



**Strategic & Spectrum Missions Advanced Resilient Trusted Systems (S²MARTS)  
Request for Solutions (RFS)**

*in support of*

**Project KANAGAWA**

**Co-Packaged Analog-Drive High-Bandwidth Optical Input/Output**

**Project No. 22-13**

**A. OPPORTUNITY OVERVIEW**

<b>Project Title</b>	Project KANAGAWA – Co-Packaged Analog-Drive High-Bandwidth Optical Input/Output
<b>Project Sponsor</b>	OUSD(R&E) Trusted & Assured Microelectronics
<b>Contracting Activity</b>	Naval Surface Warfare Center Crane Division
<b>Questions Deadline</b>	8 July 2022 (10 Days after RFS)
<b>Response Deadline</b>	27 July 2022 (30 Days after RFS)
<b>Anticipated Project Budget</b>	\$24M (details below)
<b>Resultant Award Type</b>	Prototype Other Transaction Agreement (10 U.S.C. § 4022)

*All respondents must be active NSTXL members.*

**B. PROTOTYPE PROJECT DETAIL**

1. **Authority:** 10 U.S.C. § 4022, “Authority of the Department of Defense to Carry Out Certain Prototype Projects”

2. **Project Background & Current Capability:**

***Reason for Project***

Co-packaged optics (CPO), the integration of photonic integrated circuits (PIC) with electronic integrated circuits (EIC) inside multi-chip packages (MCP) enables long-reach and high-bandwidth data input/output (I/O), and offers to significantly expand the capabilities of defense microelectronics. For example, such technology can generate dramatically higher data rates from the field-programmable gate arrays (FPGA) that process digital beamforming signals, opening up the possibility of new phased array radar architectures.

While the merits of co-packaged optical I/O have been well known for two decades, the technology is nascent and requires substantial maturation prior to adoption in DoD programs of record. Additionally, the manufacturing processes and supply chain for the photonic chips that comprise co-packaged optical modules is not well established, and demonstrations to date have relied on expensive, custom assembly that are not compatible with high-volume production. The Co-Packaged Analog-Drive High-Bandwidth Optical

Input/Output (KANAGAWA) project aims to promote the maturation of CPO and demonstrate optical links with compelling performance to stimulate transition into the DoD advanced packaging ecosystem and the Defense Industrial Base (DIB).

KANAGAWA will design, build, and test prototypes which demonstrate CPO, laser sources, and heterogeneous integration techniques with other electrical ICs (e.g., FPGAs, data converters). Key performance parameters include an input/output (I/O) bandwidth exceeding 2 Tbps and energy losses below 5pJ/bit (including laser contribution). Secondly, KANAGAWA will strategically partner CPO designers with packaging facilities to assess and demonstrate the maturation of underlying manufacturing processes. By tailoring metrics from the [DoD Manufacturing Readiness Level \(MRL\) Deskbook 2020](#), KANAGAWA will de-risk the transition of CPO I/O technology towards the DIB, while driving affordability and scalability for production.

### **Background & Current State of Technology**

Electronic means of data transmission suffer from skin-depth effects in electrical wires that produce frequency-dependent loss that limits bandwidth and link reach. In contrast, optical data I/O that carries digital information via modulated light can propagate over vast distances in optical fiber with negligible loss at high bandwidth. To date however, the current practice of integrating pluggable optical transceivers with microelectronics at the circuit board level imposes high power consumption, consuming approximately 30 pJ per bit of information. Such power consumption limits the data rates that can be practically translated into the optical domain to the range of 100 – 400 Gbps per transceiver module.

In contrast to using copper electrical wires on the board, CPO intimately integrates optical I/O into MCPs by leveraging integrated photonics manufacturing that produce compact optical chiplets. With advanced microelectronic packaging methods enabling significantly shorter wire lengths from EICs to PICs inside the package, CPO provides significantly lower power consumption and higher data rate than board-level systems. Recent demonstrations have produced Tbps-level data throughput from a single chiplet, consuming only 5 pJ/bit.

Still, a number of factors remain to be addressed before the benefits of co-packaged optical I/O can be applied to large-scale defense and commercial systems. Although the defense industrial base (DIB) is unlikely to require as high of unit volumes as commercial users, large-scale radar and communication systems may demand thousands of optical I/O modules, implying yield, cost, and availability requirements consistent with scaling. The integrated photonics supply chain that generates CPO I/O chiplets is still an emerging ecosystem, and yield has not been studied at scale. In addition to chiplets, some co-packaged optical I/O demonstrations make use of stand-alone multi-wavelength laser modules which will also require the development of new, scalable assembly methods. Optical fiber connections to both photonic chiplets and laser modules must be established with high yield, throughput, and compatibility with the MCP assembly processes. In addition to manufacturing-relevant concerns, defense applications impose further technology readiness requirements on optical I/O parts. As an example, semiconductor lasers are well-known to suffer from efficiency decreases at the elevated temperatures that should be expected in radar systems or other DoD environments. Verifying the performance of co-packaged optical components in relevant environments is vital to future deployment. In order to facilitate system-level testing and maturation, development of new link modalities, firmware, and control algorithms may be required for interfaces with other system components such as RF data converters.

### **3. Desired End-State & Success Criteria:**

#### **Contract Structure – Tasks, Iterations, & Phases**

The Co-Packaged Analog-Drive High-Bandwidth Optical Input/Output (KANAGAWA) project aims to promote the maturation of CPO and demonstrate optical links with compelling performance to stimulate transition into the DoD advanced packaging ecosystem and the DIB. These goals will be accomplished by two project tasks:

- **Task A – Optical I/O & Laser Demonstration & Manufacturing**

- Objective: Demonstrate analog-drive optical I/O chiplet prototypes with high-yield fabrication and  $\geq 2$  Tbps aggregate data rate
- Objective: Mature the optical assembly processes for CPO I/O components to MRL-8
- **Task B – Advanced Packaging Demonstration**
  - Objective: Demonstrate state-of-the-art MCPs employing analog-drive optical I/O
  - Objective: Advance the microelectronics packaging manufacturing and technology readiness of optically-enabled MCPs

**Task A** is composed of two iterations of prototyping. The period of performance is **approximately 15 months per iteration**. It is anticipated that Task A will be awarded to a single performer. Both Iterations 1 & 2 of Task A prototyping are considered part of the base contract for Task A. This means that Task A applications must cover activities supporting the completion of both Iteration 1 & 2 of Task A. (I.e., Task A's Iteration 2 is NOT an option, and therefore does NOT require the evaluation of an additional cost and technical proposal at a later date.)

