Contract No.	NAS9-14476
DRL No.	T-967
Item No.	3
DRD No.	MA-384T
Vought Rpt. No.:	221RPN0533

CR 151185

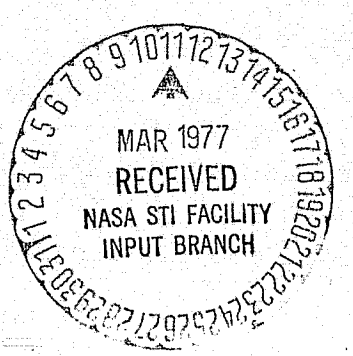
FINAL REPORT
FOR
Reinforced Carbon Carbon (RCC) Oxidation Resistant Material Samples - Baseline Coated, And Baseline Coated With Tetraethyl Orthosilicate (TEOS) Impregnation

Dated

7 January 1977

Submitted To

The National Aeronautics and Space Administration
Johnson Spacecraft Center
Houston, Texas



VOUGHT CORPORATION
P. O. Box 5907
Dallas, Texas 75222

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Houston, Texas

Written By: E. E. Gantz
E. E. Gantz
Test Project Engineer - LESS

Approved By: G. B. Whisenhunt
G. B. Whisenhunt
Program Manager - LESS

VOUGHT CORPORATION
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Dallas, Texas 75222

ABSTRACT

This report presents a description of the program for: (1) the fabrication of Reinforced Carbon Carbon (RCC) oxidation resistant plasma arc, combined environment and mechanical properties specimens for evaluation by the NASA, and (2) the silicon carbide coating of six NASA heater elements. The specimens provided included both baseline coated specimens as well as baseline coated/Tetraethyl Orthosilicate (TEOS) impregnated specimens.

All of the specimens were fabricated and processed in accordance with specification procedures accepted by the prime Shuttle Contractor for the fabrication and processing of the Leading Edge Structural Subsystem (LESS) elements for the Space Shuttle Orbiter.

TABLE OF CONTENTS

1.0 INTRODUCTION

This program was initiated by Vought Corporation on 2 December 1974 under Contract NAS9-14476. The program objective was twofold: (1) to provide Reinforced Carbon Carbon (RCC) material samples both baseline coated and baseline coated, Tetraethyl Orthosilicate (TEOS) impregnated for evaluation by the NASA Lyndon B. Johnson Space Center, and (2) to silicon carbide coat six NASA heater elements for evaluation by the Lyndon B. Johnson Space Center.

The (RCC) specimens were machined from 19 and 33 ply flat panels which were fabricated and processed in accordance with the specifications and procedures accepted by the prime Shuttle Contractor for the fabrication and processing of the Leading Edge Structural Subsystem (LESS) elements for the Space Shuttle Orbiter. The specimens were then baseline coated and TEOS impregnated, as applicable, in accordance with the procedures and requirements of the appropriate LESS production specifications.

Three heater bars were ATJ graphite silicon carbide coated with the Vought "pack cementation" coating process, and three were Stackpole Grade 2020 graphite silicon carbide coated with the chemical vapor deposition process (CVD) utilized by Vought in coating the LESS shell development program entry heater elements.

2.0 PROGRAM MATERIAL SUMMARY

The end items of this contract are the test samples and materials as specified in Paragraph 3.0 of the contract statement of work. A summary discussion of the items delivered with regard to the appropriate statement of work requirement follows:

2.1 RCC Baseline Coated Test Specimens

By Paragraph 3.1 of Reference (a), "a minimum of 130 RCC baseline coated specimens shall be supplied in a configuration mix of 1.0 in. to 3.0 in. diameter discs, and 0.8 in. x 2.8 in. to 1.4 in. x 6.5 in. bars. The specimens are to be fabricated from thin ply (19 ply) and thick ply (38 ply) panels. Approximately 10 of the 3.0 in. diameter discs are to be instrumented with three thermocouples each."

A total of 130 specimens were fabricated and shipped to the NASA in the configuration mix as outlined in Table 1.0, page 7. Table 1.0 also presents the specimen serial numbers and identifies the NASA center to which the various specimens were shipped.

As will be noted, additional specimen configurations were included and the specimen configuration mix varied somewhat from the requirements specified in Paragraph 3.1 of Reference (a). These adjustments were discussed with the NASA Technical Monitor on 13 May 1975 in a telephone conversation with Mr. E. E. Gantz of Vought.

Copies of the shipping papers for these specimens are the Certification Reports are presented in Enclosures (1) and (2).

2.2 Coated Graphite Heater Elements

Paragraph 3.2 of Reference (a) states, "The Contractor shall apply the 0.020 in. thick oxidation inhibited coating to the following (GFE) graphite heater elements: (a) six carbon strips, 29.875 in. x 1.850 in. x 0.136 in., (b) six carbon blocks, 1.375 in. x 1.75 in. x 0.875 in., and (c) six carbon pins, 5/16 in. diameter x 0.25 in."

Subsequent Vought experience in coating graphite indicated that Speer 890S graphite is not a suitable graphite for the Vought silicon carbide "pack cementation" coating process, and that ATJ graphite is the optimum graphite substrate for this process. Based on experience in coating the shell development program entry thermal heater bars, Vought strongly recommended that NASA coat their heater bars with the silicon carbide chemical vapor deposition coating.

TABLE 1.0

RCC SPECIMEN SUMMARY

Specimen Quantity	Specimen Part No.	Specimen Configuration	Specimen Serial Numbers	Remarks
RCC Baseline Coated Specimens				
2	221GT4027	Lug Specimen	9-7 and 9-8	Shipped to NASA/JSC
18	221GT4027	1 in. Dia Disc	7-37, 7-38, 7-39, 7-40, 7-29, 7-30, 7-31, 7-32, 7,33, 7-35, 7-36, 7-41, 7-42, 7-43, 7-44, 7-45, 7-46, 7-52	Shipped to NASA/JSC
4	221GT4027	1 in.x 5 in. Flex Bar	4-5-1, 4-6-1, 4-7-1, and 4-35	Shipped to NASA/JSC
9	221GT4027	1-1/2 in.x 6 in. Flex Bar	2-11, 2-26, 2-31, 6-35, 6-36, 6-37, 6-38, 6-39 6-48	Shipped to NASA/JSC
23	221GT4027	2.8 in. Dia Disc	3-18-1, 3-19-1, 3-20-1, 3-21-1, 3-48, 3-50, 3-51, 3-54, 3-55, 3-56, 3-57, 3-58, 3-59, 3-60, 3-61, 3-62, 3-63, 3-64, 3-65, 3-66, 3-67, 3-68, 3-69	Shipped to NASA/JSC
6	221GT4066	1 in.x 6 in. Flex Bar	032-022, 033-022, 033-024, 033-025, 033-026, 033-027	Shipped to NASA/JSC
3	221GT4066	2.8 in. Dia Disc	033-011, 033-009, 033-010	Shipped to NASA/JSC
11	221GT4066	1.5 in. Dia Disc	033-029, 033-030, 033-031, 033-032, 033-033, 033-034, 033-035, 033-036, 033-037, 033-038, 033-039	Shipped to NASA/JSC
41	221GT4066	1 in.x 1 in. Square	032-046, 032-047, 032-048, 032-049, 032-050, 032-051, 032-052, 032-053, 032-055, 032-056, 032-057, 032-058, 032-059, 032-060, 032-061, 032-064, 032-065, 032-066, 032-067, 032-068, 032-069, 032-071, 032-075, 032-076, 032-078, 032-080, 032-081, 032-082, 032-083, 032-084, 032-086, 032-087, 032-088, 032-089, 032-090, 032-091, 032-092, 032-093, 032-094, 032-062	Shipped to NASA/JSC
1	221GT4066	6 in.x 12 in. Panel	031-001	Shipped to NASA/JSC
6	221GT4066	1 in.x 6 in. Flexure Bar	032-013, 032-014, 032-017, 032-018, 032-019, 032-021	Shipped to NASA/Langley
6	221GT4066	2.8 in. Dia Disc -	031-002, 031-003, 031-004, 031-006, 031-007, 031-008	Shipped to NASA/JSC
RCC Baseline Coated, TEOS Impregnated Specimens				
20	-	2.8 in. Dia x 33 Ply RCC Disc	3-18-I, 3-19-I, 3-20-I, 3-21-I, 3-40, 3-48 3-50, 3-51, 3-56, 3-58, 3-59, 3-61, 3-62, 3-63, 3-64, 3-65, 3-66, 3-67, 3-68, 3-69	Shipped to NASA/JSC
2	-	1.5 in.x 6.5 in. x 33 Ply RCC Flexure Bar	2-11 and 2-26	Shipped to NASA/JSC
10	-	1.5 in.x 6.5 in.x 19 Ply RCC Flexure Bar	2-1-1, 2-2-1, 2-7, 2-8, 2-9, 2-10, 2-33, 2-34, 2-35, 2-36	Shipped to NASA/JSC
18	-	2.8 in. Dia x 19 Ply RCC Disc	3-14-1, 3-19, 009, 011, 3-13, 3-14, 3-15, 3-17, 3-70, 3-71, 3-72, 3-73, 3-74, 3-76, 3-77, 3-78, 3-80, 3-81	Shipped to NASA/JSC
9	221GT4067	NASA Mass Loss Specimens-19 Ply	NO39P-1 thru N039P-9	Shipped to NASA/JSC
9	221GT4067	NASA Mass Loss Specimens-33 Ply	NO40P-1 thru NO40P-9	Shipped to NASA/JSC

