.65	.83	.62	.87	.74
32.0	.97	.63	.97	.66	.94	.63	.98	.63

Negative Margin of Safety? ______ Yes ✓ No Station: ______ Degree: ______

Record the Aft Inlet Ring Char (-504) and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
34.0	.89	.55	.91	.52	.86	.56	.92	.52
36.0	.87	.60	.89	.56	.87	.58	.94	.48
38.0	.98	.59	.95	.61	.95	.65	.99	.63
39.0	.99	.61	.96	.66	.98	.64	1.03	.59

Negative Margin of Safety? ______ Yes ✓ No Station: ______ Degree: ______

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-1
Nozzle Assembly Quick-look Condition

Motor No.: 360T026	Side: Right (B)	Date: 9-25-92

Assessment Engineer(s)/Inspector(s): M. Clark, T. Freston

Nozzle Assembly Quick-look Observations:	Yes	No	Comment #
A. Metal Damage Due to Transportation or Handling?		✓	
B. Phenolic Damage Due to Transportation or Handling?	✓		1
C. Foreign Material?		✓	

Notes / Comments

1) Damaged phenolic area between 351°-0°-5° on nosecap forward end and -503 forward inlet ring. The area measured 7.5" radial by 6" circ. the deepest area was centered at 1° and measured 1.5" radial by 2.8" circ. by 0.55" deep from flow surface. The phenolic edges are sharp. This is centered on the Nosecap/Nose inlet ring bondline and appears to have been rubbed or worn. A preliminary PFAR was written.

2) Area of discoloration on forward exit cone aft shear pins at:
172.5°, 3.3" circ. by 0.9" axial
202.5°, 2.5" circ. by 1.0" axial
270°, 2.4" circ. by 1.0" axial
Area was observed at KSC. A preliminary PFAR has been written.
Samples were taken.

Preliminary PFAR(s)? ✓ Yes ____ No   Preliminary PFAR Number(s): 47C-01, 47C-02

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-1
Nozzle Assembly Quick-look Condition

Motor No.: 360T026	Side: Right (B)	Date: 9-25-92
Assessment Engineer(s)/Inspector(s): M. Clark, T Freston		

Nozzle Assembly Quick-look Observations:

	Yes	No	Comment #
A. Metal Damage Due to Transportation or Handling?		✓	
B. Phenolic Damage Due to Transportation or Handling?	✓		1
C. Foreign Material?		✓	

Notes / Comments

1) Damaged phenolic area between 351°-0°-5° on nosecap forward end and -303 forward [illegible] ring. The area measured 7.5" radial by 6" circ. The deepest area was centered at 1° and measured 1.5" radial by 2.5" circ. by 0.55" deep from flow surface. The phenolic edges are sharp. This is centered on the Nosecap/Nose inlet ring bondline and appears to have been rubbed or worn. A preliminary PFAR was written.

2) Areas of discoloration on forward exit cone aft shear pins at:
172.5°, 3.3" circ. by 0.9" axial
202.5°, 2.5" circ. by 1.0" axial
270°, 2.4" circ. by 1.0" axial
[illegible] observed at KSC. A preliminary PFAR has been written.
Samples were taken.

Preliminary PFAR(s)? ✓ Yes ___ No   Preliminary PFAR Number(s): 47C-01, 47C-02

Clarification Form(s)? ___ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-2
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): M. Clark, R. Lange, J. Waller, T. Preston		
Joint: Nose Inlet-to-Flex Bearing-to-Cowl (Joint #2)		

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Gas Penetration in the RTV (Terminated, Through)?	✓		1
B. RTV Not Below Char Line?		✓	
C. RTV To the Primary O-ring?		✓	
D. RTV Past the Primary O-ring?		✓	
E. Uncured RTV?		✓	
F. Voids Within RTV?		✓	
G. Foreign Material?		✓	
H. Heat Affected or Eroded Virgin CCP, GCP/SCP, or adhesive?		✓	
I. Damaged Phenolics?		✓	
J. Bondline Edge Separations? Use Clarification Form.	✓		2
K. Phenolics Axially Displaced From Housing?		✓	
L. Heat Affected Metal?		✓	
M. Unbonded or Blistered Paint?		✓	
N. Corrosion?	✓		3
O. Excessive Grease in Threaded Bolt Holes?		✓	
P. Bolt Hole Damage (Through, Threaded/Helical Coil Insert)?		✓	
Q. Bent or Broken Bolts?		✓	
R. Metal Damage (Joints or Housings)?		✓	

Notes / Comments

1. SOOT TO PRI O-RING AND IN JOINT INTERMITTENTLY. GAS PATH AT 350° (47C-12)
2. REF PAGE C-29A
3. REF PAGE C-30 FOR LOCATION AND DISCRIPTION
4. FOREIGN MATERIAL IN BEARING/THROAT CAVITY. PFAR 47C-10.

Preliminary PFAR(s)? ✓ Yes ___ No Preliminary PFAR Number(s): 47C-10, -12, -13

Clarification Form(s)? ✓ Yes ___ No Clarification Form Page No.(s): C-29A

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Interface Separation Clarification Form

Motor No.: 360T026 | Side: ☐ Left (A) ☒ Right (B) | Date: 9-30-92

Assessment Engineer(s)/Inspector(s): CLARK - LANGE - WALKER - PRESTON

Part:
- ☐ Forward Exit Cone (Forward End)
- ☐ Throat Ring (Aft End)
- ☐ Throat Inlet Ring (Forward End)
- ☐ Aft Inlet Ring (Aft End)
- ☒ Nose Cap (Aft End)
- ☐ Cowl (Forward End)*
- ☐ Inner Boot Ring (Forward End)

Interface Separation Types:
- A. Metal-to-Adhesive
- B. Within Adhesive
- C. Adhesive-to-GCP
- D. Within GCP
- E. GCP-to-CCP
- F. Within CCP
- *G. Adhesive-to-SCP
- *H. Within SCP
- *I. SCP-to-CCP

Circumferential Location	Separation Type	Maximum Radial Width
360° INTERMITTENT	A	.005

Corresponding Comment Number(s): 2

REVISION ____

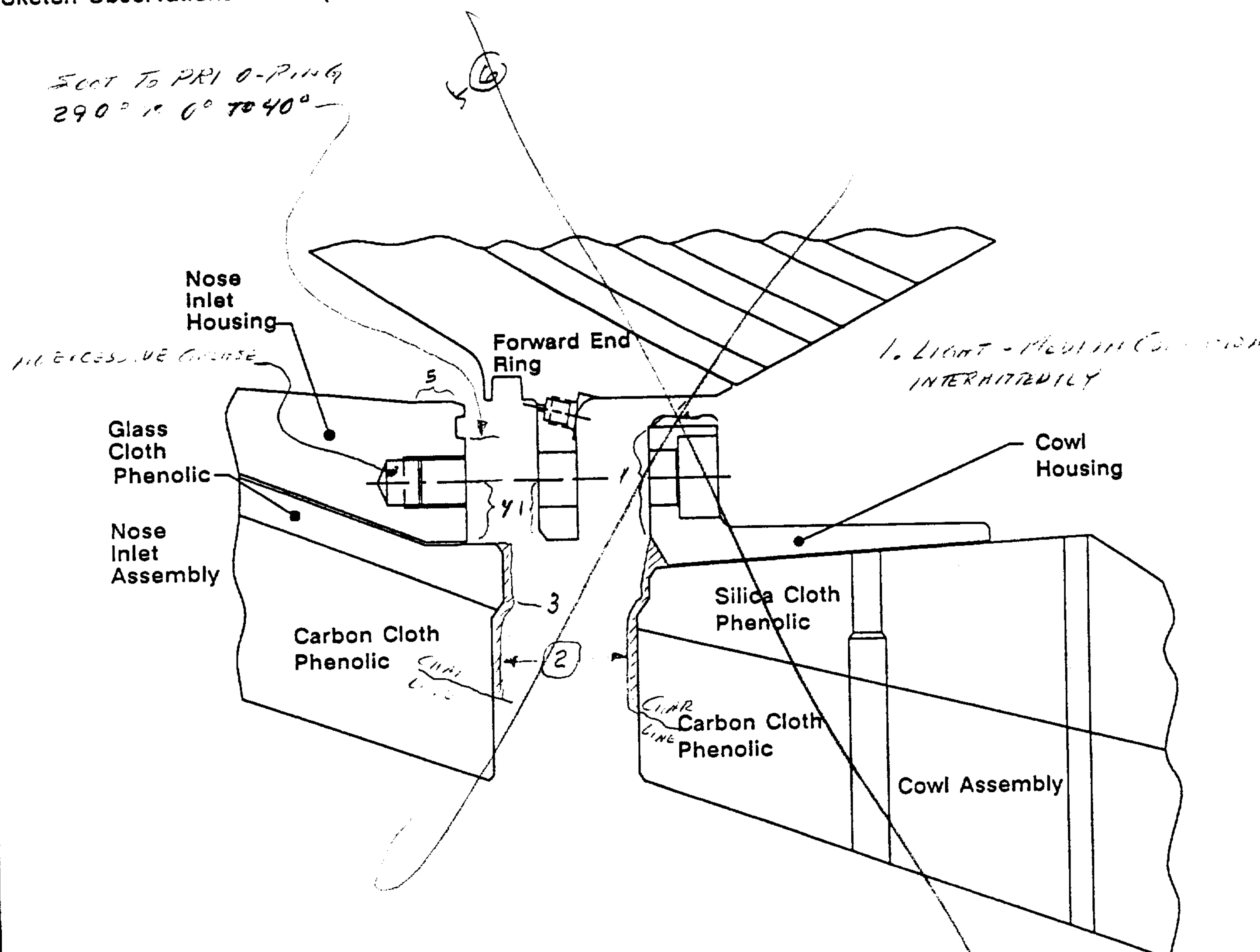
DOC NO. TWR-64204 | VOL
SEC | PAGE C-29A

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-3
Nose Inlet-to-Flex Bearing-to-Cowl Joint (Joint #2) Condition Drawing Worksheet

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): M. Clark, R. Lange, J. Walker, T. Freston		

Sketch Observations Below (include locations and sizes of sketched features):



2. TYP RTV & ADHESIVE INTERMIXED WITH SOOT ENTERING BETWEEN LAYERS
3. GAS PATH AT 350° Reference C-30A with heat affected CCP & GCP/SCP
4. TYP SOOTING, LIGHT/MEDIUM INTERMITTENTLY
5. TYP LIGHT BURNISHING INTERMITTENTLY
6 WASHER WAS FOUND AT THE INTERSECTION OF FLEX BRG CORE AND FWD END RING 265° (47C-10)

Clarification Form(s)? ✓ Yes ___ No   Clarification Form Page No.(s): C-30A

REVISION ___

DOC NO. TWR-64204 VOL
SEC PAGE C-30

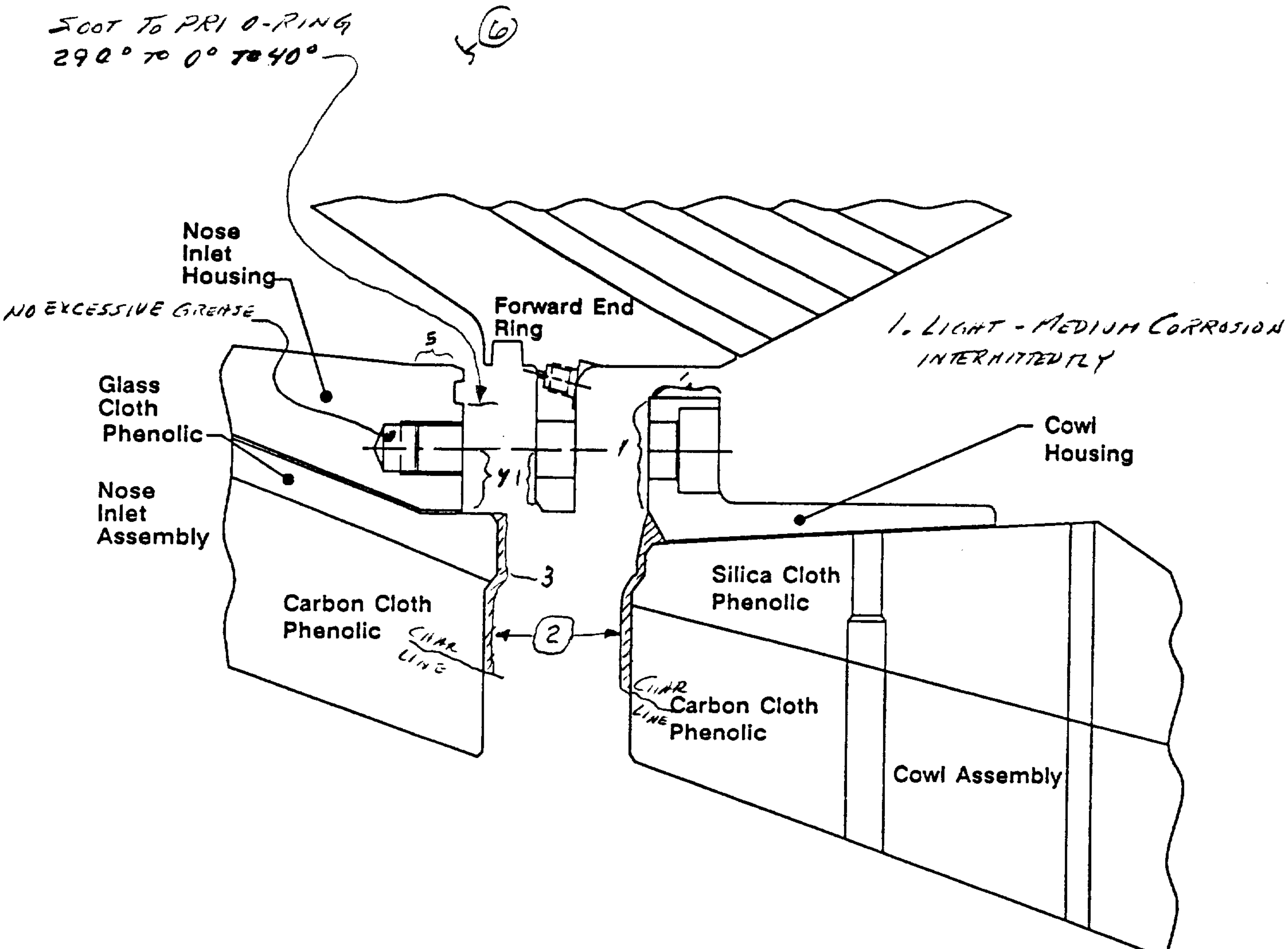
Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-3

Nose Inlet-to-Flex Bearing-to-Cowl Joint (Joint #2) Condition Drawing Worksheet

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): M. Clark, R. Lange, J. Walker, T. Freston		

Sketch Observations Below (include locations and sizes of sketched features):



1. LIGHT - MEDIUM CORROSION INTERMITTENTLY

2. TYP RTV & ADHESIVE INTERMIXED WITH SOOT ENTERING BETWEEN LAYERS

3. GAS PATH AT 350° Reference C-30A with heat affected CCP & GCP/SCP

4. TYP SOOTING, LIGHT/MEDIUM INTERMITTENTLY

5. TYP LIGHT BURNISHING INTERMITTENTLY

6 WASHER WAS FOUND AT THE INTERSECTION OF FLEX BRG CORE AND FWD END RING 265° (47C-10)

Clarification Form(s)? ✓ Yes ____ No   Clarification Form Page No.(s): C-30A

Thiokol CORPORATION
SPACE OPERATIONS

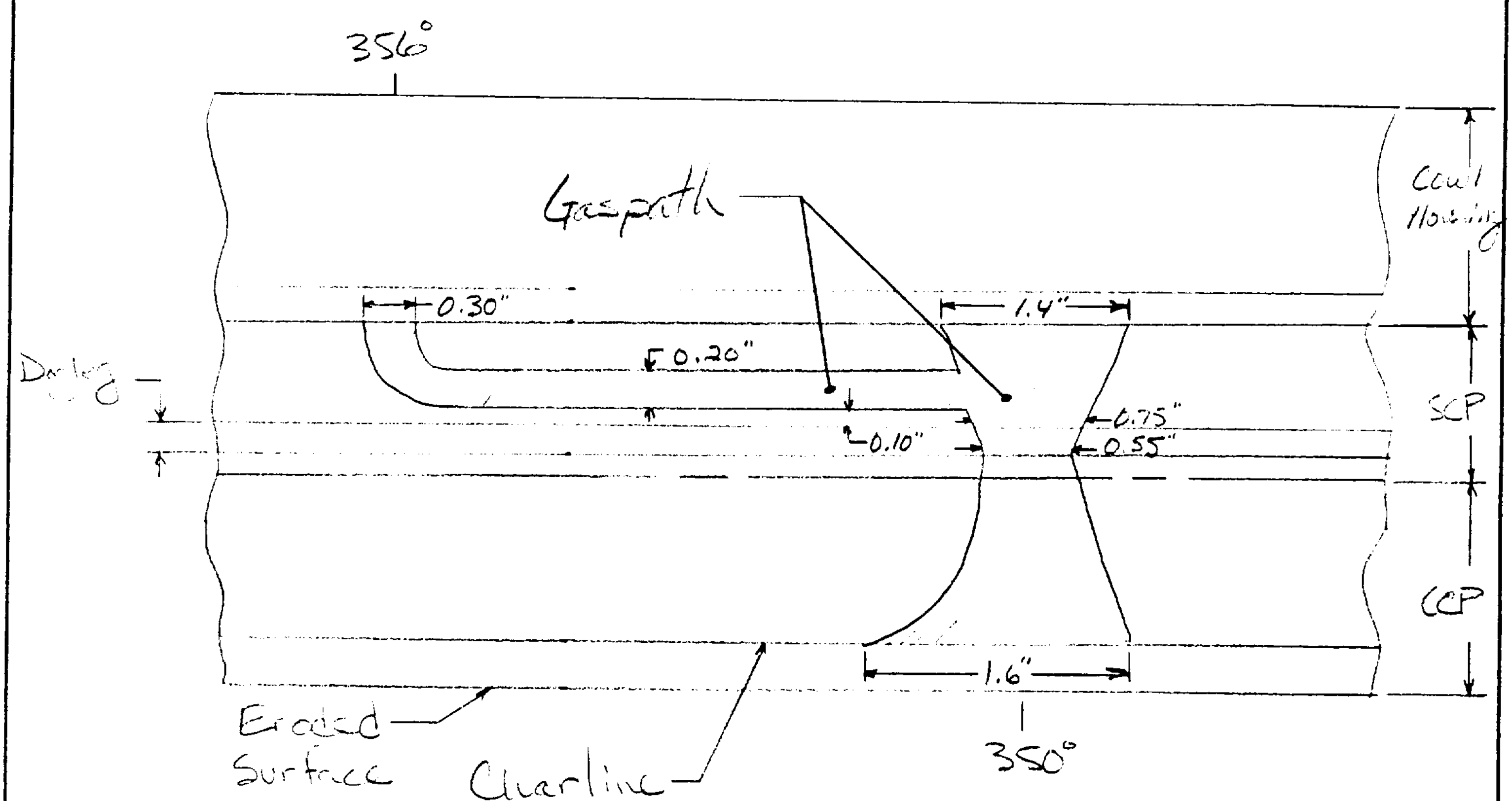
General Hardware Clarification Form

Motor No.: 360TO26	Side: ☐ Left (A) ☒ Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s): M. Clark, B. Quick, T. Freston

Description: Joint 2 Gaspath

Sketch Observations Below (include locations and sizes of sketched features):



Corresponding Comment Number(s): 3

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-2

Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): R. Quick

Joint: Nose Inlet-to-Throat (Joint #3)

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Gas Penetration in the RTV (Terminated, Through)?		✓	
B. RTV Not Below Char Line?		✓	
C. RTV To the Primary O-ring?		✓	
D. RTV Past the Primary O-ring?		✓	
E. Uncured RTV?		✓	
F. Voids Within RTV?		✓	
G. Grease Inhibiting RTV Backfill?		✓	
H. Foreign Material?		✓	
I. Heat Affected or Eroded Virgin CCP, GCP/SCP, or adhesive?		✓	
J. Damaged Phenolics?	✓		1
K. Bondline Edge Separations? Use Clarification Form.			
L. Phenolics Axially Displaced From Housing?		✓	
M. Heat Affected Metal?		✓	
N. Unbonded or Blistered Paint?		✓	
O. Corrosion?	✓		2
P. Alignment Pin Damage?		N/A	
Q. Excessive Grease in Threaded Bolt Holes?		✓	
R. Bolt Hole Damage (Through, Threaded/Helical Coil Insert)?		✓	
S. Bent or Broken Bolts?		✓	
T. Metal Damage (Joints or Housings)?		✓	

Notes / Comments

Special Issues 3.2.3.2 - NO SEAL SURFACE DAMAGE OR ATYPICAL CORROSION FOUND
1- SEE SHEET C-31A & C-31B.
2- TYPICAL LIGHT TO MEDIUM CORROSION UPSTREAM OF PRIMARY O-RING INTERMITTENT 360° ON NOSE INLET HOUSING

Preliminary PFAR(s)? ✓ Yes ___ No   Preliminary PFAR Number(s): 47C-11

Clarification Form(s)? ✓ Yes ___ No   Clarification Form Page No.(s): C-31A & C-31B

Nozzle Interface Separation Clarification Form

Motor No.: 360T026 | Side: ☐ Left (A) ☒ Right (B) | Date: 9-30-92

Assessment Engineer(s)/Inspector(s): R.Quick

Part:
- ☐ Forward Exit Cone (Forward End)
- ☐ Throat Ring (Aft End)
- ☒ Throat Inlet Ring (Forward End)
- ☐ Aft Inlet Ring (Aft End)
- ☐ Nose Cap (Aft End)
- ☐ Cowl (Forward End)*
- ☐ Inner Boot Ring (Forward End)

Interface Separation Types:

A. Metal-to-Adhesive
B. Within Adhesive
C. Adhesive-to-GCP
D. Within GCP
E. GCP-to-CCP
F. Within CCP
*G. Adhesive-to-SCP
*H. Within SCP
*I. SCP-to-CCP

Circumferential Location	Separation Type	Maximum Radial Width
0°-50°	A	.020
60°-90°	A	.005
100°-120°	A	.010
150°-260°	A	.015
290°-0°	A	.012

Corresponding Comment Number(s): 1

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Interface Separation Clarification Form

Motor No.: 360T026	Side: ☐ Left (A) ☒ Right (B)	Date: 9-30-92

Assessment Engineer(s)/Inspector(s): R. QUICK

Part:
- ☐ Forward Exit Cone (Forward End)
- ☐ Throat Ring (Aft End)
- ☐ Throat Inlet Ring (Forward End)
- ☒ Aft Inlet Ring (Aft End)
- ☐ Nose Cap (Aft End)
- ☐ Cowl (Forward End)*
- ☐ Inner Boot Ring (Forward End)

Interface Separation Types:

A. Metal-to-Adhesive
B. Within Adhesive
C. Adhesive-to-GCP
D. Within GCP
E. GCP-to-CCP
F. Within CCP
*G. Adhesive-to-SCP
*H. Within SCP
*I. SCP-to-CCP

Circumferential Location	Separation Type	Maximum Radial Width
28°-31°	A	.005
125°-142°	A	.005
158-162°	A	.005

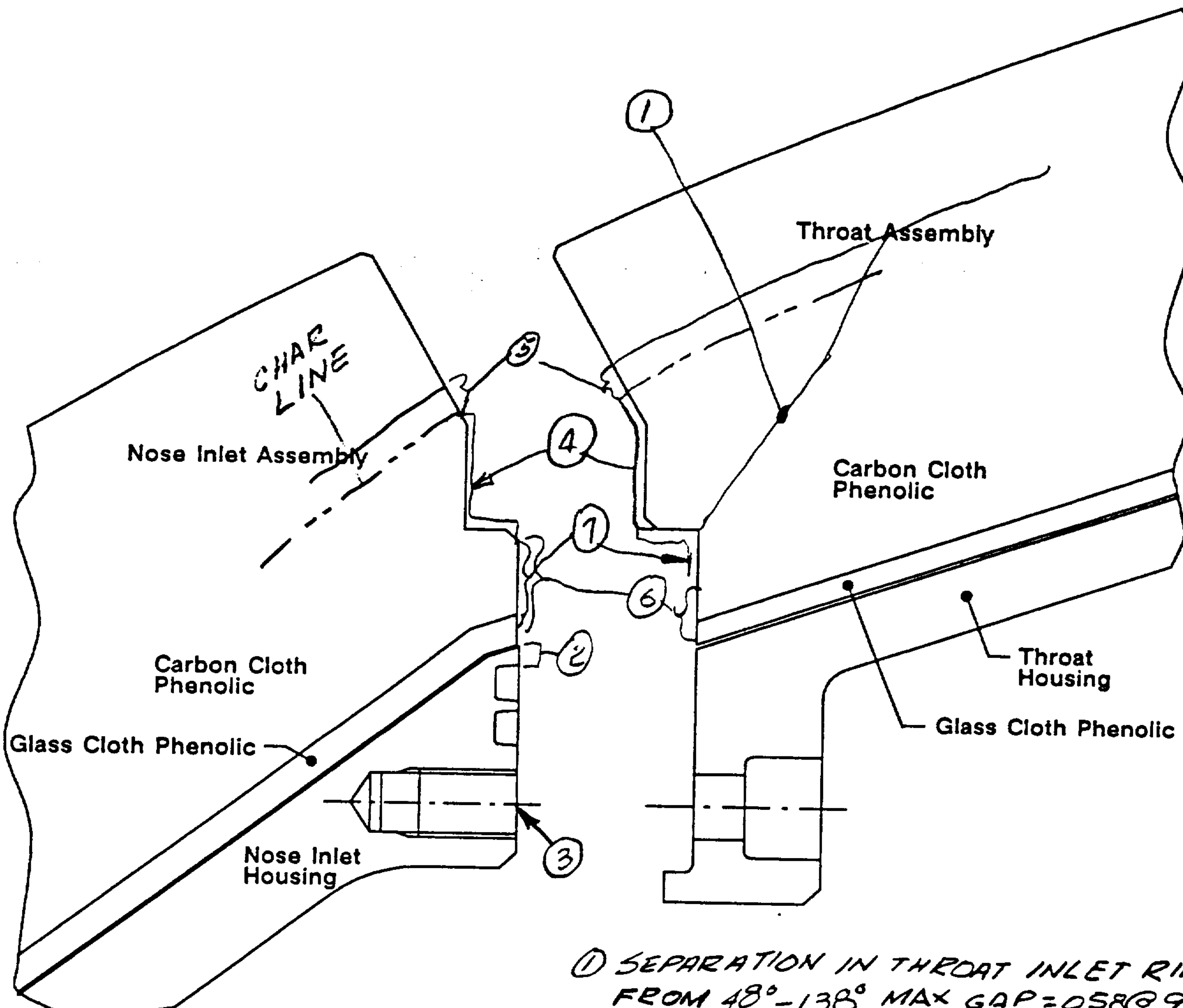
Corresponding Comment Number(s): 1

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-4
Nose Inlet-to-Throat Joint (Joint #3) Condition Drawing Worksheet

Motor No.: 360T026	Side: Right (B)	Date: 9-30-92
Assessment Engineer(s)/Inspector(s): R. QUICK		

Sketch Observations Below (include locations and sizes of sketched features):



① SEPARATION IN THROAT INLET RING FROM 48°-138° MAX GAP=.058@90°
② SEE SHEET C-31
③ NO EXCESS GREASE IN BOLT HOLES
④ RTV BELOW CHAR LINE 360°
⑤ SOOT TO CHAR LINE INTERMITTENT 360°
⑥ CORROSION FROM SEA WATER 360°
⑦ RTV AT LOC 50°-60°, 65°-90°, 100°-130°

Clarification Form(s)? ______ Yes __✓__ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-2
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 9-28-92
Assessment Engineer(s)/Inspector(s): R QUICK R. TELLERS		
Joint: Throat-to-Forward Exit Cone (Joint #4)		

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Gas Penetration in the RTV (Terminated, Through)?		✓	
B. RTV Not Below Char Line?		✓	
C. RTV To the Primary O-ring?	✓		SEE PG 34
D. RTV Past the Primary O-ring?		✓	
E. Uncured RTV?		✓	
F. Voids Within RTV?		✓	
G. Grease Inhibiting RTV Backfill?		✓	
H. Foreign Material?		✓	
I. Heat Affected or Eroded Virgin CCP, GCP/SCP, or adhesive?		✓	
J. Damaged Phenolics?		✓	
K. Bondline Edge Separations? Use Clarification Form.	✓		1
L. Phenolics Axially Displaced From Housing?		✓	
M. Heat Affected Metal?		✓	
N. Unbonded or Blistered Paint?		✓	
O. Corrosion?	✓		2
P. Alignment Pin Damage?		✓	
Q. Excessive Grease in Threaded Bolt Holes?		✓	
R. Bolt Hole Damage (Through, Threaded/Helical Coil Insert)?		✓	
S. Bent or Broken Bolts?		✓	
T. Metal Damage (Joints or Housings)?		✓	

Notes / Comments

Special Issues 3.3.1 NO DAMAGE TO BOLTS OR BOLTHOLES

1 - SEE CLARIFICATION PAGE C-33A & C-33B

2 - MEDIUM CORROSION INBOARD OF PRIMARY SEAL SURFACE ON THROAT FULL CIRCUMFERENCE, LIGHT CORROSION ON SECONDARY SEAL SURFACE AND BETWEEN PRIMARY AND SECONDARY SEAL SURFACE OF FWD EXIT CONE AND MATING SURFACES ON THROAT INTERMITTENT FULL CIRCUMFERENCE