**Task B** includes up to three phases. The period of performance is **approximately 10 months for Phase 1, and approximately 15 months for each of Phase 2 and Phase 3**. Note, each follow-on phase (Task B-2 and Task B-3) is an option, and will require the evaluation of an additional formal cost and technical proposal at a later date to begin execution. (See "Unpriced Options" section later in this document for more information.) It is anticipated that Task B awards may support approximately 3 different performers working in parallel. It is recommended that applicants begin at Task B-1 in order to (1) align the Task B roadmap with DoD needs, (2) provide Task B activities with ample mature die and lasers via Task A, and (3) provide sufficient time to develop capabilities necessary to support the advanced integration of CPO. However, if an applicant determines they can satisfy these interests while beginning directly with Task B-2 or Task B-3, such a proposal would be considered during this RFS process.

Tasks A and B are parallel tasks. If an applicant is applying to both Tasks A and B, please submit separate proposals for each.

Figure 1 illustrates how KANAGAWA objectives are addressed over time by the contract structure.

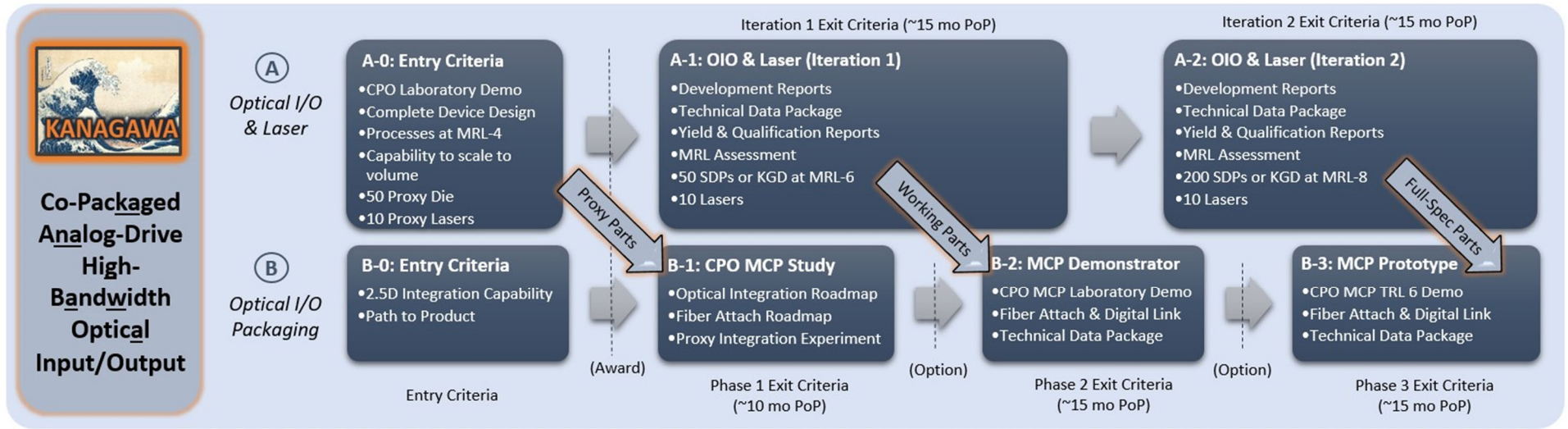


Figure 1. KANAGAWA’s technical objectives will be accomplished by a unique contract structure. Activities and deliverables are broken out per task, iteration, and/or phase over time.

## Technical Metrics for Task A – Optical I/O & Laser Demonstration

Design, build, and test state-of-the-art optical I/O chiplets and laser sources. At minimum, adhere to the following instructions and end-state objectives:

1. **Link Configuration** – Optical I/O chiplets must provide fiber links that drop into serial electrical channels typically employed by advanced microelectronics, such that customization of EICs is not required when devices are eventually co-packaged. While it is expected that the optical I/O will employ analog circuitry in order to be driven directly by high-rate Serializer/Deserializer (SerDes) circuitry, applicants may propose any method that enables SerDes direct driving and is compatible with metrics targets.
2. **Bandwidth & Efficiency** – Demonstrate aggregate bandwidth  $\geq 2$  Tbps from a single chiplet and energy losses below 5 pJ/bit (measured from electrical input channel to electrical output channel, and including laser contribution). Applicants may accomplish the aggregate bandwidth through a combination of wavelength and fiber channels.
  - o **Per-Channel Data Rate** – Measure with eye diagram
  - o **# of Wavelengths** - Demonstrate the per-fiber data rate with an operational link that runs all required wavelengths simultaneously at the per-channel data rate
  - o **# of Fibers** – Demonstrate functionality of each fiber port at specified data rate and number of wavelengths.
3. **Link Budget** – Measure the link budget for the prototype units and correlate the measurements with the calculated link budget
4. **Optical Power of Laser** – Demonstrate multi-wavelength laser prototypes with output power at each wavelength that is consistent with 1 dB link margin.
5. **Latency** – Measure correlation showing end-to-end latency  $< 4$  ns + time of flight (TOF).
6. **Bit Error Rate (BER)** - Demonstrate link BER of  $10^{-12}$
7. **Electrical Interface** – Task A awardee(s) should collaborate with Task B awardee(s) to identify and implement an electrical interface that enables co-packaging with advanced electrical ICs.
8. **Laser Reliability and Lifetime** – Measure mean time to failure for a portion of the deliverable units, with a goal of 50,000 hour lifetime at room temperature. It is expected that stress conditions, accelerated aging, and extrapolation will be used to characterize lifetime.
9. **Environmental Characterization** – Through a combination of modeling and laboratory testing, analyze the performance of optical I/O chiplet and laser sources as a function of ambient temperature and vibration. Collaborate with Task B awardee(s) to identify reliability issues in mission-relevant operating environmental conditions. For proposal purposes, assume that operation anywhere within the full military temperature range of -55 to 125 C will be required. It is expected that meeting these conditions will entail a thermal control system, particularly for lasers. Proposals should discuss the expected methods of thermal control and corresponding size, weight, and power considerations. It is acceptable for multiple thermal design concepts to address portions of the temperature range via different versions of the laser modules.
10. **Chiplet Yield** – Fabricate optical I/O chiplets and demonstrate greater than 70% yield measured at wafer level based on functional test of I/O control circuitry.
11. **V-Groove Qualification** – If relevant to the proposed fiber attach process, develop and complete a V-groove qualification plan using prototype samples.
12. **Fiber Attach Yield** – Perform optical fiber attach and demonstrate greater than 70% yield for insertion loss consistent with link budget.
13. **Manufacturing Readiness Level Assessment** – Demonstrate MRL-8 for packaged optical I/O chiplet and laser by assessing specific sub-threads of the DoD MRL Deskbook 2020
  - a. **Sub-Thread A.2 Manufacturing Technology Development** – Deliver laser sources and optical I/O chiplets to Task B awardee(s) in proxy die, SDP, or known-good die (KGD) format depending on Task B awardee(s) integration scheme.
    - i. Iteration 1 – Deliver 10 proxy laser sources and 50 proxy optical chiplet die by month 3 after award. Proxy optical die must at least contain V-groove test structures or other relevant fiber-coupling components, and have the same dimensions as Task A prototypes. Proxy die with functional single-channel optical I/O are preferred. Proxy lasers must generate at least one