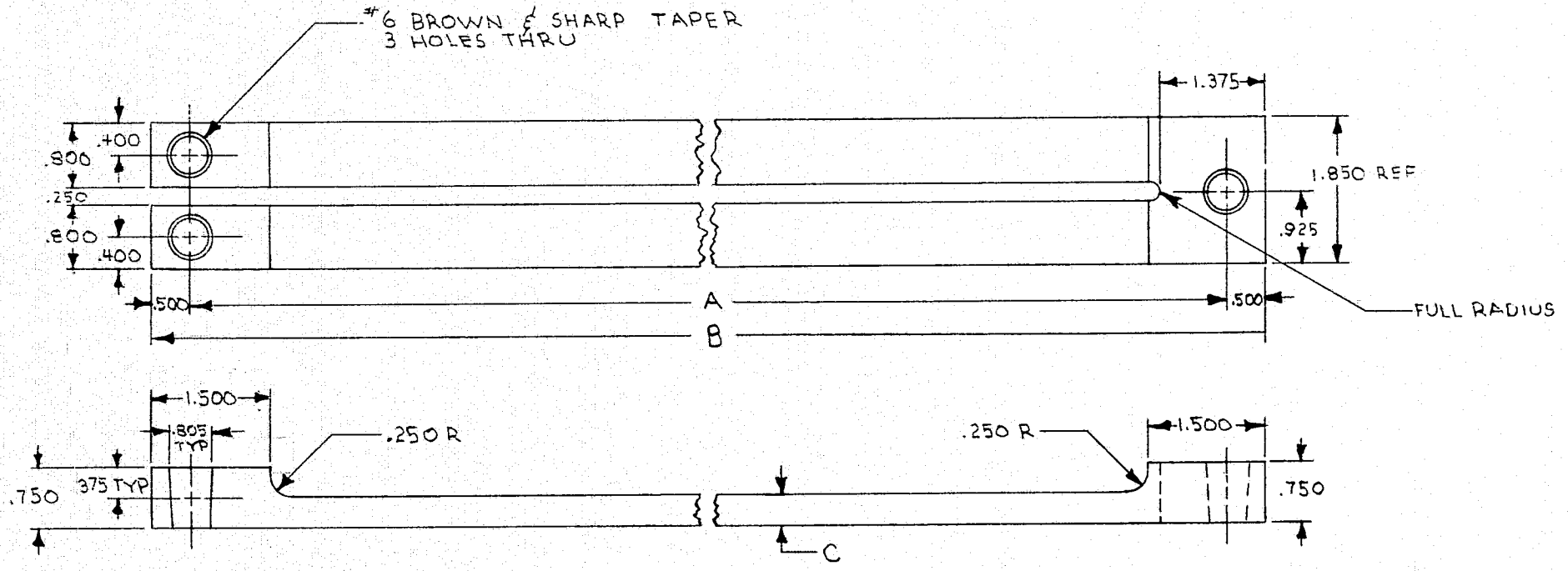
To gather data with which to substantiate the predicted characteristics of the "pack cementation", a coating system on Speer 890S graphite, NASA delivered two heater elements to Vought which were cut into small specimens and coated. The coating thickness was very irregular - the coating disappearing completely at the corners of the specimens. The coating bond to the graphite was also extremely fragile and the graphite had eroded severely in the areas of coating discontinuity.

Based on these test data, it was agreed with the NASA Technical Monitor that the existing NASA heater bars would not be coated with the Vought silicon carbide "pack cementation" process as specified in the contract. Instead, three NASA (-5) configuration heater bars (Figure 1.0, Page 9), of ATJ graphite would be silicon carbide coated with the Vought "pack cementation" process, and three (-5) configuration bars of Stackpole Grade 2020 graphite would be silicon carbide coated with the chemical vapor deposition process by the Materials Technology Corporation of Garland, Texas. Vought would supply the graphite to NASA/JSC, NASA would machine the elements, and Vought would be responsible for coating the bars. The length of the bar would be limited to 28 in. maximum by the diameter of the Materials Technology Corporation coating reactor. The CVD applied coating thickness would be 0.010 in. applied in two 0.005 in. passes. The bar supports would be repositioned for the second pass to preclude pin holes through the coating at the support points.

NASA completed machining of the six bars to the NASA (-5) heater bar configuration and shipped them to Dallas on 4 December 1976. One bar was fractured at Materials Technology Corporation during coating. The failure was reported to the NASA technical monitor. He instructed Vought to ship the bar "as is".

The bars were coated and shipped to NASA/JSC on 27 January 1976. Copies of the shipping papers are presented in Enclosure (3).

On arrival of the six bars at NASA/JSC, all were broken. As replacements, Vought machined 2 additional bars of Stackpole graphite Grade 2020, had them CVD coated by Materials Technology Corporation, and "hand carried" them to NASA/JSC on 13 April 1976.



DASH NO.	DIM A	DIM B	DIM C
-1	72.000	73.000	.420±.004
-3	48.000	49.000	.182± .003
-5	17.000	19.00	.270±.003

FIGURE 1.0

NASA / JSC HEATER ELEMENT CONFIGURATION

2.3 NASA Mass Loss Specimens - RCC Baseline Coated and TEOS Impregnated

By Paragraph 3.1.6 of Reference (a), "18 specimens shall be supplied to the configuration shown in Figure 2.0, page 11. Nine shall be cut from one 12 in. x 16 in. x 33 ply panel, and 9 shall be cut from a 12 in. x 16 in. x 19 ply panel. The specimens shall be baseline coated and TEOS impregnated. "

The specimens were shipped to NASA/JSC on 21 December 1976. Copies of the shipping papers, and the Certification Report are presented in Enclosure (5).

2.4 RCC BASELINE COATED AND TEOS IMPREGNATED TEST SPECIMENS

By Reference (b), the contract statement of work was revised with the addition of Paragraph 3.3 to the TEOS impregnation of 50 RCC baseline coated specimens. The specimens were to be government furnished in the following mix.

a. 20 - 3" diameter disc (33 ply)

b. 18 - 3" diameter disc (19 ply)