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

Clarification Form(s)? ✓ Yes ____ No   Clarification Form Page No.(s): C-33A & C-33B

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Interface Separation Clarification Form

Motor No.: 360T026	Side: ☐ Left (A) ☒ Right (B)	Date: 9-28-92
Assessment Engineer(s)/Inspector(s): R. QUICK R. TELLERS		

Part:
- ☒ Forward Exit Cone (Forward End)
- ☐ Throat Ring (Aft End)
- ☐ Throat Inlet Ring (Forward End)
- ☐ Aft Inlet Ring (Aft End)
- ☐ Nose Cap (Aft End)
- ☐ Cowl (Forward End)*
- ☐ Inner Boot Ring (Forward End)

Interface Separation Types:

A. Metal-to-Adhesive
B. Within Adhesive
C. Adhesive-to-GCP
D. Within GCP
E. GCP-to-CCP
F. Within CCP
*G. Adhesive-to-SCP
*H. Within SCP
*I. SCP-to-CCP

Circumferential Location	Separation Type	Maximum Radial Width
0°- 30°	A	.008
45° - 70°	A	.019
150°-180°	A	.005
180°-225°	A	.019
110°-115°	C	.011
117°-122°	C	.011

Corresponding Comment Number(s): 1

Nozzle Interface Separation Clarification Form

Motor No.: 360T026 | Side: ☐ Left (A) ☒ Right (B) | Date: 9-28-92

Assessment Engineer(s)/Inspector(s): R. Quick, R. Tellers

Part:
- ☐ Forward Exit Cone (Forward End)
- ☒ Throat Ring (Aft End)
- ☐ Throat Inlet Ring (Forward End)
- ☐ Aft Inlet Ring (Aft End)
- ☐ Nose Cap (Aft End)
- ☐ Cowl (Forward End)*
- ☐ Inner Boot Ring (Forward End)

Interface Separation Types:
- A. Metal-to-Adhesive
- B. Within Adhesive
- C. Adhesive-to-GCP
- D. Within GCP
- E. GCP-to-CCP
- F. Within CCP
- *G. Adhesive-to-SCP
- *H. Within SCP
- *I. SCP-to-CCP

Circumferential Location	Separation Type	Maximum Radial Width
350°-0°-20°	A	.013
30°-92°	A	.009
120°-160°	A	.015
180°-200°	A	.005
200°-330°	A	.013

Corresponding Comment Number(s): 1

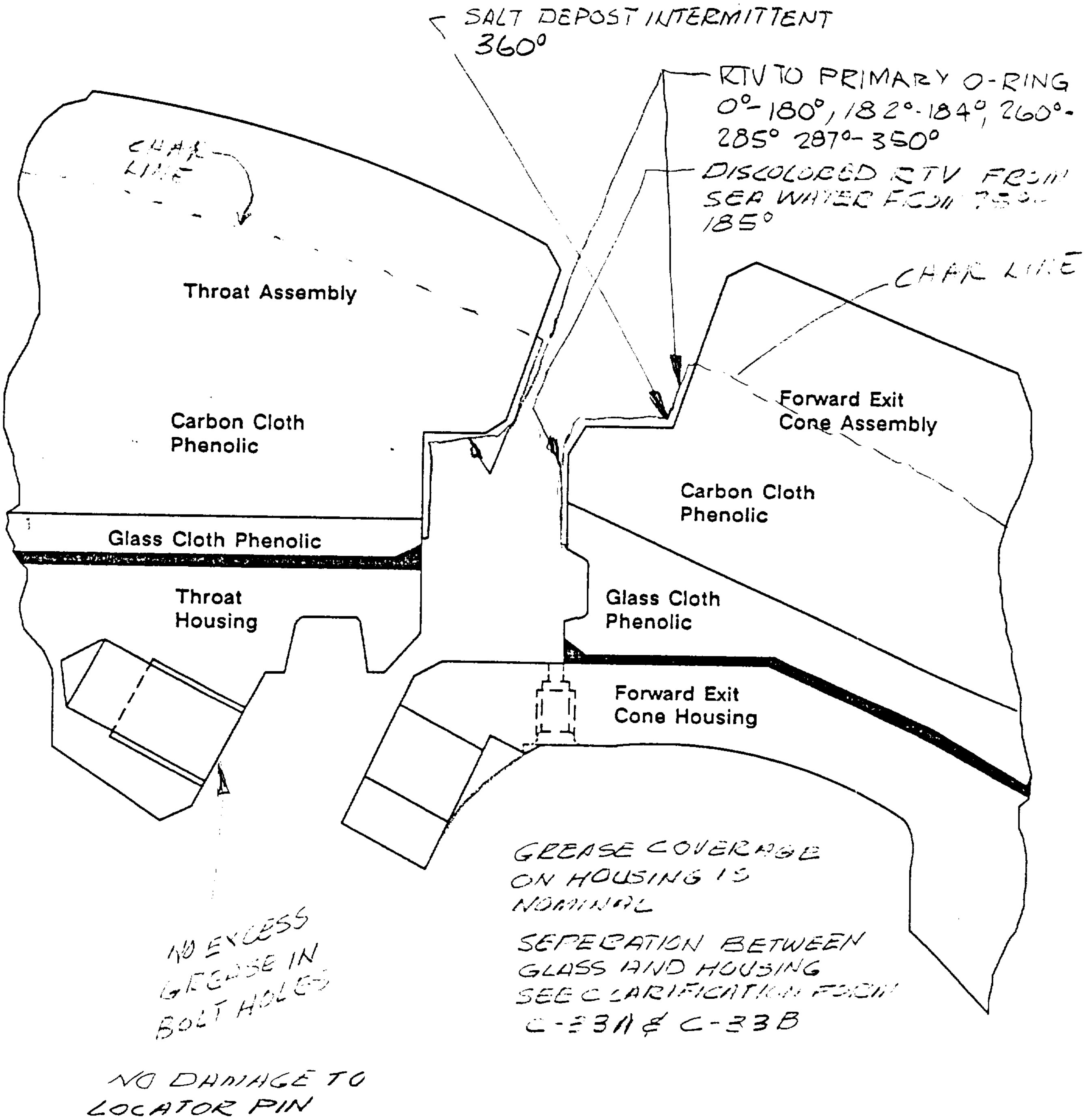
Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-5

Throat-to-Forward Exit Cone Joint (Joint #4) Condition Drawing Worksheet

Motor No.: 360T026	Side: Right (B)	Date: 9-28-92
Assessment Engineer(s)/Inspector(s): R.QUICK, R.TELLERS		

Sketch Observations Below (include locations and sizes of sketched features):



Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ____________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-2
Internal Nozzle Joint Condition

Motor No.: 360T026	Side: Right (B)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): M.E. Clark, T. Freston		
Joint: Aft End Ring-to-Fixed Housing (Joint #5)		

Internal Nozzle Joint Observations:	Yes	No	Comment #
A. Gas Penetration in the RTV (Terminated, Through)?		✓	
B. RTV Not Below Char Line?		✓	
C. RTV To the Primary O-ring?		✓	
D. RTV Past the Primary O-ring?		✓	
E. Uncured RTV?		✓	
F. Voids Within RTV?	✓		1
G. Foreign Material?		✓	
H. Heat Affected or Eroded Virgin CCP, GCP/SCP, or adhesive?		✓	
I. Damaged Phenolics?		✓	
J. Bondline Edge Separations? Use Clarification Form.		✓	
K. Phenolics Axially Displaced From Housing?		✓	
L. Heat Affected Metal?		✓	
M. Unbonded or Blistered Paint?	✓		3
N. Corrosion?	✓		2
O. Alignment Pin Damage?		✓	
P. Excessive Grease in Threaded Bolt Holes?		✓	
Q. Bolt Hole Damage (Through, Threaded/Helical Coil Insert)?		✓	
R. Bent or Broken Bolts?		✓	
S. Metal Damage (Joints or Housings)?		✓	

Notes / Comments

1) Typical encapsulated voids due to assembly process.

2) Corrosion documented on page C-36.

3) AREA OF PAINT THAT HAS SMALL BUBBLES FROM 90°-180° ON I D OF HOUSING 16.0 IN. FROM AFT FACE OF MOUNTING FLANGE. NO HEAT AFFECT

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

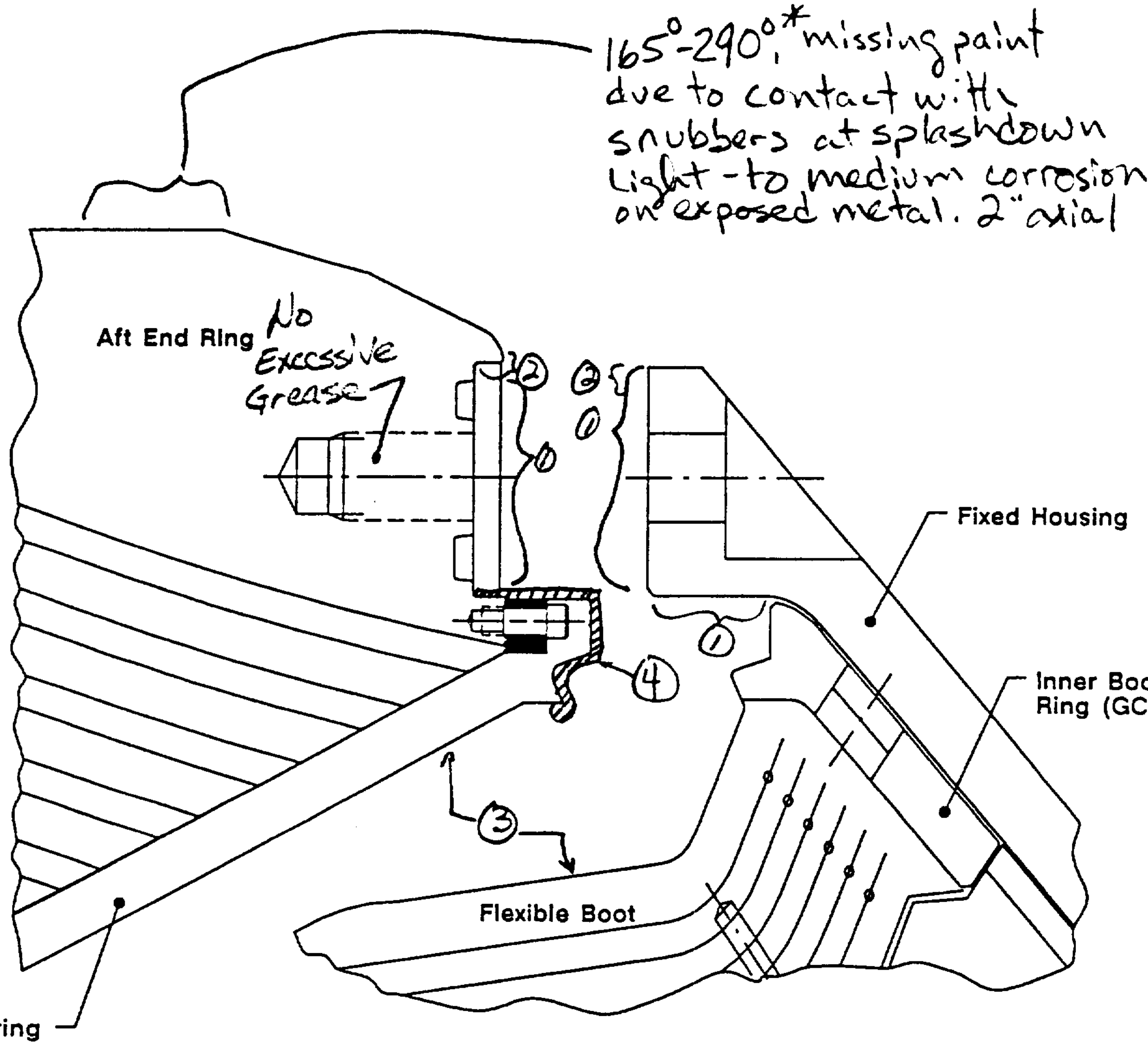
Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

POSTFLIGHT OBSERVATION RECORD (PFOR) C-6

Aft End Ring-to-Fixed Housing Joint (Joint #5) Condition Drawing Worksheet

Motor No.: 360T026	Side: Right (B)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): M. E. Clark, T. Freston		*REVISED LEW 10-5-92

Sketch Observations Below (include locations and sizes of sketched features):



1) Nominal Grease
No Corrosion
2) Intermittent Light-to-medium corrosion
3) Typical coating of soot

4) RTV condition was nominal. Typical encapsulated voids from assembly.

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ____________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-7
Cowl Insulation Segment Condition

Motor No.: 360T026	Side: Right (B)	Date: 9/29/92
Assessment Engineer(s)/Inspector(s): R. Quick R Tellers		

Cowl Insulation Segment Observations:

	Yes	No	Comment #
A. Spring Pin Holes Completely Through the Cowl Segment?		✓	
B. Abnormal Heat Effects or Erosion?		✓	
C. Soot Between the Cowl Segment and Cowl Housing?		✓	
D. Bondline Failure Mode? Data Collection Only.	N/A	N/A	

Notes / Comments

3 % with in Segment
85 % Rubber To Adhesive Failure
12 % Co adhesive Failure
pin location 0 - 360 adhesive from silica pin extruded To I.D. of cowl housing intermittent.
appx. 1.3 inch Diameter

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-8

Flexible Bearing, Flexible Bearing Protector, and Flexible Boot Condition

Motor No.: 360T026 | Side: Right (B) | Date: 9-29-92

Assessment Engineer(s)/Inspector(s): M.E. Clark, T. Freston

Flexible Bearing, Bearing Protector, and Boot Observations:

	Yes	No	Comment #
A. Bearing Protector Burn-Through?		✓	
B. Cracks Through the Bearing Protector?		✓	
C. Bearing Protector Heat Effects or Erosion Other Than at Cowl Vent Hole Locations?	✓		1
D. Soot Between the Bearing Protector and Flexible Bearing?		✓	
E. Heat Effects to the Flexible Bearing?		✓	
F. Bent or Broken Bearing Protector Bolts?		✓	
G. Flexible Boot Burn-Through?		✓	
H. Abnormal Heat Effects or Erosion to Flexible Boot ID?		✓	
I. Foreign Material in Boot Cavity?	✓		1

Notes / Comments

Special Issues 3.3.2, 3.3.3 and 3.3.5

3.3.2 No abnormal erosion on flex boot.
3.3.3 No abnormal erosion on flex boot
3.3.5 NO BENT OR BROKEN BOLTS

1) Two areas of erosion other than cowl vent location on belly band. Reference C-38A for size and locations. Slag found in cavity is same location as erosion. Preliminary PFAR has been written.

Preliminary PFAR(s)? ✓ Yes ____ No Preliminary PFAR Number(s): 47C-05

Clarification Form(s)? ✓ Yes ____ No Clarification Form Page No.(s): C-38A

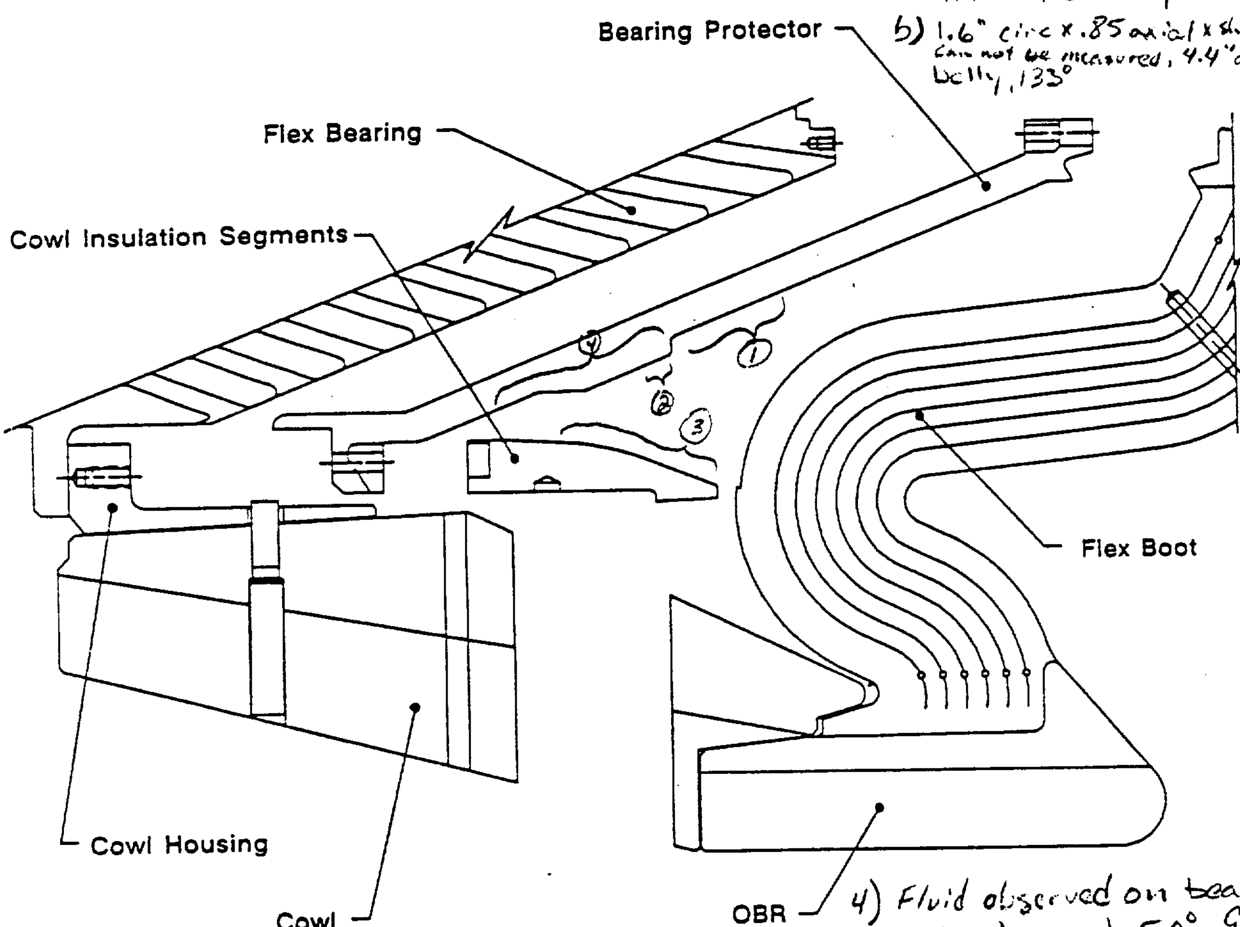
Flexible Boot Cavity Clarification Form

Motor No.: 360T026	Side: ☐ Left (A) ☑ Right (B)	Date: 9-29-92
Assessment Engineer(s)/Inspector(s): M.E. Clark, T. Freston		
Description: Boot Cavity Conditions		

Sketch Observations Below (include locations and sizes of sketched features):

3) Bubbles on cowl segments at 260°-360° average size = 0.25" dia.

1) Erosion areas not at the vent hole impingment
a) 4.8" circ x 1.8" axial x .12" deep 1.4" aft of belly Band, 132°
b) 1.6" circ x .85 axial x shallow depth can not be measured, 4.4" aft of belly, 133°



2) Deepest erosion on belly band occured at 10°. The cowl vent hole was open with plugging with slag when it was removed from segment

The remaining material thickness at 10° will recorded on C-39.

4) Fluid observed on bearing protector at 50°-90° on and forward of belly band. Fluid has been observed on previous motors and is the result of the thermal degradation of the bearing protector material

Corresponding Comment Number(s): 1

POSTFLIGHT OBSERVATION RECORD (PFOR) C-9

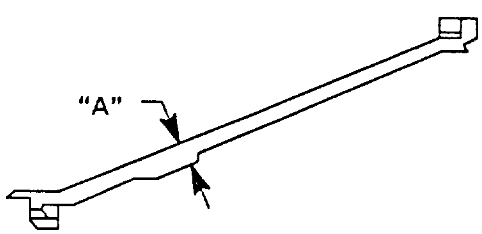
Flexible Bearing Protector Thickness Measurements

Motor No.: 360T026	Side: Right (B)	Date: 10-14-92

Assessment Engineer(s)/Inspector(s): R.R. Gallegos / D. Turnbull

Record the Flexible Bearing Protector Gas Impingement Area Thickness Measurements (see figure) Below:

Degree Location	Thickness Measurement "A"* (inches)	Degree Location	Thickness Measurement "A"* (inches)	Degree Location	Thickness Measurement "A"* (inches)
0	.694	120	.653	240	.683
10	.696	130	.666	250	.693
20	.699	140	.646	260	.686
30	.675	150	.658	270	.684
40	.686	160	.670	280	.674
50	.691	170	.669	290	.686
60	.683	180	.670	300	.692
70	.694	190	.671	310	.704
80	.677	200	.673	320	.705
90	.686	210	.691	330	.703
100	.650	220	.691	340	.697
110	.654	230	.699	350	.689



* "A" is the minimum thickness of the bearing protector in-line with the cowl vent holes. It corresponds to the deepest gas impingement location.

Notes / Comments

SL 47230

NOTE: At Approx. 12° there is a divit that checks .532"

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-10
Throat Diameter Measurements (Data Collection Only)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92

Assessment Engineer(s)/Inspector(s):

Record the Nozzle Throat Diameter Measurements Below:

Degree Location	Diameter Measurement (inches)
0	55.885
45	55.855
90	55.876
135	55.876

Notes / Comments

arification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ________

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-10
Throat Diameter Measurements (Data Collection Only)

Motor No.: 360T026	Side: Right (B)	Date: 10-1-92
Assessment Engineer(s)/Inspector(s):		

Record the Nozzle Throat Diameter Measurements Below:

Degree Location	Diameter Measurement (inches)
0	55.888
45	55.885
90	55.896
135	55.896

Notes / Comments

arification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) C-11

Outer Boot Ring Char and Erosion Measurements and Flexible Boot Condition

Motor No.: 360T026	Side: Right (B)	Date: 12-24-92

Assessment Engineer(s)/Inspector(s): WILKES

Flexible Boot/Outer Boot Ring Separation Observations:

	Yes	No	Comment #
A. Heat Effects in Boot/OBR Separation?		✓	

Record the Outer Boot Ring Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
8.0	NA		NA		NA		NA	
9.0	.01	.98	NA		NA		.10	1.16
10.0	.03	.97	.01	1.33	.09	1.10	.11	1.19
11.3	.05	1.09	.00	1.14	.07	1.17	.09	1.28

Negative Margin of Safety? ____ Yes ✓ No Station: ____ Degree: ____

Record the Number of Plies Remaining on the Flexible Boot:

Degree Location	Plies Remaining
0	3.8
90	3.4
180	3.8
270	3.4
140	3.8

140°

STATION	EROSION	CHAR
8.0	NA	
9.0	NA	
10.0	.07	1.08
11.3	.07	1.02

Negative Margin of Safety? ____ Yes ✓ No Degree: ____

Notes / Comments

Special Issues 3.3.3 NO ABNORMAL EROSION OF FLEX BOOT PLIES WAS OBSERVED AT 140 DEGREES. REMAINING BOOT PLIES WERE AT MAXIMUM AT THIS SECTION.

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026	Side: Right (B)	Date: 10-12-92
Assessment Engineer(s)/Inspector(s): M. Clark		
Phenolic Subassembly: Aft Exit Cone Assembly		

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0-90	90-180	180-270	270-360			Total
Metal-to-Adhesive	5	2	3	0			2
Within Adhesive							
Adhesive-to-GCP							
Within GCP	95	98	97	100			98
GCP-to-CCP							
Within CCP							

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

	0-90	90-180	180-270	270-360			
Metal-to-Adhesive		1		1			
Within Adhesive							
Adhesive-to-GCP	100	99	100	99			

Phenolic Removal Method: ______

Metal Housing Bondline Surface Observations:	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?		✓	
D. Foreign Material?		✓	
E. Voids in Polysulfide (Aft Exit Cone Polysulfide Groove)?	✓		2

Notes / Comments
1) Intermittent small voids, largest void at 185°, 1.1" axial x 0.70" circ, 24" from fwd.
2) Intermittent small voids, largest void: 0.10" diameter

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Right (B) | Date: 10-12-92

Assessment Engineer(s)/Inspector(s): M. Clark

Phenolic Subassembly: Aft Exit Cone Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0-90	90-180	180-270	270-360				Total
Metal-to-Adhesive	5	2	3	0				2
Within Adhesive								
Adhesive-to-GCP								
Within GCP	95	98	97	100				98
GCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

	0-90	90-180	180-270	270-360			
Metal-to-Adhesive		1		1			
Within Adhesive							
Adhesive-to-GCP	100	99	100	99			

Phenolic Removal Method: ______

Metal Housing Bondline Surface Observations:	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?		✓	
D. Foreign Material?		✓	
E. Voids in Polysulfide (Aft Exit Cone Polysulfide Groove)?	✓		2

Notes / Comments
1) Intermittent small voids, largest void at 185°, 1.1" axial x 0.70" circ, 24" from fwd.
2) Intermittent small voids, largest void: 0.10" diameter

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No   Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Right (B) | Date: 10-7-92

Assessment Engineer(s)/Inspector(s): M.E. Clark, J. Walker, K. Tellers

Phenolic Subassembly: Forward Exit Cone Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0-45	45-90	90-135	135-180	180-225	225-270	270-315	315-0
Metal-to-Adhesive	45	85	40	60	65	30	80	68
Within Adhesive	5		5	5	1	5	2	2
Adhesive-to-GCP	50	15	55	35	34	65	18	30
Within GCP								
GCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

	N/A							
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								

Phenolic Removal Method: ______

Metal Housing Bondline Surface Observations:	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?	✓		2
D. Foreign Material?		✓	

Notes / Comments

1) Reference C-43A
2) Medium-to-heavy corrosion in areas of metal-to-adhesive separation.

Preliminary PFAR(s)? ______ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ✓ Yes ______ No   Clarification Form Page No.(s): C-43A

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026	Side: ☐ Left (A) ☑ Right (B)	Date: 10-7-97
Assessment Engineer(s)/Inspector(s): M.E. Clark, J. Walker, R. Teller		
Nozzle Subassembly: Fwd Exit Cone		

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size: Axial	Void Size: Circ.	Location on Bonding Surface: Distance From Fwd	Location on Bonding Surface: Distance From Aft
150	1.0	0.5		10.9
168	0.7	0.5		8.2
213	1.0	0.7		11.5
[illegible]	1.4	0.5		9.8
[illegible]	0.7	0.4		14.7

Notes / Comments

Corresponding Comment Number(s): 1

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Right (B) | Date: 10-5-92

Assessment Engineer(s)/Inspector(s): R. Quick T. Freston

Phenolic Subassembly: Throat Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0°-45°	45°-90°	90°-135°	135°-180°	180°-225°	225°-270°	270°-315°	315°-0°
Metal-to-Adhesive	100%	100%	100%	100%	100%	100%	100%	100%
Within Adhesive								
Adhesive-to-GCP								
Within GCP								
GCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								

Phenolic Removal Method: ______

Metal Housing Bondline Surface Observations:

	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		2
C. Corrosion?	✓		1
D. Foreign Material?		✓	

Notes / Comments

Special Issues 3.3.4 AFT SHIMS IMPROVED THE DISTRIBUTION OF ADHESIVE AND REDUCED THE VOIDS GREATLY

1. MEDIUM TO HEAVY CORROSION FULL CIRCUMFERENCE
2. SEE CLARIFICATION FORM PAGE C-44 A.

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ______

Clarification Form(s)? ✓ Yes ____ No   Clarification Form Page No.(s): C-44A

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026 | Side: ☐ Left (A) ☒ Right (B) | Date: 10-5-92

Assessment Engineer(s)/Inspector(s): R. QUICK / T. FRESTON

Nozzle Subassembly: THROAT ASSEMBLY

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size Axial	Void Size Circ.	Location on Bonding Surface: Distance From Fwd	Location on Bonding Surface: Distance From Aft
5°	.80	.30		1.00
6°	.85	.45		1.00
50°		.40		.70 *
58°	.65	.30		.10
60°	.35	.65		.08
62°	.60	1.05		0

Notes / Comments
* ETENDS DOWN 3.5 IN A "U" SHAPE

Corresponding Comment Number(s): 2

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026	Side: Right (B)	Date: 10-5-92

Assessment Engineer(s)/Inspector(s): WILKES/FRESTON

Phenolic Subassembly: Aft Inlet/Forward Nose Rings

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0-45	45-90	90-135	135-180	180-225	225-270	270-315	315-360
Metal-to-Adhesive	100	85	100	100	100	80	100	100
Within Adhesive								
Adhesive-to-GCP		15				20		
Within GCP								
GCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

NA

Degree Location

Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								

Phenolic Removal Method: N/A

Metal Housing Bondline Surface Observations:	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?	✓		2
D. Foreign Material?		✓	

Notes / Comments ① ONE ADHESIVE VOID WAS OBSERVED IN THE NOSE CAP-TO-FWD NOSE RING (-503) AT 187°, LOCATED FROM METAL INTERFACE TO 1.10 INCH AFT AND 0.35 INCH CIRCUMFERENCE. VERY FEW SMALL VOIDS, 0.30 INCH MAXIMUM DIAMETER, WERE OBSERVED.
② LIGHT-TO-HEAVY CORROSION WAS OBSERVED OVER LENGTH AND CIRCUMFERENCE EXCEPT AT 60°-80° AND 230°-285° ON FORWARD TO MID 4.20 INCHES ON THE AFT INLET RING (-504) SHOWED NO CORROSION.

