

**Technical Statement of Objectives (SOO)**  
**Strategic High Temperature 3D Carbon-Carbon Material Capacity Expansion**  
**05 June 2020**

**1.0 Scope**

1.1 Scope: This Statement of Objectives (SOO) defines the cost and schedule business improvement processes, technical objectives for design/development, and goals for test and delivery of prototype materials, items, and associated technical data related to Carbon/Carbon (C/C) materials/technology. The C/C materials/technology is used in propulsion applications for space and missiles and for missile Thermal Protection Systems (TPS) including missile Noses, leading edges, and aeroshells. The objectives and requirements are to provide improved missile performance across Department of Defense (DoD) programs, lower costs, and improve delivery schedules. The SOO includes technical objectives and data/meeting requirements to be executed across four technical areas. Associated technical data packages (TDPs), quality control requirements, security requirements, program management requirements, and acceptance criteria are also included in this SOO.

1.2 Background: The evolving requirements of the United States' strategic missile programs have required continuous development of highly capable advanced composite materials such as C/C to achieve improved and optimal missile performance. To meet these anticipated demands, this effort seeks specifically to increase capacity to support weaving, infusion, and densification of C/C materials used in missile applications. In addition to increasing capacity, successful execution of the tasks defined herein will improve capability to modernize and optimize manufacturing processes, resulting in improved productivity. Cost savings, decreased part size, and improved missile performance capabilities will result, greatly benefiting the anticipated needs of DoD programs.

Technologies of Interest include 1) Near Net Shaped component and aeroshell scale-up part count reduction, design, simplification, performance enhancement, and risk reduction; 2) fabrication, densification, and machining of high density re-entry grade C/C TPS materials; 3) Three Dimensional (3D) reinforced fine-weave architectures applied to scaled-up TPS applications; and 4) Off the shelf fiber modifications to enable fabrication of tailored textile architectures for TPS components.

**2.0 Applicable Documents**

- |     |  |                            |
|-----|--|----------------------------|
| 2.1 | Commercial Documents<br>ISO 9001:2015  | Quality Management Systems |
| 2.2 | Government Documents<br>DI-QCIC-80553A | Acceptance Test Plans      |

DI-MGMT-81928	Contractor's Progress, Status, and Management Report
DI-ADMN-81373	Presentation Material
DI-ADMN-81249B	Conference Agenda
DI-ADMN-81250B	Conference Minutes
DI-SESS-80776B	Technical Data Packages
DI-QCIC-81891	Acceptance Test Reports
DI-MISC-81356A	Certificate of Conformance
DI-NDTI-80603A	Test Procedures
DI-MISC-80508B	Technical Report-Study/Services
DD254	Department of Defense Contract Security Classification Specification

### **3.0 Capabilities, Technical Objectives and Process, Test, and Data Requirements**

3.1 Overall Capabilities: This tasking requires the ability to produce 3D C/C materials and machining of those materials to enhance and optimize U.S. Navy missile performance. This may include: graphite fiber yarn management/pre-treatments; automatic 3D weaving of large graphite fiber preforms; tailored pitch resin densification of these preforms into carbon-carbon billets, and the formation of localized ceramic regions within Shape Stable Nostips (SSNT) billets. Additionally, the skills, knowledge, capabilities and facilities (or facilities access) for the specialized high pressure pitch resin impregnation carbon-carbon densification process and/or development of the required localized ceramic regions within SSNT billets is required. The resulting 3D C/C materials must hold/exhibit strength in 3 directions (X,Y,Z axis) using 3D carbon-carbon with high pressure densification, or equivalent processes, to achieve a shape stable nose tip for consistent nosetip ablation.

3.2 Task 1 Objectives. The period of performance for Task 1 is desired to be as depicted in Attachment B (notional schedule). As part of the technical response, the contractor shall develop a detailed Statement of Work and schedule (SOW) to meet the goals and objectives of Task 1 per the subparagraphs in this section. The contractor's SOW shall clearly identify each process, step, and the data and prototype delivery/deliveries required to meet the objectives of Task 1. The contractor's SOW shall identify the success criteria for Task 1.