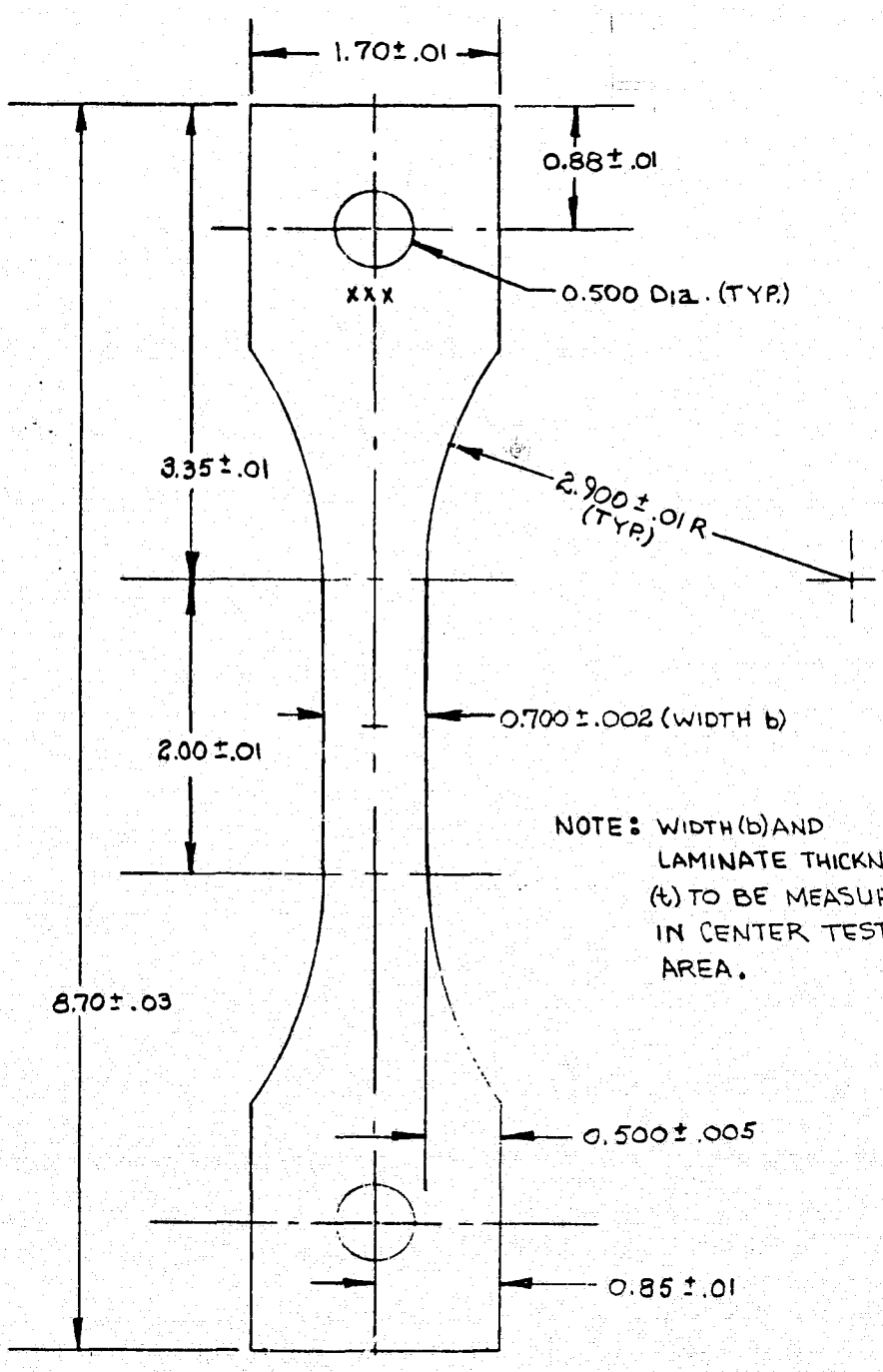
c. 10 - 1 1/2 in. 6 1/2 in. bar (19 ply)

d. 2 - 1 1/2 in. x 6 1/2 in. bar (33 ply)

The TEOS was to be applied using the same processes defined in specifications accepted by the prime Shuttle Contractor.

The specimens were received on 5 October 1976, TEOS Impregnated, and shipped to NASA/JSC on 7 December 1976. Copies of the shipping papers and certification documentation are presented in Enclosure (4). The specimens are identified by configuration and serial number in Table 1.0, page 7.

NASA RCC MASS LOSS SPECIMEN CONFIGURATION



SIMULTANEOUS CONDITIONING SPECIMEN
(FOR EXPOSURE)

FIGURE 2.C

REFERENCES

(a) Exhibit A Statement of Work, "Reinforced Oxidation Resistant Carbon-Carbon (RCC) Material Samples and Graphite Heater Elements", dated 2 December 1974.

(b) Revision of Exhibit A Statement of Work, "Reinforced Oxidation Resistant Carbon-Carbon (RCC) Material Samples and Graphite Heater Elements", dated 2 September 1976.

LIST OF TABLES

LIST OF FIGURES

ENCLOSURE (1)

TEST SPECIMEN SHIPPING PAPERS

AND CERTIFICATION DOCUMENTS - RCC

BASELINE COATED TEST SPECIMENS

CONTRACT NAS9-14476

Report NO. 221RPN0533
Enclosure (1)
Page 2 of 20

SECURITY CLASSIFICATION
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LTV AEROSPACE CORPORATION
P.O. BOX 5907
DALLAS, TEXAS 75222

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NASA Lyndon B. Johnson Space Center
Houston, Texas 77058

DATE 10 April 1975 NUMBER RFS-RCC-69

YOUR INVOICE	DATED	AMOUNT	REC. REPORT
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INSPECTION REQUIRED: ☒ LTV ☐ GOV'T. ☐ CUST. MATERIAL CLASS: ☐ HAZARDOUS ☒ NON-HAZARDOUS

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			NAS9-14476		2636 AAAA

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
1.	2 ea.	221GT4027	Lug Specimens - Serial Nos.: 9-7 & 9-8	N/A	N/A
2.	18 ea.	221GT4027	1 In. Dia. Discs - Serial Nos.: 7-29, 7-30, 7-31, 7-32, 7-33, 7-35, 7-36, 7-37, 7-38, 7-39, 7-40, 7-41, 7-42, 7-43, 7-44, 7-45, 7-46, 7-52	N/A	N/A
3.	23 ea.	221GT4027	2.8 In. Dia. Discs - Serial Nos.: 3-18-I, 3-19-I, 3-20-I, 3-21-I, 3-48, 3-50, 3-51, 3-54, 3-55, 3-56, 3-57, 3-58, 3-59, 3-60, 3-61, 3-62, 3-63, 3-64, 3-65, 3-66, 3-67, 3-68, 3-69	N/A	N/A

INSPECTION LTV	INSPECTION CUST	LAYOUT LTV	LAYOUT CUST	PRESERVATION LTV	PRESERVATION CUST	PACKING LTV	PACKING CUST

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			NAS9-14476	2636 AAAA

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
4.	4 ea.	221GT4027	1 x 5 Flex Bars - Serial Nos.: 4-5-1, 4-6-1, 4-7-1, 4-35	N/A	N/A
5.	9 ea.	221GT4027	1½ x 6 Flex Bars - Serial Nos.: 2-11, 2-26, 2-31, 6-35, 6-36, 6-37, 6-38, 6-39, 6-48	N/A	N/A
6.	3 Copies		Quality Control NDE and Test Logs and Certification Report	N/A	N/A

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INSPECTION LTV	INSPECTION CUST	LAYOUT LTV	LAYOUT CUST	PRESERVATION LTV	PRESERVATION CUST	PACKING LTV	PACKING CUST

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NASA COATED CARBON TEST SAMPLES

DOCUMENTATION PACKAGE

CONTRACT NAS9-14476

VOUGHT SYSTEMS DIVISION
LTV AEROSPACE CORPORATION
P. O. BOX 5907
DALLAS, TEXAS 75222

This certifies that the RCC test specimens listed herein conform to the requirements of Contract NAS 9-14476 with the exceptions noted in the Deviation Summary.

Test reports and acceptance data are on file and are subject to examination on request.

G. F. Bentinck 4/11/75

G. F. Bentinck Date
Quality Program Manager
Leading Edge Structural
Subsystem

TABLE OF CONTENTS

NONDESTRUCTIVE TEST RESULTS

RCC specimens included in this shipment have been subjected to radiographic examination and ultrasonic inspection per Process Specifications 208-7-40 and 208-7-41 and accepted.

Coating thickness has been verified by eddy current technique and has been accepted with deviations noted in Deviation Summary.

TEST DATA SUMMARY

	REQUIRED
• FLEX TEST	
As coated 14,247 - 14,731 psi	13,000 psi min.
Furnace cycled 13,100 - 15,705 psi	13,000 psi min.
• FURNACE CYCLE % WEIGHT CHANGE	
-.06 to +.30 percent	-1% max.
• PLASMA TEST MASS LOSS	
.78 to 1.61 x 10^{-5} lbs. ft. sq.	4.0 x 10^{-5} max.

