

STATEMENT OF WORK FORMAT

Composite and Adhesive Property Knowledge Tests

PR: _____

Note: Only use the sections that are applicable to your service procurement.

Background

Goddard Space flight Center is looking for a vendor to provide testing for the WFIRST program on composite laminates and bonding adhesives . These characteristic tests will be performed at three different temperatures.

Scope

The purpose of this document is to define a set of test articles and what work is required for the WFIRST program. The Statement of Work (SOW) defines the roles and responsibilities of both Goddard Space Flight Center (GSFC) and the Contractor. The contractor shall describe, in the response to the request for proposal, the method of cool-down including any specific monitoring or controlling. The contractor shall also describe the method of alignment that will be used on the flatwise tension and any other testing.

Requirements

Section 1.01 TUBE LAMINATE (YELLOW SECTION IN TEST MATRIX)

- (a) The contractor shall perform all testing listed in Table 1 of the test matrix.
- (b) GSFC will machine all composite specimens and provide them to Contractor.
- (c) The contractor shall provide thread information for the flatwise tension blocks (FWT) per Figure 1 and GSFC will provide 120 titanium blocks for bonding. These Blocks will be unprimed and the contractor shall prime before bonding.
- (d) The contractor shall provide fixtures and bond FWT specimens. The bonded specimen configuration shall be consistent with Fig. 1. Minimum bond fillets are required.
- (e) The contractor shall bond the FWT specimens, maintaining the test article and centerline of the blocks for proper alignment during testing and to provide best test results. GSFC will provide all adhesives 9309.2NA. The contractor can provide bondline control but must be approved by GSFC before bonding.
- (f) The contractor shall maintain all identification provided by GSFC and reflect the identifiers in the test report

Section 1.02 GUSSET PANEL (BLUE ON WORD DOC)

- (a) The contractor shall perform all testing listed in Table 2 of the test matrix.
- (b) GSFC will machine all composite specimens and provide them to Contractor.
- (c) GSFC will supply the FWT specimens per section 3.01 (c).
- (d) The contractor shall provide fixtures and bond FWT's. The bonded specimen configuration shall be consistent with Fig. 1. Minimum bond fillets are required.
- (e) The contractor shall bond the FWT specimens, maintaining the test article and centerline of the blocks for proper alignment during testing and to provide best test results. GSFC will provide all adhesives 9309.2NA. The contractor can provide bondline control but must be approved by GSFC before bonding.
- (f) The contractor shall maintain all identification provided by GSFC and reflect the identifiers in the test report

Section 1.03 ADHESIVE TESTING (PINK ON WORD DOC)

- (a) The contractor shall perform all testing listed in Table 3 of the test matrix.
- (b) GSFC will cut all titanium parts for the FWT specimens and provide blocks see section 3.01 (c).
- (c) The contractor shall bond the FWT specimens, maintaining the test article and centerline of the blocks for proper alignment during testing and to provide best test results. The bonded specimen configuration shall be consistent with Fig. 1. Minimum bond fillets are required. GSFC will provide all adhesives 9309.2NA. The contractor can provide bondline control but must be approved by GSFC before bonding
- (d) GSFC will provide 4 panels per Fig. 3. The contractor shall review the size and provide GSFC with a size if different than what is called out on drawing. The contractor shall machine and test per ASTM D5656 and provide an all aluminum load/deflection calibration specimen as required in the ASTM. GSFC will use wires for bondline control and identify the location of the bondlines to not interfere with test or machining. GSFC will approve the machining speed, feed, and cutter.
 - (i) The panels for the ASTM D5656 will have NDI performed before leaving GSFC and the results will be provided to the contractor.
- (e) The contractor shall maintain a specimen identification and provide it to GSFC. The test report shall reflect the specimen identification and associated test results.

Section 1.04 DOUBLE LAP SHEARS PER ASTM 3528

- (a) GSFC shall provide all Double Lap Shear specimens fully bonded and identified. Fig. 2 gives an example specimen.
- (b) The contractor shall test the Double Lap Shear specimens per ASTM D3528. GSFC will define up to six strain gage locations on the specimens. Strain gage locations are TBD. The Contractor will record the strain gages during testing.