Preliminary PFAR(s)? ____ Yes ✓ No   Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No   Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026	Side: Right (B)	Date: 10-5-92
Assessment Engineer(s)/Inspector(s): WILKES / FRESTON		
Phenolic Subassembly: Nose Cap		

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0-360							
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								
Within GCP	5							
GCP-to-CCP	95							
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

	0-45	45-90	90-135	135-180	180-225	225-270	270-315	315-0
Metal-to-Adhesive	15	15	20	20	25	20	20	25
Within Adhesive	5	5				5	3	3
Adhesive-to-GCP	80	80	80	80	75	75	77	72

Phenolic Removal Method: NYLON WEDGE & HAMMER & VERY HARD TO PEEL

Metal Housing Bondline Surface Observations:	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?	✓		2
D. Foreign Material?		✓	

Notes / Comments ① SEE PFOR CLARIFICATION FORM PAGE C-46A.
② LIGHT TO MEDIUM CORROSION FORWARD 0.5-1.5 INCHES AND AFT 1.0-4.5 INCHES FOR FULL CIRCUMFERENCE.

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ✓ Yes ____ No Clarification Form Page No.(s): C-46A

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026	Side: ☐ Left (A) ☑ Right (B)	Date: 10-5-92
Assessment Engineer(s)/Inspector(s): WILKES / FRESTON		
Nozzle Subassembly: NOSE CAP		

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size Axial	Void Size Circ.	Location on Bonding Surface Distance From Fwd	Location on Bonding Surface Distance From Aft
39°	1.70	1.50	3.80	
50°	0.50	0.35	0.20	
[illegible]	0.40	0.20	5.25	
[illegible]	[illegible]	0.50	11.50	
[illegible]	0.57	0.28	9.60	
288°	0.47	0.25	7.00	
290°	0.40	0.23	6.50	
320°	0.43	0.30	2.70	

Notes / Comments: ① VERY FEW SMALL VOIDS 0.30 INCH MAXIMUM DIAMETER WERE OBSERVED.

Corresponding Comment Number(s): 1

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12

Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Right (B) | Date: 6 Oct 92

Assessment Engineer(s)/Inspector(s): R. Quick T. Freston

Phenolic Subassembly: Cowl Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	0-45	45-90	90-135	135-180	180-225	225-270	270-315	315-0
Metal-to-Adhesive	100%	100%	100%	100%	100%	100%	100%	100%
Within Adhesive								
Adhesive-to-SCP								
Within SCP								
SCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-SCP								

Phenolic Removal Method: ________

Metal Housing Bondline Surface Observations:	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		SEE PG C-47A
C. Corrosion?	✓		1
D. Foreign Material?		✓	

Notes / Comments 1-LIGHT TO MEDIUM CORROSION FULL CIRCUMFERENCE

Preliminary PFAR(s)? ___ Yes ✓ No   Preliminary PFAR Number(s): ________

Clarification Form(s)? ✓ Yes ___ No   Clarification Form Page No.(s): C-47A

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026 | Side: ☐ Left (A) ☒ Right (B) | Date: 10-6-92

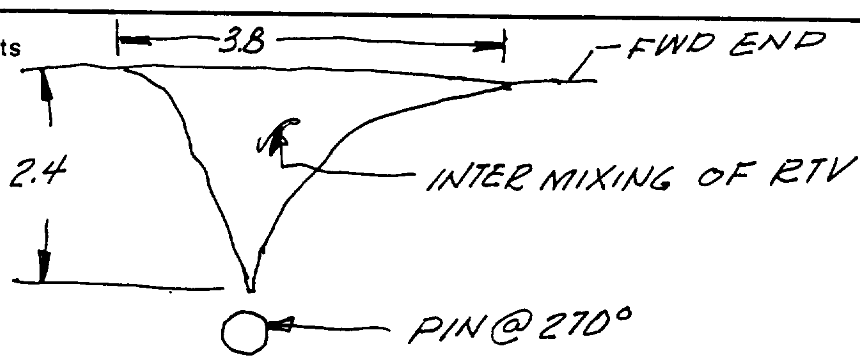
Assessment Engineer(s)/Inspector(s): R. QUICK T. FRESTON

Nozzle Subassembly: COWL ASSEMBLY

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size Axial	Void Size Circ.	Location on Bonding Surface Distance From Fwd	Location on Bonding Surface Distance From Aft
90°	.80	.28	.60	
282°	.58	.20	.20	

Notes / Comments



Corresponding Comment Number(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026 | Side: Right (B) | Date: 10-2-92

Assessment Engineer(s)/Inspector(s): M. Clark, P. Miller

Phenolic Subassembly: Fixed Housing Assembly

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

	Degree Location						
	315-45	45-135	135-225	225-315			TOTAL
Metal-to-Adhesive	95	93	97	96			95
Within Adhesive							
Adhesive-to-GCP	5	7	3	4			5
Within GCP							
GCP-to-CCP							
Within CCP							

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

	Degree Location							
	N/A							
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								

Phenolic Removal Method: ______

Metal Housing Bondline Surface Observations:

	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?		✓	
D. Foreign Material?		✓	

Notes / Comments

1) [illegible] void, 0.20" dia Reference C-48A

2) Unbonded area onfwdend that was detected by ultrasonics is visible on [illegible] area is lighter gray than the other areas of adhesive and has a white [illegible] boundary between [illegible]. The line is most visible between 45°-225°

3) Resin Glaze present in 95% of glass-to-adhesive separation areas, max axial width of 3.0".

Preliminary PFAR(s)? ✓ Yes ___ No   Preliminary PFAR Number(s): 47C-15

Clarification Form(s)? ✓ Yes ___ No   Clarification Form Page No.(s): C-48A, B, C, D, E

REVISION ___

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026	Side: Right (B)	Date: 10-2-92
Assessment Engineer(s)/Inspector(s): M. Clark, P. Miller		
Phenolic Subassembly: Fixed Housing Assembly		

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	315-45	45-135	135-225	225-315				TOTAL
Metal-to-Adhesive	95	93	97	96				95
Within Adhesive								
Adhesive-to-GCP	5	7	3	4				5
Within GCP								
GCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

	N/A							
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								

Phenolic Removal Method: ____________________

Metal Housing Bondline Surface Observations:

	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?		✓	
D. Foreign Material?		✓	

Notes / Comments

1) Intermittent void, 0.20" dia
Reference C-48A
2) Unbond area on fwd end that was detected by ultrasonics is visible on adhesive. Unbond area is lighter gray than the other areas of adhesive and has a white line that mark the boundary between unbond and bond areas. The line is most visible between 45°-225°
3) Resin Glaze present in 95% of glass-to adhesive separation areas. max axial width of 3.0".

Preliminary PFAR(s)? ✓ Yes ____ No Preliminary PFAR Number(s): 47C-15

Clarification Form(s)? ✓ Yes ____ No Clarification Form Page No.(s): C-48A, B, C, D, E

Thiokol CORPORATION
SPACE OPERATIONS

Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: 360T026 | Side: ☐ Left (A) ☒ Right (B) | Date: 10-2-92

Assessment Engineer(s)/Inspector(s): M. Clark

Nozzle Subassembly: Fixed Housing

Record Bondline Adhesive Void Measurements and Locations Below:

Degree Location	Void Size Axial	Void Size Circ.	Location on Bonding Surface Distance From Fwd	Location on Bonding Surface Distance From Aft
165°	0.65	0.40		3.2
234	0.60	0.25		1.6

Notes / Comments

Corresponding Comment Number(s): 1

REVISION ____

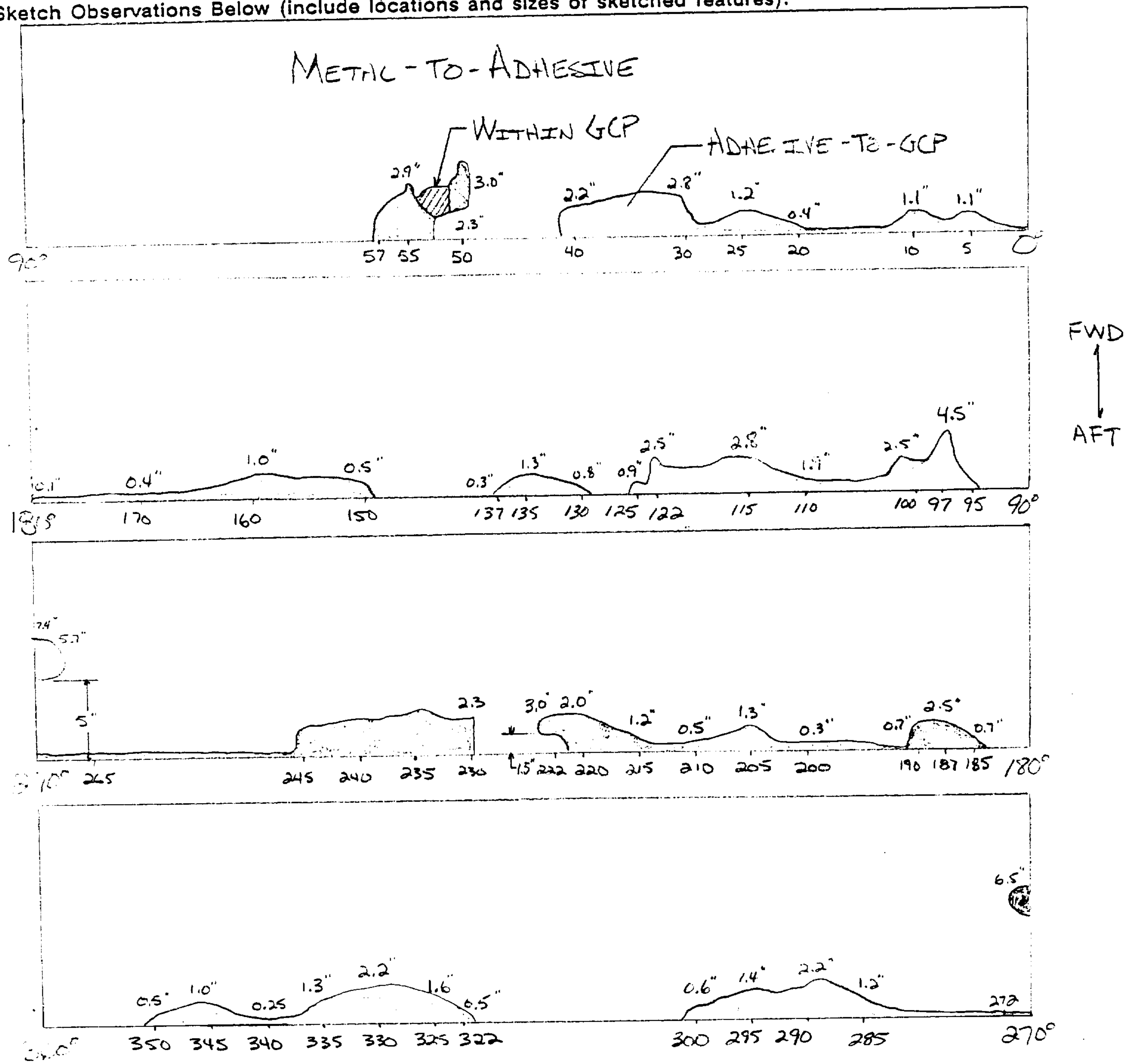
DOC NO. TWR-64204 | VOL
SEC | PAGE C-48A

Thiokol CORPORATION
SPACE OPERATIONS

General Hardware Clarification Form

Motor No.: 360T026	Side: ☐ Left (A) ☒ Right (B)	Date: 10-2-92
Assessment Engineer(s)/Inspector(s): M. Clark		
Description: Fixed housing bondline separation (Fixed Housing Side)		

Sketch Observations Below (include locations and sizes of sketched features):



Corresponding Comment Number(s): 2

REVISION ____

DOC NO. TWR-64204 | VOL
SEC | PAGE C-48B

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-12
Nozzle Subassembly Phenolic Bondline Condition

Motor No.: 360T026	Side: Right (B)	Date: 10-9-92

Assessment Engineer(s)/Inspector(s): M. Clark, T. Freston

Phenolic Subassembly: IBR

Record Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):

Degree Location

	315-45	45-135	135-225	225-315				Total
Metal-to-Adhesive	70	65	80	50				66
Within Adhesive	10	10	10	20				13
Adhesive-to-GCP	20	15	10	15				15
Within GCP		10		15				6
GCP-to-CCP								
Within CCP								

Record Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):

Degree Location

		45-135		225-315			
Metal-to-Adhesive							
Within Adhesive							
Adhesive-to-GCP		100		100			

Phenolic Removal Method: hand & wedges

Metal Housing Bondline Surface Observations:	Yes	No	Comment #
A. Soot?		✓	
B. Voids in Adhesive?	✓		1
C. Corrosion?	✓		2
D. Foreign Material?		✓	

Notes / Comments
1) Intermittent small voids with diameter of 0.30" or smaller
2) Light-to-medium corrosion intermittently in areas of metal-to-adhesive separations
3) The fixed housing insulation was removed 1 week ago (10/2/92)

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ✓ Yes ____ No Clarification Form Page No.(s): C-48D

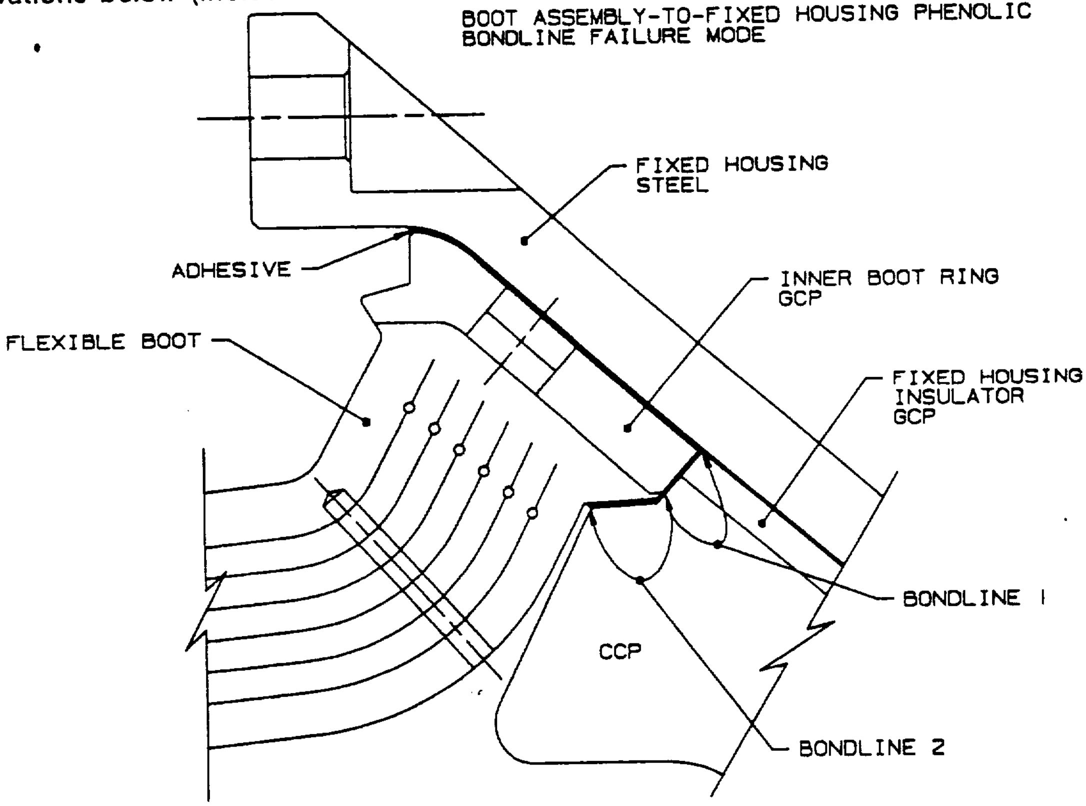
Thiokol CORPORATION
SPACE OPERATIONS

General Hardware Clarification Form

Motor No.: 360T026	Side: ☐ Left (A) ☑ Right (B)	Date: 10-5-92
Assessment Engineer(s)/Inspector(s): L.E. WILKES		
Description: BOOT ASSEMBLY-TO-FIXED HOUSING PHENOLIC BONDLINE		

Sketch Observations Below (include locations and sizes of sketched features):

BOOT ASSEMBLY-TO-FIXED HOUSING PHENOLIC BONDLINE FAILURE MODE



RSRM-26B NOZZLE

BONDLINE 1 FAILURE MODE IBR-TO-FIXED HSG PHENOLICS	PERCENT OF CIRCUMFERENCE
FIXED HSG-TO-ADHESIVE	5
WITHIN ADHESIVE	9
IBR-TO- ADHESIVE	86

BONDLINE 2 FAILURE MODE FLEX BOOT-TO-FIXED HSG CCP	PERCENT OF CIRCUMFERENCE
WITHIN FIXED HSG CHARRED CCP	28
WITHIN INNER BOOT RING GCP	1
WITHIN FLEXIBLE BOOT NBR	6
ADHESIVE-TO-FIXED HSG CCP	62
WITHIN ADHESIVE	3

Corresponding Comment Number(s): 3

Thiokol CORPORATION
SPACE OPERATIONS

General Hardware Clarification Form

Motor No.: 360T026	Side: ☐ Left (A) ☑ Right (B)	Date: 10-5-92
Assessment Engineer(s)/Inspector(s): T. FRESTON / L. WILKES		
Description: FIXED HOUSING BONDLINE METAL SURFACE HARDNESS		

Sketch Observations Below (include locations and sizes of sketched features):

ROCKWELL-C HARDNESS MEASUREMENTS

AXIAL LOCATIONS	ANGULAR LOCATIONS	
RANDOM AREAS APPROXIMATELY EQUAL DISTANCE APART OVER AXIAL LENGTH	90°	270°
HARDNESS	48	48
	49	48
	50	47
	48	49

Corresponding Comment Number(s): 2

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-13
Cowl Ring Phenolic (CCP) Section Condition

Motor No.: 360T026 | Side: Right (B) | Date: 3-2-93

Assessment Engineer(s)/Inspector(s): WILKES

Cowl Phenolic Section Observations:

	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Cowl Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
0.3	.25	.62	.29	.58	.28	.69	.25	.71
1.0	.31	.63	.30	.57	.28	.68	.29	.64
2.0	.33	.55	.32	.60	.32	.63	.30	.65
3.0	.37	.58	.35	.60	.33	.62	.31	.71
4.0	.35	.60	.35	.59	.35	.63	.31	.74
5.0	NA	.87 *	NA	.97*	NA	1.00 *	NA	1.10 *
6.0	NA	.88*	NA	.95*	NA	.97 *	NA	1.06 *
6.8	NA	.92 *	NA	1.00*	NA	1.00 *	NA	1.05*

Negative Margin of Safety? ____ Yes ✓ No Station: ____ Degree: ____

Notes / Comments * TOTAL EROSION AND CHAR DEPTH

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

arification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-14
Forward Exit Cone Phenolic (CCP) Section Condition

Motor No.: 360T026	Side: Right (B)	Date: 3-1-93
Assessment Engineer(s)/Inspector(s): WILKES		

Forward Exit Cone Phenolic Section Observations:

	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Forward Exit Cone Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
1.0	.36	.74	.36	.72	.36	.78	.35	.81
4.0	.34	.69	.36	.70	.34	.71	.36	.70
4.6	.35	.66	.34	.72	.33	.74	.33	.74
8.0	.35	.65	.32	.74	.35	.72	.33	.71
12.0	NA	NA	NA	NA	NA	NA	NA	NA
16.0								
20.0								
24.0								
28.0								
32.0								
32.9								
34.0								

Negative Margin of Safety? ______ Yes ✓ No Station: ______ Degree: ______

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

arification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-15
Fixed Housing Phenolic (CCP) Section Condition

Motor No.: 360T026 | Side: Right (B) | Date: 3-3-93

Assessment Engineer(s)/Inspector(s): WILKES

Fixed Housing Phenolic Section Observations:

	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Fixed Housing Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
0.0	.09	.90	.08	1.17	.06	1.19	.10	1.08
1.0	.06	.99	.04	1.08	.02	1.11	.05	1.09
2.0	.00	.92	.01	.95	.00	.99	.00	1.02
3.0		.91	.00	.97		.96		.99
4.0		.89	.00	.93		1.02		.98
5.0		.86	.00	.96		1.00		.99
6.0		.88	.02	.91		.99		.98
7.0		.87	.00	.95		1.00		1.00
8.0	.00	.79	.00	.90	.00	.85		.87
9.0	NA	.77 *	.00	.93	NA	.82 *		.76
10.75	NA	1.67 *	.07	1.85	NA	.85 *	.00	1.70

Negative Margin of Safety? ____ Yes ✓ No Station: ____ Degree: ____

Notes / Comments * TOTAL DEPTH, EROSION PLUS CHAR

Preliminary PFAR(s)? ____ Yes ✓ No Preliminary PFAR Number(s): ____

Clarification Form(s)? ____ Yes ✓ No Clarification Form Page No.(s): ____

REVISION ____

POSTFLIGHT OBSERVATION RECORD (PFOR) C-16
Throat Inlet Assembly Phenolic (CCP) Section Condition

Motor No.: 360T026	Side: Right (B)	Date: 3-3-93
Assessment Engineer(s)/Inspector(s): WILKES		

Throat Inlet Assembly Phenolic Section Observations:

	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Throat Inlet Ring and Throat Ring Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
1.0	1.05	.57	NA	NA	1.03	.58	1.03	.53
2.0	1.07	.53	1.06	.53	1.07	.57	1.08	.53
4.0	1.09	.59	1.11	.56	1.11	.60	1.10	.61
6.0	1.04	.57	1.16	.57	1.14	.60	1.15	.62
8.0	1.08	.57	1.20	.51	1.22	.49	1.21	.52
10.0	1.16	.48	1.15	.50	1.14	.49	1.15	.56
12.0	1.15	.53	1.16	.48	1.15	.49	1.14	.52
14.0	1.13	.52	1.15	.47	1.10	.50	1.12	.50
16.0	1.07	.55	1.06	.58	1.03	.55	1.02	.59
18.0	.94	.59	.91	.69	.92	.61	.89	.64
20.0	.73	.67	.74	.69	.71	.70	.71	.67
22.0	.51	.79	.46	.79	.43	.86	.46	.79
23.0	.44	.85	.41	.85	.37	.87	.40	.80

Negative Margin of Safety? ______ Yes ✓ No Station: ______ Degree: ______

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

arification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

Thiokol CORPORATION
SPACE OPERATIONS

POSTFLIGHT OBSERVATION RECORD (PFOR) C-17
Nose Cap Phenolic (CCP) Section Condition

Motor No.: 360T026	Side: Right (B)	Date: 3-3-93
Assessment Engineer(s)/Inspector(s): WILKES		

Nose Cap Phenolic Section Observations:

	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Nose Cap Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
1.5	.30	.67	.29	.69	.38	.67	.28	.63
4.0	.34	.74	.35	.64	.36	.61	.33	.57
6.0	.37	.78	.39	.65	.41	.63	.35	.58
8.0	.44	.63	.46	.54	.44	.60	.41	.55
10.0	.45	.65	.47	.51	.50	.50	.49	.49
12.0	.50	.59	.55	.50	.56	.52	.50	.52
14.0	.57	.53	.59	.53	.61	.52	.56	.52
16.0	.66	.51	.73	.49	.80	.47	.70	.43
18.0	.84	.48	.83	.42	.90	.47	.79	.39
20.0	1.03	.39	1.04	.48	1.10	.48	1.02	.37
22.0	1.53	.57	1.55	.60	1.66	.61	1.53	.53
24.0	1.67	.66	1.71	.65	1.79	.70	1.73	.70
26.0	1.10	.77	1.18	.66	1.21	.74	1.27	.71

Negative Margin of Safety? ______ Yes ✓ No Station: ______ Degree: ______

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

arification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

POSTFLIGHT OBSERVATION RECORD (PFOR) C-18

Forward Nose Ring and Aft Inlet Ring Phenolic (CCP) Section Condition

Motor No.: 360T026	Side: Right (B)	Date: 3-2-93
Assessment Engineer(s)/Inspector(s): WILKES		

Forward Nose and Aft Inlet Ring Phenolic Section Observations:

	Yes	No	Comment #
A. Cross-ply cracking in virgin material?		✓	
B. Ply lifting?		✓	

Record the Forward Nose Ring (-503) Char and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
28.0	1.06	.70	1.10	.77	1.14	.63	1.16	.70
30.0	.86	.67	.87	.76	.89	.66	.93	.65
32.0	.94	.66	.95	.63	.95	.62	.98	.62

Negative Margin of Safety? ______ Yes ✓ No Station: ______ Degree: ______

Record the Aft Inlet Ring Char (-504) and Erosion Measurements Below:

Station Location	0° Erosion	0° Char	90° Erosion	90° Char	180° Erosion	180° Char	270° Erosion	270° Char
34.0	.83	.59	.82	.58	.82	.62	.84	.60
36.0	.85	.56	.86	.60	.92	.56	.86	.58
38.0	.95	.61	.91	.63	1.00	.56	.93	.63
39.0	.97	.65	.96	.71	1.02	.62	.97	.67

Negative Margin of Safety? ______ Yes ✓ No Station: ______ Degree: ______

Notes / Comments

Preliminary PFAR(s)? ______ Yes ✓ No Preliminary PFAR Number(s): ______

Clarification Form(s)? ______ Yes ✓ No Clarification Form Page No.(s): ______

TWR-64204

SPACE SHUTTLE

Solid Rocket Motor
Thiokol Corporation

Appendix D
Nozzle Postfire Data

Final Postflight Hardware Evaluation Report 360T026 (RSRM-26, STS-47)

April 1993

Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

Contract No.	NAS8-38100
DR No.	4-23
WBS No.	4C601-04-01
ECS No.	SS4769

Thiokol CORPORATION
SPACE OPERATIONS

P.O. Box 707, Brigham City, Utah 84302-0707 (801) 863-3511

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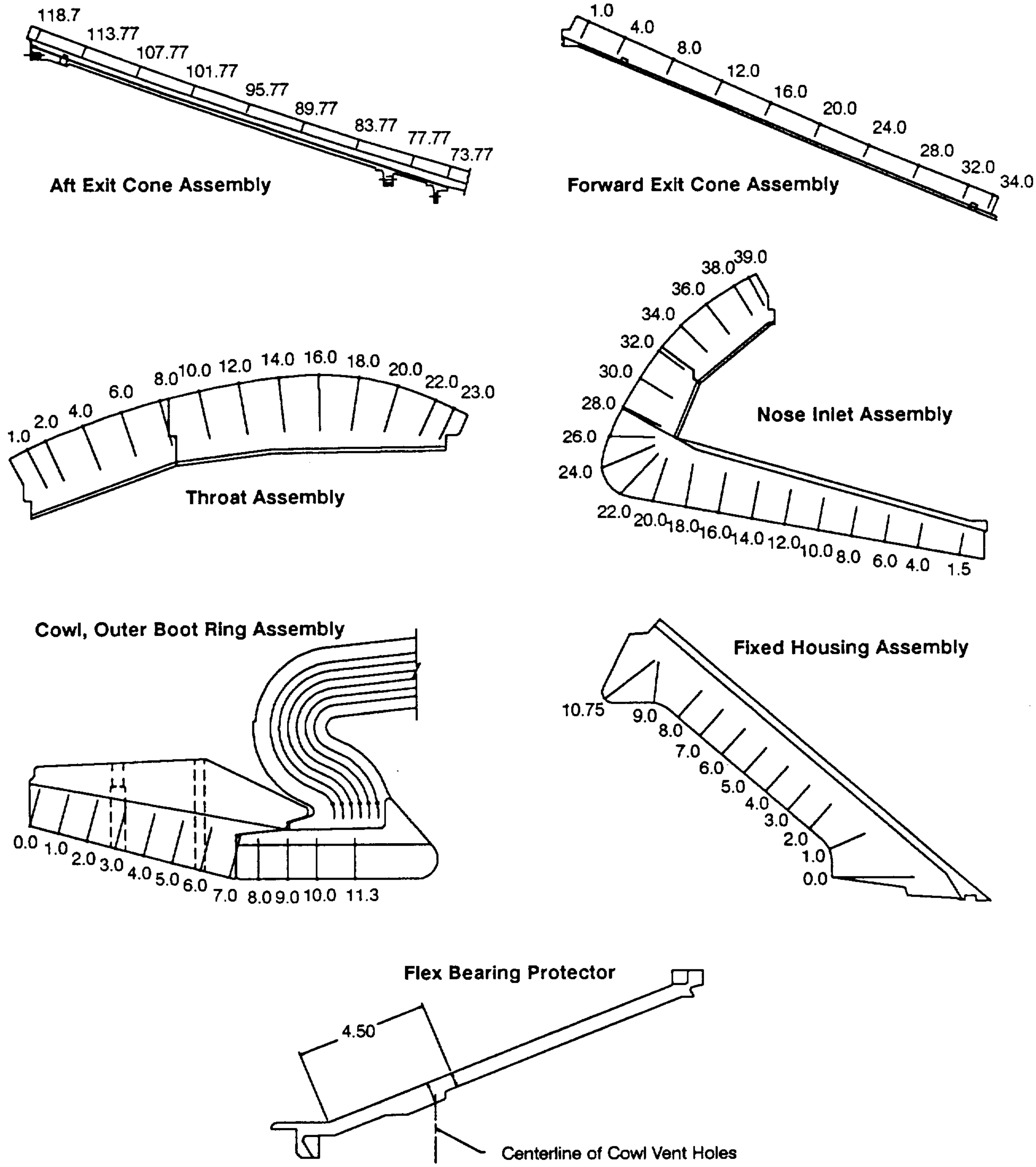