wavelength with sufficient power to measure proxy chiplet insertion loss using standard laboratory equipment.

- ii. Iteration 1 – Deliver 10 Task A laser prototypes and 50 Task A chiplet prototype units to Task B awardee(s) in either SDP or KGD form factor, by month 15 after award.
- iii. Iteration 2 – Deliver 10 Task A laser prototypes and 200 Task A prototype units to Task B awardee(s) in either SDP or KGD form factor by month 30 after award.
- b. **Sub-Thread B.1 Producibility** – Deliver production volume capacity plan to meet demand for SDP or MCP as the choice vehicle.
- c. **Sub-Thread C.2 Cost Analysis** –
  - i. **Chiplet** – Show the percentage contribution of cost of for the key elements including known-good die considerations and packaging for the prototypes. Identify gaps and present cost reduction strategies for higher volume production quantities.
  - ii. **Laser** – Show the percentage contribution of cost of for the key elements including laser die, control electronics, and packaging for the prototypes. Identify gaps and present cost reduction strategies for higher volume production quantities.
- b. **Sub-Thread E.3 Process Yield** – Showcase >50% wafer yield on multiple (10+) wafers and compare against target yield. Deliver yield improvement plan for high volume production.

<b>Task Set A – Optical I/O &amp; Laser Demonstration &amp; Manufacturing</b>			
<i>Parameter</i>	<i>Proposal Entry Criteria</i>	<i>Iteration 1 Exit Criteria</i>	<i>Iteration 2 Exit Criteria</i>
Aggregate Bandwidth	Experimental demo of > 10 Gbps link. Complete design and simulation traceable to Iteration 2 criteria	≥ 256 Gbps	≥ 2 Tbps
Link Margin		0 dB	1 dB
Latency		10 ns + TOF	4 ns + TOF
BER		10 <sup>-10</sup>	10 <sup>-12</sup>
MRL	4	6	8
Chiplet Yield	Data consistent with MRL-4 sub-threads to be provided in proposal	≥ 50%	≥ 70%
Fiber Attach Yield	Disclose	≥ 50%	≥ 70%
Process Yield	Disclose	≥ 30%	≥ 50%
Number of Chiplet Units	50 proxy die available by month 3 after award	50 Iteration 1 prototypes (combination of KGD and SDPs)	200 Iteration 2 prototypes (combination of KGD and SDPs)
Number of Laser Units	10 proxy lasers available by month 3 after award	10 Task A prototypes	10 Task A prototypes
Laser Lifetime	Disclose	≥ 5,000 hours	≥ 50,000 hours
Thermal	Disclose thermal specifications for proxy parts	-40°C to 85°C *	-55°C to 125°C *
Solder Reflow Compatibility	Disclose reliability specifications for proxy parts	250°C for 5 minutes	250°C for 5 minutes

*\*note Task A.9 Environmental Characterization – Through a combination of modeling and laboratory testing, analyze the performance of optical I/O chiplet and laser sources as a function of ambient temperature and vibration. Collaborate with Task B awardee(s) to identify reliability issues in mission-relevant operating environmental conditions. For proposal purposes, assume that operation anywhere within the full military temperature range of -55 to 125 C will be required. It is expected that meeting these conditions will entail a thermal control system,*

*particularly for lasers. Proposals should discuss the expected methods of thermal control and corresponding size, weight, and power considerations. It is acceptable for multiple thermal design concepts to address portions of the temperature range via different versions of the laser modules.*

## **Collaboration for Task A**

**The awardee(s) of Task A should collaborate with the awardee(s) of Task B.** This will include, but not be limited to, regularly monthly technical interchange meetings, onsite coaching for development and demonstration of advanced packaging procedures, and general education and mentorship in the design, manufacturing, and test of co-packaged optics and lasers.

**Task A performer should collaborate with the US Government** in order to support independent verification and validation (IV&V) of project deliverables and processes.