3.3 The contractor's SOW shall demonstrate reduced cost and schedule related to preforming and densification processes for the production of C/C extended length leading edges billets, nose collars, and other frustra components for Navy hypersonic flight vehicle applications. The cost reduction requirement is 25% minimum. As part of the contractor's technical response SOW, requirements to successfully meet the goals and objectives of Task 2 per the subparagraphs in this section shall be included. The SOW shall clearly identify each process, step, business and technical data, and

prototype delivery/deliveries required to meet the objectives of Task 2. The SOW shall identify the success criteria for Task 2.

3.3.1 The contractor's SOW shall demonstrate the ability to machine multi-directionally (such as 3D) reinforced C/C components to the size and dimensional tolerances required by current and future Navy Reentry Bodies and Hypersonic Flight Vehicles developed in Task 1.

3.3.2 The contractor's SOW shall produce at least one prototype machined part to demonstrate the machining capability developed. Dimensional tolerances and profiles shall meet the current Navy requirements as defined in the Request for Solutions (RFS) section 5, Task 2 description. A business process shall be provided, defining tasks to be executed so that future requirements (larger C/C material end items) will be met.

3.3.3 The contractor shall execute Task 2 in accordance with the final approved SOW for Task 2. The contractor shall deliver the Task 2 Technical Data Package as defined in the approved final SOW provided by the contractor. The Technical Data Package shall be delivered by contract closeout with all Governments comments implemented

3.4 Task 3 Objectives. Task 3 shall run concurrently with Task 1 as shown in Attachment B (notional schedule). As part of the contractor's technical response SOW, requirements to successfully achieve the goals and objectives of Task 3 per the subparagraphs in this section shall be included. The SOW shall clearly identify each process, step, and the data and prototype delivery/deliveries required to meet the objectives of Task 3. The SOW shall identify the success criteria for Task 3.

3.4.1 The contractor's SOW shall demonstrate the ability to expand, control, and monitor stretch broken fiber processes in order to modify off-the-shelf fibers to enable fabrication of tailored fiber architectures for multi-directionally reinforced C/C components.

3.4.2 The contractor's SOW shall produce prototype examples of parts/components fabricated using capabilities developed that demonstrates multi-directionally reinforced C/C product improvement.

3.4.3 The contractor shall execute Task 3 in accordance with the final approved SOW for Task 3. The contractor shall deliver the Task 3 Technical Data Package as defined in the approved final SOW provided by the contractor. The Technical Data Package shall be delivered by contract closeout with all Governments comments implemented.

3.5 Task 4 Objectives. Task 4 may run concurrently with Tasks 1, 2, and 3 as shown in Attachment B (notional schedule). ). As part of the contractor's technical response SOW, requirements to successfully meet the goals and objectives of Task 4 per the subparagraphs in this section shall be included. The SOW shall clearly identify

each process, step, and the data and prototype delivery/deliveries required to meet the objectives of Task 4. The SOW shall identify the success criteria for Task 4.

3.5.1 The contractor's SOW shall demonstrate the ability to perform thermo-mechanical testing of materials developed/produced in Tasks 1, 2 and 3.

3.5.2 The contractor's SOW shall demonstrate ability to measure thermal and mechanical properties of materials developed during this effort by developing and completing the necessary set of acceptance testing limits at elevated temperatures where appropriate.

3.5.3 The contractor shall execute Task 4 in accordance with the final approved SOW for Task 4. The contractor shall deliver the Task 4 Technical Data Package as defined in the approved final SOW provided by the contractor. The Technical Data Package shall be delivered by contract closeout with all Governments comments implemented.

### 3.6 Reporting and Closeout Briefing

3.6.1 The contractor shall provide final project summary technical report per DID DI-MISC-80508B after the completion of tasks 1-4. The report shall include all trade studies performed, risks identified, risks successfully mitigated and how they were mitigated, issues found and resolved, identification of expansion projects for technologies used/proven, and lessons learned. The timing of the report delivery shall be as designated in the contractor's schedule. The report shall be delivered prior to the closeout brief.