DEVIATION SUMMARY

1. Specimens 014-2-26, 014-4-6-I, and 026-6-36 do not have .03 radius on edges (LDS 65063).

2. Specimens have spots in coating and/or discoloration of coating (LDS 63837, 63842, 63840).

S/N	S/N	S/N
014-2-26	017-3-60	026-7-36
2-31	3-61	7-37
4-6-I	3-63	7-39
6-48	3-64	7-42
7-52	026-2-11	7-45
015-9-7	6-35	
9-8	6-36	
016-3-48	6-37	
3-50		
3-54		
3-55		

3. Ink markings came through coating (LSD 63837).

4. Temperature lagging time requirements of specification during coating cycle (LDS 63833).

5. Specimens 015-9-7 and 015-9-8 have coating thickness to .044 in. - Exceeds spec. max. of .040 in. (MRA 043694).

SERIAL NUMBER LISTING

PNL 014	PNL 015	PNL 016
2-26	4-5-I	3-48
2-31	9-7	50
6-48	9-8	51
4-6-I		54
4-7-I		55
4-35		56
7-52		

PNL 017	PNL 026
3-18-I	2-11
19-I	6-35
20-I	36
21-I	37
57	38
58	39
59	
60	7-29
61	30
62	31
63	32
64	33
65	35
66	36
67	37
68	38
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Enclosure (1) to Report No. 221RPN0533

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☒ MISCELLANEOUS (EXPLAIN) Test Specimens

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Houston, Texas / Air			
REJ. REPORT NO.	OUR PO NUMBER	STORES REQ.	GOV'T CONTRACT NO. / ORDER NO.
			NAS9-14476 / 2636-AAAA

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
1	6 ea.	221GT 4066	1 In. x 6 In. Flexure Bars - Ser. Nos.: 032-022, 033-023, 033-024, 033-025, 033-026, 033-027	N/A	N/A
2	3 ea.	221GT 4066	2.8 In. Dia. Discs (Un-instrumented) Serial Nos.: 033-011, 033-010, 033-009	N/A	N/A
~~3~~	~~6 ea.~~	~~221GT 4066~~	~~2.8 In. Dia. Discs (Instrumented)~~ Serial Nos.: ~~031-003, 031-006, 031-004, 031-007, 031-002, 031-008~~	N/A	N/A
4	11 ea.	221GT 4066	1.5 In Dia. Discs - Ser. Nos.: 033-029, 033-030, 033-031, 033-032, 033-033, 033-034, 033-035, 033-036, 033-037, 033-038, 033-039	N/A	N/A

INSPECTION LTV	INSPECTION CUST	LAYOUT LTV	LAYOUT CUST	PRESERVATION LTV	PRESERVATION CUST	PACKING LTV	PACKING CUST

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(Continued)

Contr. Item No.	Qty.	Part No.	Description	Unit Price	Total Amount
5	41 ea.	221GT 4066	1 In. x 1 In. Squares - Ser. Nos.: 032-046 032-061 032-082 032-047 032-064 032-083 032-048 032-065 032-084 032-049 032-066 032-086 032-050 032-067 032-087 032-051 032-068 032-088 032-052 032-069 032-089 032-053 032-071 032-090 032-055 032-072 032-091 032-056 032-075 032-092 032-057 032-076 032-093 032-058 032-078 032-094 032-059 032-080 032-062 032-060 032-081	N/A	N/A
6	1 ea.	221GT 4066	6 In. x 12 In. Panel - Ser. No. 031-001	N/A	N/A
7	3 copies	221GT 4066	Quality Control NDE and Test Logs and Certification Report	N/A	N/A

NASA TEST SPECIMENS

DOCUMENTATION PACKAGE

CONTRACT NAS9-14476

VOUGHT SYSTEMS DIVISION
LTV AEROSPACE CORPORATION
P. O. BOX 5907
DALLAS, TEXAS 75222

This certifies that the RCC test specimens listed herein conform to the requirements of Contract NAS9-14476 with the exceptions noted in the Deviation Summary.

Test reports and acceptance data are on file and are subject to examination on request.

F. J. Patterson 17 July 1975

F. J. Patterson
Quality Program Manager
Leading Edge Structural
Subsystem

Date

TABLE OF CONTENTS

NONDESTRUCTIVE TEST RESULTS

RCC specimens included in this shipment have been subjected to radiographic examination and ultrasonic inspection per Process Specification 208-7-40 and 208-7-41 and accepted.

Coating thickness has been verified by Eddy Current technique and has been accepted with deviations noted in Deviation Summary.

TEST DATA SUMMARY

	ACTUAL	REQUIRED
• FLEX TEST		
As coated	12638 PSI	12042 PSI minimum
Furnace cycled	13147 PSI	11133 PSI minimum
• FURNACE CYCLED % WEIGHT CHANGE		
-0.39 to -0.90 Percent		-1% maximum
• PLASMA TEST MASS LOSS		
1.62 to 2.39 x 10^{-5} lbs. ft. sq.		4.0 x 10^{-5} maximum

DEVIATION SUMMARY

1. All specimens have darker color, brownish, on mold side than normal (Ref. LDS #72977).

2. 1.5" dia. discs S/N #033-045 has white ditto mark on bag surface .3" long (Ref. LDS #72965).

3. Specimens S/N's 033-35 and 033-36 have coating thickness below specification limit. Thickness should be .020 - .040. Specimens measure:

033-35	.019 mold side	.024 bag side
033-36	.019 mold side	.025 bag side

Reference MRA 0053542.

SERIAL NUMBER LISTING

1 In. x 6 In. Flexture Bars - Serial No.'s:

032-022	033-026
033-023	033-027
033-024	
033-025	

2.8 In. Dia. Discs (Uninstrumented) - Serial No.'s:

033-011	033-010
033-009	

1.5 In. Dia. Discs - Serial No.'s:

033-029	033-035
033-030	033-036
033-031	033-037
033-032	033-038
033-033	033-039
033-034	

1 In. x 1 In. Squares - Serial No.'s:

032-046	032-061	032-082
032-047	032-064	032-083
032-048	032-065	032-084
032-049	032-066	032-086
032-050	032-067	032-087
032-051	032-068	032-088
032-052	032-069	032-089
032-053	032-071	032-090
032-055	032-072	032-091
032-056	032-075	032-092
032-057	032-076	032-093
032-058	032-078	032-094
032-059	032-080	032-062
032-060	032-081	

6 In. x 12 In. Panel - Serial No.:

031-001

Enclosure (1) to Report
No: 221RPN0533
Page: 20 of 20

SECURITY CLASSIFICATION
☐ TOP SECRET ☐ CONFIDENTIAL
☐ SECRET ☒ UNCLASSIFIED
☐ CONFIDENTIAL - MODIFIED HANDLING
CHECK ONE

(TYPE IN DIVISION NAME)
Vought Systems Division
LTV Aerospace Corporation
P.O. Box [illegible] 7
Dallas, Texas 75222

☒ SHIPPING REQUEST
☐ SHIPPING MEMO
☐ DEBIT MEMO

SHIP TO
National Aeronautics & Space Adm.
Langley Research Center
Hampton, Virginia 23665

Attn: Mr. Donald Rummler
Mail Stop 188B

DATE 11 July 1975 NUMBER RFS-RCC-80

YOUR INVOICE	DATED	AMOUNT	REC. REPORT

☐ RETURNED FOR CREDIT
☐ RETURNED FOR CREDIT AND REPLACEMENT
☐ REPAIR OR REWORK AT VENDOR'S EXPENSE
☐ REPAIR OR REWORK AT OUR EXPENSE
☐ REPAIR OR REPLACEMENT COVERED BY GUARANTEE
☐ MISCELLANEOUS (EXPLAIN) Test Specimens

CHARGE TO

INSPECTION REQUIRED: ☒ LTV ☐ GOV'T. ☐ CUST. MATERIAL CLASS: ☐ HAZARDOUS ☒ NON-HAZARDOUS

REFER TO:	ACCOUNT NO.	DELIVERY DATE DUE	YOUR PO NUMBER
Paragraph 3.1 of S.O.W.		ASAP	

F. O. B. / VIA	B/L NO.		TERMS
Hampton, Virginia Air Mail		☒ PREPAID ☐ COLLECT	

REJ. REPORT NO.	OUR PO NUMBER	STORES REQ.	GOV'T CONTRACT / ORDER NO.	G. O. NUMBER
			NAS9-14476	2636-AAAA

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
1	6 ea	221GT 4066	1 In. x 6 In. Flexure Bars - Ser. Nos.: 032-013 032-014 032-017 032-018 032-019 032-021	N/A	N/A

INSPECTION LTV	INSPECTION CUST	LAYOUT LTV	LAYOUT CUST	PRESERVATION LTV	PRESERVATION CUST	PACKING LTV	PACKING CUST

BOX NO.	TYPE	LGTH	WIDTH	HT.	GROSS WT.