## **Technical Metrics for Task B – Advanced Packaging Demonstration**

Assess, develop, and demonstrate heterogeneous integration processes to co-package the optical I/O chiplets from Task A with other state-of-the-art electrical EICs (e.g., field programmable gate arrays (FPGA) or data converters). Optical I/O chiplets must be electrically connected to EIC(s) within a proximity of 50 mm. Applicants may be in different stages of maturity. The most competitive proposals with compelling DoD application will be accepted. The following is a list of activities which are segregated by potential maturity stage of the applicant:

1. **Phase 1 - CPO Assessment and Experiment** – Investigate emerging 2.5D/3D heterogeneous technologies, such as those used in prior CPO demonstrations, and develop a plan to insert/demonstrate these capabilities over time into the DoD Microelectronics Roadmap for secure advanced packaging.
  - a. Perform self-analysis of existing CPO capabilities, resources, and skills.
  - b. Collect and analyze industry data to determine emerging trends and roadmaps
  - c. Conduct a capability gap analysis
  - d. Develop a robust capability development roadmap and detailed plan for optical chiplet integration. Include hiring, partnerships, sub contracts, mergers/acquisitions, equipment/facilities, etc.
  - e. Perform basic laboratory experiments of heterogeneous integration and fiber attach processes using proxy optical I/O die and lasers received from Task A awardee(s). Assess anticipated reliability and environmental performance – temperature, shock/vibe, and solder reflow.
2. **Phase 2 – CPO Assessment & MCP Demonstration**
  - a. **Fiber Attach** – Develop, demonstrate, and perform structural analyses on fiber attach processes
  - b. **Packaging Analysis** – Develop, demonstrate and perform analyses of heterogeneous integrated package development using a silicon photonic chiplet compatible with existing packaging processes
  - c. **Gap Analysis** – Deliver manufacturing gap analysis with a roadmap to volume commercial manufacturing
  - d. **Process Development** – Develop a CPO heterogeneous integration process using lasers, SDPs, and/or KGD received from Task A awardee(s)
  - e. **Demonstrate Digital Fiber Link** – Develop at least two MCP units that include CPO with either internal or external lasers sources. Demonstrate successful communication between the two electrical end-components on the MCPs connected by optical fiber.
  - f. **Environmental Measurement** – Collaborate with Task A awardee(s) to measure Task A optical I/O SDP, Task A laser, and Task B.3 MCP performance subjected to varying environmental conditions. At a minimum, reliability, temperature, and shock/vibration testing must be performed. Ideal targets for temperature and solder reflow are the same as Task A Iteration 1.
3. **Phase 3 – Mature CPO Prototype**
  - a. **Prototype** – Develop and demonstrate at least two state-of-the-art MCP units that employ co-packaged optical I/O chiplets and laser sources received from Task A awardee(s), with

compelling alignment to DoD program needs. Demonstrate successful communication between the two electrical end-components on the MCPs connected by optical fiber.

- b. **Environmental Analysis** – Collaborate with Task A awardee(s) to characterize the operating environment of prototype components based on expected use case. Note that external laser sources may be subject to different conditions than the MCP.
- c. **Environmental Measurement** – Collaborate with Task A awardee(s) to measure Task A optical I/O SDP, Task A laser, and Task B.3 MCP performance subjected to relevant environmental conditions. At a minimum, reliability, temperature, and shock/vibration testing must be performed. Temperature and solder reflow requirements are the same as Task A Iteration 2.

### **Collaboration for Task B**

**The awardee(s) of Task B should collaborate with the awardee(s) of Task A.** This will include, but not be limited to, regularly monthly technical interchange meetings, onsite coaching for development and demonstration of optical I/O chiplets and lasers, and general education and mentorship in the packaging, test, and higher-level integration of co-packaging optical chiplets and lasers.

**Each Task B awardee should collaborate with the US Government** in order to support independent verification and validation (IV&V) of project deliverables and processes.

### **Clause Language**

**Access Recoupment:** Performer agrees to maintain the KANAGAWA-funded capital equipment installed through its depreciable life. If the performer no longer supports the defense business through use of KANAGAWA-funded capital equipment, the performer will send to the US Government the remaining book value of the equipment as shown by the carrying value on the performer's balance sheet.

**Depreciation of Assets:** The performer agrees to maintain the funded equipment through its depreciable life. The performer further agrees to exclude the depreciation of assets acquired under this Agreement in future proposals to support DoD requirements.

### **Unpriced Options**

If awarded, performers acknowledge that there may be opportunities to author additional formal cost and technical proposals supporting the potential execution of the following unpriced options:

- **Task B-2 MCP Demo** – develop and demonstrate MCP 1 in an integrated system or subsystem.
- **Task B-3 Integrated Prototype**– develop and demonstrate MCP 2 in an integrated system or subsystem.
- **Microelectronics Assurance Framework (MAF)** – insert and demonstrate MAF for co-packaged optics.
- **Thermal Control System** – develop thermal control system for lasers and chiplets.
- **MCP Integrated Demo** – develop and demonstrate MCP in an integrated system or subsystem.
- **Government Independent Verification & Validation** – collaborate with USG to perform IV&V of prototypes.
- **Advanced MCP Solutions** – develop and demonstrate Advanced MCP solutions with co-package optics.
- **Advanced Process** – develop and demonstrate advanced processes which increase performance and/or size, weight, and power – cooling (SWAP-C).
- **Advanced T&E** – perform additional test and evaluation requests from the USG.
- **Additional Volume** – provide increased quantity of deliverables.

## **4. Potential Follow-On Activity:**



- a. Upon successful completion of this prototype effort, the Government anticipates that a follow-on production effort may be awarded via either contract or transaction, without the use of competitive procedures if the participants in this transaction successfully complete the prototype project as competitively awarded from this document. The prototype effort will be considered successfully complete upon demonstration of the aforementioned technology objectives.
- b. Successful completion for a specific capability may occur prior to the conclusion of the project to allow the Government to transition that aspect of the prototype project into production while other aspects of the prototype project have yet to be completed.
- c. Requirements of other potential follow-on activities could involve, though not limited to, continued development and baseline management, fielding, sustainment, training, further scaling of the solution, integration of future capabilities, or integration of the solution with other capabilities.

**5. Project Deliverables:**

Project Deliverables are divided into three sections of numbering: Task A, Task B, & Program Management. Task A applicants should address all Task A and Program Management milestones in their Task A proposals. Task B applicants should address all Task B and Program Management milestones in their Task B proposals. If an applicant is applying to both Tasks A and B, please submit separate proposals for each.