3.6.2 Closeout Brief: The contractor shall host a closeout brief for the effort. The closeout brief shall show all accomplishments; provide an overview of trade studies performed; provide lessons learned; identify failed business and technical prototype processes; recommendations for future advancements; and a closeout summary of program successes. The timing of the closeout brief shall be as designated in the contractor's schedule. The contractor shall provide an agenda for the closeout brief per DI-ADMN-81249B 30 days prior to event. The contractor shall provide presentation material 7 days prior to the closeout brief per tailored DID DI-ADMN-81373. The contractor shall take meeting minutes and document action items per tailored DID DI-ADMN-81250B. The closeout brief shall accommodate physical attendance as well as off-site attendance using web-based meeting tools.

### 3.7 Test (as applicable to Tasks 1, 2, 3, and 4):

3.7.1 The contractor shall generate an Acceptance Test Plan per DID DI-NDTI-80566A that addresses the testing required for all four tasks, where applicable. Prior to executing inspection and/or testing for each task, the contractor shall submit test/inspection procedures per tailored DID DI-NDTI-80603A. The contractor shall include the results of each test/inspection procedure as defined in the test results section of tailored DID DI-NDTI-80603A. The test/inspection reports shall be included in

the TDP delivered to the Government at the conclusion of each task. All testing locations shall be defined in the SOW provided in the technical response. The Government shall have the right to witness all testing. The contractor shall notify the Government of test event 30 days prior to the start of testing.

### 3.8 Program Management Requirements (applicable to Tasks 1, 2, 3 and 4):

3.8.1 Kickoff Brief: The contractor shall conduct a kickoff brief as designated in the technical response SOW. The timing of the brief will be as negotiated at contract award. The contractor shall provide presentation material for the kickoff brief within 7 calendar days of the brief. Presentation material shall be per tailored DID DI-ADMN-81373. The kickoff brief shall include at a minimum an agenda (DI-ADMN-81249B); Introductions; Contractor Points of Contact (POCs) and roles; Government POCs and roles; Communication Protocols; Task Implementation Timelines; Data Flow Explanations; Web Tools/Enrollment; Structure and Frequency of Technical Interchange Meetings (TIMs), In-Process Reviews, and Program Reviews; Technical Overview; Milestone Payment Schedules; Risk Management; and Quality Management. The contractor shall use web-based meeting/communication tools to the greatest extent practical. If applicable, the contractor shall abide by any pandemic guidelines in effect which impact physical meeting requirements throughout execution of the contract. The contractor shall take meeting minutes and document action items per tailored DID DI-ADMN-81250B. The kickoff brief shall accommodate physical attendance as well as off-site attendance using web-based meeting tools.

3.8.2 Quarterly Reviews: The contractor shall conduct reviews each quarter. The contractor shall provide an agenda for each TIM per DI-ADMN-81249B 30 days prior to review. The contractor shall provide presentation material 7 days prior to the review per DID DI-ADMN-81373. Each quarterly review shall provide an overview of the program/task status; identify current issues; explain issue resolution plans; identify risks and mitigation plans; provide test status (when applicable); and review quality issues. The contractor shall take meeting minutes and document action items per tailored DID DI-ADMN-81250B. The quarterly reviews shall accommodate physical attendance as well as off-site attendance using web-based meeting tools.

3.8.3 Technical Interchange Meetings (TIMs) with Navy Integrated Product Team (IPT) or Personnel: The contractor shall provide technical status/update briefings to the designated Navy IPT or personnel via teleconference/web based tools each month.

3.8.4 Quarterly Reports: The contractor shall provide a contractor's progress, status, and management report per tailored DID DI-MGMT-81928. The report shall be submitted the 15<sup>th</sup> day of the month. The first report shall be delivered as negotiated at contract award. Subsequent reports shall cover the work/progress between the first and last day of the previous quarter.

3.8.5 In-Process Reviews (IPRs): The contractor shall participate IPRs semi-annually. During these IPRs, the contractor shall present details/schedules of prototypes completed, planned, and in-process; plans/recommendations of future

fabrications; and results, progress, and plans of any engineering studies. The contractor shall provide an agenda for each IPR per DI-ADMN-81249B 30 days prior to IPRs. The contractor shall provide presentation material 7 days prior to the IPR per tailored DID DI-ADMN-81373. The contractor shall take meeting minutes and document action items per tailored DID DI-ADMN-81250B. The IPRs shall accommodate physical attendance as well as off-site attendance using web-based meeting tools.

3.8.6 The contractor shall provide monthly status reports. The format of the reports is as defined in tailored DID DI-MGMT-81928.