AUTHORIZED IN ACCORDANCE WITH AER. S.P. 441.1

G. B. Wrisenhunt
SIGNATURE

NAME (TYPE)	UNIT	EXT.
G. B. Wrisenhunt	2-16000	7722

FOR SHIPPING USE ONLY

CHECK	M.T.P.B.	COMM. INV.	SHIP. MEMO	DATE SHIPPED

REQUEST FOR SHIPMENT

ENCLOSURE (2)

TEST SPECIMEN SHIPPING PAPERS AND
CERTIFICATION DOCUMENTS - RCC BASELINE
COATED TEST SPECIMENS.

NAS 9 - 14476

SECURITY CLASSIFICATION
☐ TOP SECRET ☐ CONFIDENTIAL
☐ SECRET ☒ UN-CLASSIFIED
☐ CONFIDENTIAL - MODIFIED HANDLING
CHECK ONE

(TYPE IN DIVISION NAME)
Vought Systems Division
LTV Aerospace Corporation
P.O. Box 5907
Dallas, Texas 75222

Enclosure (2) to Report No: 221RPN0533

☒ SHIPPING REQUEST
☐ SHIPPING MEMO
☐ DEBIT MEMO

SHIP TO
Transportation Officer
NASA Lyndon B. Johnson Space Center
Houston, Texas 77058

Mark for: Accountability Property Officer 807402

Mark With: Purchase Req. No. 4-266-020
Contract # NAS9-14476

CHARGE TO
For Reissue To: D. J. Tillian, ES11, Bldg. 420

DATE 21 July 1975 NUMBER RFS-RCC-81

YOUR INVOICE	DATED	AMOUNT	REC. REPORT

☐ RETURNED FOR CREDIT
☐ RETURNED FOR CREDIT AND REPLACEMENT
☐ REPAIR OR REWORK AT VENDOR'S EXPENSE
☐ REPAIR OR REWORK AT OUR EXPENSE
☐ REPAIR OR REPLACEMENT COVERED BY GUARANTEE
☒ MISCELLANEOUS (EXPLAIN) Test Specimens

INSPECTION REQUIRED: ☒ LTV ☐ GOV'T. ☐ CUST. MATERIAL CLASS: ☐ HAZARDOUS ☐ NON-HAZARDOUS

REFER TO:	ACCOUNT NO.	DELIVERY DATE DUE	YOUR PO NUMBER
Paragraph 3.1 of S.O.W.		ASAP	

F. O. B.	VIA	B/L NO.		TERMS
Houston, Texas	AIR		☒ PREPAID ☐ COLLECT	

REJ. REPORT NO.	OUR PO NUMBER	STORES REQ.	GOV'T CONTRACT	ORDER NO.	G. O. NUMBER
			NAS9-14476		2636-AAAA

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
1	6 ea.	221GT4066	2.8 In. Dia. Discs (Instrumented) Serial Nos: 031-002 031-003 031-004 031-006 031-007 031-008	N/A	N/A

INSPECTION		LAYOUT		PRESERVATION		PACKING	
LTV	CUST	LTV	CUST	LTV	CUST	LTV	CUST

BOX NO.	TYPE	LGTH	WIDTH	HT.	GROSS WT.

AUTHORIZED IN ACCORDANCE WITH AER. S.P. 441.1
G. B. Whisenhunt
SIGNATURE
G. B. Whisenhunt 2-16000 7722
NAME (TYPE) UNIT EXT.

FOR SHIPPING USE ONLY

CHECK	M.I.R.R.	COMM. INV.	SHIP. MEMO	DATE SHIPPED

REQUEST FOR SHIPMENT 0-67574 R2

NASA TEST SPECIMENS
DOCUMENTATION PACKAGE
CONTRACT NAS9-14476

VOUGHT SYSTEMS DIVISION
LTV AEROSPACE CORPORATION
P.O. BOX 5907
DALLAS, TEXAS 75222

This certifies that the RCC test specimens listed herein conform to the requirements of Contract NAS9-14476 with the exceptions noted in the Deviation Summary.

Test reports and acceptance data are on file and are subject to examination on request.

F. J. Patterson
Quality Program Manager
Leading Edge Structural
Subsystem

26 August 1975
Date

TABLE OF CONTENTS

NONDESTRUCTIVE TEST RESULTS

RCC specimens included in this shipment have been subjected to radiographic examination and ultrasonic inspection per Process Specification 208-7-40 and 208-7-41 and accepted.

Coating thickness has been verified by Eddy Current technique and has been accepted.

TEST DATA SUMMARY

	ACTUAL	REQUIRED
• FLEX TEST		
As coated	12638 PSI	12042 PSI Minimum
Furnace cycled	13147 PSI	11133 PSI Minimum
• FURNANCE CYCLED % WEIGHT CHANGE		
	-0.39 to -0.90 Percent	-1% Maximum
• PLASMA TEST MASS LOSS		
	1.62 to 2.39 x 10^{-5} lbs. ft. sq.	4.0 x 10^{-5} Maximum

DEVIATION SUMMARY

1. All specimens have darker color, brownish, on mold side than normal (Ref. LDS #72977).

SERIAL NUMBER LISTING

2.8 In. Dia. Discs (Instrumented)

031-002
031-003
031-004
031-005
031-006
031-007
031-008

ENCLOSURE (3)

SHIPPING PAPERS -

SILICON CARBIDE COATED NASA

HEAT ELEMENTS

CONTRACT NAS 9 - 14476

SECURITY CLASSIFICATION
☐ TOP SECRET ☐ CONFIDENTIAL
☐ SECRET ☒ UN-CLASSIFIED
☐ CONFIDENTIAL - MODIFIED HANDLING
CHECK ONE

(TYPE IN DIVISION NAME)
VOUGHT CORPORATION
SYSTEMS DIVISION
P.O. Box 5907
Dallas, Texas 75222

Enclosure (3) to Report
No: 221RPN0533
Page: 2 of 2
☒ SHIPPING REQUEST
☐ SHIPPING MEMO
☐ DEBIT MEMO

SHIP TO: Transportation Officer
NASA Lyndon B. Johnson Space Center
Houston, Texas 77058

DATE 27 Jan. 1976 NUMBER RFS-RCC-99

Mark for: Accountability Property Officer 807402

YOUR INVOICE	DATED	AMOUNT	REC. REPORT

Mark with: Purchase Reg. No. 4-266-020
Contract No. NAS9-14476

CHARGE TO: For Reissue to: D. J. Tillian, ES11, Bldg. 420

(Ship in "as is" condition - No inspection required)

INSPECTION REQUIRED: ☐ LTV ☐ GOV'T. ☐ CUST.

☐ RETURNED FOR CREDIT
☐ RETURNED FOR CREDIT AND REPLACEMENT
☐ REPAIR OR REWORK AT VENDOR'S EXPENSE
☐ REPAIR OR REWORK AT OUR EXPENSE
☐ REPAIR OR REPLACEMENT COVERED BY GUARANTEE
☒ MISCELLANEOUS (EXPLAIN) Silicon carbide coated graphite heater bars

REFER TO:	DELIVERY DATE DUE	YOUR PO NUMBER
Paragraph 3.2 of S.O.W.		

F. O. B.	VIA	B/L NO.		TERMS
Houston, Texas	AIR		☒ PREPAID ☐ COLLECT	

REJ. REPORT NO.	OUR PO NUMBER	STORES REQ.	GOV'T CONTRACT	ACCT NO	G. O. NUMBER
					2636 AAAA

ITEM	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
1	6		Silicon Carbide Coated Heater Bars: 3 Bars - Vought Corporation Silicon Carbide Pack Cementation Coating - .020 in. thick (1ATJ Graphite Bar & 2 Stackpole 2020 Graphite Bars) 3 Bars - CVD Silicon Carbide Coating - .010 in. thick (Stackpole 2020 Graphite Bars)	N/A	N/A

NOTE: These heater bars are "CRITICALLY FRAGILE" items - Class AA and should be packaged for shipment accordingly.