No.	Title	Description	Frequency	Delivery Method
<i>Task A-1 Deliverables</i>				
A-1.01	Kickoff	Travel to Indianapolis, IN to deliver an in-person brief to the USG.	1	PPT, In-Person Brief
<i>Proxy Laser &amp; Chiplet</i>				
A-1.02	Baseline MRL Assessment of Laser	Tailor DoD MRL Deskbook 2020 (sub-threads A.2, B.1, C.2, and E.3 at minimum) to assess initial MRL of laser.	1	PPT, Virtual Brief, Supporting Evidence
A-1.03	Baseline MRL Assessment of Chiplet	Tailor DoD MRL Deskbook 2020 (sub-threads A.2, B.1, C.2, and E.3 at minimum) to assess initial MRL of chiplet.	1	PPT, Virtual Brief, Supporting Evidence
A-1.04	Baseline Assessment of Environmental and Reliability for Proxy Laser and Chiplet	Baseline assessment of environmental and reliability for proxy lasers and die. Evaluate multiple thermal design concepts to address portions of the temperature range via different versions of the laser modules. Prepare to communicate with Task B performers and collect feedback.	1	PPT, Virtual Brief, Excel document for supporting data, Word document for supporting documentation
A-1.05	10 Proxy Lasers	Provide USG and Task B partners a total of 10 proxy lasers by month 3 after award. USG determines how the 10 lasers are distributed amongst USG and Task B partners.	1	Physical Delivery (e.g., Post)

A-1.06	50 Proxy Die	Provide USG and Task B partners a total of 50 proxy die by month 3 after award. USG determines how the 50 die are distributed amongst USG and Task B partners.	1	Physical Delivery (e.g., Post)
<i>MRL-5 Laser &amp; Chiplet</i>				
A-1.07	MRL-5 Assessment of Laser	Tailor DoD MRL Deskbook 2020 (sub-threads A.2, B.1, C.2, and E.3 at minimum) to assess MRL of laser and verify MRL-5.	1	PPT, Virtual Brief, Supporting Evidence
A-1.08	MRL-5 Assessment of Chiplet	Tailor DoD MRL Deskbook 2020 (sub-threads A.2, B.1, C.2, and E.3 at minimum) to assess MRL of chiplet and verify MRL-5.	1	PPT, Virtual Brief, Supporting Evidence
A-1.09	Assessment of Environmental and Reliability for MRL-5 Laser and Chiplet	Assessment of environmental and reliability for MRL-5 lasers and chiplets. Evaluate multiple thermal design concepts to address portions of the temperature range via different versions of the laser modules. Distill communications with Task B performers and utilize feedback to verify assumptions and approach. Demonstrate progress towards Iteration 1 metrics.	1	PPT, Virtual Brief, Excel document for supporting data, Word document for supporting documentation
A-1.10	(Optional) 5 Laser Prototypes at MRL-5	Demonstrate optical I/O chiplet assembly at MRL-5. Provide USG and Task B partners a total of 5 laser prototypes by month 10 after award. USG determines how the 5 lasers chiplets are distributed amongst USG and Task B partners.	1	Physical Delivery (e.g., Post)
A-1.11	(Optional) 25 Chiplet Prototypes at MRL-5	Demonstrate optical I/O chiplet assembly at MRL-5. Provide USG and Task B partners a total of 25 chiplet prototypes (SDP or KGD) by month 10 after award. USG determines how the 25 chiplets are distributed amongst USG and Task B partners.	1	Physical Delivery (e.g., Post)
<i>MRL-6 Laser &amp; Chiplet</i>				
A-1.12	MRL-6 Assessment of Laser	Tailor DoD MRL Deskbook 2020 (sub-threads A.2, B.1, C.2, and E.3 at minimum) to assess MRL of laser and verify MRL-6.	1	PPT, Virtual Brief, Supporting Evidence
A-1.13	MRL-6 Assessment of Chiplet	Tailor DoD MRL Deskbook 2020 (sub-threads A.2, B.1, C.2, and E.3 at minimum) to	1	PPT, Virtual Brief, Supporting Evidence

		assess MRL of chiplet and verify MRL-6.		
A-1.14	Assessment of Environmental and Reliability for MRL-6 Laser and Chiplet	Assessment of environmental and reliability for MRL-6 lasers and chiplets. Evaluate multiple thermal design concepts to address portions of the temperature range via different versions of the laser modules. Distill communications with Task B performers and utilize feedback to verify assumptions and approach. Demonstrate Iteration 1 metrics.	1	PPT, Virtual Brief, Excel document for supporting data, Word document for supporting documentation
A-1.15	10 Laser Prototypes at MRL-6	Demonstrate optical I/O chiplet assembly at MRL-6. Provide USG and Task B partners a total of 10 laser prototypes by month 15 after award. USG determines how the 10 lasers chiplets are distributed amongst USG and Task B partners.	1	Physical Delivery (e.g., Post)
A-1.16	50 Chiplet Prototypes at MRL-6	Demonstrate optical I/O chiplet assembly at MRL-6. Provide USG and Task B partners a total of 50 chiplet prototypes (SDP or KGD) by month 15 after award. USG determines how the 50 chiplets are distributed amongst USG and Task B partners.	1	Physical Delivery (e.g., Post)
A-1.17	Technical Data Package for MRL-6 Laser	Technical Data Package should include the documentation needed to design and manufacture the laser under GPR. This should include, but not be limited to, design files, simulation files, layouts, schematics, specifications, characterization data, operating instructions, etc. Should be provided at least two weeks prior to the close out brief site visit and presentation.	1	Overview Documentation (PPT or Word) & Software Files
A-1.18	Technical Data Package for MRL-6 Chiplet	Technical Data Package should include the documentation needed to design and manufacture the chiplet under GPR. This should include, but not be limited to, design files, simulation files, layouts, schematics, specifications, characterization data, operating instructions, etc. Should be provided at least two weeks	1	Overview Documentation (PPT or Word) & Software Files