3.9 Prototype and Technical Data Deliveries (as applicable to Tasks 1, 2, 3 and 4):

3.9.1 Upon completion of successful prototype tasks associated with Tasks 1, 2, 3, and 4, the contractor shall provide a technical data package (TDP) for the prototypes. The TDP shall include physical characteristics (weight, dimensions, density, porosity, and process summaries) per DI-SESS-80776B; acceptance test reports per DI-QCIC-81891, Certificates of Compliance (COCs) for all constituent inputs per DI-MISC-81356A; and COCs verifying compliance with applicable specifications per DI-MISC-81356A.

3.9.2 Prior to the closeout brief, the contractor shall provide the prototypes to the Government.

4.0 Government Furnished Items

4.1 Government Furnished Information (GFI): Data Item Descriptions (DIDs) which are tailored are provided as GFI in Attachment D. For any DIDs not included in Attachment D, all paragraphs of the DID are applicable. No other GFI is provided.

4.2 Government Furnished Equipment (GFE): No GFE will be provided

4.3 Government Furnished Material (GFM): No GFM will be provided.

5.0 Data Deliverables

5.1 The contractor's technical response SOW shall include a listing of data deliverables based on the data provided in Section 6 of the RFS. The SOW shall identify the data in the format defined below.

Data Deliverable Number:	1
Data Title:	Monthly Status Report
DID Guidance:	DI-MGMT-81928
SOW Reference:	Enter Contractor SOW Paragraph Number

Data Deliverable Number:	2A
Data Title:	Kickoff Meeting Presentation Material
DID Guidance:	DID DI-ADMN-81373

SOW Reference:	Enter Contractor SOW Paragraph Number
Data Deliverable Number:	2B
Data Title:	Kickoff Meeting Agenda
DID Guidance:	DI-ADMN-81249B
SOW Reference:	Enter Contractor SOW Paragraph Number
Data Deliverable Number:	2C
Data Title:	Kickoff Meeting, Meeting Minutes
DID Guidance:	DID DI-ADMN-81250B
SOW Reference:	Enter Contractor SOW Paragraph Number
Data Deliverable Number:	3
Data Title:	Quarterly Status Report
DID Guidance:	DID DI-MGMT-81928
SOW Reference:	Enter Contractor SOW Paragraph Number
Data Deliverable Number:	4A
Data Title:	TIM Presentation Material
DID Guidance:	DID DI-ADMN-81373
SOW Reference:	Enter Contractor SOW Paragraph Number
Data Deliverable Number:	4B
Data Title:	TIM Agenda
DID Guidance:	DI-ADMN-81249B
SOW Reference:	Enter Contractor SOW Paragraph Number
Data Deliverable Number:	4C
Data Title:	TIM, Meeting Minutes
DID Guidance:	DID DI-ADMN-81250B
SOW Reference:	Enter Contractor SOW Paragraph Number
Data Deliverable Number:	5A
Data Title:	IPR Presentation Material
DID Guidance:	DID DI-ADMN-81373
SOW Reference:	Enter Contractor SOW Paragraph Number
Data Deliverable Number:	5B
Data Title:	IPR Agenda
DID Guidance:	DI-ADMN-81249B
SOW Reference:	Enter Contractor SOW Paragraph Number
Data Deliverable Number:	5C
Data Title:	IPR Meeting Minutes
DID Guidance:	DID DI-ADMN-81250B
SOW Reference:	Enter Contractor SOW Paragraph Number
Deliverable Number:	6
Data Title:	N/A. This is a Hardware Deliverable (Prototype, Densification Process Cost & Lead Time

Reduction.) Data associated with this deliverable is included in 8A, 8B, 8C, and 10D.

Deliverable Number:

7

Data Title:

N/A. This is a Hardware Deliverable (Prototype, stretch broken fiber product improvement) Data associated with this deliverable is included in technical business processes included in 8A, and test plans and procedures/test results included in 9A and 9B, and final report in 10D.