INSPECTION		LAYOUT		PRESERVATION		PACKING	
LTV	CUST	LTV	CUST	LTV	CUST	LTV	CUST

BOX NO.	TYPE	LGTH	WIDTH	HT.	GROSS WT.

AUTHORIZED
SIGNATURE
G. B. Whisenhunt 2-16000 7722
NAME (TYPE) UNIT EXT.

FOR SHIPPING USE ONLY

CHECK	M.I.R.R.	COMM. INV.	SHIP. MEMO	DATE SHIPPED

REQUEST FOR SHIPMENT 0-67574

ENCLOSURE (4)

SHIPPING PAPERS AND CERTIFICATION DOCUMENTS - RCC BASELINE COATED AND TEOS IMPREGNATED TEST SPECIMENS

SECURITY CLASSIFICATION
[ ] TOP SECRET [ ] CONFIDENTIAL
[ ] SECRET [X] UN-CLASSIFIED
[ ] CONFIDENTIAL - MODIFIED HANDLING
CHECK ONE

(TYPE IN DIVISION NAME)
Vought Corporation
Systems Division
P. O. Box 5907
Dallas, Texas 75222

[X] SHIPPING REQUEST
[ ] SHIPPING MEMO
[ ] DEBIT MEMO

SHIP TO
National Aeronautics & Space Administration
Johnson Space Center
1720 NASA Road 1
Houston, Texas 77058

DATE 7 December 1976 NUMBER RFS-RCC-119

YOUR INVOICE	DATED	AMOUNT	REC. REPORT

CHARGE TO
Mark For: Accountability Property Officer 807402
Mark With: Purchase Req. No. 4-266-020
Contract No. NAS9-14476
For Reissue to: D. J. Tillian, ES11, Bldg. 420

[ ] RETURNED FOR CREDIT
[ ] RETURNED FOR CREDIT AND REPLACEMENT
[ ] REPAIR OR REWORK AT VENDOR'S EXPENSE
[ ] REPAIR OR REWORK AT OUR EXPENSE
[ ] REPAIR OR REPLACEMENT COVERED BY GUARANTEE
[X] MISCELLANEOUS (EXPLAIN) Test Specimens

Test Specimens - No Inspection Required

INSPECTION REQUIRED: [ ] LTV [ ] GOV'T. [ ] CUST.
MATERIAL CLASS: [ ] HAZARDOUS [X] NON-HAZARDOUS

REFER TO:	ACCOUNT NO.	DELIVERY DATE DUE	YOUR PO NUMBER
Paragraph 3.3 of S.O.W.			

F. O. B. VIA	B/L NO.		TERMS
Houston, Texas Air Parcel Post		[X] PREPAID [ ] COLLECT	

REJ. REPORT NO.	OUR PO NUMBER	STORES REQ.	GOV'T CONTRACT ORDER NO.	G. O. NUMBER
			NAS9-14476	2636 AAAA

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
1.	20 ea	-	2.8 in. Dia x 33 ply RCC Disc - Baseline Coated & TEOS Impregnated. Serial Nos.: 3-18-I 3-50 3-62 3-68 3-19-I 3-51 3-63 3-69 3-20-I 3-56 3-64 3-21-I 3-58 3-65 3-40 3-59 3-66 3-48 3-61 3-67		
2.	2 ea	-	1.5 in. x 6.5 x 33 ply RCC Flexure Bar Specimen, Baseline Coated & TEOS Impregnated. Serial Nos.: 2-11 2-26		

INSPECTION LTV	INSPECTION CUST	LAYOUT LTV	LAYOUT CUST	PRESERVATION LTV	PRESERVATION CUST	PACKING LTV	PACKING CUST

BOX NO.	TYPE	LGTH	WIDTH	HT.	GROSS WT.

AUTHORIZED IN ACCORDANCE WITH AER. S.P. 441.1

G. B. Whisenhunt
SIGNATURE

G. B. Whisenhunt 2-16000 7722
NAME (TYPE) UNIT EXT.

FOR SHIPPING USE ONLY

CHECK	M.I.R.R.	COMM. INV.	SHIP. MEMO	DATE SHIPPED

REQUEST FOR SHIPMENT 0-87574 R2

SECURITY CLASSIFICATION — (TYPE IN DIVISION NAME)

[ ] TOP SECRET [ ] CONFIDENTIAL
[ ] SECRET [ ] UN-CLASSIFIED
[ ] CONFIDENTIAL - MODIFIED HANDLING
CHECK ONE

[ ] SHIPPING REQUEST
[ ] SHIPPING MEMO
[ ] DEBIT MEMO

SHIP TO

DATE 7 December 1976 NUMBER RFS-RCC-119

YOUR INVOICE	DATED	AMOUNT	REC. REPORT

CHARGE TO

[ ] RETURNED FOR CREDIT
[ ] RETURNED FOR CREDIT AND REPLACEMENT
[ ] REPAIR OR REWORK AT VENDOR'S EXPENSE
[ ] REPAIR OR REWORK AT OUR EXPENSE
[ ] REPAIR OR REPLACEMENT COVERED BY GUARANTEE
[ ] MISCELLANEOUS (EXPLAIN)

INSPECTION REQUIRED: [ ] LTV [ ] GOV'T. [ ] CUST. MATERIAL CLASS: [ ] HAZARDOUS [ ] NON-HAZARDOUS

REFER TO:	ACCOUNT NO.	DELIVERY DATE DUE	YOUR PO NUMBER
F.O.B. / VIA	B/L NO.	PREPAID / COLLECT	TERMS
REJ. REPORT NO. / OUR PO NUMBER	STORES REQ.	GOV'T CONTRACT / ORDER NO.	G. O. NUMBER

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
3.	4 ea	-	2.8 in. Dia x 19 ply RCC Disc - Baseline Coated and TEOS Impregnated. Serial Nos.: 3-14-1 3-19 009 011		
4.	10 ea	-	1.5 in. x 6.5 in. x 19 Ply RCC Flexure Bar Specimen, Baseline Coated and TEOS Impregnated - Serial Nos.: 2-1-1 2-8 2-33 2-36 2-2-1 2-9 2-34 2-7 2-10 2-35		
			- LOT PRICE		$5,904.00
5.	3 cc		Certification Report No. 221RPN0526		

INSPECTION		LAYOUT		PRESERVATION		PACKING	
LTV	CUST	LTV	CUST	LTV	CUST	LTV	CUST

BOX NO.	TYPE	LGTH	WIDTH	HT.	GROSS WT.

AUTHORIZED IN ACCORDANCE WITH AER. SP. 441.1

[signature]

SIGNATURE

G. B. Whisenhunt 2-16000 7722
NAME (TYPE) UNIT EXT.

FOR SHIPPING USE ONLY

CHECK	M.I.R.R.	COMM. INV.	SHIP. MEMO	DATE SHIPPED

REQUEST FOR SHIPMENT 0-87874 R2

Enclosure (4) to Report
No: 221RPN0533

SECURITY CLASSIFICATION
[ ] TOP SECRET [ ] CONFIDENTIAL
[ ] SECRET [ ] UN-CLASSIFIED
[ ] CONFIDENTIAL - MODIFIED HANDLING
CHECK ONE

(TYPE IN DIVISION NAME)

[ ] SHIPPING REQUEST
[ ] SHIPPING MEMO
[ ] DEBIT MEMO

DATE 7 December 1976 NUMBER RFS-RCC-119

SHIP TO:

YOUR INVOICE	DATED	AMOUNT	REC. REPORT

[ ] RETURNED FOR CREDIT
[ ] RETURNED FOR CREDIT AND REPLACEMENT
[ ] REPAIR OR REWORK AT VENDOR'S EXPENSE
[ ] REPAIR OR REWORK AT OUR EXPENSE
[ ] REPAIR OR REPLACEMENT COVERED BY GUARANTEE
[ ] MISCELLANEOUS (EXPLAIN)

CHARGE TO

INSPECTION REQUIRED: [ ] LTV [ ] GOV'T. [ ] CUST. MATERIAL CLASS: [ ] HAZARDOUS [ ] NON-HAZARDOUS

REFER TO:	ACCOUNT NO.	DELIVERY DATE DUE	YOUR PO NUMBER
F. O. B. VIA		B/L NO. [ ] PREPAID [ ] COLLECT	TERMS

REJ. REPORT NO.	OUR PO NUMBER	STORES REQ.	GOV'T CONTRACT ORDER NO.	G. O. NUMBER

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT

Notes:

(1) Per Article VII of the contract, "Final inspection and acceptance shall be accomplished by the Contracting Officer or his duly authorized representative at NASA Lyndon B. Johnson Space Center".