Figure 1
Nozzle Liner Char and Erosion Station Locations

RSRM-26A Forward Exit Cone Assenbly Erosion and Char Data

Angular Location	Stations							
0 degrees	1.0	4.0	4.6	8.0	28.0	32.0	32.9	34.0
Measured Erosion	0.38	0.37	0.37	0.40	0.27	0.26	0.21	0.18
Measured Char	0.71	0.70	0.70	0.68	0.72	0.74	0.75	0.80
Adjusted Char *	0.57	0.56	0.56	0.54	0.58	0.59	0.60	0.64
Denomenator	1.36	1.33	1.11	1.36	1.18	1.18	0.92	1.11
RSRM Liner Thickness	1.807	1.731	1.411	1.629	1.328	1.372	1.127	1.408
Margin of Safety	0.33	0.30	0.27	0.20	0.13	0.16	0.23	0.27
90 degrees								
Measured Erosion	0.38	0.37	0.35	0.39	0.26	0.27	0.21	0.21
Measured Char	0.80	0.73	0.77	0.70	0.71	0.75	0.76	0.76
Adjusted Char *	0.64	0.58	0.62	0.56	0.57	0.60	0.61	0.61
Denomenator	1.45	1.36	1.14	1.36	1.15	1.21	0.92	1.12
RSRM Liner Thickness	1.807	1.731	1.411	1.629	1.328	1.372	1.127	1.408
Margin of Safety	0.25	0.27	0.24	0.20	0.15	0.13	0.22	0.26
180 degrees								
Measured Erosion	0.37	0.35	0.34	0.28	0.28	0.23	0.17	
Measured Char	0.76	0.72	0.71	0.73	0.72	0.70	0.74	
Adjusted Char *	0.61	0.58	0.57	0.58	0.58	0.56	0.59	
Denomenator	1.39	1.31	1.08	1.21	1.20	1.09	0.85	
RSRM Liner Thickness	1.807	1.731	1.411	1.629	1.328	1.372	1.127	1.408
Margin of Safety	0.30	0.32	0.31	0.35	0.11	0.26	0.33	
270 degrees								
Measured Erosion	0.37	0.35	0.35	0.39	0.25	0.21	0.21	0.17
Measured Char	0.75	0.68	0.69	0.68	0.73	0.71	0.69	0.70
Adjusted Char *	0.60	0.54	0.55	0.54	0.58	0.57	0.55	0.56
Denomenator	1.38	1.28	1.08	1.34	1.16	1.07	0.87	0.99
RSRM Liner Thickness	1.807	1.731	1.411	1.629	1.328	1.372	1.127	1.408
Margin of Safety	0.31	0.36	0.31	0.21	0.15	0.29	0.30	0.42

Minimum margin of safety is 0.11 at station 28.00 degree 180.00
Maximum margin of safety is 0.42 at station 34.00 degree 270.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{1.70 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$

Table 1

RSRM-26B Forward Exit Cone Assembly Erosion and Char Data

Angular Location	Stations			
0 degrees	1.0	4.0	4.6	8.0
Measured Erosion	0.36	0.34	0.35	0.35
Measured Char	0.74	0.69	0.66	0.65
Adjusted Char *	0.59	0.55	0.53	0.52
Denomenator	1.35	1.27	1.05	1.25
RSRM Liner Thickness	1.807	1.731	1.411	1.629
Margin of Safety	0.34	0.37	0.34	0.31
90 degrees				
Measured Erosion	0.36	0.36	0.34	0.32
Measured Char	0.72	0.70	0.72	0.74
Adjusted Char *	0.58	0.56	0.58	0.59
Denomenator	1.33	1.31	1.09	1.28
RSRM Liner Thickness	1.807	1.731	1.411	1.629
Margin of Safety	0.36	0.32	0.30	0.27
180 degrees				
Measured Erosion	0.36	0.34	0.33	0.35
Measured Char	0.78	0.71	0.74	0.72
Adjusted Char *	0.62	0.57	0.59	0.58
Denomenator	1.39	1.29	1.09	1.31
RSRM Liner Thickness	1.807	1.731	1.411	1.629
Margin of Safety	0.30	0.34	0.30	0.24
270 degrees				
Measured Erosion	0.35	0.36	0.33	0.33
Measured Char	0.81	0.70	0.74	0.71
Adjusted Char *	0.65	0.56	0.59	0.57
Denomenator	1.41	1.31	1.09	1.27
RSRM Liner Thickness	1.807	1.731	1.411	1.629
Margin of Safety	0.29	0.32	0.30	0.28

Minimum margin of safety is 0.24 at station 8.00 degree 180.00
Maximum margin of safety is 0.37 at station 4.00 degree 0.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{1.70 \times \text{erosion} + 1.25 \times \text{adj char *}} - 1$$

Table 2

RSRM-26A Throat Assembly Erosion and Char Data

Angular Location	Stations												
0 degrees	1.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	23.0
Measured Erosion	1.09	1.13	1.20	1.23	1.26	1.19	1.16	1.14	1.07	0.93	0.73	0.51	0.41
Measured Char	0.62	0.60	0.65	0.66	0.52	0.54	0.54	0.53	0.59	0.67	0.76	0.82	0.81
Adjusted Char *	0.47	0.45	0.49	0.50	0.39	0.41	0.41	0.40	0.44	0.54	0.61	0.66	0.65
Denomenator	2.76	2.82	3.01	3.08	3.01	2.89	2.83	2.78	2.69	2.53	2.22	1.84	1.63
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3,626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.15	0.15	0.10	0.07	0.06	0.18	0.24	0.31	0.38	0.42	0.46	0.40	0.29
90 degrees													
Measured Erosion	1.07	1.02	1.18	1.21	1.25	1.20	1.19	1.13	1.09	0.93	0.75	0.55	0.44
Measured Char	0.55	0.57	0.63	0.61	0.51	0.57	0.58	0.63	0.68	0.70	0.72	0.78	0.84
Adjusted Char *	0.41	0.43	0.47	0.46	0.38	0.43	0.43	0.47	0.51	0.56	0.58	0.62	0.67
Denomenator	2.66	2.57	2.95	2.99	2.98	2.93	2.92	2.85	2.82	2.56	2.22	1.88	1.72
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.20	0.26	0.12	0.10	0.07	0.16	0.20	0.27	0.32	0.40	0.46	0.37	0.23
180 degrees													
Measured Erosion	1.02	1.06	1.10	1.16	1.19	1.13	1.14	1.12	1.06	0.88	0.72	0.50	0.39
Measured Char	0.63	0.66	0.66	0.67	0.52	0.52	0.48	0.51	0.60	0.66	0.73	0.86	0.89
Adjusted Char *	0.47	0.50	0.50	0.50	0.39	0.39	0.36	0.38	0.45	0.53	0.58	0.69	0.71
Denomenator	2.63	2.74	2.82	2.95	2.87	2.75	2.73	2.72	2.68	2.42	2.17	1.86	1.67
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.21	0.19	0.18	0.11	0.11	0.24	0.29	0.33	0.38	0.48	0.49	0.39	0.26
270 degrees													
Measured Erosion	1.06	1.01	1.15	1.20	1.26	1.17	1.12	1.11	1.06	0.91	0.73	0.45	0.37
Measured Char	0.60	0.60	0.64	0.69	0.53	0.51	0.52	0.50	0.55	0.65	0.73	0.86	0.89
Adjusted Char *	0.45	0.45	0.48	0.52	0.40	0.38	0.39	0.38	0.41	0.52	0.58	0.69	0.71
Denomenator	2.68	2.58	2.90	3.05	3.02	2.82	2.73	2.69	2.64	2.47	2.19	1.76	1.63
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.18	0.26	0.14	0.08	0.06	0.21	0.29	0.35	0.41	0.45	0.48	0.47	0.29

Minimum margin of safety is 0.06 at station 8.00 degree 270.00
Maximum margin of safety is 0.49 at station 20.00 degree 180.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^*} - 1$$

Table 3

RSRM-26B Throat Assembly Erosion and Char Data

Angular Location	Stations												
0 degrees	1.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	23.0
Measured Erosion	1.05	1.07	1.09	1.04	1.08	1.16	1.15	1.13	1.07	0.94	0.73	0.51	0.44
Measured Char	0.57	0.53	0.59	0.57	0.57	0.48	0.53	0.52	0.55	0.59	0.67	0.79	0.85
Adjusted Char *	0.43	0.40	0.44	0.43	0.43	0.36	0.40	0.39	0.41	0.47	0.54	0.63	0.68
Denomenator	2.63	2.64	2.73	2.61	2.69	2.77	2.80	2.75	2.66	2.47	2.13	1.81	1.73
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.20	0.23	0.21	0.25	0.18	0.23	0.26	0.32	0.40	0.45	0.52	0.43	0.22
90 degrees													
Measured Erosion		1.06	1.11	1.16	1.20	1.15	1.16	1.15	1.06	0.91	0.74	0.46	0.41
Measured Char		0.53	0.56	0.57	0.51	0.50	0.48	0.47	0.58	0.69	0.69	0.79	0.85
Adjusted Char *		0.40	0.42	0.43	0.38	0.38	0.36	0.35	0.43	0.55	0.55	0.63	0.68
Denomenator		2.62	2.75	2.85	2.88	2.77	2.77	2.74	2.66	2.51	2.17	1.71	1.67
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety		0.24	0.21	0.15	0.11	0.23	0.27	0.32	0.39	0.43	0.49	0.51	0.26
180 degrees													
Measured Erosion	1.03	1.07	1.11	1.14	1.22	1.14	1.15	1.10	1.03	0.92	0.71	0.43	0.37
Measured Char	0.58	0.57	0.60	0.60	0.49	0.49	0.49	0.50	0.55	0.61	0.70	0.86	0.87
Adjusted Char *	0.43	0.43	0.45	0.45	0.37	0.37	0.37	0.38	0.41	0.49	0.56	0.69	0.70
Denomenator	2.60	2.67	2.78	2.84	2.90	2.74	2.76	2.67	2.58	2.45	2.12	1.72	1.61
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.22	0.21	0.19	0.15	0.10	0.24	0.27	0.36	0.44	0.46	0.52	0.50	0.31
270 degrees													
Measured Erosion	1.03	1.08	1.10	1.15	1.21	1.15	1.14	1.12	1.02	0.89	0.71	0.46	0.40
Measured Char	0.53	0.53	0.61	0.62	0.52	0.56	0.52	0.50	0.59	0.64	0.67	0.79	0.80
Adjusted Char *	0.40	0.40	0.46	0.47	0.39	0.42	0.39	0.38	0.44	0.51	0.54	0.63	0.64
Denomenator	2.56	2.66	2.77	2.88	2.91	2.82	2.77	2.71	2.59	2.42	2.09	1.71	1.60
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.24	0.22	0.20	0.14	0.09	0.20	0.27	0.34	0.43	0.48	0.55	0.51	0.32

Minimum margin of safety is 0.09 at station 8.00 degree 270.00
Maximum margin of safety is 0.55 at station 20.00 degree 270.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$

Table 4

... Erosion and Char Data

Angular Location	Stations												
0 degrees	[illegible]			[illegible]	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0
Measured Erosion	[illegible]	[illegible]	[illegible]	[illegible]	0.50	[illegible]	0.73	0.80	1.07	[illegible]	1.84	1.28	1.14
Measured Char	[illegible]	[illegible]	[illegible]	[illegible]	0.56	0.57	0.49	0.50	0.42	0.67	0.65	0.71	0.62
Adjusted Char *	[illegible]	[illegible]	[illegible]	0.50	0.45	0.46	0.39	0.40	0.34	0.54	0.52	0.53	0.47
Denomenator	1.26	[illegible]	1.30	1.35	1.56	1.71	1.95	2.10	2.56	3.97	4.33	3.23	2.86
RSRM Liner Thickness	2.038	[illegible]	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863	3.508
Margin of Safety	0.62	[illegible]	[illegible]	0.92	0.84	0.81	0.69	0.67	0.58	0.19	0.08	0.20	0.23
90 degrees													
Measured Erosion	0.25	[illegible]	[illegible]	0.41	0.47	0.55	0.59	0.71	0.98	1.49	1.67	1.18	1.12
Measured Char	0.62	[illegible]	[illegible]	0.58	0.53	0.43	0.43	0.42	0.44	0.72	0.75	0.71	0.55
Adjusted Char *	0.50	[illegible]	[illegible]	0.46	0.42	0.34	0.34	0.34	0.35	0.58	0.60	0.53	0.41
Denomenator	[illegible]	[illegible]	[illegible]	1.40	1.47	1.53	1.61	1.84	2.40	3.70	4.09	3.03	2.76
RSRM Liner Thickness	2.038	[illegible]	[illegible]	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863	3.508
Margin of Safety	[illegible]	[illegible]	[illegible]	0.91	0.96	1.02	1.05	0.91	0.69	0.27	0.15	0.28	0.27
180 degrees													
Measured Erosion	[illegible]	[illegible]	[illegible]	0.37	0.43	0.50	0.64	0.73	0.94	1.46	1.59	1.05	1.05
Measured Char	[illegible]	[illegible]	[illegible]	0.50	0.51	0.51	0.55	0.53	0.55	0.62	0.68	0.77	0.71
Adjusted Char *	[illegible]	[illegible]	[illegible]	0.40	0.41	0.41	0.44	0.42	0.44	0.50	0.54	0.58	0.53
Denomenator	[illegible]	[illegible]	1.20	1.24	1.37	1.51	1.83	1.99	2.43	3.54	3.86	2.82	2.77
RSRM Liner Thickness	[illegible]	[illegible]	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863	3.508
Margin of Safety	0.71	[illegible]	1.05	1.15	1.10	1.05	0.80	0.76	0.67	0.33	0.22	0.37	0.27
270 degrees													
Measured Erosion	[illegible]	[illegible]	[illegible]	0.43	0.48	0.51	0.61	0.72	0.92	1.50	1.75	1.31	1.01
Measured Char	[illegible]	[illegible]	[illegible]	0.55	0.50	0.49	0.55	0.46	0.48	0.65	0.68	0.87	0.72
Adjusted Char *	[illegible]	[illegible]	[illegible]	[illegible]	0.40	0.39	0.44	0.37	0.38	0.52	0.54	0.65	0.54
Denomenator	[illegible]	[illegible]	[illegible]	[illegible]	1.46	1.51	1.77	1.90	2.32	3.65	4.18	3.44	2.70
RSRM Liner Thickness	[illegible]	[illegible]	[illegible]	[illegible]	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863	3.508
Margin of Safety	[illegible]	[illegible]	[illegible]	0.89	0.97	1.05	0.86	0.85	0.75	0.29	0.12	0.12	0.30

Minimum margin of saf[illegible] ... on 24.00 degree 0.0[illegible]

Maximum margin of saf[illegible] ... on 10.00 degree 180.[illegible]

* M[illegible] ... action [illegible]

Margin [illegible] = ... liner thickness / ... erosion + 1.25 X adj char * − 1

RSRM-26A Nose Inlet Assembly Erosion and Char Data

Angular Location	Stations												
0 degrees	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0
Measured Erosion	0.33	0.35	0.35	0.38	0.50	0.57	0.73	0.80	1.07	1.65	1.84	1.28	1.14
Measured Char	0.60	0.59	0.60	0.63	0.56	0.57	0.49	0.50	0.42	0.67	0.65	0.71	0.62
Adjusted Char *	0.48	0.47	0.48	0.50	0.45	0.46	0.39	0.40	0.34	0.54	0.52	0.53	0.47
Denomenator	1.26	1.29	1.30	1.39	1.56	1.71	1.95	2.10	2.56	3.97	4.33	3.23	2.86
RSRM Liner Thickness	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863	3.508
Margin of Safety	0.62	0.74	0.89	0.92	0.84	0.81	0.69	0.67	0.58	0.19	0.08	0.20	0.23
90 degrees													
Measured Erosion	0.25	0.34	0.44	0.41	0.47	0.55	0.59	0.71	0.98	1.49	1.67	1.18	1.12
Measured Char	0.62	0.57	0.53	0.58	0.53	0.43	0.43	0.42	0.44	0.72	0.75	0.71	0.55
Adjusted Char *	0.50	0.46	0.42	0.46	0.42	0.34	0.34	0.34	0.35	0.58	0.60	0.53	0.41
Denomenator	1.12	1.25	1.41	1.40	1.47	1.53	1.61	1.84	2.40	3.70	4.09	3.03	2.76
RSRM Liner Thickness	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863	3.508
Margin of Safety	0.82	0.80	0.74	0.91	0.96	1.02	1.05	0.91	0.69	0.27	0.15	0.28	0.27
180 degrees													
Measured Erosion	0.33	0.33	0.35	0.37	0.43	0.50	0.64	0.73	0.94	1.46	1.59	1.05	1.05
Measured Char	0.53	0.50	0.50	0.50	0.51	0.51	0.55	0.53	0.55	0.62	0.68	0.77	0.71
Adjusted Char *	0.42	0.40	0.40	0.40	0.41	0.41	0.44	0.42	0.44	0.50	0.54	0.58	0.53
Denomenator	1.19	1.16	1.20	1.24	1.37	1.51	1.83	1.99	2.43	3.54	3.86	2.82	2.77
RSRM Liner Thickness	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863	3.508
Margin of Safety	0.71	0.94	1.05	1.15	1.10	1.05	0.80	0.76	0.67	0.33	0.22	0.37	0.27
270 degrees													
Measured Erosion	0.36	0.31	0.40	0.43	0.48	0.51	0.61	0.72	0.92	1.50	1.75	1.31	1.01
Measured Char	0.64	0.59	0.60	0.55	0.50	0.49	0.55	0.46	0.48	0.65	0.68	0.87	0.72
Adjusted Char *	0.51	0.47	0.48	0.44	0.40	0.39	0.44	0.37	0.38	0.52	0.54	0.65	0.54
Denomenator	1.36	1.21	1.40	1.41	1.46	1.51	1.77	1.90	2.32	3.65	4.18	3.44	2.70
RSRM Liner Thickness	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863	3.508
Margin of Safety	0.50	0.86	0.76	0.89	0.97	1.05	0.86	0.85	0.75	0.29	0.12	0.12	0.30

Minimum margin of safety is 0.08 at station 24.00 degree 0.00
Maximum margin of safety is 1.15 at station 10.00 degree 180.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^*} - 1$$

Table 5

RSRM-26A Nose Inlet Assembly Erosion and Char Data

Angular Location	Stations					
0 degrees	30.0	32.0	34.0	36.0	38.0	39.0
Measured Erosion	0.89	0.97	0.89	0.87	0.98	0.99
Measured Char	0.69	0.63	0.55	0.60	0.59	0.61
Adjusted Char *	0.52	0.47	0.41	0.45	0.44	0.46
Denomenator	2.43	2.53	2.30	2.30	2.51	2.55
RSRM Liner Thickness	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.34	0.17	0.39	0.39	0.20	0.18
90 degrees						
Measured Erosion	0.91	0.97	0.91	0.89	0.95	0.96
Measured Char	0.65	0.66	0.52	0.56	0.61	0.66
Adjusted Char *	0.49	0.50	0.39	0.42	0.46	0.50
Denomenator	2.43	2.56	2.31	2.31	2.47	2.54
RSRM Liner Thickness	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.34	0.15	0.38	0.39	0.22	0.18
180 degrees						
Measured Erosion	0.83	0.94	0.86	0.87	0.95	0.98
Measured Char	0.62	0.63	0.56	0.58	0.65	0.64
Adjusted Char *	0.47	0.47	0.42	0.43	0.49	0.48
Denomenator	2.24	2.47	2.25	2.28	2.51	2.56
RSRM Liner Thickness	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.45	0.19	0.42	0.40	0.21	0.17
270 degrees						
Measured Erosion	0.87	0.98	0.92	0.94	0.99	1.03
Measured Char	0.74	0.63	0.52	0.48	0.63	0.59
Adjusted Char *	0.56	0.47	0.39	0.36	0.47	0.44
Denomenator	2.43	2.55	2.33	2.33	2.57	2.61
RSRM Liner Thickness	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.34	0.16	0.37	0.37	0.18	0.15

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char *}} - 1$$

Table 5

RSRM-26B Nose Inlet Assembly Erosion and Char Data

Angular Location	Stations												
0 degrees	1.5	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0
Measured Erosion	0.30	0.34	0.37	0.44	0.45	0.50	0.57	0.66	0.84	1.03	1.53	1.67	1.10
Measured Char	0.67	0.74	0.78	0.63	0.65	0.59	0.53	0.51	0.48	0.39	0.57	0.66	0.77
Adjusted Char *	0.54	0.59	0.62	0.50	0.52	0.47	0.42	0.41	0.38	0.31	0.46	0.53	0.58
Denomenator	1.27	1.42	1.52	1.51	1.55	1.59	1.67	1.83	2.16	2.45	3.63	4.00	2.92
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety	0.40	0.44	0.48	0.63	0.72	0.81	0.85	0.80	0.62	0.66	0.30	0.17	0.32
90 degrees													
Measured Erosion	0.29	0.35	0.39	0.46	0.49	0.55	0.59	0.73	0.83	1.04	1.55	1.71	1.18
Measured Char	0.69	0.64	0.65	0.54	0.51	0.50	0.53	0.49	0.42	0.48	0.60	0.65	0.66
Adjusted Char *	0.55	0.51	0.52	0.43	0.41	0.40	0.42	0.39	0.34	0.38	0.48	0.52	0.50
Denomenator	1.27	1.34	1.43	1.46	1.49	1.60	1.71	1.95	2.08	2.56	3.70	4.07	2.98
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety	0.40	0.52	0.57	0.68	0.79	0.80	0.81	0.69	0.69	0.58	0.27	0.15	0.30
180 degrees													
Measured Erosion	0.38	0.36	0.41	0.44	0.50	0.56	0.61	0.80	0.90	1.10	1.66	1.79	1.21
Measured Char	0.67	0.61	0.63	0.60	0.50	0.52	0.52	0.47	0.47	0.48	0.61	0.70	0.74
Adjusted Char *	0.54	0.49	0.50	0.48	0.40	0.42	0.42	0.38	0.38	0.38	0.49	0.56	0.56
Denomenator	1.43	1.33	1.45	1.48	1.50	1.64	1.74	2.07	2.27	2.68	3.93	4.28	3.11
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety	0.24	0.53	0.55	0.66	0.78	0.75	0.77	0.59	0.54	0.51	0.20	0.10	0.24
270 degrees													
Measured Erosion	0.28	0.33	0.35	0.41	0.49	0.50	0.56	0.70	0.79	1.02	1.53	1.73	1.27
Measured Char	0.63	0.57	0.58	0.55	0.49	0.52	0.52	0.43	0.39	0.37	0.53	0.70	0.71
Adjusted Char *	0.50	0.46	0.46	0.44	0.39	0.42	0.42	0.34	0.31	0.30	0.42	0.56	0.53
Denomenator	1.19	1.23	1.28	1.37	1.47	1.52	1.64	1.83	1.97	2.41	3.59	4.16	3.21
RSRM Liner Thickness	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
Margin of Safety	0.49	0.66	0.76	0.79	0.81	0.89	0.88	0.80	0.78	0.68	0.31	0.13	0.21

Minimum margin of safety is 0.10 at station 24.00 degree 180.00
Maximum margin of safety is 0.89 at station 12.00 degree 270.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$

Table 6

RSRM-26B Nose Inlet Assembly Erosion and Char Data

Angular Location	Stations						
0 degrees	28.0	30.0	32.0	34.0	36.0	38.0	39.0
Measured Erosion	1.06	0.86	0.94	0.83	0.85	0.95	0.97
Measured Char	0.70	0.67	0.66	0.59	0.56	0.61	0.65
Adjusted Char *	0.53	0.50	0.50	0.44	0.42	0.46	0.49
Denomenator	2.78	2.35	2.50	2.21	2.23	2.47	2.55
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.26	0.38	0.18	0.44	0.44	0.22	0.18
90 degrees							
Measured Erosion	1.10	0.87	0.95	0.82	0.86	0.91	0.96
Measured Char	0.77	0.76	0.63	0.58	0.60	0.63	0.71
Adjusted Char *	0.58	0.57	0.47	0.43	0.45	0.47	0.53
Denomenator	2.92	2.45	2.49	2.18	2.28	2.41	2.59
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.20	0.33	0.18	0.46	0.40	0.26	0.16
180 degrees							
Measured Erosion	1.14	0.89	0.95	0.82	0.92	1.00	1.02
Measured Char	0.63	0.66	0.62	0.62	0.56	0.56	0.62
Adjusted Char *	0.47	0.50	0.47	0.47	0.42	0.42	0.47
Denomenator	2.87	2.40	2.48	2.22	2.37	2.52	2.62
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.22	0.36	0.19	0.43	0.35	0.20	0.14
270 degrees							
Measured Erosion	1.16	0.93	0.98	0.84	0.86	0.93	0.97
Measured Char	0.70	0.65	0.62	0.60	0.58	0.63	0.67
Adjusted Char *	0.53	0.49	0.47	0.45	0.43	0.47	0.50
Denomenator	2.98	2.47	2.54	2.24	2.26	2.45	2.57
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.18	0.32	0.16	0.42	0.41	0.23	0.17

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char *}} - 1$$

Table 6

RSRM-26A Cowl, Outer Boot Ring Assembly Erosion and Char Data

Angular Location	Stations				
0 degrees	0.3	1.0	2.0	3.0	4.0
Measured Erosion	0.17	0.21	0.28	0.31	
Measured Char	0.70	0.67	0.67	0.66	
Adjusted Char *	0.56	0.54	0.54	0.53	
Denomenator	1.04	1.09	1.23	1.28	
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733
Margin of Safety	0.38	0.38	0.28	0.29	
90 degrees					
Measured Erosion	0.21	0.25	0.28	0.31	
Measured Char	0.60	0.59	0.62	0.62	
Adjusted Char *	0.48	0.47	0.50	0.50	
Denomenator	1.02	1.09	1.18	1.24	
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733
Margin of Safety	0.41	0.38	0.34	0.33	
180 degrees					
Measured Erosion	0.19	0.23	0.28	0.28	0.31
Measured Char	0.66	0.62	0.59	0.65	0.66
Adjusted Char *	0.53	0.50	0.47	0.52	0.53
Denomenator	1.04	1.08	1.15	1.21	1.28
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733
Margin of Safety	0.38	0.39	0.37	0.37	0.35
270 degrees					
Measured Erosion	0.20	0.23	0.27	0.28	0.25
Measured Char	0.64	0.67	0.62	0.65	0.71
Adjusted Char *	0.51	0.54	0.50	0.52	0.57
Denomenator	1.04	1.13	1.16	1.21	1.21
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733
Margin of Safety	0.38	0.33	0.36	0.37	0.43

Minimum margin of safety is 0.28 at station 2.00 degree 0.00
Maximum margin of safety is 0.53 at station 6.80 degree 180.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^*} - 1$$

Table 7

RSRM-26B Cowl, Outer Boot Ring Assembly Erosion and Char Data

Angular Location	Stations							
0 degrees	0.3	1.0	2.0	3.0	4.0	9.0	10.0	11.3
Measured Erosion	0.25	0.31	0.33	0.37	0.35	0.01	0.03	0.05
Measured Char	0.62	0.63	0.55	0.58	0.60	0.98	0.97	1.09
Adjusted Char *	0.50	0.50	0.44	0.46	0.48	0.78	0.78	0.87
Denomenator	1.12	1.25	1.21	1.32	1.30	1.19	1.21	1.38
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.674	1.687	1.703
Margin of Safety	0.28	0.20	0.30	0.25	0.33	0.41	0.40	0.23
90 degrees								
Measured Erosion	0.29	0.30	0.32	0.35	0.35		0.01	0.00
Measured Char	0.58	0.57	0.60	0.60	0.59		1.33	1.14
Adjusted Char *	0.46	0.46	0.48	0.48	0.47		1.06	0.91
Denomenator	1.16	1.17	1.24	1.30	1.29		1.61	1.37
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.674	1.687	1.703
Margin of Safety	0.24	0.28	0.27	0.27	0.34		0.05	0.24
140 degrees								
Measured Erosion							0.07	0.07
Measured Char							1.08	1.02
Adjusted Char *							0.86	0.82
Denomenator							1.40	1.33
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.674	1.687	1.703
Margin of Safety							0.20	0.28
180 degrees								
Measured Erosion	0.28	0.28	0.32	0.33	0.35		0.09	0.07
Measured Char	0.69	0.68	0.63	0.62	0.63		1.10	1.17
Adjusted Char *	0.55	0.54	0.50	0.50	0.50		0.88	0.94
Denomenator	1.25	1.24	1.27	1.28	1.33		1.46	1.51
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.674	1.687	1.703
Margin of Safety	0.15	0.21	0.24	0.29	0.30		0.16	0.13
270 degrees								
Measured Erosion	0.25	0.29	0.30	0.31	0.31	0.10	0.11	0.09
Measured Char	0.71	0.64	0.65	0.71	0.74	1.18	1.19	1.28
Adjusted Char *	0.57	0.51	0.52	0.57	0.59	0.94	0.95	1.02
Denomenator	1.21	1.22	1.25	1.33	1.36	1.57	1.59	1.67
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.674	1.687	1.703
Margin of Safety	0.19	0.23	0.26	0.24	0.27	0.07	0.06	0.02