Data Deliverable Number:

8A

Data Title:

Task 1 through 4 TDP

DID Guidance:

DI-SESS-80776B

SOW Reference:

Enter Contractor SOW Paragraph Number

Data Deliverable Number:

8B

Data Title:

Acceptance Test Reports

DID Guidance:

DI-QCIC-81891

SOW Reference:

Enter Contractor SOW Paragraph Number

Data Deliverable Number:

8C

Data Title:

Certificate of Conformance

DID Guidance:

DI-MISC-81356A

SOW Reference:

Enter Contractor SOW Paragraph Number

Data Deliverable Number:

9A

Data Title:

Test Plan

DID Guidance:

DI-NDTI-80566A

SOW Reference:

Enter Contractor SOW Paragraph Number

Data Deliverable Number:

9B

Data Title:

Test Procedures

DID Guidance:

DI-NDTI-80603A

SOW Reference:

Enter Contractor SOW Paragraph Number

Data Deliverable Number:

10A

Data Title:

IPR Presentation Material

DID Guidance:

DID DI-ADMN-81373

SOW Reference:

Enter Contractor SOW Paragraph Number

Data Deliverable Number:

10B

Data Title:

IPR Agenda

DID Guidance:

DI-ADMN-81249B

SOW Reference:

Enter Contractor SOW Paragraph Number

Data Deliverable Number:

10C

Data Title:

IPR Meeting Minutes

DID Guidance:

DID DI-ADMN-81250B

SOW Reference:

Enter Contractor SOW Paragraph Number



Data Deliverable Number:	10D
Data Title:	Summary Technical Report
DID Guidance:	DI-MISC-80508B
SOW Reference:	Enter Contractor SOW Paragraph Number

## 6.0 Special Conditions

6.1 Security Specifications (DD254): The Other Transaction Authority (OTA) base contract DD-254 requirements are applicable to this effort. The contractor's technical response SOW shall include all applicable security requirements required to create, handle, protect, transmit, store, and/or manage classified information. The contractor shall refer to section 8 of the RFS and include specific requirements in their SOW. Information security, personnel security, and cyber security requirements shall be included in the SOW.

## 6.2 Sensitive, Proprietary, and Personal Information

6.2.1 The contractor's technical response SOW shall include any applicable sensitive, proprietary, and personal information protection requirements.

6.2.2 Information Subject to Export Control Laws/International Traffic in Arms Regulation (ITAR): The contractor shall include the following in their technical response SOW: Public Law 90-629, "Arms Export Control Act," as amended (22 U.S.C 2751 et. Seq.) requires that all unclassified technical data with military application may not be exported lawfully without an approval, authorization, or license under EO 12470 or the Arms Export Control Act and that such data required an approval, authorization, or license for export under EO 12470 or Arms Export Control Act. For purposes of making this determination, the Militarily Critical Technologies List (MCTL) shall be used as general guidance. All documents determined to contain export controlled technical data will be marked with the following notice: WARNING: This document contains technical data whose export is restricted by the Arms Export Control Act (Title 22, U.S.C., App. 2401 et seq. Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25

6.2.3 Facility Clearance: The contractor's technical response SOW shall include any applicable facility clearance requirements.

6.2.4 Physical Security: The contractor's technical response SOW shall include any applicable physical security requirements.

## 6.3 Electronic Spillages:

6.3.1 The contractor's technical response SOW shall include any applicable requirements related to handling of electronic spillages.

## 6.4 Operations Security (OPSEC)

6.4.1 The contractor's technical response SOW shall include any applicable OPSEC requirements.

6.5 Deliverable Markings and Instructions

6.5.1 Data markings shall be as defined in the RFS, Section 8.

6.6 Quality: The contractor shall have a quality program that is ISO 9001:2015 compliant or meets the following requirements: monitor and control critical processes; continuously improve processes; establish mechanisms for performance feedback; and maintain an effective root cause analysis and corrective action system. The Government reserves the right to perform reviews of the contractor's Quality Management System processes for compliance.

6.7 Environmental: The contractor shall adhere with Federal, State, and local environmental laws and regulations, Executive Orders, treaties, and agreements. The contractor shall consider alternate materials and processes in order to eliminate, reduce or minimize the generation of hazardous waste while minimizing item cost and risk/degradation to system performance

6.8 Travel: The contractor shall identify any required travel within their technical response SOW in table format as shown.

<b>From</b>	<b>To</b>	<b>Trips</b>	<b>Number of People</b>	<b>Duration (days)</b>

Table 1: Travel Locations