(2) Vought Corporation inspection required for packaging and shipping only.

(3) Shipping to prepare a DD-250 shipping document for shipment of these items with copies distributed as follows:

Quan.	
2	NAVPRO Inspection Agency
2	NASA-JSC Contracting Officer
1	NASA-JSC Transportation Officer
1	NASA-JSC Technical Monitor
1	NASA-JSC Accountability Property Officer, Mail Code JF9
1	NASA-JSC Cost & Accounting Branch, Mail Code BR8
2	Data Package
4	Attached

Internal Distribution - Vought

1	J. M. Abbott - Unit 2/65000
1	G. B. Whisenhunt - Unit 2/16000

INSPECTION LTV	INSPECTION CUST	LAYOUT LTV	LAYOUT CUST	PRESERVATION LTV	PRESERVATION CUST	PACKING LTV	PACKING CUST

BOX NO.	TYPE	LGTH	WIDTH	HT.	GROSS WT.

AUTHORIZED IN ACCORDANCE WITH AER. S.P. 441.1

G. B. Whisenhunt
SIGNATURE

G. B. Whisenhunt 2-16000 7722
NAME (TYPE) UNIT EXT.

FOR SHIPPING USE ONLY

CHECK	M.I.R.R.	COMM. INV.	SHIP. MEMO	DATE SHIPPED

REQUEST FOR SHIPMENT 0-87574 R2

NASA TEST SPECIMENS

CERTIFICATION REPORT

CONTRACT NAS9-14476

REPORT NO. 221RPN0526

9 DECEMBER 1976

VOUGHT CORPORATION
P. O. BOX 5907
DALLAS, TEXAS 75222

This document certifies that the GFE RCC specimens listed herein have been TEOS impregnated in accordance with Specification procedures accepted by the prime Shuttle Contractor as required by Contract NAS9-14476.

Test reports and acceptance data are on file and are subject to examination on request.

E. E. Gantz
E. E. Gantz
Test Project Engineer
Leading Edge Structural Subsystem

9 December 1976
Date

TABLE OF CONTENTS

NONDESTRUCTIVE TESTS RESULTS

The TEOS impregnated, baseline coated RCC specimens, covered by this document have been checked for conformance with the process controls, NDE test requirements, and coating performance requirements as defined in the TEOS Impregnation Process Specification, 208-7-42 and meet the appropriate requirements as stated.

TEST DATA SUMMARY

Paragraph of Spec 208-7-42	Item	Required	Actual
4.2.8(b)	Control Specimen Weight Gain - 19 Ply Flex Bar	4.7% to 8.0%	4.99% to 7.25%
5.6.1.3	Control Specimen Tube Furnace Mass Loss	< 0.041 lb/ft^2	.028 lb/ft^2 max.

SPECIMEN SERIAL NUMBER SUMMARY

1. 20 ea - 2.8 in. Dia x 33 ply RCC Disc - Baseline Coated and TEOS Impregnated

3-18-1	3-50	3-62	3-68
3-19-1	3-51	3-63	3-69
3-20-1	3-56	3-64	
3-21-1	3-58	3-65	
3-40	3-59	3-66	
3-48	3-61	3-67	

2. 2 ea - 1.5 in. x 6.5 in. x 33 ply RCC Flexure Bar - Baseline Coated and TEOS Impregnated

2-11
2-26

3. 4 ea - 2.8 in. Dia x 19 ply RCC Disc - Baseline Coated and TEOS Impregnated

3-14-1
3-19
009
011

4. 10 ea - 1.5 in. x 6.5 in. x 19 ply RCC Flexure Bar - Baseline Coated and TEOS Impregnated

2-1-1	2-8	2-33	2-36
2-2-1	2-9	2-34	
2-7	2-10	2-35	

SECURITY CLASSIFICATION
☐ TOP SECRET ☐ CONFIDENTIAL
☐ SECRET ☒ UN-CLASSIFIED
☐ CONFIDENTIAL - MODIFIED HANDLING
CHECK ONE

(TYPE IN DIVISION NAME)
Vought Corporation
P. O. Box 5907
Dallas, Texas 75222

Enclosure (4) to Report
No: 221RPN0533
Page: 11 of 18

☒ SHIPPING REQUEST
☐ SHIPPING MEMO
☐ DEBIT MEMO

SHIP TO
National Aeronautics & Space Administration
Johnson Space Center
1720 NASA Road 1

DATE 14 December 1976 NUMBER RFS-RCC-120

YOUR INVOICE	DATED	AMOUNT	REC. REPORT

CHARGE TO
Mark For: Accountability Property Officer 807402
Mark With: Purchase Req. No. 4-266-020
Contract No. NAS9-14476

☐ RETURNED FOR CREDIT
☐ RETURNED FOR CREDIT AND REPLACEMENT
☐ REPAIR OR REWORK AT VENDOR'S EXPENSE
☐ REPAIR OR REWORK AT OUR EXPENSE
☐ REPAIR OR REPLACEMENT COVERED BY GUARANTEE
☒ MISCELLANEOUS (EXPLAIN) Test Specimens

INSPECTION REQUIRED: ☐ LTV ☐ GOV'T. ☐ CUST.
MATERIAL CLASS: ☐ HAZARDOUS ☒ NON-HAZARDOUS

REFER TO:	ACCOUNT NO.	DELIVERY DATE DUE	YOUR PO NUMBER
Paragraph 3.3 of S.O.W.			

F. O. B.	VIA	B/L NO.		TERMS
Houston, Texas	Air Parcel Post		☒ PREPAID ☐ COLLECT	

REJ. REPORT NO.	OUR PO NUMBER	STORES REQ.	GOV'T CONTRACT ORDER NO.	G. O. NUMBER
			NAS9-14476	2636 AAAA

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
1.	14 ea	-	2.8 in. dia. x 19 ply RCC disc - baseline coated and TEOS impregnated. Serial Nos.: 3-13, 3-14, 3-15, 3-17, 3-70, 3-71, 3-72, 3-73, 3-74, 3-76, 3-77, 3-78, 3-80, 3-81		
			Lot Price		$2,296.00
2.	3 cc	-	Certification Report No. 221RP N0528		

INSPECTION LTV	INSPECTION CUST	LAYOUT LTV	LAYOUT CUST	PRESERVATION LTV	PRESERVATION CUST	PACKING LTV	PACKING CUST

BOX NO.	TYPE	LGTH	WIDTH	HT.	GROSS WT.

AUTHORIZED IN ACCORDANCE WITH AER. S.P. 441.1
G B Whisenhunt
SIGNATURE
G. B. Whisenhunt 2-16000 7722
NAME (TYPE) UNIT EXT.

FOR SHIPPING USE ONLY

CHECK	M.I.R.R.	COMM. INV.	SHIP. MEMO	DATE SHIPPED

REQUEST FOR SHIPMENT 0-87574 R2

SECURITY CLASSIFICATION
☐ TOP SECRET ☐ CONFIDENTIAL
☒ SECRET ☐ UN-CLASSIFIED
☐ CONFIDENTIAL - MODIFIED HANDLING
CHECK ONE

(TYPE IN DIVISION NAME)

☐ SHIPPING REQUEST
☐ SHIPPING MEMO
☐ DEBIT MEMO

DATE 7 December 1976 NUMBER RFS-RCC-120

SHIP TO

CHARGE TO

YOUR INVOICE	DATED	AMOUNT	REC. REPORT

☐ RETURNED FOR CREDIT
☐ RETURNED FOR CREDIT AND REPLACEMENT
☐ REPAIR OR REWORK AT VENDOR'S EXPENSE
☐ REPAIR OR REWORK AT OUR EXPENSE
☐ REPAIR OR REPLACEMENT COVERED BY GUARANTEE
☐ MISCELLANEOUS (EXPLAIN)

INSPECTION REQUIRED: ☐ LTV ☐ GOV'T. ☐ CUST. MATERIAL CLASS: ☐ HAZARDOUS ☐ NON-HAZARDOUS

REFER TO:	ACCOUNT NO.	DELIVERY DATE DUE	YOUR PO NUMBER
F. O. B. VIA		B/L NO. ☐ PREPAID ☐ COLLECT	TERMS

REJ. REPORT NO.	OUR PO NUMBER	STORES REQ.	GOV'T CONTRACT	ORDER NO.	G. O. NUMBER

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT

Notes:

(1) Per Article VII of the contract, "Final inspection and acceptance shall be accomplished by the Contracting Officer or his duly authorized representative at NASA Lyndon B. Johnson Space Center".