Table 8

Angular Location	Stations							
0 degrees	0.3	1.[illegible]	2.0	3.0	4.0	9.0	10.0	11.3
Measured Erosion	0.[illegible]		[illegible]	0.37	0.3[illegible]	0.01	0.03	0.05
Measured Char	0.[illegible]		[illegible]	0.58	0.60	0.98	0.97	1.09
Adjusted Char *	0.50	[illegible]	0.44	0.46	0.43	0.78	0.78	0.87
Denomenator	1.12	1.[illegible]	1.21	1.32	1.30	1.19	1.21	1.38
RSRM Liner Thickness	1.4[illegible]	1.[illegible]	1.577	1.655	1.733	1.674	1.687	1.703
Margin of Safety			0.30	0.25	0.33	0.41	0.40	0.23
90 degrees								
Measured Erosion			0.32	0.35	0.35		0.01	0.00
Measured Char			0.60	0.60	0.59		1.33	1.14
Adjusted Char *	[illegible]	[illegible]	0.48	0.48	0.47		1.06	0.91
Denomenator	1.16	1.17	1.24	1.30	1.29		1.61	1.37
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.674	1.687	1.703
Margin of Safety	0.24	0.28	0.27	0.27	0.34		0.05	0.24
140 degrees								
Measured Erosion							0.07	0.07
Measured Char							1.08	1.02
Adjusted Char *							0.86	0.82
Denomenator							1.40	1.33
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.674	1.687	1.703
Margin of Safety							0.20	0.28
180 degrees								
Measured Erosion	0.28	0.28	0.32	0.33	0.35		0.09	0.07
Measured Char	0.69	0.68	0.63	0.62	0.63		1.10	1.17
Adjusted Char *	0.[illegible]		0.50	0.50	0.50		0.88	0.94
Denomenator	[illegible]		[illegible]	[illegible]	[illegible]		1.4[illegible]	1.51
[illegible]								
[illegible]								
Measured Erosion			[illegible]	0.31	0.31	0.19	0.11	0.09
Measured Char				[illegible]	[illegible]	[illegible]	1.19	1.28
Adjusted Char *				[illegible]	[illegible]		0.95	[illegible]
Denomenator				[illegible]	1.[illegible]	1.[illegible]	1.50	1.67
RSRM Liner Thickness			[illegible]	[illegible]	1.[illegible]	[illegible]	1.6[illegible]	1.703
Margin of Safety				[illegible]	[illegible]		[illegible]	[illegible]

Table 8

RSRM-26A Fixed Housing Assembly Erosion and Char Data

Angular Location	Stations										
0 degrees	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.75
Measured Erosion	0.11	0.06	0.01	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.12
Measured Char	1.16	1.07	1.08	1.07	1.03	1.04	1.01	1.02	0.85	0.87	1.82
Adjusted Char *	0.93	0.86	0.86	0.86	0.82	0.83	0.81	0.82	0.68	0.70	1.46
Denomenator	1.38	1.19	1.10	1.11	1.07	1.06	1.03	1.02	0.85	0.87	2.06
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	1.76	0.75	0.66	0.65	0.71	0.73	0.78	0.80	1.16	1.79	0.48
90 degrees											
Measured Erosion	0.09	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.17
Measured Char	1.01	1.06	1.04	1.02	1.03	1.00	1.01	0.93	0.90	0.78	1.65
Adjusted Char *	0.81	0.85	0.83	0.82	0.82	0.80	0.81	0.74	0.72	0.62	1.32
Denomenator	1.19	1.18	1.04	1.02	1.03	1.00	1.01	0.93	0.90	0.80	1.99
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.20	0.76	0.75	0.79	0.78	0.83	0.81	0.97	1.04	2.03	0.53
180 degrees											
Measured Erosion	0.07	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
Measured Char	1.14	1.05	1.01	1.04	1.01	0.98	0.95	0.96	0.91	0.83	1.69
Adjusted Char *	0.91	0.84	0.81	0.83	0.81	0.78	0.76	0.77	0.73	0.66	1.35
Denomenator	1.28	1.17	1.01	1.04	1.01	0.98	0.95	0.96	0.91	0.83	1.79
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	1.97	0.78	0.81	0.76	0.81	0.87	0.93	0.91	1.02	1.92	0.70
270 degrees											
Measured Erosion	0.07	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Measured Char	1.07	1.03	1.07	1.12	1.09	1.10	1.09	1.05	0.99	0.97	1.73
Adjusted Char *	0.86	0.82	0.86	0.90	0.87	0.88	0.87	0.84	0.79	0.78	1.38
Denomenator	1.21	1.09	1.11	1.14	1.09	1.10	1.09	1.05	0.99	0.97	1.99
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.15	0.91	0.64	0.60	0.68	0.66	0.68	0.75	0.85	1.50	0.53

Minimum margin of safety is 0.48 at station 10.75 degree 0.00
Maximum margin of safety is 2.20 at station 0.00 degree 90.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^*} - 1$$

Table 9

RSRM-26B Fixed Housing Assembly Erosion and Char Data

Angular Location	Stations										
0 degrees	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.75
Measured Erosion	0.09	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Measured Char	0.90	0.99	0.92	0.91	0.89	0.86	0.88	0.87	0.79		
Adjusted Char *	0.72	0.79	0.74	0.73	0.71	0.69	0.70	0.70	0.63		
Denomenator	1.08	1.11	0.92	0.91	0.89	0.86	0.88	0.87	0.79		
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.52	0.87	0.98	1.01	1.06	1.13	1.08	1.11	1.32		
90 degrees											
Measured Erosion	0.08	0.04	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.07
Measured Char	1.17	1.08	0.95	0.97	0.93	0.96	0.91	0.95	0.90	0.93	1.85
Adjusted Char *	0.94	0.86	0.76	0.78	0.74	0.77	0.73	0.76	0.72	0.74	1.48
Denomenator	1.33	1.16	0.97	0.97	0.93	0.96	0.95	0.95	0.90	0.93	1.99
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	1.86	0.79	0.88	0.88	0.97	0.91	0.93	0.93	1.04	1.61	0.53
180 degrees											
Measured Erosion	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Measured Char	1.19	1.11	0.99	0.96	1.02	1.00	0.99	1.00	0.85		
Adjusted Char *	0.95	0.89	0.79	0.77	0.82	0.80	0.79	0.80	0.68		
Denomenator	1.31	1.15	0.99	0.96	1.02	1.00	0.99	1.00	0.85		
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	1.91	0.81	0.84	0.90	0.79	0.83	0.85	0.83	1.16		
270 degrees											
Measured Erosion	0.10	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Measured Char	1.08	1.09	1.02	0.99	0.98	0.99	0.98	1.00	0.87	0.76	1.70
Adjusted Char *	0.86	0.87	0.82	0.79	0.78	0.79	0.78	0.80	0.70	0.61	1.36
Denomenator	1.28	1.19	1.02	0.99	0.98	0.99	0.98	1.00	0.87	0.76	1.70
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	1.97	0.75	0.79	0.85	0.87	0.85	0.87	0.83	1.11	2.19	0.79

Minimum margin of safety is 0.53 at station 10.75 degree 90.00
Maximum margin of safety is 2.52 at station 0.00 degree 0.00

* Measured char adjusted to end of action time

$$\text{Margin of Safety} = \frac{\text{minimum liner thickness}}{2.00 \times \text{erosion} + 1.25 \times \text{adj char}^{*}} - 1$$

Table 10

TWR-64204

Appendix E
Insulation Postfire Data

Final Postflight Hardware Evaluation Report 360T026 (RSRM-26, STS-47)

April 1993

Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

Contract No.	NAS8-38100
DR No.	4-23
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ECS No.	SS4769

Thiokol CORPORATION
SPACE OPERATIONS

P.O. Box 707, Brigham City, Utah 84302-0707 (801) 863-3511

360T026 Appendix E Contents

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TABLE 1

RSRM-26A NOZZLE TO CASE JOINT PERFORMANCE

DEGREE LOCATION	PREFIRE (INCHES)	POSTFIRE (INCHES)	MDD	CSF	ASF
0.0	5.633	4.262	1.371	3.6	4.1
21.6	5.626				
46.8	5.618	5.000	0.618	7.9	9.1
68.4	5.607				
90.0	5.622	4.962	0.660	7.4	8.5
111.6	5.629				
136.8	5.635	4.731	0.904	5.4	6.2
158.4	5.623				
180.0	5.628	4.710	0.918	5.3	6.1
201.6	5.624				
226.8	5.582	4.481	1.101	4.5	5.1
248.4	5.606				
270.0	5.622	4.797	0.825	5.9	6.8
291.6	5.621				
316.8	5.594	4.878	0.716	6.8	7.8
338.4	5.606				
	MEDIAN 5.622	MEDIAN 4.764	MEDIAN 0.865	MINIMUM 3.6	MINIMUM 4.1

A SAFETY FACTOR OF 2.0 IS REQUIRED

A BLANK INDICATES THAT POSTFIRE DATA COLLECTION IS NOT REQUIRED AT THAT LOCATION

TABLE 2

RSRM-26A AFT FIELD JOINT PERFORMANCE

DEGREE LOCATION	PREFIRE (INCHES)	POSTFIRE (INCHES)	MDD	CSF	ASF
2.0	2.686	2.358	0.328	7.9	8.2
16.0	2.698				
30.0	2.696				
46.0	2.701	2.294	0.407	6.4	6.6
60.0	2.704				
76.0	2.697				
90.0	2.704	2.270	0.434	6.0	6.2
106.0	2.703				
120.0	2.706				
136.0	2.702	2.330	0.372	7.0	7.3
150.0	2.701				
166.0	2.699				
180.0	2.704	2.278	0.426	6.1	6.3
196.0	2.702				
210.0	2.700				
226.0	2.697	2.285	0.412	6.3	6.5
242.0	2.701				
256.0	2.704				
270.0	2.699	2.305	0.394	6.6	6.9
286.0	2.706				
300.0	2.703				
316.0	2.702	2.322	0.380	6.8	7.1
330.0	2.697				
346.0	2.693				
	MEDIAN	MEDIAN	MEDIAN	MINIMUM	MINIMUM
	2.701	2.300	0.401	6.0	6.2

A SAFETY FACTOR OF 2.0 IS REQUIRED

A BLANK INDICATES THAT POSTFIRE DATA COLLECTION IS NOT REQUIRED AT THAT LOCATION

TABLE 3

RSRM-26A CENTER FIELD JOINT PERFORMANCE

DEGREE LOCATION	PREFIRE (INCHES)	POSTFIRE (INCHES)	MDD	CSF	ASF
2.0	2.787	2.614	0.173	15.0	16.1
16.0	2.793				
30.0	2.793				
46.0	2.790	2.591	0.199	13.0	14.0
60.0	2.780				
76.0	2.770				
90.0	2.769	2.643	0.126	20.6	22.0
106.0	2.759				
120.0	2.765				
136.0	2.772	2.609	0.163	15.9	17.0
150.0	2.788				
166.0	2.795				
180.0	2.776	2.615	0.161	16.1	17.2
196.0	2.761				
210.0	2.752				
226.0	2.749	2.609	0.140	18.5	19.6
242.0	2.742				
256.0	2.760				
270.0	2.754	2.605	0.149	17.4	18.5
286.0	2.750				
300.0	2.751				
316.0	2.747	2.629	0.118	22.0	23.3
330.0	2.744				
346.0	2.749				
	MEDIAN 2.763	MEDIAN 2.612	MEDIAN 0.155	MINIMUM 13.0	MINIMUM 14.0

A SAFETY FACTOR OF 2.0 IS REQUIRED

A BLANK INDICATES THAT POSTFIRE DATA COLLECTION IS NOT REQUIRED AT THAT LOCATION

TABLE 4

RSRM-26A FORWARD FIELD JOINT PERFORMANCE

DEGREE LOCATION	PREFIRE (INCHES)	POSTFIRE (INCHES)	MDD	CSF	ASF
2.0	2.706	2.621	0.085	30.5	31.8
16.0	2.689				
30.0	2.688				
46.0	2.705	2.642	0.063	41.2	42.9
60.0	2.680				
76.0	2.691				
90.0	2.687	2.659	0.028	92.7	96.0
106.0	2.693				
120.0	2.710				
136.0	2.799	2.636	0.163	15.9	17.2
150.0	2.786				
166.0	2.754				
180.0	2.770	2.618	0.152	17.1	18.2
196.0	2.768				
210.0	2.762				
226.0	2.775	2.609	0.166	15.6	16.7
242.0	2.757				
256.0	2.747				
270.0	2.745	2.625	0.120	21.6	22.9
286.0	2.763				
300.0	2.737				
316.0	2.751	2.633	0.118	22.0	23.3
330.0	2.744				
346.0	2.727				
	MEDIAN 2.744	MEDIAN 2.629	MEDIAN 0.119	MINIMUM 15.6	MINIMUM 16.7

A SAFETY FACTOR OF 2.0 IS REQUIRED

A BLANK INDICATES THAT POSTFIRE DATA COLLECTION IS NOT REQUIRED AT THAT LOCATION

TABLE 5

RSRM-26A AFT DOME INSULATION PERFORMANCE

COMPLIANCE SAFETY FACTOR (CSF)

STATION (IN)	0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	DEGREE LOCATIONS MIN.	PLANE	REQUIRED S.F.
9.3	4.58	4.18	4.61	4.96	3.91	4.38	4.84	5.88	3.91	180.0	1.5
10.7	5.37	4.02	4.51	4.24	3.72	4.16	4.67	4.45	3.72	180.0	1.5
12.0	5.03	3.70	3.85	3.90	2.07	3.69	3.67	4.25	2.07	180.0	1.5
13.1	5.30	3.35	3.39	3.87	3.81	3.15	3.26	3.91	3.15	226.8	1.5
14.4	5.54	3.18	3.48	3.77	4.13	3.07	3.20	3.63	3.07	226.8	1.5
16.0	5.01	3.08	3.48	3.31	4.42	3.14	3.16	3.46	3.08	46.8	1.5
17.3	5.04	3.26	3.67	3.38	4.70	3.31	3.38	4.29	3.26	46.8	1.5
18.5	5.64	3.76	4.16	3.50	5.25	3.64	3.43	3.56	3.43	270.0	1.5
19.5	5.30	4.29	4.43	3.81	5.17	4.49	4.40	4.04	3.81	136.8	1.5
21.3	5.86	4.43	4.19	4.03	4.32	4.34	4.66	3.95	3.95	316.8	1.5
24.3	4.79	3.87	3.24	3.09	3.53	3.65	3.49	4.02	3.09	136.8	1.5
33.0	2.61	2.48	2.60	2.42	2.55	2.33	2.49	2.30	2.30	316.8	1.5
45.0	2.41	2.18	2.64	2.49	2.65	2.27	2.32	2.22	2.18	46.8	1.5
53.0	2.91	2.82	3.52	3.61	3.93	3.50	3.37	3.14	2.82	46.8	1.5
56.0	3.06	3.41	3.60	3.69	4.09	5.20	5.82	3.73	3.06	0.0	2.0
72.0	4.38	4.83	5.73	3.65	4.16	4.13	4.25	4.13	3.65	136.8	1.5
75.0	4.16	4.38	5.92	6.52	4.29	4.11	3.77	3.81	3.77	270.0	1.5
78.0	3.92	4.28	6.15	3.23	4.23	4.24	3.91	3.70	3.23	136.8	1.5

SEGMENT MINIMUM = 2.07 AT THE 12.0 INCH STATION

ACTUAL SAFETY FACTOR (ASF)

STATION (IN)	0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	DEGREE LOCATIONS MIN.	PLANE	REQUIRED S.F.
9.3	4.69	4.41	4.94	5.04	4.01	4.58	4.93	5.86	4.01	180.0	1.5
10.7	5.82	4.41	4.91	4.64	4.05	4.57	5.00	4.81	4.05	180.0	1.5
12.0	5.53	4.11	4.23	4.32	2.74	4.09	4.00	4.68	2.74	180.0	1.5
13.1	5.86	3.76	3.76	4.31	4.22	3.50	3.58	4.34	3.50	226.8	1.5
14.4	5.99	3.50	3.80	4.11	4.50	3.37	3.47	3.98	3.37	226.8	1.5
16.0	5.55	3.43	3.89	3.71	4.90	3.51	3.50	3.94	3.43	46.8	1.5
17.3	5.76	3.76	4.21	3.93	5.40	3.82	3.85	4.90	3.76	46.8	1.5
18.5	6.64	4.42	4.90	4.17	6.20	4.32	4.04	4.23	4.04	270.0	1.5
19.5	6.39	5.22	5.30	4.65	6.24	5.35	5.24	4.87	4.65	136.8	1.5
21.3	6.98	5.28	4.98	4.77	5.16	5.09	5.49	4.71	4.71	316.8	1.5
24.3	5.68	4.67	3.90	3.72	4.16	4.30	4.06	4.73	3.72	136.8	1.5
33.0	2.93	2.84	2.91	2.78	2.98	2.73	2.85	2.68	2.68	316.8	1.5
45.0	2.62	2.37	2.81	2.74	2.99	2.61	2.57	2.43	2.37	46.8	1.5
53.0	3.31	3.18	3.82	4.00	4.36	3.91	3.73	3.56	3.18	46.8	1.5
56.0	3.83	4.29	4.29	4.44	4.93	6.29	6.98	4.54	3.83	0.0	2.0
72.0	4.90	5.15	6.09	4.21	4.64	4.74	4.74	4.58	4.21	136.8	1.5
75.0	4.54	4.93	6.31	7.26	4.76	4.75	4.26	4.34	4.26	270.0	1.5
78.0	4.15	4.72	6.56	3.61	4.62	4.74	4.32	4.19	3.61	136.8	1.5

SEGMENT MINIMUM = 2.37 AT THE 45.0 INCH STATION

TABLE 5

RSRM-26A AFT DOME INSULATION PERFORMANCE

MATERIAL DECOMPOSITION DEPTH (MDD)
INCHES

STATION (IN)	0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	DEGREE LOCATIONS MEDIAN	MAX.	DESIGN M+3S
9.3	1.070	1.173	1.063	0.988	1.253	1.120	1.012	0.834	1.066	1.253	2.560
10.7	0.876	1.169	1.043	1.108	1.264	1.129	1.007	1.056	1.082	1.264	2.261
12.0	0.894	1.215	1.170	1.154	2.171	1.220	1.225	1.058	1.192	2.171	2.208
13.1	0.811	1.284	1.270	1.112	1.129	1.366	1.318	1.099	1.200	1.366	2.218
14.4	0.740	1.289	1.178	1.088	0.992	1.334	1.282	1.128	1.153	1.334	2.225
16.0	0.754	1.229	1.085	1.143	0.856	1.203	1.196	1.092	1.118	1.229	1.980
17.3	0.707	1.092	0.969	1.054	0.757	1.075	1.052	0.829	1.010	1.092	1.675
18.5	0.596	0.893	0.808	0.960	0.640	0.922	0.980	0.943	0.907	0.980	1.496
19.5	0.594	0.734	0.711	0.826	0.609	0.702	0.716	0.780	0.714	0.826	1.617
21.3	0.502	0.664	0.701	0.729	0.680	0.677	0.631	0.744	0.678	0.744	1.654
24.3	0.614	0.760	0.908	0.950	0.833	0.806	0.843	0.732	0.820	0.950	1.832
33.0	1.226	1.292	1.233	1.320	1.257	1.371	1.283	1.392	1.288	1.392	1.399
45.0	1.079	1.193	0.984	1.043	0.980	1.144	1.121	1.169	1.100	1.193	1.222
53.0	1.162	1.200	0.959	0.936	0.859	0.965	1.002	1.077	0.983	1.200	1.305
56.0	0.912	0.817	0.774	0.756	0.682	0.537	0.479	0.748	0.752	0.912	1.369
72.0	0.457	0.414	0.349	0.548	0.481	0.484	0.471	0.484	0.476	0.548	0.817
75.0	0.433	0.411	0.304	0.276	0.420	0.438	0.478	0.473	0.426	0.478	0.773
78.0	0.408	0.374	0.260	0.495	0.378	0.377	0.409	0.432	0.393	0.495	0.718

MATERIAL DECOMPOSITION RATE (MDR)
MILS / SECOND

STATION (IN)	0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	DEGREE LOCATIONS AVE.	EXPOSURE TIME
9.3	8.9	9.8	8.9	8.3	10.5	9.4	8.5	7.0	8.9	119.6
10.7	7.5	9.9	8.9	9.4	10.8	9.6	8.6	9.0	9.2	117.5
12.0	7.8	10.6	10.2	10.1	19.0	10.7	10.7	9.2	11.0	114.5
13.1	7.3	11.5	11.4	9.9	10.1	12.2	11.8	9.8	10.5	111.8
14.4	6.8	11.8	10.8	10.0	9.1	12.2	11.8	10.3	10.3	109.1
16.0	7.1	11.6	10.2	10.8	8.1	11.3	11.3	10.3	10.1	106.1
17.3	6.9	10.6	9.4	10.2	7.3	10.4	10.2	8.0	9.1	103.2
18.5	5.9	8.8	8.0	9.5	6.3	9.1	9.7	9.3	8.3	101.1
19.5	6.0	7.4	7.2	8.3	6.1	7.1	7.2	7.9	7.2	99.1
21.3	5.2	6.9	7.3	7.6	7.1	7.1	6.6	7.8	7.0	95.8
24.3	6.7	8.3	9.9	10.3	9.1	8.8	9.2	8.0	8.8	91.9
33.0	15.0	15.8	15.1	16.1	15.3	16.7	15.7	17.0	15.8	81.9
45.0	14.7	16.2	13.4	14.2	13.3	15.6	15.3	15.9	14.8	73.5
53.0	15.9	16.4	13.1	12.8	11.8	13.2	13.7	14.7	14.0	73.1
56.0	12.5	11.2	10.6	10.4	9.4	7.4	6.6	10.3	9.8	72.9
72.0	8.3	7.5	6.3	9.9	8.7	8.8	8.5	8.8	8.3	55.3
75.0	8.7	8.3	6.1	5.6	8.5	8.8	9.6	9.5	8.1	49.6
78.0	9.0	8.2	5.7	10.9	8.3	8.3	9.0	9.5	8.6	45.5

MOTOR ACTION TIME = 120.4 SECONDS

TABLE 5
RSRM-26A AFT DOME INSULATION PERFORMANCE

PART NO. 1U76668-02
SERIAL NO. 0000020

PREFIRE MEASUREMENTS
INCHES

STATION (IN)	0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	MIN.	MEDIAN	MDT
9.3	5.017	5.171	5.252	4.983	5.028	5.134	4.991	4.887	4.887	5.023	4.900
10.7	5.094	5.156	5.121	5.140	5.121	5.161	5.039	5.076	5.039	5.121	4.700
12.0	4.940	4.996	4.948	4.987	5.958	4.991	4.901	4.950	4.901	4.969	4.500
13.1	4.756	4.832	4.781	4.793	4.762	4.776	4.723	4.769	4.723	4.773	4.300
14.4	4.435	4.516	4.473	4.474	4.460	4.495	4.448	4.492	4.435	4.474	4.100
16.0	4.187	4.215	4.216	4.241	4.196	4.219	4.190	4.304	4.187	4.216	3.780
17.3	4.073	4.102	4.082	4.146	4.085	4.103	4.047	4.065	4.047	4.083	3.560
18.5	3.959	3.944	3.956	4.001	3.965	3.987	3.962	3.985	3.944	3.964	3.360
19.5	3.795	3.830	3.767	3.838	3.799	3.758	3.755	3.797	3.755	3.796	3.150
21.3	3.506	3.504	3.493	3.480	3.508	3.443	3.464	3.503	3.443	3.498	2.940
24.3	3.486	3.549	3.545	3.535	3.469	3.462	3.422	3.465	3.422	3.478	2.940
33.0	3.597	3.671	3.591	3.671	3.745	3.743	3.661	3.730	3.591	3.671	3.200
45.0	2.831	2.827	2.761	2.853	2.928	2.984	2.882	2.845	2.761	2.849	2.600
53.0	3.842	3.817	3.668	3.746	3.748	3.774	3.734	3.839	3.668	3.761	3.380
56.0	3.492	3.507	3.322	3.357	3.363	3.380	3.344	3.397	3.322	3.372	2.790
72.0	2.241	2.133	2.125	2.306	2.233	2.292	2.234	2.215	2.125	2.234	2.000
75.0	1.967	2.028	1.917	2.005	2.000	2.079	2.035	2.052	1.917	2.017	1.800
78.0	1.692	1.764	1.705	1.787	1.748	1.787	1.767	1.808	1.692	1.766	1.600

PART NO. 1U76957-03
SERIAL NO. 0000011

POSTFIRE MEASUREMENTS
INCHES

STATION (IN)	0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	MIN.	MEDIAN
9.3	3.947	3.998	4.189	3.995	3.775	4.014	3.979	4.053	3.775	3.997
10.7	4.218	3.987	4.078	4.032	3.857	4.032	4.032	4.020	3.857	4.032
12.0	4.046	3.781	3.778	3.833	3.787	3.771	3.676	3.892	3.676	3.784
13.1	3.945	3.548	3.511	3.681	3.633	3.410	3.405	3.670	3.405	3.591
14.4	3.695	3.227	3.295	3.386	3.468	3.161	3.166	3.364	3.161	3.330
16.0	3.433	2.986	3.131	3.098	3.340	3.016	2.994	3.212	2.986	3.115
17.3	3.366	3.010	3.113	3.092	3.328	3.028	2.995	3.236	2.995	3.102
18.5	3.363	3.051	3.148	3.041	3.325	3.065	2.982	3.042	2.982	3.058
19.5	3.201	3.096	3.056	3.012	3.190	3.056	3.039	3.017	3.012	3.056
21.3	3.004	2.840	2.792	2.751	2.828	2.766	2.833	2.759	2.751	2.810
24.3	2.872	2.789	2.637	2.585	2.636	2.656	2.579	2.733	2.579	2.647
33.0	2.371	2.379	2.358	2.351	2.488	2.372	2.378	2.338	2.338	2.372
45.0	1.752	1.634	1.777	1.810	1.948	1.840	1.761	1.676	1.634	1.769
53.0	2.680	2.617	2.709	2.810	2.889	2.809	2.732	2.762	2.617	2.747
56.0	2.580	2.690	2.548	2.601	2.681	2.843	2.865	2.649	2.548	2.665
72.0	1.784	1.719	1.776	1.758	1.752	1.808	1.763	1.731	1.719	1.761
75.0	1.534	1.617	1.613	1.729	1.580	1.641	1.557	1.579	1.534	1.597
78.0	1.284	1.390	1.445	1.292	1.370	1.410	1.358	1.376	1.284	1.373

TABLE 6

RSRM-26A AFT CYLINDER INSULATION PERFORMANCE

COMPLIANCE SAFETY FACTOR (CSF)

STATION (IN)	DEGREE LOCATIONS 0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	MIN.	PLANE	REQUIRED S.F.
85.0	3.57	3.05	3.62	3.25	3.78	4.96	3.12	3.37	3.05	46.8	1.5
90.0	2.85	3.45	3.83	3.19	3.17	4.85	3.15	2.96	2.85	0.0	1.5
98.0	2.51	3.05	3.21	2.40	2.49	3.28	2.59	2.43	2.40	136.8	1.5
105.8	2.62	2.71	2.92	2.51	2.76	2.27	2.66	2.64	2.27	226.8	1.5
116.0	2.65	3.01	2.94	2.64	2.63	2.62	2.69	2.71	2.62	226.8	1.5
124.5	2.33	3.07	2.77	2.53	2.70	2.75	2.62	2.42	2.33	0.0	1.5
133.0	2.25	2.63	2.68	2.58	2.63	2.68	2.40	2.44	2.25	0.0	1.5
145.5	2.28	2.45	2.38	2.27	2.44	2.30	2.61	2.38	2.27	136.8	1.5
158.5	2.43	2.55	2.57	2.94	2.53	2.91	2.99	2.38	2.38	316.8	1.5
166.0	3.06	2.59	3.06	2.58	2.25	2.44	2.56	2.29	2.25	180.0	1.5
177.7	2.51	3.02	3.22	2.40	2.18	2.34	2.52	3.68	2.18	180.0	2.0
192.5	2.49	2.61	2.84	2.77	3.02	2.69	3.16	2.95	2.49	0.0	1.5
202.5	2.53	3.02	2.75	2.65	2.57	3.17	2.73	2.91	2.53	0.0	1.5
214.0	2.63	2.62	3.04	2.64	2.46	2.78	3.15	3.02	2.46	180.0	1.5
227.3	3.14	2.84	2.50	3.65	3.01	3.11	2.70	3.07	2.50	90.0	1.5
238.3	3.04	3.42	2.84	2.81	3.42	3.00	3.28	3.04	2.81	136.8	1.5
250.0	2.61	2.50	2.93	2.75	2.63	2.85	3.16	3.14	2.50	46.8	1.5
269.0	2.60	3.27	3.55	3.27	2.96	2.81	5.43	3.01	2.60	0.0	1.5
283.9	2.83	2.59	3.06	3.00	2.56	2.83	3.98	2.78	2.56	180.0	1.5
299.1	3.43	4.42	3.41	3.12	2.86	3.60	3.25	3.86	2.86	180.0	2.0
322.0	3.11	2.79	2.64	3.22	3.14	3.19	3.19	3.69	2.64	90.0	1.5
339.0	5.28	4.81	7.92	3.80	5.67	2.68	3.96	4.00	2.68	226.8	1.5
358.0	6.03	+	+	47.50	42.22	4.87	+	8.44	4.87	226.8	1.5
367.0	5.00	3.22	3.28	4.75	3.36	5.28	3.22	5.94	3.22	46.8	1.5
377.5	9.14	3.05	4.86	5.30	3.66	5.25	8.55	4.31	3.05	46.8	1.5