ARTICLE II. TEST MATRIX

Table 1

Test Item	Loading	Temp	ASTM	No.	Dimensions			Remarks
		K		Samples	L (in)	w (in)	t (in)	
Tube Laminate Axial	Compression	293	D 6641	3	5.5	0.5	0.0952	No tabs
	Compression	220	D 6641	6	5.5	0.5	0.0952	No tabs
	Compression	170	D 6641	6	5.5	0.5	0.0952	No tabs
Tube Laminate Axial	SBS Flexure	293	D 2344	3	0.6	0.2	0.0952	Span/Tks = 4
	SBS Flexure	220	D 2344	6	0.6	0.2	0.0952	Span/Tks = 4
	SBS Flexure	170	D 2344	6	0.6	0.2	0.0952	Span/Tks = 4
Tube Laminate Axial	FWT	293	D7291 (GSFC modified)	3	1.75 dia		0.0952	See drawing
	FWT	220	D7291 (GSFC modified)	12	1.75 dia		0.0952	See drawing
	FWT	170	D7291 (GSFC modified)	12	1.75 dia		0.0952	See drawing
Tube Laminate Transverse	Flexure	293	D790-81	3	2.5	1	0.0952	3 pt shear
	Flexure	220	D790-81	6	2.5	1	0.0952	3 pt shear
	Flexure	170	D790-81	6	2.5	1	0.0952	3 pt shear

Table 2

Test Item	Loading	Temp	ASTM	No	Dimensions			Remarks
		K		Samples	L (in)	w (in)	t (in)	
Gusset Laminate	Compression	293	D 6641	3	5.5	0.5	0.0896	No tabs
	Compression	220	D 6641	5	5.5	0.5	0.0896	No tabs
	Compression	170	D 6641	5	5.5	0.5	0.0896	No tabs
Gusset Laminate	SBS Flexure	293	D 2344	3	0.6	0.2	0.0896	Span/Depth = 4
	SBS Flexure	220	D 2344	5	0.6	0.2	0.0896	Span/Depth = 4
	SBS Flexure	170	D 2344	5	0.6	0.2	0.0896	Span/Depth = 4
Gusset Laminate	FWT	293	D7291 (GSFC modified)	3	1.75 dia		0.0896	See drawing
	FWT	220	D7291 (GSFC modified)	5	1.75 dia		0.0896	See drawing
	FWT	170	D7291 (GSFC modified)	5	1.75 dia		0.0896	See drawing

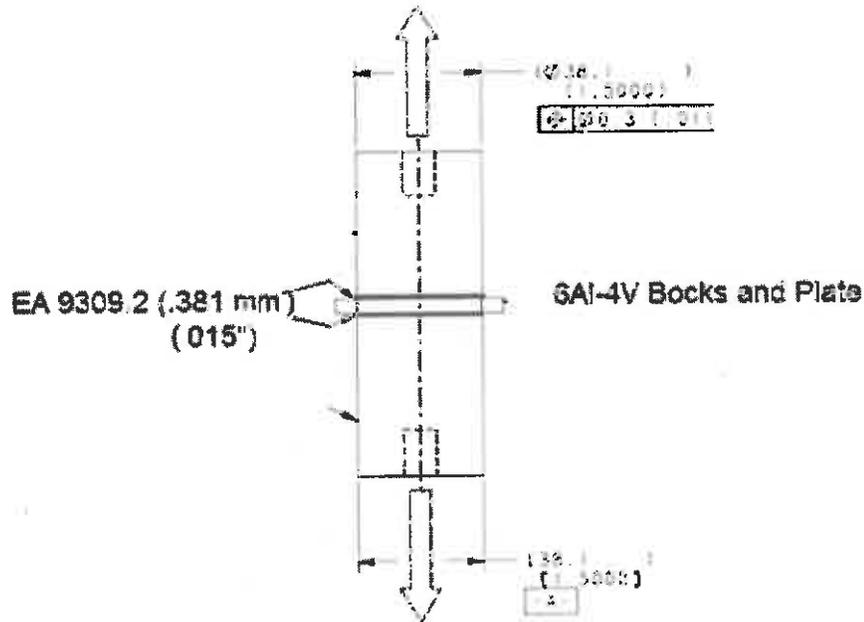
Table 3

Test Item	Loading	Temp	ASTM	No	Dimensions			Remarks
		K		Samples	L (in)	W (in)	t (in)	
Adhesive	Thick Adhd Lap Shear	293	D 5656	3	9	1	0.76	Determine Shear Stress/Strain Curve
	Thick Adhd Lap Shear	220	D 5656	3	9	1	0.76	Determine Shear Stress/Strain Curve
	Thick Adhd Lap Shear	170	D 5656	3	9	1	0.76	Determine Shear Stress/Strain Curve
Adhesive	Adhesive Joint Shear	293	D3528 Type B	3	See sketch	1	See sketch	Assume 6 axial strain gages
	Adhesive Joint Shear	220	D3528 Type B	5	See sketch	1	See sketch	Assume 6 axial strain gages
	Adhesive Joint Shear	170	D3528 Type B	5	See sketch	1	See sketch	Assume 6 axial strain gages
Adhesive	FWT	293	D7291 (GSFC modified)	3	1.75 dia		0.25" 6Al4V ti	See drawing
	FWT	220	D7291 (GSFC modified)	5	1.75 dia		0.25" 6Al4V ti	See drawing
	FWT	170	D7291 (GSFC modified)	5	1.75 dia		0.25" 6Al4V ti	See drawing