		prior to the close out brief site visit and presentation.		
A-1.19	USG Independent Verification & Validation (IV&V)	Site visit to USG facility to assist with IV&V testing and evaluation.	1	In-Person Support at USG facility
A-1.20	Close Out Brief, Demos, & Report	Host in-person site visit by USG. Provide written report capturing the results of Iteration 1 activities. This includes, but is not limited to, the design, manufacturing, and performance of MRL-6 lasers and chiplets. Reference the RFS text and Task A Metrics. E.g., fiber attach yield, V-groove qualification, environmental, and reliability.	1	In-Person Onsite PPT Brief, Physical Demos, and Written Report in Word
<i>Task A-2 Deliverables</i>				
A-2.01	Kickoff	Travel to Indianapolis, IN to deliver an in-person brief to the USG.	1	PPT, In-Person Brief
<i>MRL-7 Laser &amp; Chiplet</i>				
A-2.02	MRL-7 Assessment of Laser	Tailor DoD MRL Deskbook 2020 (sub-threads A.2, B.1, C.2, and E.3 at minimum) to assess MRL of laser and verify MRL-7.	1	PPT, Virtual Brief, Supporting Evidence
A-2.03	MRL-7 Assessment of Chiplet	Tailor DoD MRL Deskbook 2020 (sub-threads A.2, B.1, C.2, and E.3 at minimum) to assess MRL of chiplet and verify MRL-7.	1	PPT, Virtual Brief, Supporting Evidence
A-2.04	Assessment of Environmental and Reliability for MRL-7 Laser and Chiplet	Assessment of environmental and reliability for MRL-7 lasers and chiplets. Evaluate multiple thermal design concepts to address portions of the temperature range via different versions of the laser modules. Distill communications with Task B performers and utilize feedback to verify assumptions and approach. Demonstrate progress towards Iteration 2 metrics.	1	PPT, Virtual Brief, Excel document for supporting data, Word document for supporting documentation
A-2.05	(Optional) 5 Laser Prototypes at MRL-7	Demonstrate optical I/O chiplet assembly at MRL-7. Provide USG and Task B partners a total of 5 laser prototypes by month 10 after start of Iteration 2. USG determines how the 5 lasers chiplets are distributed amongst USG and Task B partners.	1	Physical Delivery (e.g., Post)

A-2.06	(Optional) 25 Chiplet Prototypes at MRL-7	Demonstrate optical I/O chiplet assembly at MRL-7. Provide USG and Task B partners a total of 25 chiplet prototypes (SDP or KGD) by month 10 after start of Iteration 2. USG determines how the 25 chiplets are distributed amongst USG and Task B partners.	1	Physical Delivery (e.g., Post)
<i>MRL-8 Laser &amp; Chiplet</i>				
A-2.07	MRL-8 Assessment of Laser	Tailor DoD MRL Deskbook 2020 (sub-threads A.2, B.1, C.2, and E.3 at minimum) to assess MRL of laser and verify MRL-8.	1	PPT, Virtual Brief, Supporting Evidence
A-2.08	MRL-8 Assessment of Chiplet	Tailor DoD MRL Deskbook 2020 (sub-threads A.2, B.1, C.2, and E.3 at minimum) to assess MRL of chiplet and verify MRL-8.	1	PPT, Virtual Brief, Supporting Evidence
A-2.09	Assessment of Environmental and Reliability for MRL-8 Laser and Chiplet	Assessment of environmental and reliability for MRL-8 lasers and chiplets. Evaluate multiple thermal design concepts to address portions of the temperature range via different versions of the laser modules. Distill communications with Task B performers and utilize feedback to verify assumptions and approach. Demonstrate Iteration 2 metrics.	1	PPT, Virtual Brief, Excel document for supporting data, Word document for supporting documentation
A-2.10	10 Laser Prototypes at MRL-8	Demonstrate optical I/O chiplet assembly at MRL-6. Provide USG and Task B partners a total of 10 laser prototypes by month 15 after award. USG determines how the 10 lasers chiplets are distributed amongst USG and Task B partners.	1	Physical Delivery (e.g., Post)
A-2.11	200 Chiplet Prototypes at MRL-8	Demonstrate optical I/O chiplet assembly at MRL-8. Provide USG and Task B partners a total of 200 chiplet prototypes (SDP or KGD) by month 15 after start of Iteration 2. USG determines how the 200 chiplets are distributed amongst	1	Physical Delivery (e.g., Post)

		USG and Task B partners.		
A-2.12	Technical Data Package for MRL-8 Laser	Technical Data Package should include the documentation needed to design and manufacture the laser under GPR. This should include, but not be limited to, design files, simulation files, layouts, schematics, specifications, characterization data, operating instructions, etc.	1	Overview Documentation (PPT or Word) & Software Files
A-2.13	Technical Data Package for MRL-8 Chiplet	Technical Data Package should include the documentation needed to design and manufacture the chiplet under GPR. This should include, but not be limited to, design files, simulation files, layouts, schematics, specifications, characterization data, operating instructions, etc. Should be provided at least two weeks prior to the close out brief site visit and presentation.	1	Overview Documentation (PPT or Word) & Software Files
A-2.14	USG Independent Verification & Validation (IV&V)	Site visit to USG facility to assist with IV&V testing and evaluation.	1	In-Person Support at USG facility
A-2.15	Close Out Brief, Demos, & Report	Host in-person site visit by USG. Provide written report capturing the results of Iteration 2 activities. This includes, but is not limited to, the design, manufacturing, and performance of MRL-8 lasers and chiplets. Reference the RFS text and Task A Metrics. E.g., fiber attach yield, V-groove qualification, environmental, and reliability.	1	In-Person Onsite PPT Brief, Physical Demos, and Narrative Report in Word
<b>Task B-1 Deliverables</b>				
B-1.01	Kickoff	Travel to Indianapolis, IN to deliver an in-person brief to the USG.	1	PPT, In-Person Brief
B-1.02	Initial Assessment & Capability Gap Analysis	Perform self-assessment and conduct a CPO capabilities gap analysis. Assess supply chain for	1	PPT, Virtual Brief