SEGMENT MINIMUM = 2.18 AT THE 177.7 INCH STATION

A " + " MEANS NEGLIGIBLE MDD HAS OCCURRED

TABLE 6

RSRM-26A AFT CYLINDER INSULATION PERFORMANCE

ACTUAL SAFETY FACTOR (ASF)

STATION (IN)	0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	DEGREE LOCATIONS MIN.	PLANE	REQUIRED S.F.
85.0	4.12	3.77	4.28	3.98	4.60	6.11	3.83	4.05	3.77	46.8	1.5
90.0	3.41	4.08	4.35	3.79	3.81	5.81	3.78	3.54	3.41	0.0	1.5
98.0	3.38	4.06	4.34	3.10	3.27	4.27	3.40	3.31	3.10	136.8	1.5
105.8	2.72	2.83	3.04	2.64	2.94	2.43	2.85	2.79	2.43	226.8	1.5
116.0	2.72	3.05	3.07	2.80	2.80	2.79	2.90	2.85	2.72	0.0	1.5
124.5	2.45	3.18	2.93	2.71	2.92	2.95	2.83	2.60	2.45	0.0	1.5
133.0	2.79	3.29	3.34	3.13	3.27	3.33	2.99	3.10	2.79	0.0	1.5
145.5	2.32	2.51	2.47	2.34	2.50	2.36	2.63	2.42	2.32	0.0	1.5
158.5	2.51	2.68	2.68	3.05	2.62	3.02	3.10	2.57	2.51	0.0	1.5
166.0	3.70	3.16	3.71	3.29	3.02	3.13	3.28	2.94	2.94	316.8	2.0
177.7	3.71	4.56	4.79	3.66	3.55	3.59	3.90	5.65	3.55	180.0	1.5
192.5	2.89	3.05	3.29	3.34	3.64	3.18	3.65	3.44	2.89	0.0	1.5
202.5	2.59	3.09	2.81	2.71	2.62	3.25	2.78	2.96	2.59	0.0	1.5
214.0	2.68	2.72	3.13	2.66	2.58	2.88	3.20	3.06	2.58	180.0	1.5
227.3	3.70	3.45	2.84	4.11	3.48	3.62	3.21	3.70	2.84	90.0	1.5
238.3	3.12	3.49	2.93	2.83	3.49	3.07	3.34	3.08	2.83	136.8	1.5
250.0	2.71	2.60	3.02	2.79	2.72	2.95	3.22	3.18	2.60	46.8	1.5
269.0	3.02	3.79	4.20	3.80	3.43	3.30	6.28	3.49	3.02	0.0	1.5
283.9	3.08	2.90	3.46	3.33	2.91	3.14	4.42	3.04	2.90	46.8	2.0
299.1	5.47	7.01	5.50	5.06	4.68	5.84	5.39	6.23	4.68	180.0	1.5
322.0	3.41	3.10	2.96	3.62	3.55	3.60	3.66	4.11	2.96	90.0	1.5
339.0	5.88	5.29	8.79	4.18	6.39	2.99	4.43	4.45	2.99	226.8	1.5
358.0	7.67	+	+	55.00	53.00	6.29	+	9.56	6.29	226.8	1.5
367.0	6.14	4.17	4.19	6.21	4.27	6.78	4.14	7.81	4.14	270.0	1.5
377.5	10.67	4.03	5.86	6.61	4.54	6.45	10.03	5.15	4.03	46.8	1.5

SEGMENT MINIMUM = 2.32 AT THE 145.5 INCH STATION

A " + " MEANS NEGLIGIBLE MDD HAS OCCURRED

TABLE 6

RSRM-26A AFT CYLINDER INSULATION PERFORMANCE

MATERIAL DECOMPOSITION DEPTH (MDD)
INCHES

STATION (IN)	DEGREE LOCATIONS 0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	MEDIAN	MAX.	DESIGN M+3S
85.0	0.364	0.426	0.359	0.400	0.344	0.262	0.416	0.386	0.375	0.426	0.618
90.0	0.444	0.367	0.330	0.396	0.399	0.261	0.401	0.427	0.397	0.444	0.576
98.0	0.453	0.372	0.354	0.473	0.455	0.346	0.439	0.467	0.446	0.473	0.582
105.8	0.413	0.398	0.370	0.431	0.391	0.475	0.406	0.409	0.407	0.475	0.559
116.0	0.396	0.349	0.357	0.397	0.399	0.401	0.390	0.387	0.393	0.401	0.527
124.5	0.442	0.335	0.372	0.407	0.381	0.374	0.393	0.425	0.387	0.442	0.522
133.0	0.436	0.372	0.366	0.380	0.373	0.366	0.409	0.402	0.377	0.436	0.516
145.5	0.408	0.380	0.390	0.410	0.381	0.404	0.357	0.391	0.390	0.410	0.493
158.5	0.362	0.345	0.342	0.299	0.348	0.302	0.294	0.369	0.344	0.369	0.491
166.0	0.278	0.328	0.278	0.330	0.377	0.348	0.332	0.371	0.331	0.377	0.466
177.7	0.399	0.331	0.311	0.416	0.459<	0.428	0.397	0.272	0.398	0.459	0.452
192.5	0.313	0.299	0.275	0.282	0.258	0.290	0.247	0.264	0.278	0.313	0.400
202.5	0.288	0.242	0.265	0.275	0.284	0.230	0.267	0.251	0.266	0.288	0.376
214.0	0.266	0.267	0.230	0.265	0.284	0.252	0.222	0.232	0.259	0.284	0.351
227.3	0.207	0.229	0.260	0.178	0.216	0.209	0.241	0.212	0.214	0.260	0.317
238.3	0.207	0.184	0.222	0.224	0.184	0.210	0.192	0.207	0.207	0.224	0.331
250.0	0.211	0.220	0.188	0.200	0.209	0.193	0.174	0.175	0.197	0.220	0.285
269.0	0.192	0.153	0.141	0.153	0.169	0.178	0.092	0.166	0.160	0.192	0.297
283.9	0.159	0.174	0.147	0.150	0.176	0.159	0.113	0.162	0.159	0.176	0.251
299.1	0.197	0.153	0.198	0.217	0.236	0.188	0.208	0.175	0.197	0.236	0.253
322.0	0.122	0.136	0.144	0.118	0.121	0.119	0.119	0.103	0.120	0.144	0.197
339.0	0.072	0.079	0.048	0.100	0.067	0.142	0.096	0.095	0.087	0.142	0.190
358.0	0.063	0	0	0.008	0.009	0.078	0	0.045	0.008	0.078	0.181
367.0	0.076	0.118	0.116	0.080	0.113	0.072	0.118	0.064	0.097	0.118	0.175
377.5	0.058	0.174	0.109	0.100	0.145	0.101	0.062	0.123	0.105	0.174	0.237

A " < " INDICATES THE PRECEDING MDD HAS EXCEEDED THE M + 3 SIGMA DESIGN CRITERIA

TABLE 6

RSRM-26A AFT CYLINDER INSULATION PERFORMANCE

MATERIAL DECOMPOSITION RATE (MDR)
MILS / SECOND

STATION (IN)	DEGREE LOCATIONS 0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	AVE.	EXPOSURE TIME
85.0	8.2	9.6	8.1	9.0	7.8	5.9	9.4	8.7	8.4	44.2
90.0	10.2	8.4	7.6	9.1	9.2	6.0	9.2	9.8	8.7	43.6
98.0	10.6	8.7	8.3	11.1	10.7	8.1	10.3	11.0	9.9	42.6
105.8	9.9	9.5	8.9	10.3	9.4	11.4	9.7	9.8	9.8	41.8
116.0	9.7	8.5	8.7	9.7	9.7	9.8	9.5	9.4	9.4	41.0
124.5	11.0	8.4	9.3	10.1	9.5	9.3	9.8	10.6	9.8	40.1
133.0	11.2	9.6	9.4	9.8	9.6	9.4	10.5	10.3	10.0	38.9
145.5	11.1	10.3	10.6	11.1	10.3	10.9	9.7	10.6	10.6	36.9
158.5	10.2	9.7	9.7	8.4	9.8	8.5	8.3	10.4	9.4	35.4
166.0	7.9	9.4	7.9	9.4	10.8	9.9	9.5	10.6	9.4	35.0
177.7	11.9	9.9	9.3	12.4	13.7	12.7	11.8	8.1	11.2	33.6
192.5	10.3	9.8	9.0	9.2	8.5	9.5	8.1	8.7	9.1	30.5
202.5	9.9	8.3	9.1	9.5	9.8	7.9	9.2	8.6	9.0	29.1
214.0	9.7	9.7	8.4	9.7	10.4	9.2	8.1	8.5	9.2	27.4
227.3	8.1	9.0	10.2	7.0	8.5	8.2	9.5	8.3	8.6	25.4
238.3	8.7	7.7	9.3	9.4	7.7	8.8	8.1	8.7	8.6	23.8
250.0	9.5	9.9	8.4	9.0	9.4	8.7	7.8	7.8	8.8	22.3
269.0	9.9	7.9	7.3	7.9	8.7	9.2	4.7	8.6	8.0	19.4
283.9	9.6	10.5	8.9	9.0	10.6	9.6	6.8	9.8	9.3	16.6
299.1	11.5	8.9	11.5	12.6	13.7	10.9	12.1	10.2	11.4	17.2
322.0	9.8	10.9	11.5	9.4	9.7	9.5	9.5	8.2	9.8	12.5
339.0	6.1	6.6	4.0	8.4	5.6	11.9	8.1	8.0	7.3	11.9
358.0	5.7	0	0	0.7	0.8	7.0	0	4.1	2.3	11.1
367.0	7.0	10.9	10.7	7.4	10.5	6.7	10.9	5.9	8.8	10.8
377.5	2.9	8.7	5.5	5.0	7.3	5.1	3.1	6.2	5.5	19.9

MOTOR ACTION TIME = 120.4 SECONDS

TABLE 6

RSRM-26A AFT CYLINDER INSULATION PERFORMANCE

PART NO. 1U76668-02
SERIAL NO. 0000020

PREFIRE MEASUREMENTS
INCHES

STATION (IN)	DEGREE LOCATIONS 0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	MIN.	MEDIAN	MDT
85.0	1.501	1.608	1.537	1.592	1.583	1.602	1.592	1.565	1.501	1.587	1.300
90.0	1.512	1.499	1.436	1.502	1.522	1.516	1.515	1.512	1.436	1.512	1.265
98.0	1.533	1.512	1.535	1.466	1.486	1.478	1.491	1.547	1.466	1.502	1.135
105.8	1.123	1.126	1.125	1.139	1.151	1.155	1.157	1.140	1.123	1.140	1.080
116.0	1.076	1.065	1.096	1.110	1.116	1.117	1.132	1.102	1.065	1.106	1.050
124.5	1.084	1.065	1.091	1.102	1.111	1.103	1.112	1.106	1.065	1.103	1.030
133.0	1.215	1.223	1.224	1.189	1.218	1.220	1.221	1.247	1.189	1.220	0.980
145.5	0.948	0.954	0.964	0.960	0.952	0.953	0.940	0.946	0.940	0.953	0.930
158.5	0.908	0.925	0.916	0.912	0.912	0.912	0.912	0.947	0.908	0.912	0.880
166.0	1.029	1.038	1.031	1.087	1.137	1.088	1.088	1.091	1.029	1.088	0.850
177.7	1.482	1.509	1.489	1.523	1.630	1.538	1.549	1.538	1.482	1.531	1.000
192.5	0.904	0.912	0.905	0.942	0.938	0.921	0.902	0.909	0.902	0.910	0.780
202.5	0.745	0.748	0.744	0.745	0.744	0.748	0.741	0.742	0.741	0.745	0.730
214.0	0.712	0.727	0.720	0.706	0.734	0.725	0.711	0.710	0.706	0.716	0.700
227.3	0.766	0.789	0.738	0.731	0.751	0.757	0.774	0.785	0.731	0.762	0.650
238.3	0.646	0.643	0.650	0.635	0.642	0.645	0.641	0.638	0.635	0.643	0.630
250.0	0.571	0.571	0.567	0.557	0.569	0.569	0.560	0.557	0.557	0.568	0.550
269.0	0.579	0.580	0.592	0.582	0.579	0.588	0.578	0.579	0.578	0.580	0.500
283.9	0.490	0.504	0.509	0.500	0.512	0.500	0.499	0.492	0.490	0.500	0.450
299.1	1.078	1.072	1.089	1.097	1.105	1.097	1.122	1.091	1.072	1.094	0.676
322.0	0.416	0.421	0.426	0.427	0.430	0.428	0.436	0.423	0.416	0.426	0.380
339.0	0.423	0.418	0.422	0.418	0.428	0.425	0.425	0.423	0.418	0.423	0.380
358.0	0.483	0.420	0.441	0.440	0.477	0.491	0.430	0.430	0.420	0.441	0.380
367.0	0.467	0.492	0.486	0.497	0.483	0.488	0.488	0.500	0.467	0.488	0.380
377.5	0.619	0.701	0.639	0.661	0.659	0.651	0.622	0.633	0.619	0.645	0.530

TABLE 6

RSRM-26A AFT CYLINDER INSULATION PERFORMANCE

POSTFIRE MEASUREMENTS
INCHES

PART NO. 1U76957-03
SERIAL NO. 0000011

STATION (IN)	DEGREE LOCATIONS 0.0	46.8	90.0	136.8	180.0	226.8	270.0	316.8	MIN.	MEDIAN
85.0	1.137	1.182	1.178	1.192	1.239	1.340	1.176	1.179	1.137	1.181
90.0	1.068	1.132	1.106	1.106	1.123	1.255	1.114	1.085	1.068	1.110
98.0	1.080	1.140	1.181	0.993	1.031	1.132	1.052	1.080	0.993	1.080
105.8	0.710	0.728	0.755	0.708	0.760	0.680	0.751	0.731	0.680	0.729
116.0	0.680	0.716	0.739	0.713	0.717	0.716	0.742	0.715	0.680	0.716
124.5	0.642	0.730	0.719	0.695	0.730	0.729	0.719	0.681	0.642	0.719
133.0	0.779	0.851	0.858	0.809	0.845	0.854	0.812	0.845	0.779	0.845
145.5	0.540	0.574	0.574	0.550	0.571	0.549	0.583	0.555	0.540	0.563
158.5	0.546	0.580	0.574	0.613	0.564	0.610	0.618	0.578	0.546	0.579
166.0	0.751	0.710	0.753	0.757	0.760	0.740	0.756	0.720	0.710	0.752
177.7	1.083	1.178	1.178	1.107	1.171	1.110	1.152	1.266	1.083	1.161
192.5	0.591	0.613	0.630	0.660	0.680	0.631	0.655	0.645	0.591	0.638
202.5	0.457	0.506	0.479	0.470	0.460	0.518	0.474	0.491	0.457	0.477
214.0	0.446	0.460	0.490	0.441	0.450	0.473	0.489	0.478	0.441	0.467
227.3	0.559	0.560	0.478	0.553	0.535	0.548	0.533	0.573	0.478	0.550
238.3	0.439	0.459	0.428	0.411	0.458	0.435	0.449	0.431	0.411	0.437
250.0	0.360	0.351	0.379	0.357	0.360	0.376	0.386	0.382	0.351	0.368
269.0	0.387	0.427	0.451	0.429	0.410	0.410	0.486	0.413	0.387	0.420
283.9	0.331	0.330	0.362	0.350	0.336	0.341	0.386	0.330	0.330	0.338
299.1	0.881	0.919	0.891	0.880	0.869	0.909	0.914	0.916	0.869	0.900
322.0	0.294	0.285	0.282	0.309	0.309	0.309	0.317	0.320	0.282	0.309
339.0	0.351	0.339	0.374	0.318	0.361	0.283	0.329	0.328	0.283	0.334
358.0	0.420	0.442	0.443	0.432	0.468	0.413	0.434	0.385	0.385	0.433
367.0	0.391	0.374	0.370	0.417	0.370	0.416	0.370	0.436	0.370	0.383
377.5	0.561	0.527	0.530	0.561	0.514	0.550	0.560	0.510	0.510	0.540

TABLE 7

RSRM-26A AFT CENTER SEGMENT INSULATION PERFORMANCE

COMPLIANCE SAFETY FACTOR (CSF)

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	MIN.	PLANE	REQUIRED S.F.
3.5	4.41	4.88	3.61	6.01	4.76	3.93	4.83	4.08	3.61	90.0	2.0
11.0	3.23	3.30	3.78	4.46	2.88	3.63	3.77	3.04	2.88	180.0	1.5
30.7	2.88	3.47	3.74	2.70	3.38	3.41	2.76	2.90	2.70	136.0	1.5
36.2	3.06	6.19	4.08	4.11	4.00	4.41	3.70	3.49	3.06	0.0	1.5
44.6	6.00	+	7.66	10.59	5.81	5.54	12.00	7.66	5.54	226.0	1.5
71.5	4.59	4.25	42.50	4.25	6.30	3.47	12.14	4.36	3.47	226.0	1.5
126.0	12.50	10.71	13.64	18.75	7.89	3.00	21.43	15.00	3.00	226.0	1.5
145.0	10.00	4.84	10.00	9.37	25.00	7.89	4.05	13.64	4.05	270.0	1.5
161.4	+	7.15	1.46<	8.14	2.78	13.88	9.44	4.37	1.46	90.0	2.0
163.0	11.80	11.24	3.32	4.92	4.92	3.58	3.69	9.08	3.32	90.0	2.0
178.0	5.42	7.65	26.00	16.25	14.44	5.00	8.12	5.20	5.00	226.0	1.5
214.1	+	+	+	+	14.44	4.48	+	+	4.48	226.0	1.5
280.0	+	+	+	+	8.18	+	+	+	8.18	180.0	1.5
298.0	+	+	+	+	+	+	+	+	+	0.0	1.5
311.8	+	+	+	+	+	+	+	+	+	0.0	1.5

SEGMENT MINIMUM = 1.46 AT THE 161.4 INCH STATION

A " < " INDICATES THE PRECEDING SAFETY FACTOR HAS VIOLATED THE MINIMUM SAFETY FACTOR REQUIREMENT

A " + " MEANS NEGLIGIBLE MDD HAS OCCURRED

ACTUAL SAFETY FACTOR (ASF)

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	MIN.	PLANE	REQUIRED S.F.
3.5	5.52	5.97	4.64	6.99	5.72	4.86	5.97	5.02	4.64	90.0	2.0
11.0	4.21	4.17	4.75	5.56	3.60	4.79	5.13	4.00	3.60	180.0	1.5
30.7	3.15	3.91	4.15	2.93	3.81	3.74	3.07	3.20	2.93	136.0	1.5
36.2	4.13	8.41	5.49	5.46	5.33	6.01	4.99	4.66	4.13	0.0	1.5
44.6	6.35	+	7.85	10.97	6.15	5.77	12.60	8.13	5.77	226.0	1.5
71.5	5.32	4.85	47.00	4.62	6.85	3.92	13.07	4.72	3.92	226.0	1.5
126.0	13.58	11.64	14.82	20.00	8.47	3.20	23.00	16.20	3.20	226.0	1.5
145.0	11.00	5.32	11.20	10.12	28.00	8.63	4.41	14.64	4.41	270.0	1.5
161.4	+	17.67	4.22	20.34	6.88	33.71	22.48	9.98	4.22	90.0	2.0
163.0	27.50	26.19	7.75	11.46	11.46	8.33	8.59	21.15	7.75	90.0	2.0
178.0	7.92	11.18	36.60	23.50	20.67	7.12	11.62	7.52	7.12	226.0	1.5
214.1	+	+	+	+	15.67	4.76	+	+	4.76	226.0	1.5
280.0	+	+	+	+	9.91	+	+	+	9.91	180.0	1.5
298.0	+	+	+	+	+	+	+	+	+	0.0	1.5
311.8	+	+	+	+	+	+	+	+	+	0.0	1.5

SEGMENT MINIMUM = 2.93 AT THE 30.7 INCH STATION

A " + " MEANS NEGLIGIBLE MDD HAS OCCURRED

TABLE 7

RSRM-26A AFT CENTER SEGMENT INSULATION PERFORMANCE

MATERIAL DECOMPOSITION DEPTH (MDD)
INCHES

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	MEDIAN	MAX.	DESIGN M+3S
3.5	0.481	0.434	0.588	0.353	0.445	0.540	0.439	0.519	0.463	0.588	1.067
11.0	0.589	0.575	0.502	0.426	0.660	0.524	0.504	0.626	0.549	0.660	0.829
30.7	0.269	0.223	0.207	0.287	0.229	0.227	0.280	0.267	0.248	0.287	0.484
36.2	0.196	0.097	0.147	0.146	0.150	0.136	0.162	0.172	0.148	0.196	0.318
44.6	0.060	0	0.047	0.034	0.062	0.065	0.030	0.047	0.047	0.065	0.090
71.5	0.037	0.040	0.004	0.040	0.027	0.049	0.014	0.039	0.038	0.049	0.086
126.0	0.012	0.014	0.011	0.008	0.019	0.050	0.007	0.010	0.012	0.050	0.074
145.0	0.015	0.031	0.015	0.016	0.006	0.019	0.037	0.011	0.016	0.037	0.063
161.4	0	0.033	0.162<	0.029	0.085<	0.017	0.025	0.054	0.031	0.162	0.082
163.0	0.020	0.021	0.071	0.048	0.048	0.066	0.064	0.026	0.048	0.071	0.082
178.0	0.024	0.017	0.005	0.008	0.009	0.026	0.016	0.025	0.017	0.026	0.065
214.1	0	0	0	0	0.009	0.029	0	0	0	0.029	0.029
280.0	0	0	0	0	0.011<	0	0	0	0	0.011	0.005
298.0	0	0	0	0	0	0	0	0	0	0	0.005
311.8	0	0	0	0	0	0	0	0	0	0	0.003

A " < " INDICATES THE PRECEDING MDD HAS EXCEEDED THE M + 3 SIGMA DESIGN CRITERIA

MATERIAL DECOMPOSITION RATE (MDR)
MILS / SECOND

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	AVE.	EXPOSURE TIME
3.5	4.4	4.0	5.4	3.2	4.1	4.9	4.0	4.7	4.3	109.5
11.0	6.2	6.0	5.3	4.5	6.9	5.5	5.3	6.6	5.8	95.2
30.7	5.8	4.8	4.5	6.2	4.9	4.9	6.0	5.7	5.3	46.5
36.2	6.1	3.0	4.6	4.6	4.7	4.3	5.1	5.4	4.7	31.9
44.6	5.1	0	4.0	2.9	5.3	5.6	2.6	4.0	3.7	11.7
71.5	3.7	4.0	0.4	4.0	2.7	4.9	1.4	3.9	3.1	10.0
126.0	1.4	1.6	1.3	0.9	2.2	5.8	0.8	1.2	1.9	8.6
145.0	2.1	4.3	2.1	2.2	0.8	2.6	5.1	1.5	2.6	7.2
161.4	0	3.4	16.5	3.0	8.7	1.7	2.6	5.5	5.2	9.8
163.0	2.0	2.1	7.2	4.9	4.9	6.7	6.5	2.7	4.6	9.8
178.0	4.1	2.9	0.8	1.4	1.5	4.4	2.7	4.2	2.8	5.9
214.1	0	0	0	0	1.5	4.9	0	0	0.8	5.9
280.0	0	0	0	0	3.3	0	0	0	0.4	3.3
298.0	0	0	0	0	0	0	0	0	0	2.7
311.8	0	0	0	0	0	0	0	0	0	2.0

MOTOR ACTION TIME = 120.4 SECONDS

TABLE 7

RSRM-26A AFT CENTER SEGMENT INSULATION PERFORMANCE

PART NO. 1U76667-02 PREFIRE MEASUREMENTS
SERIAL NO. 0000051 INCHES

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	MIN.	MEDIAN	MDT
3.5	2.656	2.589	2.726	2.467	2.547	2.626	2.619	2.605	2.467	2.612	2.120
11.0	2.479	2.399	2.386	2.368	2.373	2.510	2.585	2.507	2.368	2.439	1.900
30.7	0.848	0.871	0.860	0.841	0.872	0.848	0.861	0.854	0.841	0.857	0.774
36.2	0.809	0.816	0.807	0.797	0.800	0.817	0.808	0.802	0.797	0.808	0.600
44.6	0.381	0.373	0.369	0.373	0.381	0.375	0.378	0.382	0.369	0.377	0.360
71.5	0.197	0.194	0.188	0.185	0.185	0.192	0.183	0.184	0.183	0.186	0.170
126.0	0.163	0.163	0.163	0.160	0.161	0.160	0.161	0.162	0.160	0.162	0.150
145.0	0.165	0.165	0.168	0.162	0.168	0.164	0.163	0.161	0.161	0.165	0.150
161.4	0.539	0.583	0.683	0.590	0.585	0.573	0.562	0.539	0.539	0.578	0.236
163.0	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.236
178.0	0.190	0.190	0.183	0.188	0.186	0.185	0.186	0.188	0.183	0.187	0.130
214.1	0.138	0.142	0.140	0.139	0.141	0.138	0.139	0.136	0.136	0.139	0.130
280.0	0.108	0.118	0.105	0.111	0.109	0.106	0.107	0.105	0.105	0.108	0.090
298.0	0.109	0.119	0.105	0.109	0.107	0.110	0.107	0.109	0.105	0.109	0.090
311.8	0.109	0.113	0.110	0.109	0.109	0.110	0.107	0.109	0.107	0.109	0.090

PART NO. 1U76791-01 POSTFIRE MEASUREMENTS
SERIAL NO. 0000022 INCHES

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	MIN.	MEDIAN
3.5	2.175	2.155	2.138	2.114	2.102	2.086	2.180	2.086	2.086	2.126
11.0	1.890	1.824	1.884	1.942	1.713	1.986	2.081	1.881	1.713	1.887
30.7	0.579	0.648	0.653	0.554	0.643	0.621	0.581	0.587	0.554	0.604
36.2	0.613	0.719	0.660	0.651	0.650	0.681	0.646	0.630	0.613	0.650
44.6	0.321	0.381	0.322	0.339	0.319	0.310	0.348	0.335	0.310	0.329
71.5	0.160	0.154	0.184	0.145	0.158	0.143	0.169	0.145	0.143	0.156
126.0	0.151	0.149	0.152	0.152	0.142	0.110	0.154	0.152	0.110	0.152
145.0	0.150	0.134	0.153	0.146	0.162	0.145	0.126	0.150	0.126	0.148
161.4	0.558	0.550	0.521	0.561	0.500	0.556	0.537	0.485	0.485	0.544
163.0	0.530	0.529	0.479	0.502	0.502	0.484	0.486	0.524	0.479	0.502
178.0	0.166	0.173	0.178	0.180	0.177	0.159	0.170	0.163	0.159	0.171
214.1	L	L	L	L	0.132	0.109	L	L	0.109	0.139
280.0	L	L	L	L	0.098	L	L	L	0.098	0.106
298.0	L	L	L	L	L	L	L	L	L	0.109
311.8	L	L	L	L	L	L	L	L	L	0.109

AN " L " INDICATES THAT LINER MATERIAL WAS REMAINING AT THAT LOCATION.
THE MEDIAN AND MINIMUM VALUES WERE CALCULATED USING THE PREFIRE THICKNESSES AT THE LOCATIONS WHERE LINER MATERIAL WAS REMAINING

TABLE 8

RSRM-26A FORWARD CENTER SEGMENT INSULATION PERFORMANCE

COMPLIANCE SAFETY FACTOR (CSF)

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	MIN.	PLANE	REQUIRED S.F.
3.5	22.80	39.26	12.62	15.25	16.56	35.33	34.19	19.81	12.62	90.0	2.0
11.0	18.45	63.33	39.58	+	+	+	82.61	+	18.45	0.0	1.5
30.7	5.09	8.90	8.06	7.17	5.53	7.74	4.93	6.00	4.93	270.0	1.5
36.2	4.69	8.11	+	5.71	6.90	9.52	5.26	8.45	4.69	0.0	1.5
44.6	+	90.00	+	72.00	+	60.00	20.00	+	20.00	270.0	1.5
71.5	+	+	21.25	85.00	14.17	34.00	34.00	3.62	3.62	316.0	1.5
126.0	7.50	4.29	+	+	+	7.89	37.50	+	4.29	46.0	1.5
145.0	+	+	+	+	+	+	6.82	+	6.82	270.0	1.5
161.4	3.52	+	9.08	3.11	14.75	3.11	4.14	2.74	2.74	316.0	2.0
163.0	2.95	6.74	3.15	4.00	3.58	3.81	19.67	3.06	2.95	0.0	2.0
178.0	3.10	+	+	+	+	+	+	+	3.10	0.0	1.5
214.1	+	+	+	+	+	+	+	+	+	0.0	1.5
280.0	+	+	+	+	+	+	+	+	+	0.0	1.5
298.0	+	+	+	+	+	+	+	+	+	0.0	1.5
311.8	+	+	+	+	+	+	+	+	+	0.0	1.5

SEGMENT MINIMUM = 2.74 AT THE 161.4 INCH STATION
A " + " MEANS NEGLIGIBLE MDD HAS OCCURRED

ACTUAL SAFETY FACTOR (ASF)