Table 4

Test Item	Loading	Temp	ASTM	No	Dimensions			Remarks
		K		Samples	L (in)	w (in)	t (in)	
Double Lap	Joint shear	293	D 3528 Type B	3	See sketch	1	See sketch	Assume 6 axial strain gages
	Joint shear	220	D 3528 Type B	5	See sketch	1	See sketch	Assume 6 axial strain gages
	Joint shear	170	D 3528 Type B	5	See sketch	1	See sketch	Assume 6 axial strain gages

Flatwise Tension Test Configuration Figure 1



Test specimen disk overhangs the loading blocks to which it is bonded. The overhang shall be critically aligned with the centerline of the 2 blocks. Minimum filets are required.

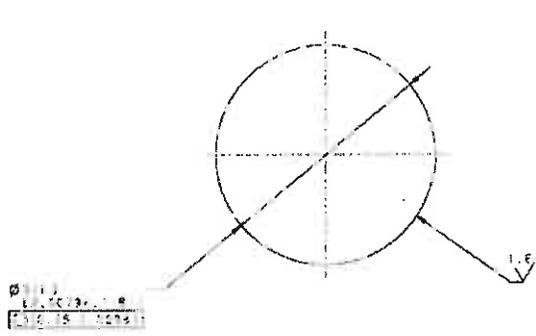
Flatwise tension Test Sample Reference Figure only

NOTES: UNLESS OTHERWISE SPECIFIED

1. USE DIAMOND TOOLING OR EQUIVALENT MACHINE SPECIFICATIONS. VARIATIONS TO AVOID NOTICES, IMPROVED, UNIFORM SURFACES, OR OBTAIN MATRONS.
2. TAG PART NUMBER 010-0073-01, INCLUDE TO AND TAG WITH PART NUMBER 00000000.

Composite specimen -011
Titanium specimen @ .0625" thick

Released
MASTER DRAWING
AS ISSUED BY
RELEASED
SA/ITHN FILE CO
25 Jun 08



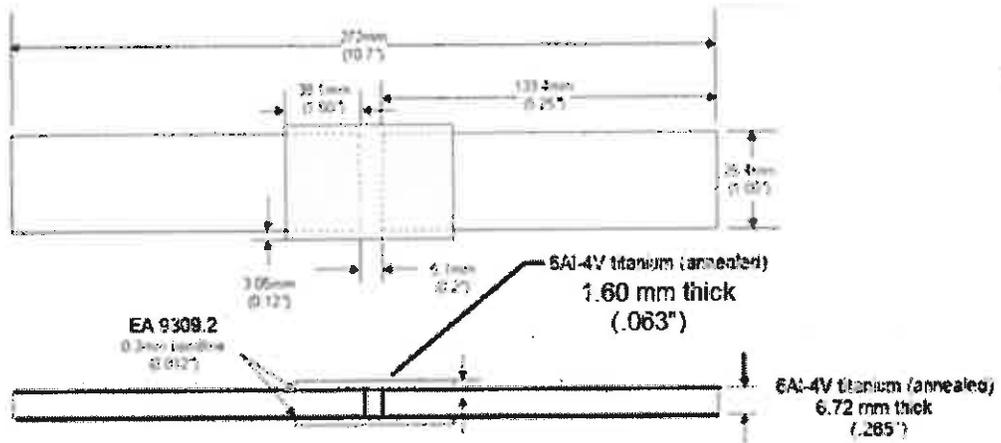
PART NO.	A. DIA.	SOURCE
-001	2.8	2070100
-003	2.8	2070100-001
-007	2.8	2070100-005
-009	2.8	2070100-011
-011	2.8	2070100
-013	2.8	2070100-001

ITEM		DESCRIPTION	QTY	UNIT	REVISION
LIST TO: MA 0000					
Goddard Space Flight Center					
MATERIAL TEST SPECIMEN, COMPOSITE					
GC 2070100					