(2) Vought Corporation inspection required for packaging and shipping only.

(3) Shipping to prepare a DD-250 shipping document for shipment of these items with copies distributed as follows:

Quan.	
2	NAVPRO Inspection Agency
2	NASA-JSC Contracting Officer
1	NASA-JSC Transportation Officer
1	NASA-JSC Technical Monitor
1	NASA-JSC Accountability Property Officer, Mail Code JF9
1	NASA-JSC Cost & Accounting Branch, Mail Code BR8
2	Data Package
4	Attached

Internal Distribution - Vought

1	J. M. Abbott - Unit 2/65000
1	G. B. Whisenhunt - Unit 2/16000

INSPECTION		LAYOUT		PRESERVATION		PACKING	
LTV	CUST	LTV	CUST	LTV	CUST	LTV	CUST

BOX NO.	TYPE	LGTH	WIDTH	HT.	GROSS WT.

AUTHORIZED IN ACCORDANCE WITH AER. S.P. 441.1

G. B. Whisenhunt
SIGNATURE

G. B. Whisenhunt 2-16000 7722
NAME (TYPE) UNIT EXT.

FOR SHIPPING USE ONLY

CHECK	M.I.R.R.	COMM. INV.	SHIP. MEMO	DATE SHIPPED

REQUEST FOR SHIPMENT 0-87574 R2

NASA TEST SPECIMENS

CERTIFICATION REPORT

CONTRACT NAS9-14476

REPORT NO. 221RPNO528

17 DECEMBER 1976

VOUGHT CORPORATION
P. O. BOX 5907
DALLAS, TEXAS 75222

This document certifies that the GFE RCC specimens listed herein have been TEOS impregnated in accordance with specification procedures accepted by the prime Shuttle Contractor as required by Contract NAS9-14476.

Test reports and acceptance data are on file and are subject to examination on request.

E. E. Gantz

17 December 1976
Date

E. E. Gantz
Test Project Engineer
Leading Edge Structural
Subsystem

TABLE OF CONTENTS

NONDESTRUCTIVE TEST RESULTS

The TEOS impregnated, baseline coated RCC specimens covered by this document have been checked for conformance with the process controls, NDE test requirements, and coating performance requirements as defined in the TEOS Impregnation Process Specification, 208-7-42, and meet the appropriate requirements as stated except that the tube furnace mass loss of both control specimens exceeds the maximum allowable specification value of 0.041 lb/ft^2.

The excessive control specimen mass loss is not considered to be indicative of unacceptable TEOS impregnation, however, since the percentage weight gain of these 14 specimens during the TEOS processing agreed closely with the weight gains experience with the other 36 specimens in the impregnation run. The indicated excessive tube furnace mass loss is considered rather to reflect a deficiency in the control specimen substrate only. No specimens of the actual specimen substrate lot were available so the control specimens were selected from another substrate lot which was adjudged to be similar.

To confirm the acceptability of the specimen TEOS impregnation, one specimen (Serial No. 3-13) was subjected to the tube furnace check, and demonstrated mass loss well within specification requirements.

TEST DATA SUMMARY

Paragraph of Spec. 208-7-42	Item	Required	Actual
4.2.8(b)	Control Specimen Weight Gain - 19 Ply Flex Bar	4.7% to 8.0%	6.64% to 6.69%
5.6.1.3	Control Specimen Tube Furnace Mass Loss	0.041 lb/ft^2	0.056 lb/ft^2 max
5.6.1.3	Specimen Number 3-13 Tube Furnace Mass Loss	0.041 lb/ft^2	0.029 lb/ft^2

SPECIMEN SERIAL NUMBER SUMMARY

1. 3-13
2. 3-14
3. 3-15
4. 3-17
5. 3-70
6. 3-71
7. 3-72
8. 3-73
9. 3-74
10. 3-76
11. 3-77
12. 3-78
13. 3-80
14. 3-81

SHIPPING PAPERS AND CERTIFICATION

DOCUMENT - NASA MASS LOSS SPECIMENS, RCC

BASELINE COATED AND TEOS IMPREGNATED

CONTRACT NAS 9 - 14476

Enclosure (5) to
Report No: 221RPN0533
Page: 2 of 4

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(TYPE IN DIVISION NAME)
Vought Corporation
P. O. Box 5907
Dallas, Texas 75222

☒ SHIPPING REQUEST
☐ SHIPPING MEMO
☐ DEBIT MEMO

SHIP TO
National Aeronautics & Space Administration
Johnson Space Center
1720 NASA Road 1
Houston, Texas 77058

DATE 21 December 1976 NUMBER RFS-RCC-121

YOUR INVOICE	DATED	AMOUNT	REC. REPORT

CHARGE TO
Mark For: Accountability Property Officer 807402
Mark With: Purchase Req. No. 4-266-020
Contract No. NAS9-14476
For Reissue To: D. J. Tillian, ES11, Bldg. 420

☐ RETURNED FOR CREDIT
☐ RETURNED FOR CREDIT AND REPLACEMENT
☐ REPAIR OR REWORK AT VENDOR'S EXPENSE
☐ REPAIR OR REWORK AT OUR EXPENSE
☐ REPAIR OR REPLACEMENT COVERED BY GUARANTEE
☒ MISCELLANEOUS (EXPLAIN) Test Specimens

INSPECTION REQUIRED: ☒ LTV ☐ GOV'T. ☐ CUST.
MATERIAL CLASS: ☐ HAZARDOUS ☒ NON-HAZARDOUS

REFER TO:	ACCOUNT NO.	DELIVERY DATE DUE	YOUR PO NUMBER
Paragraph 3.1.b of S.O.W.		ASAP	

F. O. B. VIA	B/L NO.		TERMS
Houston, Texas Insured Air Parcel Post		☒ PREPAID ☐ COLLECT	

REJ. REPORT NO.	OUR PO NUMBER	STORES REQ.	GOV'T CONTRACT ORDER NO.	G. O. NUMBER
			NAS9-14476	2636 AAAA

CONTRACT ITEM NO.	QUANTITY	PART NO.	DESCRIPTION	UNIT PRICE	TOTAL AMOUNT
1.	9 ea	221GT4067	NASA Mass Loss Specimen-19 Ply RCC, Baseline Coated, TEOS Impregnated - Serial Nos.: N039P-1 thru N039P-9		
2.	9 ea	221GT4067	NASA Mass Loss Specimen-33 Ply RCC, Baseline Coated, TEOS Impregnated - Serial Nos.: N040P-1 thru N040P-9		
			Lot Price		$21,000
3.	3 cc	-	Quality Certification		

INSPECTION LTV	INSPECTION CUST	LAYOUT LTV	LAYOUT CUST	PRESERVATION LTV	PRESERVATION CUST	PACKING LTV	PACKING CUST

BOX NO.	TYPE	LGTH	WIDTH	HT.	GROSS WT.

AUTHORIZED IN ACCORDANCE WITH AER. S.P. 441.1
SIGNATURE
G. B. Whisenhunt 2-16000 7722
NAME (TYPE) UNIT EXT.

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REQUEST FOR SHIPMENT 0-87574 R2

VOUGHT CORPORATION
P. O. BOX 5907
DALLAS, TEXAS 75222

This certifies that the RCC test specimens listed below have been manufactured, inspected and tested to the applicable Vought process specifications and requirements of contract NAS9-14476.

Test data for mechanical properties and non-destructive testing is on file.

S/N	NO39P-1	S/N	NO40P-1
	2		2
	3		3
	4		4
	5		5
	6		6
	7		7
	8		8
	9		9

F. J. Patterson 12/23/1976

F. J. Patterson
Quality Assurance Manager
LESS Program
22 December 1976

/mlm