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	MIN.	PLANE	REQUIRED S.F.
3.5	27.30	46.93	15.08	18.04	19.52	42.00	40.82	24.08	15.08	90.0	2.0
11.0	24.18	80.00	48.46	+	+	+	+	+	24.18	0.0	1.5
30.7	5.61	9.74	8.96	7.93	6.36	8.56	5.61	6.81	5.61	270.0	1.5
36.2	6.66	10.85	+	8.13	9.18	12.84	7.31	11.49	6.66	0.0	1.5
44.6	+	92.00	+	72.60	+	61.33	20.56	+	20.56	270.0	1.5
71.5	+	+	23.25	91.00	15.50	36.20	36.60	3.89	3.89	316.0	1.5
126.0	7.70	4.49	+	+	+	8.05	38.25	+	4.49	46.0	1.5
145.0	+	+	+	+	+	+	7.41	+	7.41	270.0	1.5
161.4	8.61	+	20.46	7.14	36.94	7.88	10.30	6.86	6.86	316.0	2.0
163.0	6.87	15.71	7.33	9.32	8.33	8.87	45.83	7.14	6.87	0.0	2.0
178.0	4.38	+	+	+	+	+	+	+	4.38	0.0	1.5
214.1	+	+	+	+	+	+	+	+	+	0.0	1.5
280.0	+	+	+	+	+	+	+	+	+	0.0	1.5
298.0	+	+	+	+	+	+	+	+	+	0.0	1.5
311.8	+	+	+	+	+	+	+	+	+	0.0	1.5

SEGMENT MINIMUM = 3.89 AT THE 71.5 INCH STATION
A " + " MEANS NEGLIGIBLE MDD HAS OCCURRED

TABLE 8

RSRM-26A FORWARD CENTER SEGMENT INSULATION PERFORMANCE

MATERIAL DECOMPOSITION DEPTH (MDD)
INCHES

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	MEDIAN	MAX.	DESIGN M+3S
3.5	0.093	0.054	0.168	0.139	0.128	0.060	0.062	0.107	0.100	0.168	1.067
11.0	0.103	0.030	0.048	0	0	0	0.023	0	0.010	0.103	0.829
30.7	0.152	0.087	0.096	0.108	0.140	0.100	0.157	0.129	0.118	0.157	0.484
36.2	0.128	0.074	0	0.105	0.087	0.063	0.114	0.071	0.081	0.128	0.318
44.6	0	0.004	0	0.005	0	0.006	0.018	0	0.002	0.018	0.090
71.5	0	0.001	0.008	0.002	0.012	0.005	0.005	0.047	0.005	0.047	0.086
126.0	0.020	0.035	0	0	0	0.019	0.004	0	0.002	0.035	0.074
145.0	0	0	0	0	0	0	0.022	0	0	0.022	0.063
161.4	0.067	0.002	0.026	0.076	0.016	0.076	0.057	0.086<	0.062	0.086	0.082
163.0	0.080	0.035	0.075	0.059	0.066	0.062	0.012	0.077	0.064	0.080	0.082
178.0	0.042	0	0	0	0	0	0	0	0	0.042	0.065
214.1	0	0	0	0	0	0	0	0	0	0	0.029
280.0	0	0	0	0	0	0	0	0	0	0	0.005
298.0	0	0	0	0	0	0	0	0	0	0	0.005
311.8	0	0	0	0	0	0	0	0	0	0	0.003

A " < " INDICATES THE PRECEDING MDD HAS EXCEEDED THE M + 3 SIGMA DESIGN CRITERIA

MATERIAL DECOMPOSITION RATE (MDR)
MILS / SECOND

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	AVE.	EXPOSURE TIME
3.5	0.8	0.5	1.5	1.3	1.2	0.5	0.6	1.0	0.9	109.5
11.0	1.1	0.3	0.5	0	0	0	0.2	0	0.3	95.4
30.7	3.2	1.9	2.0	2.3	3.0	2.1	3.3	2.8	2.6	46.9
36.2	4.0	2.3	0	3.2	2.7	1.9	3.5	2.2	2.5	32.4
44.6	0	10.0	0	12.5	0	15.0	45.0	0	10.3	0.4
71.5	0	0.1	0.7	0.2	1.1	0.5	0.5	4.4	0.9	10.8
126.0	2.1	3.7	0	0	0	2.0	0.4	0	1.0	9.4
145.0	0	0	0	0	0	0	2.8	0	0.4	7.8
161.4	6.3	0.2	2.5	7.2	1.5	7.2	5.4	8.1	4.8	10.6
163.0	7.5	3.3	7.1	5.6	6.2	5.8	1.1	7.3	5.5	10.6
178.0	6.0	0	0	0	0	0	0	0	0.7	7.0
214.1	0	0	0	0	0	0	0	0	0	7.0
280.0	0	0	0	0	0	0	0	0	0	4.1
298.0	0	0	0	0	0	0	0	0	0	3.9
311.8	0	0	0	0	0	0	0	0	0	3.3

MOTOR ACTION TIME = 120.4 SECONDS

TABLE 8

RSRM-26A FORWARD CENTER SEGMENT INSULATION PERFORMANCE

PART NO. 1U76667-02 PREFIRE MEASUREMENTS
SERIAL NO. 0000052 INCHES

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	MIN.	MEDIAN	MDT
3.5	2.539	2.534	2.534	2.507	2.498	2.520	2.531	2.577	2.498	2.533	2.120
11.0	2.491	2.400	2.326	2.131	2.344	2.299	2.385	2.351	2.131	2.348	1.900
30.7	0.852	0.847	0.860	0.856	0.891	0.856	0.880	0.879	0.847	0.858	0.774
36.2	0.853	0.803	0.790	0.854	0.799	0.809	0.833	0.816	0.790	0.813	0.600
44.6	0.373	0.368	0.367	0.363	0.371	0.368	0.370	0.368	0.363	0.368	0.360
71.5	0.185	0.188	0.186	0.182	0.186	0.181	0.183	0.183	0.181	0.184	0.170
126.0	0.154	0.157	0.153	0.153	0.154	0.153	0.153	0.158	0.153	0.154	0.150
145.0	0.161	0.160	0.158	0.163	0.159	0.158	0.163	0.160	0.158	0.160	0.150
161.4	0.577	0.531	0.532	0.543	0.591	0.599	0.587	0.590	0.531	0.582	0.236
163.0	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.550	0.236
178.0	0.184	0.187	0.185	0.192	0.187	0.188	0.187	0.187	0.184	0.187	0.130
214.1	0.133	0.129	0.130	0.139	0.114	0.130	0.129	0.130	0.114	0.130	0.130
280.0	0.107	0.093	0.103	0.100	0.105	0.104	0.105	0.110	0.093	0.105	0.090
298.0	0.105	0.103	0.099	0.097	0.104	0.105	0.103	0.104	0.097	0.104	0.090
311.8	0.104	0.095	0.105	0.100	0.104	0.104	0.104	0.111	0.095	0.104	0.090

PART NO. 1U76791-01 POSTFIRE MEASUREMENTS
SERIAL NO. 0000023 INCHES

STATION (IN)	DEGREE LOCATIONS 0.0	46.0	90.0	136.0	180.0	226.0	270.0	316.0	MIN.	MEDIAN
3.5	2.446	2.480	2.366	2.368	2.370	2.460	2.469	2.470	2.366	2.453
11.0	2.388	2.370	2.278	2.470	2.356	2.443	2.362	2.354	2.278	2.366
30.7	0.700	0.760	0.764	0.748	0.751	0.756	0.723	0.750	0.700	0.751
36.2	0.725	0.729	0.817	0.749	0.712	0.746	0.719	0.745	0.712	0.737
44.6	0.373	0.364	0.378	0.358	0.371	0.362	0.352	0.372	0.352	0.368
71.5	0.200	0.187	0.178	0.180	0.174	0.176	0.178	0.136	0.136	0.178
126.0	0.134	0.122	L	L	L	0.134	0.149	L	0.122	0.151
145.0	0.170	0.173	L	L	L	L	0.141	L	0.141	0.160
161.4	0.510	0.529	0.506	0.467	0.575	0.523	0.530	0.504	0.467	0.516
163.0	0.470	0.515	0.475	0.491	0.484	0.488	0.538	0.473	0.470	0.486
178.0	0.142	L	L	L	0.242	L	L	L	0.142	0.187
214.1	L	L	L	L	L	L	L	L	L	0.130
280.0	L	L	L	L	L	L	L	L	L	0.105
298.0	L	L	L	L	L	L	L	L	L	0.104
311.8	L	L	L	L	L	L	L	L	L	0.104

AN " L " INDICATES THAT LINER MATERIAL WAS REMAINING AT THAT LOCATION.
THE MEDIAN AND MINIMUM VALUES WERE CALCULATED USING THE PREFIRE THICKNESSES
AT THE LOCATIONS WHERE LINER MATERIAL WAS REMAINING

TABLE 9

RSRM-26A FORWARD SEGMENT STAR TIP INSULATION PERFORMANCE

COMPLIANCE SAFETY FACTOR (CSF)

STATION (IN)	DEGREE LOCATIONS 90.0	154.0	222.0	286.0	352.0	MIN.	PLANE	REQUIRED S.F.
3.5	8.95	42.40	+	+	23.82	8.95	90.0	2.0
13.0	+	40.62	19.12	25.00	21.67	19.12	222.0	1.5
27.0	+	+	+	+	+	+	90.0	1.5
44.0	+	+	+	+	+	+	90.0	1.5
60.0	+	+	+	+	+	+	90.0	1.5
94.7	+	+	+	+	+	+	90.0	1.5
142.0	+	+	+	+	+	+	90.0	1.5
152.0	+	3.87	7.55	7.04	4.17	3.87	154.0	1.5
162.0	+	4.48	5.16	3.99	6.75	3.99	286.0	2.0
175.5	3.47	4.00	3.97	3.23	4.54	3.23	286.0	1.5
187.0	2.66	3.17	3.02	2.53	3.28	2.53	286.0	1.5
199.0	3.10	2.36	3.01	3.15	2.87	2.36	154.0	1.5
213.0	3.08	3.42	3.21	3.54	3.39	3.08	90.0	1.5
224.0	2.96	2.81	2.96	2.84	2.97	2.81	154.0	1.5
230.0	3.33	2.94	3.54	3.32	3.15	2.94	154.0	1.5
236.0	2.95	2.79	4.52	3.78	3.18	2.79	154.0	1.5
240.0	2.52	2.55	2.59	2.97	2.68	2.52	90.0	1.5
254.0	2.83	2.94	2.81	2.81	3.36	2.81	222.0	1.5
263.0	2.84	3.07	2.51	2.38	2.94	2.38	286.0	1.5
282.0	2.94	3.26	3.14	3.38	2.97	2.94	90.0	1.5
293.0	2.79	2.74	3.33	2.81	3.55	2.74	154.0	1.5
305.0	3.55	2.50	2.79	4.30	3.09	2.50	154.0	1.5
312.0	2.96	3.22	3.18	2.80	2.85	2.80	286.0	1.5
321.0	4.14	5.63	5.28	6.12	6.51	4.14	90.0	2.0
339.0	3.10	2.96	2.70	2.99	3.17	2.70	222.0	1.5
350.0	4.12	3.49	3.93	2.59	3.66	2.59	286.0	1.5
362.0	2.71	2.81	3.33	2.20	3.88	2.20	286.0	1.5
371.0	3.13	2.63	3.42	2.81	2.99	2.63	154.0	1.5
383.0	3.15	2.99	3.43	3.68	3.08	2.99	154.0	1.5
397.0	3.01	3.14	4.16	2.73	2.99	2.73	286.0	1.5
403.0	4.61	3.83	3.75	5.49	4.63	3.75	222.0	1.5

SEGMENT MINIMUM = 2.20 AT THE 362.0 INCH STATION
A " + " MEANS NEGLIGIBLE MDD HAS OCCURRED

ACTUAL SAFETY FACTOR (ASF)

STATION (IN)	DEGREE LOCATIONS 90.0	154.0	222.0	286.0	352.0	MIN.	PLANE
3.5	11.50	49.68	+	+	28.31	11.50	90.0
13.0	+	53.75	28.35	33.35	29.53	28.35	222.0
27.0	+	+	+	+	+	+	90.0
44.0	+	+	+	+	+	+	90.0
60.0	+	+	+	+	+	+	90.0
94.7	+	+	+	+	+	+	90.0
142.0	+	+	+	+	+	+	90.0
152.0	+	4.74	10.36	8.33	5.16	4.74	154.0
162.0	+	5.87	6.89	5.35	8.96	5.35	286.0
175.5	4.04	4.53	4.51	3.80	5.08	3.80	286.0
187.0	2.65	3.14	3.04	2.53	3.22	2.53	286.0
199.0	3.27	2.60	3.13	3.32	2.96	2.60	154.0
213.0	3.31	3.65	3.42	3.77	3.57	3.31	90.0
224.0	3.37	3.20	3.38	3.17	3.38	3.17	286.0
230.0	3.53	3.09	3.79	3.48	3.33	3.09	154.0
236.0	3.29	3.04	4.93	4.06	3.51	3.04	154.0
240.0	2.84	2.84	2.84	3.30	2.99	2.84	90.0
254.0	2.88	2.96	2.84	2.79	3.37	2.79	286.0
263.0	2.91	3.10	2.58	2.43	2.98	2.43	286.0
282.0	3.22	3.59	3.50	3.72	3.27	3.22	90.0
293.0	3.09	3.08	3.74	3.15	3.92	3.08	154.0
305.0	4.15	2.97	3.31	5.01	3.76	2.97	154.0
312.0	3.56	3.87	3.76	3.33	3.61	3.33	286.0
321.0	4.55	5.79	5.51	6.39	6.97	4.55	90.0
339.0	3.20	3.05	2.78	3.18	3.29	2.78	222.0
350.0	4.70	3.89	4.39	2.95	4.10	2.95	286.0
362.0	3.12	3.19	3.74	2.51	4.40	2.51	286.0
371.0	4.00	3.12	3.91	3.17	3.41	3.12	154.0
383.0	3.83	3.41	4.09	4.13	3.63	3.41	154.0
397.0	3.58	3.76	5.02	3.22	3.63	3.22	286.0
403.0	5.08	4.26	4.10	6.08	5.26	4.10	222.0

SEGMENT MINIMUM = 2.43 AT THE 263.0 INCH STATION

TABLE 9

RSRM-26A FORWARD SEGMENT STAR TIP INSULATION PERFORMANCE

PREFIRE MEASUREMENTS
INCHES

PART NO. 1U76666-02
SERIAL NO. 0000027

STATION (IN)	DEGREE LOCATIONS 90.0	154.0	222.0	286.0	352.0	MIN.	MEDIAN	MDT
3.5	2.726	2.484	2.468	2.531	2.520	2.468	2.520	2.120
13.0	0.863	0.860	0.964	0.867	0.886	0.860	0.867	0.650
27.0	0.563	0.563	0.561	0.579	0.582	0.561	0.563	0.450
44.0	0.298	0.291	0.292	0.293	0.292	0.291	0.292	0.250
60.0	0.140	0.138	0.139	0.141	0.138	0.138	0.139	0.100
94.7	0.113	0.111	0.110	0.112	0.092	0.092	0.111	0.090
142.0	0.163	0.163	0.162	0.160	0.164	0.160	0.163	0.113
152.0	0.351	0.389	0.435	0.375	0.392	0.351	0.389	0.317
162.0	0.728	0.716	0.730	0.733	0.726	0.716	0.728	0.547
175.5	0.703	0.684	0.686	0.710	0.675	0.675	0.686	0.604
187.0	0.638	0.635	0.644	0.641	0.628	0.628	0.638	0.640
199.0	0.719	0.754	0.710	0.720	0.704	0.704	0.719	0.683
213.0	0.729	0.722	0.721	0.721	0.713	0.713	0.721	0.677
224.0	0.771	0.772	0.773	0.755	0.771	0.755	0.771	0.677
230.0	0.716	0.710	0.723	0.710	0.715	0.710	0.715	0.677
236.0	0.645	0.630	0.631	0.621	0.638	0.621	0.631	0.578
240.0	0.647	0.640	0.631	0.637	0.639	0.631	0.639	0.574
254.0	0.579	0.571	0.573	0.564	0.569	0.564	0.571	0.568
263.0	0.583	0.573	0.583	0.580	0.576	0.573	0.580	0.568
282.0	0.622	0.625	0.634	0.625	0.625	0.622	0.625	0.568
293.0	0.605	0.613	0.613	0.612	0.603	0.603	0.612	0.546
305.0	0.614	0.624	0.623	0.611	0.640	0.611	0.623	0.525
312.0	0.652	0.651	0.640	0.643	0.686	0.640	0.651	0.541
321.0	1.011	0.944	0.958	0.958	0.983	0.944	0.958	0.918
339.0	0.570	0.568	0.567	0.586	0.573	0.567	0.570	0.551
350.0	0.597	0.583	0.584	0.596	0.587	0.583	0.587	0.523
362.0	0.599	0.591	0.583	0.592	0.589	0.583	0.591	0.520
371.0	0.664	0.617	0.595	0.587	0.593	0.587	0.595	0.520
383.0	0.620	0.583	0.609	0.574	0.603	0.574	0.603	0.511
397.0	0.598	0.601	0.607	0.593	0.610	0.593	0.601	0.503
403.0	1.047	1.057	1.038	1.052	1.078	1.038	1.052	0.950

POSTFIRE MEASUREMENTS
INCHES

PART NO. 1U76790-05
SERIAL NO. 0000010

STATION (IN)	DEGREE LOCATIONS 90.0	154.0	222.0	286.0	352.0	MIN.	MEDIAN
3.5	2.489	2.434	2.468	2.564	2.431	2.431	2.468
13.0	0.962	0.844	0.930	0.841	0.856	0.841	0.856
27.0	L	L	L	L	L	L	0.563
44.0	L	L	L	L	L	L	0.292
60.0	L	L	L	L	L	L	0.139
94.7	L	L	L	L	L	L	0.111
142.0	L	L	L	L	L	L	0.163
152.0	L	0.307	0.393	0.330	0.316	0.307	0.330
162.0	L	0.594	0.624	0.596	0.645	0.594	0.624
175.5	0.529	0.533	0.534	0.523	0.542	0.523	0.533
187.0	0.397	0.433	0.432	0.388	0.433	0.388	0.432
199.0	0.499	0.464	0.483	0.503	0.466	0.464	0.483
213.0	0.509	0.524	0.510	0.530	0.513	0.509	0.513
224.0	0.542	0.531	0.544	0.517	0.543	0.517	0.542
230.0	0.513	0.480	0.532	0.506	0.500	0.480	0.506
236.0	0.449	0.423	0.503	0.468	0.456	0.423	0.456
240.0	0.419	0.415	0.409	0.444	0.425	0.409	0.419
254.0	0.378	0.378	0.371	0.362	0.400	0.362	0.378
263.0	0.383	0.388	0.357	0.341	0.383	0.341	0.383
282.0	0.429	0.451	0.453	0.457	0.434	0.429	0.451
293.0	0.409	0.414	0.449	0.418	0.449	0.409	0.418
305.0	0.466	0.414	0.435	0.489	0.470	0.414	0.466
312.0	0.469	0.483	0.470	0.450	0.496	0.450	0.470
321.0	0.789	0.781	0.784	0.808	0.842	0.781	0.789
339.0	0.392	0.382	0.363	0.402	0.399	0.363	0.392
350.0	0.470	0.433	0.451	0.394	0.444	0.394	0.444
362.0	0.407	0.406	0.427	0.356	0.455	0.356	0.407
371.0	0.498	0.419	0.443	0.402	0.419	0.402	0.419
383.0	0.458	0.412	0.460	0.435	0.437	0.412	0.437
397.0	0.431	0.441	0.486	0.409	0.442	0.409	0.441
403.0	0.841	0.809	0.785	0.879	0.873	0.785	0.841

AN " L " INDICATES THAT LINER MATERIAL WAS REMAINING AT THAT LOCATION.
THE MEDIAN AND MINIMUM VALUES WERE CALCULATED USING THE PREFIRE THICKNESSES
AT THE LOCATIONS WHERE LINER MATERIAL WAS REMAINING

TABLE 9

RSRM-26A FORWARD SEGMENT STAR TIP INSULATION PERFORMANCE

MATERIAL DECOMPOSITION DEPTH (MDD)
INCHES

STATION (IN)	DEGREE LOCATIONS 90.0	154.0	222.0	286.0	352.0	MEDIAN	MAX.	DESIGN M+3S
3.5	0.237<	0.050	0	0	0.089	0.050	0.237	0.103
13.0	0	0.016	0.034	0.026	0.030	0.026	0.034	0.101
27.0	0	0	0	0	0	0	0	0.044
44.0	0	0	0	0	0	0	0	0.015
60.0	0	0	0	0	0	0	0	0.012
94.7	0	0	0	0	0	0	0	0.004
142.0	0	0	0	0	0	0	0	0.019
152.0	0	0.082	0.042	0.045	0.076	0.045	0.082	0.123
162.0	0	0.122	0.106	0.137	0.081	0.106	0.137	0.227
175.5	0.174	0.151	0.152	0.187	0.133	0.152	0.187	0.324
187.0	0.241	0.202	0.212	0.253	0.195	0.212	0.253	0.398
199.0	0.220	0.290	0.227	0.217	0.238	0.227	0.290	0.427
213.0	0.220	0.198	0.211	0.191	0.200	0.200	0.220	0.423
224.0	0.229	0.241	0.229	0.238	0.228	0.229	0.241	0.422
230.0	0.203	0.230	0.191	0.204	0.215	0.204	0.230	0.375
236.0	0.196	0.207	0.128	0.153	0.182	0.182	0.207	0.327
240.0	0.228	0.225	0.222	0.193	0.214	0.222	0.228	0.342
254.0	0.201	0.193	0.202	0.202	0.169	0.201	0.202	0.318
263.0	0.200	0.185	0.226	0.239	0.193	0.200	0.239	0.334
282.0	0.193	0.174	0.181	0.168	0.191	0.181	0.193	0.349
293.0	0.196	0.199	0.164	0.194	0.154	0.194	0.199	0.330
305.0	0.148	0.210	0.188	0.122	0.170	0.170	0.210	0.309
312.0	0.183	0.168	0.170	0.193	0.190	0.183	0.193	0.308
321.0	0.222	0.163	0.174	0.150	0.141	0.163	0.222	0.434
339.0	0.178	0.186	0.204	0.184	0.174	0.184	0.204	0.319
350.0	0.127	0.150	0.133	0.202	0.143	0.143	0.202	0.300
362.0	0.192	0.185	0.156	0.236	0.134	0.185	0.236	0.285
371.0	0.166	0.198	0.152	0.185	0.174	0.174	0.198	0.304
383.0	0.162	0.171	0.149	0.139	0.166	0.162	0.171	0.295
397.0	0.167	0.160	0.121	0.184	0.168	0.167	0.184	0.287
403.0	0.206	0.248	0.253	0.173	0.205	0.206	0.253	0.287

A " < " INDICATES THE PRECEDING MDD HAS EXCEEDED THE M + 3 SIGMA DESIGN CRITERIA

MATERIAL DECOMPOSITION RATE (MDR)
MILS / SECOND

STATION (IN)	DEGREE LOCATIONS 90.0	154.0	222.0	286.0	352.0	AVE.	EXPOSURE TIME
3.5	7.1	1.5	0	0	2.6	2.2	33.6
13.0	0	0.8	1.8	1.4	1.6	1.1	19.0
27.0	0	0	0	0	0	0	4.7
44.0	0	0	0	0	0	0	2.9
60.0	0	0	0	0	0	0	1.4
94.7	0	0	0	0	0	0	0.8
142.0	0	0	0	0	0	0	1.0
152.0	0	2.6	1.3	1.4	2.4	1.5	31.9
162.0	0	2.2	1.9	2.4	1.4	1.6	56.7
175.5	2.0	1.7	1.7	2.1	1.5	1.8	87.2
187.0	2.4	2.0	2.1	2.5	2.0	2.2	99.7
199.0	2.2	2.9	2.3	2.2	2.4	2.4	99.7
213.0	2.2	2.0	2.1	1.9	2.0	2.0	99.7
224.0	2.3	2.4	2.3	2.4	2.3	2.3	99.7
230.0	2.0	2.3	1.9	2.0	2.2	2.1	99.7
236.0	2.0	2.1	1.3	1.5	1.8	1.7	99.7
240.0	2.3	2.3	2.2	1.9	2.1	2.2	99.7
254.0	2.0	1.9	2.0	2.0	1.7	1.9	99.7
263.0	2.0	1.9	2.3	2.4	1.9	2.1	99.7
282.0	1.9	1.7	1.8	1.7	1.9	1.8	99.7
293.0	2.0	2.0	1.6	1.9	1.5	1.8	99.7
305.0	1.5	2.1	1.9	1.2	1.7	1.7	99.7
312.0	1.8	1.7	1.7	1.9	1.9	1.8	99.7
321.0	2.2	1.6	1.7	1.5	1.4	1.7	101.8
339.0	1.8	1.9	2.1	1.9	1.8	1.9	98.3
350.0	1.3	1.5	1.4	2.1	1.5	1.5	98.1
362.0	2.0	1.9	1.6	2.4	1.4	1.9	97.1
371.0	1.8	2.1	1.6	2.0	1.9	1.9	92.8
383.0	1.7	1.8	1.6	1.5	1.8	1.7	94.0
397.0	1.7	1.6	1.2	1.9	1.7	1.6	98.1
403.0	1.7	2.1	2.1	1.4	1.7	1.8	120.4

MOTOR ACTION TIME = 120.4 SECONDS

TABLE 10

RSRM-26A FORWARD SEGMENT NON-STAR TIP INSULATION PERFORMANCE

COMPLIANCE SAFETY FACTOR (CSF)

STATION (IN)	DEGREE LOCATIONS 74.0	140.0	206.0	270.0	336.0	MIN.	PLANE	REQUIRED S.F.
3.5	62.35	73.10	40.00	18.12	31.64	18.12	270.0	2.0
13.0	27.08	40.62	+	38.24	27.08	27.08	336.0	1.5
27.0	+	+	+	+	+	+	74.0	1.5
44.0	+	+	+	+	+	+	74.0	1.5
60.0	+	+	+	+	+	+	74.0	1.5
94.7	+	+	+	+	+	+	74.0	1.5
142.0	+	+	+	+	+	+	74.0	1.5
152.0	+	28.82	6.22	+	22.64	6.22	206.0	1.5
162.0	8.29	6.29	8.68	6.22	7.60	6.22	270.0	2.0
175.5	5.49	5.30	4.79	4.72	4.03	4.03	336.0	1.5
187.0	4.38	5.08	4.64	4.57	5.08	4.38	74.0	1.5
199.0	4.32	4.44	4.27	4.95	5.64	4.27	206.0	1.5
213.0	5.74	4.51	4.94	4.94	6.10	4.51	140.0	1.5
224.0	5.99	4.98	5.60	4.84	4.87	4.84	270.0	1.5
230.0	5.89	5.69	6.10	5.60	5.50	5.50	336.0	1.5
236.0	4.16	4.70	6.15	4.74	4.74	4.16	74.0	1.5
240.0	5.31	4.70	4.48	4.82	4.91	4.48	206.0	1.5
254.0	5.62	5.74	5.86	4.44	5.31	4.44	270.0	1.5
263.0	5.16	5.36	4.81	4.54	5.92	4.54	270.0	1.5
282.0	9.16	5.57	5.31	4.81	4.62	4.62	336.0	1.5
293.0	6.58	5.01	5.25	4.67	5.06	4.67	270.0	1.5
305.0	4.13	5.59	4.86	4.82	3.50	3.50	336.0	1.5
312.0	4.33	5.82	6.29	4.83	5.41	4.33	74.0	1.5
321.0	8.83	6.12	9.09	9.46	19.96	6.12	140.0	2.0
339.0	4.96	4.08	5.57	5.51	4.27	4.08	140.0	1.5
350.0	4.55	4.12	3.42	3.66	4.36	3.42	206.0	1.5
362.0	2.99	3.59	3.38	6.19	3.59	2.99	74.0	1.5
371.0	3.74	2.77	3.91	3.61	4.13	2.77	140.0	1.5
383.0	3.87	2.70	3.21	4.15	4.22	2.70	140.0	1.5
397.0	2.99	2.83	2.49	2.83	2.92	2.49	206.0	1.5
403.0	4.92	5.00	4.08	4.03	4.68	4.03	270.0	1.5

SEGMENT MINIMUM = 2.49 AT THE 397.0 INCH STATION

A " + " MEANS NEGLIGIBLE MDD HAS OCCURRED

ACTUAL SAFETY FACTOR (ASF)