GC 2070100

Figure 2

Adhesive D3528 Type B Specimen



Composite-to-Titanium A3528 Type B Specimen

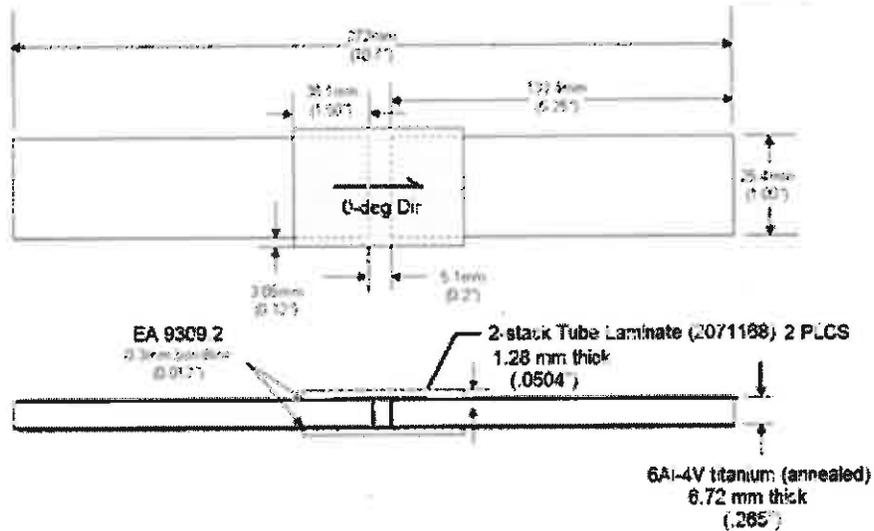


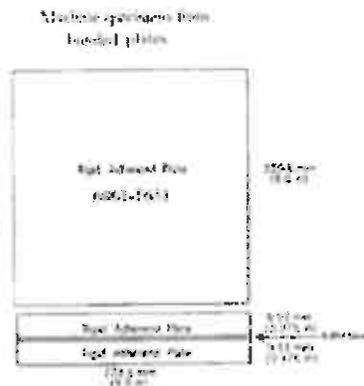
Figure 3

Thick Adherend Shear Specimen Plates

- Three (3) 9" x 9" 6061-T651 plates @ .375" thickness

– Produces up to

specimens)



Deliverables or Delivery Schedule

ARTICLE III. DOCUMENTATION

- (a) Test procedures or GSFC approved internal documentation for each of the tests shall be submitted 2 weeks before testing. These documents shall be review and approved by GSFC before testing is performed.
- (b) Testing performed per this statement of work shall be documented in a summary test report and submitted as part of the delivery data package. Preliminary reports are encouraged to help the project gain knowledge of the material properties
- (c) In addition to that documentation specifically called for in the contract, upon request by the NASA/GSFC the contractor **shall** make available a copy of any document or data generated during this contract performance for review by GSFC at either the contractor's facility or electronically. This includes, but is not limited to:
 - (d) Process Specification for Manufacture
 - (e) Technical reports and memorandums
 - (f) Drawings
 - (g) Analysis
 - (h) Fabrication, Assembly, and Inspection documentation
 - (i) Dimensional Inspection Data

ARTICLE IV. SURVEILLANCE OF THE CONTRACTOR

- (a) The work activities and operations of the contractor are subject to evaluation, review, survey, and inspection by a GSFC representative. GSFC will work with the contractor to not upset the workflow.
- (b) The contractor **shall** provide the GSFC representative with documents, and records that are required to verify any tasks.
- (c) GSFC will travel to the contractor's facility where the work is performed at key points determined by the contractor. These are not mandatory inspection points, but more for monitoring and answering any concerns on the contractor or governments part. This would be limited to a visit at the onset of the contract, one during testing and one for shipping.

ARTICLE V. ANOMALY REPORTING

Anomalies **shall** be reported to the NASA/GSFC within 24 hours of anomaly

occurrence. The contractor's processes for review and approval of anomaly reports **shall** be described in their quality plan/manual or provided as a supplemental document.

ARTICLE VI. DELIVERY MILESTONES

- (a) GSFC will deliver all adhesives and machined parts by no later than 8/21/2015
- (b) Contractor shall provide the final report by the end of October 2015. If this is not possible please provide estimated completion date based on GSFC delivery of all parts 8/21/2015
- (c) The contractor shall provide test reports on individual test as soon as possible

Government-Furnished Equipment and Government-Furnished Information

GSFC will provide test pieces and hardware to perform the testing. The Contractor shall provide the testing and bonding of articles per this SOW and return parts after broken for evaluation

Place of Performance

All work shall be performed at contractor's facility

Period of Performance

The period of performance shall be 6 months