		bottlenecks, foreign/domestic players, and strengths/weaknesses. Assess DoD and dual-use needs. Brief USG.		
B-1.03	Optical Integration Roadmap	Develop roadmap and detailed plan for optical chiplet integration. Include fiber attach. Include path to volume commercial manufacturing. Interview Defense Industrial Base, DoD primes, and program offices to inform roadmap. Brief USG.	1	PPT, Virtual Brief
B-1.04	Proxy Integration Experiment	Perform basic laboratory experiments of heterogeneous integration and fiber attach processes using proxy optical I/O die and lasers received from Task A awardee(s). Assess anticipated reliability and environmental performance – temperature, shock/vibe, and solder reflow. Brief results to USG.	1	PPT, Virtual Brief
B-1.05	(Optional) Task B-2 Capital Equipment	Purchase long-lead equipment/tools for Task B-2.	1	PDF Copy of Invoice & Receipt
B-1.06	Task B-2 Proposal	Provide formal technical (15 pages max) and cost proposal (7 pages max) for Task B-2. Optional virtual brief to USG	1	Word and Excel, Optional Virtual PPT Brief
B-1.07	Technical Data Package	Technical Data Package should include the documentation needed to design and manufacture the prototype under GPR. This should include, but not be limited to, design files, simulation files, layouts, schematics, specifications, characterization data, operating instructions, etc. Should be provided at least two weeks prior to the close out brief site visit and presentation.	1	Overview Documentation (PPT or Word) & Software Files
B-1.08	Close Out Brief	Host in-person site visit by USG. Brief USG and perform demos. Two weeks prior, provide written report capturing the results of	1	In-Person Onsite PPT Brief, Physical Demos, and

		Task B-1 activities. This includes, but is not limited to, the design, manufacturing, and performance of Task B-1 technology. Assess environmental and reliability.		Narrative Report in Word
B-1.09	USG Independent Verification & Validation (IV&V)	Host in-person site visit by USG, where USG performs onsite testing and evaluation jointly with performer engineers.	1	In-Person Support at Performer Facility
<i>Task B-2 Deliverables</i>				
B-2.01	Kickoff	Travel to Indianapolis, IN to deliver an in-person brief to the USG.	1	PPT, In-Person Brief
B-2.02	Updated Self-Assessment & Capability Gap Analysis	Update self-assessment and conduct a CPO capabilities gap analysis. Assess supply chain for bottlenecks, foreign/domestic players, and strengths/weaknesses. Assess DoD and dual use needs. Brief USG.	1	PPT, Virtual Brief
B-2.03	Updated Optical Integration Roadmap	Update roadmap and detailed plan for optical chiplet integration. Include fiber attach. Include path to volume commercial manufacturing. Interview Defense Industrial Base, DoD primes, and program offices to inform roadmap. Brief USG.	1	PPT, Virtual Brief
B-2.04	Fiber Attach	Develop, demonstrate, and perform structural analyses on fiber attach processes. Brief USG. Demo at close out brief.	1	PPT, Virtual Brief, Demo
B-2.05	Packaging Analysis	Develop, demonstrate and perform analyses of heterogeneous integrated package development using a silicon photonic chiplet compatible with existing packaging processes. Brief USG.	1	PPT, Virtual Brief
B-2.06	Process Development	Develop a CPO heterogeneous integration process using lasers, SDPs, and/or KGD received from Task A	1	PPT, Virtual Brief, Demo



		awardee(s). Brief USG. Demo at close out brief.		
B-2.07	Digital Fiber Link Demonstration	Develop at least two MCP units that include CPO with either internal or external lasers sources. Demonstrate successful communication between the two electrical end-components on the MCPs connected by optical fiber. Brief USG. Demo at close out brief.	1	PPT, Virtual Brief, Demo
B-2.08	Environmental Measurement	Collaborate with Task A awardee(s) to measure Task A optical I/O SDP, Task A laser, and Task B.3 MCP performance subjected to varying environmental conditions. At a minimum, reliability, temperature, and shock/vibration testing must be performed. Ideal targets for temperature and solder reflow are the same as Task A Iteration 1. Brief USG. Demo at close out brief.	1	PPT, Virtual Brief, Demo
B-2.09	Task B-3 Proposal	Provide formal technical (15 pages max) and cost proposal (7 pages max) for Task B-3. Optional virtual brief to USG	1	Word and Excel, Optional Virtual PPT Brief
B-2.10	Technical Data Package	Technical Data Package should include the documentation needed to design and manufacture the prototype under GPR. This should include, but not be limited to, design files, simulation files, layouts, schematics, specifications, characterization data, operating instructions, etc. Should be provided at least two weeks prior to the close out brief site visit and presentation.	1	Overview Documentation (PPT or Word) & Software Files
B-2.11	Close Out Brief	Host in-person site visit by USG. Brief USG and perform demos. Two weeks prior, provide written report capturing the results of Task B-2 activities. This	1	In-Person Onsite PPT Brief, Physical Demos, and Narrative Report in Word

		includes, but is not limited to, the design, manufacturing, and performance of Task B-2 technologies. Include technology readiness level (TRL) assessment and environmental measurement.		
B-2.12	USG Independent Verification & Validation (IV&V)	Host in-person site visit by USG, where USG performs onsite testing and evaluation jointly with performer engineers.	1	In-Person Support at Performer Facility
<i>Task B-3 Deliverables</i>				
B-3.01	Kickoff	Travel to Indianapolis, IN to deliver an in-person brief to the USG.	1	PPT, In-Person Brief
B-3.02	Updated Self-Assessment & Capability Gap Analysis	Update self-assessment and conduct a CPO capabilities gap analysis. Assess supply chain for bottlenecks, foreign/domestic players, and strengths/weaknesses. Assess DoD and dual use needs. Brief USG.	1	PPT, Virtual Brief
B-3.03	Updated Optical Integration Roadmap	Update roadmap and detailed plan for optical chiplet integration. Include fiber attach. Include path to volume commercial manufacturing. Interview Defense Industrial Base, DoD primes, and program offices to inform roadmap. Brief USG.	1	PPT, Virtual Brief
B-3.04	Mature CPO Prototype	Develop and demonstrate at least two state-of-the-art MCP units that employ co-packaged optical I/O chiplets and laser sources received from Task A awardee(s), with compelling alignment to DoD program needs. Demonstrate successful communication between the two electrical end-components on the MCPs connected by optical fiber. Brief USG. Demo at close-out brief.	1	PPT, Virtual Brief, Demo
B-3.05	Environmental Analysis	Collaborate with Task A awardee(s) to characterize the operating environment of prototype components based on expected use case. Note that external laser sources may be subject to different	1	PPT, Virtual Brief