STATION (IN)	DEGREE LOCATIONS 74.0	140.0	206.0	270.0	336.0	MIN.	PLANE
3.5	74.62	84.83	47.89	22.38	37.98	22.38	270.0
13.0	36.08	54.37	+	54.12	35.62	35.62	336.0
27.0	+	+	+	+	+	+	74.0
44.0	+	+	+	+	+	+	74.0
60.0	+	+	+	+	+	+	74.0
94.7	+	+	+	+	+	+	74.0
142.0	+	+	+	+	+	+	74.0
152.0	+	32.64	7.43	+	27.43	7.43	206.0
162.0	10.86	8.37	11.38	8.38	10.15	8.37	140.0
175.5	6.13	6.10	5.39	5.36	4.63	4.63	336.0
187.0	4.41	5.21	4.55	4.63	5.05	4.41	74.0
199.0	4.58	4.64	4.46	5.26	5.93	4.46	206.0
213.0	6.10	4.81	5.28	5.26	6.41	4.81	140.0
224.0	6.73	5.62	6.31	5.49	5.49	5.49	270.0
230.0	6.23	6.12	6.50	5.90	5.80	5.80	336.0
236.0	4.69	5.28	6.70	5.42	5.18	4.69	74.0
240.0	5.92	5.22	4.98	5.45	5.40	4.98	206.0
254.0	5.66	5.74	5.86	4.62	5.39	4.62	270.0
263.0	5.25	5.41	4.85	4.77	5.99	4.77	270.0
282.0	10.27	6.19	5.85	5.36	5.19	5.19	336.0
293.0	7.42	5.68	5.86	5.29	5.69	5.29	270.0
305.0	4.99	6.65	5.71	5.75	4.54	4.54	336.0
312.0	5.08	6.77	7.30	5.92	6.33	5.08	74.0
321.0	9.60	6.81	10.04	10.21	20.87	6.81	140.0
339.0	5.19	4.37	5.62	5.92	4.36	4.36	336.0
350.0	5.20	4.64	3.95	4.30	4.88	3.95	206.0
362.0	3.52	4.21	3.88	7.31	4.23	3.52	74.0
371.0	4.42	3.28	4.47	4.19	4.76	3.28	140.0
383.0	4.40	3.30	3.58	4.85	4.80	3.30	140.0
397.0	3.54	3.37	3.10	3.53	3.56	3.10	206.0
403.0	5.43	5.56	4.50	4.47	5.27	4.47	270.0

SEGMENT MINIMUM = 3.10 AT THE 397.0 INCH STATION

TABLE 10
RSRM-26A FORWARD SEGMENT NON-STAR TIP INSULATION PERFORMANCE

MATERIAL DECOMPOSITION DEPTH (MDD)
INCHES

STATION (IN)	DEGREE LOCATIONS 74.0	140.0	206.0	270.0	336.0	MEDIAN	MAX.	DESIGN M+3S
3.5	0.034	0.029	0.053	0.117<	0.067	0.053	0.117	0.103
13.0	0.024	0.016	0	0.017	0.024	0.017	0.024	0.101
27.0	0	0	0	0	0	0	0	0.044
44.0	0	0	0	0	0	0	0	0.015
60.0	0	0	0	0	0	0	0	0.012
94.7	0	0	0	0	0	0	0	0.004
142.0	0	0	0	0	0	0	0	0.019
152.0	0	0.011	0.051	0	0.014	0.011	0.051	0.123
162.0	0.066	0.087	0.063	0.088	0.072	0.072	0.088	0.227
175.5	0.110	0.114	0.126	0.128	0.150	0.126	0.150	0.324
187.0	0.146	0.126	0.138	0.140	0.126	0.138	0.146	0.398
199.0	0.158	0.154	0.160	0.138	0.121	0.154	0.160	0.427
213.0	0.118	0.150	0.137	0.137	0.111	0.137	0.150	0.423
224.0	0.113	0.136	0.121	0.140	0.139	0.136	0.140	0.422
230.0	0.115	0.119	0.111	0.121	0.123	0.119	0.123	0.375
236.0	0.139	0.123	0.094	0.122	0.122	0.122	0.139	0.327
240.0	0.108	0.122	0.128	0.119	0.117	0.119	0.128	0.342
254.0	0.101	0.099	0.097	0.128	0.107	0.101	0.128	0.318
263.0	0.110	0.106	0.118	0.125	0.096	0.110	0.125	0.334
282.0	0.062	0.102	0.107	0.118	0.123	0.107	0.123	0.349
293.0	0.083	0.109	0.104	0.117	0.108	0.108	0.117	0.330
305.0	0.127	0.094	0.108	0.109	0.150	0.109	0.150	0.309
312.0	0.125	0.093	0.086	0.112	0.100	0.100	0.125	0.308
321.0	0.104	0.150	0.101	0.097	0.046	0.101	0.150	0.434
339.0	0.111	0.135	0.099	0.100	0.129	0.111	0.135	0.319
350.0	0.115	0.127	0.153	0.143	0.120	0.127	0.153	0.300
362.0	0.174	0.145	0.154	0.084	0.145	0.145	0.174	0.285
371.0	0.139	0.188	0.133	0.144	0.126	0.139	0.188	0.304
383.0	0.132	0.189	0.159	0.123	0.121	0.132	0.189	0.295
397.0	0.168	0.178	0.202	0.178	0.172	0.178	0.202	0.287
403.0	0.193	0.190	0.233	0.236	0.203	0.203	0.236	0.287

MATERIAL DECOMPOSITION RATE (MDR)
MILS / SECOND

STATION (IN)	DEGREE LOCATIONS 74.0	140.0	206.0	270.0	336.0	AVE.	EXPOSURE TIME
3.5	1.0	0.9	1.6	3.5	2.0	1.8	33.6
13.0	1.3	0.8	0	0.9	1.3	0.9	19.0
27.0	0	0	0	0	0	0	4.7
44.0	0	0	0	0	0	0	2.9
60.0	0	0	0	0	0	0	1.4
94.7	0	0	0	0	0	0	0.8
142.0	0	0	0	0	0	0	1.0
152.0	0	0.5	2.5	0	0.7	0.7	20.3
162.0	1.5	2.0	1.5	2.0	1.7	1.7	43.4
175.5	1.6	1.7	1.9	1.9	2.2	1.9	66.8
187.0	2.2	1.9	2.1	2.2	1.9	2.1	65.1
199.0	2.4	2.4	2.5	2.1	1.9	2.2	65.1
213.0	1.8	2.3	2.1	2.1	1.7	2.0	65.1
224.0	1.7	2.1	1.9	2.2	2.1	2.0	65.1
230.0	1.8	1.8	1.7	1.9	1.9	1.8	65.1
236.0	2.1	1.9	1.4	1.9	1.9	1.8	65.1
240.0	1.7	1.9	2.0	1.8	1.8	1.8	65.1
254.0	1.6	1.5	1.5	2.0	1.6	1.6	65.1
263.0	1.7	1.6	1.8	1.9	1.5	1.7	65.1
282.0	1.0	1.6	1.6	1.8	1.9	1.6	65.1
293.0	1.3	1.7	1.6	1.8	1.7	1.6	65.1
305.0	2.0	1.4	1.7	1.7	2.3	1.8	65.1
312.0	1.9	1.4	1.3	1.7	1.5	1.6	65.1
321.0	1.5	2.2	1.5	1.4	0.7	1.4	69.4
339.0	1.6	1.9	1.4	1.4	1.8	1.6	71.3
350.0	1.5	1.7	2.0	1.9	1.6	1.8	75.1
362.0	2.2	1.8	1.9	1.1	1.8	1.8	79.9
371.0	1.7	2.3	1.7	1.8	1.6	1.8	80.3
383.0	1.5	2.2	1.8	1.4	1.4	1.7	87.6
397.0	1.8	1.9	2.1	1.9	1.8	1.9	95.6
403.0	1.6	1.6	1.9	2.0	1.7	1.8	120.4

MOTOR ACTION TIME = 120.4 SECONDS

A " < " INDICATES THE PRECEDING MDD HAS EXCEEDED THE M + 3 SIGMA DESIGN CRITERIA

TABLE 10

RSRM-26A FORWARD SEGMENT NON-STAR TIP INSULATION PERFORMANCE

PREFIRE MEASUREMENTS (INCHES) — PART NO. 1U76666-02, SERIAL NO. 0000027

STATION (IN)	DEGREE LOCATIONS 74.0	140.0	206.0	270.0	336.0	MIN.	MEDIAN	MDT
3.5	2.537	2.460	2.538	2.619	2.545	2.460	2.538	2.120
13.0	0.866	0.870	0.876	0.920	0.855	0.855	0.870	0.650
27.0	0.559	0.573	0.558	0.572	0.558	0.558	0.559	0.450
44.0	0.297	0.297	0.298	0.297	0.297	0.297	0.297	0.250
60.0	0.143	0.140	0.141	0.140	0.140	0.140	0.140	0.100
94.7	0.110	0.092	0.110	0.113	0.094	0.092	0.110	0.090
142.0	0.165	0.164	0.164	0.163	0.163	0.163	0.164	0.113
152.0	0.373	0.359	0.379	0.358	0.384	0.358	0.373	0.317
162.0	0.717	0.728	0.717	0.737	0.731	0.717	0.728	0.547
175.5	0.674	0.695	0.679	0.686	0.694	0.674	0.686	0.604
187.0	0.644	0.656	0.628	0.648	0.636	0.628	0.644	0.640
199.0	0.724	0.714	0.714	0.726	0.717	0.714	0.717	0.683
213.0	0.720	0.721	0.724	0.721	0.712	0.712	0.721	0.677
224.0	0.761	0.764	0.764	0.768	0.763	0.761	0.764	0.677
230.0	0.717	0.728	0.721	0.714	0.713	0.713	0.717	0.677
236.0	0.652	0.650	0.630	0.661	0.632	0.630	0.650	0.578
240.0	0.639	0.637	0.637	0.648	0.632	0.632	0.637	0.574
254.0	0.572	0.568	0.568	0.592	0.577	0.568	0.572	0.568
263.0	0.578	0.573	0.572	0.596	0.575	0.572	0.575	0.568
282.0	0.637	0.631	0.626	0.632	0.638	0.626	0.632	0.568
293.0	0.616	0.619	0.609	0.619	0.614	0.609	0.616	0.546
305.0	0.634	0.625	0.617	0.627	0.681	0.617	0.627	0.525
312.0	0.635	0.630	0.628	0.663	0.633	0.628	0.633	0.541
321.0	0.998	1.022	1.014	0.990	0.960	0.960	0.998	0.918
339.0	0.576	0.590	0.556	0.592	0.563	0.556	0.576	0.551
350.0	0.598	0.589	0.605	0.615	0.586	0.586	0.598	0.523
362.0	0.612	0.610	0.598	0.614	0.613	0.598	0.612	0.520
371.0	0.615	0.617	0.595	0.603	0.600	0.595	0.603	0.520
383.0	0.581	0.624	0.570	0.597	0.581	0.570	0.581	0.511
397.0	0.595	0.600	0.627	0.629	0.613	0.595	0.613	0.503
403.0	1.048	1.057	1.049	1.056	1.069	1.048	1.056	0.950

POSTFIRE MEASUREMENTS (INCHES) — PART NO. 1U76790-05, SERIAL NO. 0000010

STATION (IN)	DEGREE LOCATIONS 74.0	140.0	206.0	270.0	336.0	MIN.	MEDIAN
3.5	2.503	2.431	2.485	2.502	2.478	2.431	2.485
13.0	0.842	0.854	0.897	0.903	0.831	0.831	0.854
27.0	L	L	L	L	L	L	0.559
44.0	L	L	L	L	L	L	0.297
60.0	L	L	L	L	L	L	0.140
94.7	L	L	L	L	L	L	0.110
142.0	L	L	L	L	L	L	0.164
152.0	0.381	0.348	0.328	0.358	0.370	0.328	0.358
162.0	0.651	0.641	0.654	0.649	0.659	0.641	0.651
175.5	0.564	0.581	0.553	0.558	0.544	0.544	0.558
187.0	0.498	0.530	0.490	0.508	0.510	0.490	0.508
199.0	0.566	0.560	0.554	0.588	0.596	0.554	0.566
213.0	0.602	0.571	0.587	0.584	0.601	0.571	0.587
224.0	0.648	0.628	0.643	0.628	0.624	0.624	0.628
230.0	0.602	0.609	0.610	0.593	0.590	0.590	0.602
236.0	0.513	0.527	0.536	0.539	0.510	0.510	0.527
240.0	0.531	0.515	0.509	0.529	0.515	0.509	0.515
254.0	0.471	0.469	0.471	0.464	0.470	0.464	0.470
263.0	0.468	0.467	0.454	0.471	0.479	0.454	0.468
282.0	0.575	0.529	0.519	0.514	0.515	0.514	0.519
293.0	0.533	0.510	0.505	0.502	0.506	0.502	0.506
305.0	0.507	0.531	0.509	0.518	0.531	0.507	0.518
312.0	0.510	0.537	0.542	0.551	0.533	0.510	0.537
321.0	0.894	0.872	0.913	0.893	0.914	0.872	0.894
339.0	0.465	0.455	0.457	0.492	0.434	0.434	0.457
350.0	0.483	0.462	0.452	0.472	0.466	0.452	0.466
362.0	0.438	0.465	0.444	0.530	0.468	0.438	0.465
371.0	0.476	0.429	0.462	0.459	0.474	0.429	0.462
383.0	0.449	0.435	0.411	0.474	0.460	0.411	0.449
397.0	0.427	0.422	0.425	0.451	0.441	0.422	0.427
403.0	0.855	0.867	0.816	0.820	0.866	0.816	0.855

AN " L " INDICATES THAT LINER MATERIAL WAS REMAINING AT THAT LOCATION.
THE MEDIAN AND MINIMUM VALUES WERE CALCULATED USING THE PREFIRE THICKNESSES
AT THE LOCATIONS WHERE LINER MATERIAL WAS REMAINING

TABLE 11

RSRM-26A IGNITER CHAMBER AND ADAPTER INSULATION PERFORMANCE

CHAMBER PART NO. 1U75162-01
CHAMBER SERIAL NO. 0000080
ADAPTER PART NO. 1U77392-01(902)
ADAPTER SERIAL NO. 0000009

PREFIRE MEASUREMENTS
INCHES

STATION (NO.)	DEGREE LOCATION 0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	MEDIAN	MINIMUM
1.0	1.040	1.115	1.100	1.110	1.040	1.050	1.050	1.050	1.050	1.040
2.0	0.990	0.990	1.020	1.000	1.000	1.000	1.020	1.000	1.000	0.990
3.0	0.968	0.978	1.010	0.980	0.980	0.980	0.980	0.980	0.980	0.968
4.0	1.060	1.020	1.010	1.050	1.050	1.020	1.040	1.040	1.040	1.010
5.0	0.370	0.370	0.380	0.390	0.390	0.391	0.422	0.390	0.390	0.370
6.0	0.480	0.500	0.480	0.490	0.500	0.490	0.490	0.480	0.490	0.480
7.0	0.630	0.640	0.660	0.630	0.650	0.630	0.630	0.650	0.635	0.630
8.0	0.550	0.550	0.560	0.540	0.540	0.550	0.530	0.530	0.545	0.530
9.0	0.420	0.420	0.410	0.400	0.400	0.403	0.400	0.400	0.402	0.400
10.0	0.390	0.400	0.390	0.370	0.380	0.370	0.370	0.400	0.385	0.370
11.0	0.540	0.540	0.540	0.540	0.540	0.540	0.540	0.540	0.540	0.540

CHAMBER PART NO. 1U75161-01(918)
CHAMBER SERIAL NO. 0000005
ADAPTER PART NO. 1U77547-01(903)
ADAPTER SERIAL NO. 0000005

POSTFIRE MEASUREMENTS
INCHES

STATION (NO.)	DEGREE LOCATION 0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	MEDIAN	MINIMUM
1.0	0.789	0.805	0.836	0.826	0.779	0.798	0.808	0.789	0.802	0.779
2.0	0.705	0.753	0.783	0.710	0.751	0.732	0.757	0.745	0.748	0.705
3.0	0.680	0.720	0.767	0.660	0.670	0.670	0.660	0.650	0.670	0.650
4.0	0.830	0.780	0.790	0.780	0.760	0.770	0.770	0.760	0.775	0.760
5.0	0.140	0.120	0.110	0.110	0.130	0.130	0.130	0.120	0.125	0.110
6.0	0.480	0.529	0.507	0.523	0.540	0.520	0.490	0.505	0.514	0.480
7.0	0.590	0.640	0.630	0.610	0.650	0.633	0.610	0.580	0.620	0.580
8.0	0.513	0.513	0.522	0.532	0.526	0.525	0.523	0.513	0.523	0.513
9.0	0.382	0.373	0.380	0.361	0.359	0.366	0.369	0.371	0.370	0.359
10.0	0.314	0.342	0.342	0.331	0.324	0.342	0.350	0.323	0.337	0.314
11.0	0.419	0.395	0.398	0.391	0.378	0.389	0.386	0.401	0.393	0.378

3/31/93 07:39:52

TABLE 11

RSRM-26A IGNITER CHAMBER AND ADAPTER INSULATION PERFORMANCE

COMPLIANCE SAFETY FACTORS (CSF)

STATION (NO.)	DEGREE LOCATION 0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	MINIMUM	PLANE
1.0	3.66	2.96	3.48	3.23	3.52	3.64	3.79	3.52	2.96	60.0
2.0	3.22	3.87	3.87	3.17	3.69	3.43	3.49	3.60	3.17	150.0
3.0	3.19	3.56	3.78	2.87	2.96	2.96	2.87	2.78	2.78	330.0
4.0	3.99	3.82	4.17	3.40	3.17	3.67	3.40	3.28	3.17	180.0
5.0	1.50	1.38	1.28	1.24	1.33	1.33	1.18	1.28	1.18	270.0
6.0	+	+	+	+	+	+	+	+	99.90	0.0
7.0	15.72	+	20.97	31.45	+	+	31.45	8.99	8.99	330.0
8.0	13.78	13.78	13.42	63.75	36.43	20.40	72.86	30.00	13.42	90.0
9.0	10.29	8.32	13.03	10.03	9.54	10.57	12.61	13.48	8.32	60.0
10.0	4.79	6.28	7.58	9.33	6.50	13.00	18.20	4.73	4.73	330.0
11.0	3.74	3.12	3.18	3.03	2.79	2.99	2.94	3.25	2.79	180.0

SF= + INDICATES THAT NEGLIGIBLE MDD OCCURRED

ACTUAL SAFETY FACTORS (ASF)

STATION (NO.)	DEGREE LOCATION 0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	MINIMUM	PLANE
1.0	4.14	3.60	4.17	3.91	3.98	4.17	4.34	4.02	3.60	60.0
2.0	3.47	4.18	4.30	3.45	4.02	3.73	3.88	3.92	3.45	150.0
3.0	3.36	3.79	4.16	3.06	3.16	3.16	3.06	2.97	2.97	330.0
4.0	4.61	4.25	4.59	3.89	3.62	4.08	3.85	3.71	3.62	180.0
5.0	1.61	1.48	1.41	1.39	1.50	1.50	1.45	1.44	1.39	150.0
6.0	+	+	+	+	+	+	+	+	99.90	0.0
7.0	15.75	+	22.00	31.50	+	+	31.50	9.29	9.29	330.0
8.0	14.86	14.86	14.74	67.50	38.57	22.00	75.71	31.18	14.74	90.0
9.0	11.05	8.94	13.67	10.26	9.76	10.89	12.90	13.79	8.94	60.0
10.0	5.13	6.90	8.13	9.49	6.79	13.21	18.50	5.19	5.13	0.0
11.0	4.46	3.72	3.80	3.62	3.33	3.58	3.51	3.88	3.33	180.0

SF= + INDICATES THAT NEGLIGIBLE MDD OCCURRED

TABLE 11

RSRM-26A IGNITER CHAMBER AND ADAPTER INSULATION PERFORMANCE

MATERIAL DECOMPOSITION DEPTH (MDD)
(INCHES)

STATION (NO.)	DEGREE LOCATION 0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	MEDIAN	MAXIMUM
1.0	0.251	0.310	0.264	0.284	0.261	0.252	0.242	0.261	0.261	0.310
2.0	0.285	0.237	0.237	0.290	0.249	0.268	0.263	0.255	0.259	0.290
3.0	0.288	0.258	0.243	0.320	0.310	0.310	0.320	0.330	0.310	0.330
4.0	0.230	0.240	0.220	0.270	0.290	0.250	0.270	0.280	0.260	0.290
5.0	0.230	0.250	0.270	0.280	0.260	0.261	0.292	0.270	0.266	0.292
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	0.040	0.000	0.030	0.020	0.000	0.000	0.020	0.070	0.020	0.070
8.0	0.037	0.037	0.038	0.008	0.014	0.025	0.007	0.017	0.021	0.038
9.0	0.038	0.047	0.030	0.039	0.041	0.037	0.031	0.029	0.037	0.047
10.0	0.076	0.058	0.048	0.039	0.056	0.028	0.020	0.077	0.052	0.077
11.0	0.121	0.145	0.142	0.149	0.162	0.151	0.154	0.139	0.147	0.162

MATERIAL DECOMPOSITION RATE (MDR)
(MILS/SEC)

STATION (NO.)	DEGREE LOCATION 0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	AVERAGE
1.0	2.1	2.6	2.2	2.4	2.2	2.1	2.0	2.2	2.2
2.0	2.4	2.0	2.0	2.4	2.1	2.2	2.2	2.1	2.2
3.0	2.4	2.1	2.0	2.7	2.6	2.6	2.7	2.7	2.5
4.0	1.9	2.0	1.8	2.2	2.4	2.1	2.2	2.3	2.1
5.0	1.9	2.1	2.2	2.3	2.2	2.2	2.4	2.2	2.2
6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.0	0.3	0.0	0.2	0.2	0.0	0.0	0.2	0.6	0.2
8.0	0.3	0.3	0.3	0.1	0.1	0.2	0.1	0.1	0.2
9.0	0.3	0.4	0.2	0.3	0.3	0.3	0.3	0.2	0.3
10.0	0.6	0.5	0.4	0.3	0.5	0.2	0.2	0.6	0.4
11.0	1.0	1.2	1.2	1.2	1.3	1.3	1.3	1.2	1.2

MOTOR ACTION (EXPOSURE) TIME = 120.40 SEC

A MDR=0 INDICATES THAT MDR < .1 MIL/SEC

TABLE 12

RSRM-26B IGNITER CHAMBER AND ADAPTER INSULATION PERFORMANCE

MATERIAL DECOMPOSITION DEPTH (MDD)
(INCHES)

STATION (NO.)	DEGREE LOCATION 0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	MEDIAN	MAXIMUM
1.0	0.228	0.223	0.183	0.207	0.189	0.255	0.228	0.293	0.225	0.293
2.0	0.292	0.184	0.241	0.154	0.234	0.246	0.225	0.238	0.236	0.292
3.0	0.365	0.307	0.295	0.251	0.263	0.309	0.313	0.315	0.308	0.365
4.0	0.272	0.306	0.289	0.273	0.303	0.297	0.231	0.297	0.293	0.306
5.0	0.272	0.270	0.277	0.243	0.230	0.269	0.252	0.243	0.261	0.277
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	0.058	0.013	0.000	0.050	0.063	0.000	0.000	0.019	0.016	0.063
8.0	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.000	0.000	0.007
9.0	0.004	0.000	0.004	0.000	0.000	0.018	0.000	0.000	0.000	0.018
10.0	0.006	0.012	0.038	0.021	0.000	0.000	0.002	0.017	0.009	0.038
11.0	0.127	0.129	0.113	0.124	0.136	0.123	0.108	0.112	0.124	0.136

MATERIAL DECOMPOSITION RATE (MDR)
(MILS/SEC)

STATION (NO.)	DEGREE LOCATION 0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	AVERAGE
1.0	1.9	1.8	1.5	1.7	1.6	2.1	1.9	2.4	1.9
2.0	2.4	1.5	2.0	1.3	1.9	2.0	1.9	2.0	1.9
3.0	3.0	2.5	2.4	2.1	2.2	2.5	2.6	2.6	2.5
4.0	2.2	2.5	2.4	2.2	2.5	2.4	1.9	2.4	2.3
5.0	2.2	2.2	2.3	2.0	1.9	2.2	2.1	2.0	2.1
6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.0	0.5	0.1	0.0	0.4	0.5	0.0	0.0	0.2	0.2
8.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
9.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
10.0	0.0	0.1	0.3	0.2	0.0	0.0	0.0	0.1	0.1
11.0	1.0	1.1	0.9	1.0	1.1	1.0	0.9	0.9	1.0

MOTOR ACTION (EXPOSURE) TIME = 121.50 SEC

A MDR=0 INDICATES THAT MDR < .1 MIL/SEC

TABLE 12

RSRM-26B IGNITER CHAMBER AND ADAPTER INSULATION PERFORMANCE

COMPLIANCE SAFETY FACTORS (CSF)

STATION (NO.)	DEGREE LOCATION 0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	MINIMUM	PLANE
1.0	4.03	4.12	5.02	4.43	4.86	3.60	4.03	3.13	3.13	330.0
2.0	3.14	4.99	3.81	5.96	3.92	3.73	4.08	3.86	3.14	0.0
3.0	2.52	2.99	3.11	3.66	3.49	2.97	2.93	2.91	2.52	0.0
4.0	3.38	3.00	3.18	3.36	3.03	3.09	3.97	3.09	3.00	60.0
5.0	1.27	1.28	1.25	1.42	1.50	1.29	1.37	1.42	1.25	90.0
6.0	+	+	+	+	+	+	+	+	99.90	0.0
7.0	10.84	48.38	+	12.58	9.98	+	+	33.11	9.98	180.0
8.0	+	+	+	+	72.86	+	+	+	72.86	180.0
9.0	97.75	+	97.75	+	+	21.72	+	+	21.72	240.0
10.0	60.67	30.33	9.58	17.33	+	+	99.00	21.41	9.58	90.0
11.0	3.56	3.50	4.00	3.65	3.32	3.67	4.19	4.04	3.32	180.0

SF= + INDICATES THAT NEGLIGIBLE MDD OCCURRED

ACTUAL SAFETY FACTORS (ASF)

STATION (NO.)	DEGREE LOCATION 0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	MINIMUM	PLANE
1.0	4.83	4.81	5.78	5.18	5.38	4.17	4.37	3.73	3.73	330.0
2.0	3.37	5.32	4.06	6.42	4.22	3.98	4.43	4.18	3.37	0.0
3.0	2.73	3.25	3.35	3.98	3.76	3.23	3.16	3.17	2.73	0.0
4.0	3.90	3.46	3.61	3.83	3.51	3.65	4.52	3.61	3.46	60.0
5.0	1.42	1.50	1.43	1.66	1.70	1.51	1.62	1.61	1.42	0.0
6.0	+	+	+	+	+	+	+	+	99.90	0.0
7.0	11.55	51.62	+	13.64	10.94	+	+	35.53	10.94	180.0
8.0	+	+	+	+	77.14	+	+	+	77.14	180.0
9.0	99.00	+	99.00	+	+	23.72	+	+	23.72	240.0
10.0	68.33	32.58	10.76	19.43	+	+	99.00	24.24	10.76	90.0
11.0	4.25	4.19	4.78	4.35	3.97	4.39	5.00	4.82	3.97	180.0

SF= + INDICATES THAT NEGLIGIBLE MDD OCCURRED

TABLE 12

RSRM-26B IGNITER CHAMBER AND ADAPTER INSULATION PERFORMANCE

CHAMBER PART NO. 1U75162-01
CHAMBER SERIAL NO. 0000081
ADAPTER PART NO. 1U77392-01(902)
ADAPTER SERIAL NO. 0000007

PREFIRE MEASUREMENTS
INCHES

STATION	DEGREE LOCATION									
(NO.)	0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	MEDIAN	MINIMUM
1.0	1.102	1.073	1.058	1.073	1.016	1.064	0.997	1.092	1.069	0.997
2.0	0.984	0.978	0.978	0.988	0.988	0.978	0.997	0.995	0.986	0.978
3.0	0.995	0.998	0.988	0.998	0.988	0.998	0.988	1.000	0.997	0.988
4.0	1.060	1.059	1.043	1.045	1.064	1.083	1.045	1.073	1.059	1.043
5.0	0.386	0.405	0.395	0.404	0.392	0.405	0.407	0.391	0.400	0.386
6.0	0.508	0.502	0.504	0.518	0.519	0.512	0.508	0.505	0.508	0.502
7.0	0.670	0.671	0.669	0.682	0.689	0.674	0.672	0.675	0.673	0.669
8.0	0.534	0.530	0.524	0.541	0.540	0.532	0.540	0.560	0.537	0.524
9.0	0.446	0.408	0.417	0.417	0.401	0.427	0.418	0.443	0.418	0.401
10.0	0.410	0.391	0.409	0.408	0.385	0.389	0.397	0.412	0.403	0.385
11.0	0.540	0.540	0.540	0.540	0.540	0.540	0.540	0.540	0.540	0.540

CHAMBER PART NO. 1U75161-01(918)
CHAMBER SERIAL NO. 0000006
ADAPTER PART NO. 1U77547-01(903)
ADAPTER SERIAL NO. 0000006

POSTFIRE MEASUREMENTS
INCHES

STATION	DEGREE LOCATION									
(NO.)	0.0	60.0	90.0	150.0	180.0	240.0	270.0	330.0	MEDIAN	MINIMUM
1.0	0.874	0.850	0.875	0.866	0.827	0.809	0.769	0.799	0.839	0.769
2.0	0.692	0.794	0.737	0.834	0.754	0.732	0.772	0.757	0.756	0.692
3.0	0.630	0.691	0.693	0.747	0.725	0.689	0.675	0.685	0.690	0.630
4.0	0.788	0.753	0.754	0.772	0.761	0.786	0.814	0.776	0.774	0.753
5.0	0.114	0.135	0.118	0.161	0.162	0.136	0.155	0.148	0.142	0.114
6.0	0.508	0.533	0.531	0.548	0.537	0.542	0.532	0.510	0.533	0.508
7.0	0.612	0.658	0.678	0.632	0.626	0.684	0.721	0.656	0.657	0.612
8.0	0.534	0.544	0.540	0.564	0.533	0.567	0.575	0.570	0.554	0.533
9.0	0.442	0.432	0.413	0.430	0.447	0.409	0.465	0.460	0.437	0.409
10.0	0.404	0.379	0.371	0.387	0.419	0.393	0.395	0.395	0.394	0.371
11.0	0.413	0.411	0.427	0.416	0.404	0.417	0.432	0.428	0.417	0.404

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