		conditions than the MCP. Brief USG.		
B-3.06	Environmental Measurement	Collaborate with Task A awardee(s) to measure Task A optical I/O SDP, Task A laser, and Task B-3 MCP performance subjected to relevant environmental conditions. At a minimum, reliability, temperature, and shock/vibration testing must be performed. Temperature and solder reflow requirements are the same as Task A Iteration 2. Brief USG. Demo at close out brief.	1	PPT, Virtual Brief, Demo
B-3.07	Subsystem Prototype White Paper	In conjunction with a DIB partner, DoD prime, and/or program office, author a white paper proposal (including cost) for a DoD subsystem or system prototype.	1	Word and Excel, Optional Virtual PPT Brief
B-3.08	Technical Data Package	Technical Data Package should include the documentation needed to design and manufacture the prototype under GPR. This should include, but not be limited to, design files, simulation files, layouts, schematics, specifications, characterization data, operating instructions, etc. Should be provided at least two weeks prior to the close out brief site visit and presentation.	1	Overview Documentation (PPT or Word) & Software Files
B-3.09	Close Out Brief	Host in-person site visit by USG. Brief USG and perform demos. Two weeks prior, provide written report capturing the results of Task B-3 activities. This includes, but is not limited to, the design, manufacturing, and performance of Task B-3 technologies. Include TRL assessment and environmental measurement.	1	In-Person Onsite PPT Brief, Physical Demos, and Narrative Report in Word
B-3.10	USG Independent Verification & Validation (IV&V)	Host in-person site visit by USG, where USG performs onsite testing and evaluation jointly with performer engineers.	1	In-Person Support at Performer Facility

<i>Program Management Deliverables (for all phases or iterations of Task A or B)</i>				
PM-1	Meetings & Updates – Technical	Track incremental progress. Provide activity reports (2-3 sentence highlights with pictures) for achievements and completed milestones.	Monthly / As Needed	PPT & Virtual
PM-2	Meetings & Updates – Milestones & Financials	Keep an updated record of milestones	Monthly / As Needed	Excel Doc
PM-3	IMS	Demonstrate Project Management. Identify and track key performance parameters. Includes both a high-level schedule (which fits legibly on one PPT slide) and an MS Project file.	High-Level Slide (Monthly) IMS (Quarterly)	Electronic PPT, MS Project
PM-4	Technical Interchange Meetings	Host monthly meetings individually with each active performer of the opposite Task. Meeting minutes should provide input to Program Management deliverables, such as monthly USG updates and semi-annual Collaboration Reports.	Monthly per performer	PPT, Virtual Brief with USG on courtesy copy/invite
PM-5	Quarterly Reports	Quarterly high-level status updates and discussion. To include status of milestones, deliverables, and maturation roadmaps.	Quarterly	PPT & Virtual
PM-6	Collaboration Reports	Document technical interchange between task areas, government IV&V collaboration, and PhD support activities	Semi-Annual	PPT & Virtual
PM-7	Technical Execution Area Reviews	Present to OSD Leadership and Stakeholders	Semi-Annual	PPT & Virtual/In-Person

## 6. Anticipated Budget

Total Base Project - \$24,000,000 for Task A1, A2, & B1

- Task A1 & A2 - \$15,000,000 per awardee
- Task B1 - \$3,000,000 per awardee (assuming 2-3 awardees)

These values represent what is currently available for the subject project at the time of RFS release. These values are subject to change and is being provided for planning purposes only. Task A Proposals should address the Task A Base Project work (i.e., Task A1, A2, & associated PM) in detail. Task B proposals should address the Task B Base Project work (i.e., Task B-1 & associated PM) in detail. Follow-on funding is not guaranteed and program down-selects may occur at the conclusion of Task B-1.

Respondents are encouraged to clearly explain how much of their solution can be developed for the advertised amount. Capabilities or project phases that will require additional funding beyond the project budget must be identified as such.

## 7. Anticipated Number of Awards

The Government intends to award at least three (one Task A and two Task B) Other Transaction Agreements on a fixed-price basis as a result of this RFS. Please note, more than three awards may be issued if determined to be in the Government's best interest. The Government also reserves the right to execute fewer awards than anticipated, select aspects of a proposal for award, or not select any of the solutions proposed.

Responses addressing only Task A or Task B are permitted for this effort. Within a specific task (either Task A or B), partial responses addressing only a subset of the respective Task's overall objectives are not permitted for this effort.

**8. Supporting Attachments:**

- a. Section 889 Prohibition and Reporting
- b. Section 889 Verification and Representation

**C. SECURITY INFORMATION & RESTRICTIONS**

1. This RFS, to include attachments, has been released in accordance with

Distribution Statement A: Approved for public release.

2. Security classification & other restrictions:

- Respondents for Task B are restricted to North American companies only.
- A DD Form 2345 is not required.
- Compliance with International Traffic in Arms Regulation (22 C.F.R. §§ 120-130) at time of award
- By submitting a response, respondents shall certify whether covered telecommunications equipment or services **will or will not** be included as a part of its offered products or services to the Government in the performance of this effort.

RFS Attachment 1 includes additional detail regarding the representation which must be signed and returned with any submissions.

**What is included under “covered telecommunications equipment or services”?**

- ✓ Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities);
- ✓ For the purpose of public safety, security of Government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities);
- ✓ Telecommunications or video surveillance services provided by such entities or using such equipment; or
- ✓ Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.



3. All respondents/prospective performers must be compliant with the following:

- DoDI 8582.01, “Security of Unclassified DoD Information on Non-DoD Information Systems” and DoDM 5200.01 Volume3, “DoD Information Security Program: Controlled Unclassified Information”.

- NIST SP 800-171, “Protecting Controlled Unclassified Information in Non-Federal Information Systems and Organizations”
- Research findings and technology developments arising from the resulting proposed solution may constitute a significant enhancement to the national defense and to the economic vitality of the United States. As such, in the conduct of all work related to this effort, the selected performer must comply strictly with the International Traffic in Arms Regulation (22 C.F.R. §§ 120-130), the National Industrial Security Program Operating Manual (DoD 5220.22-M) and the Department of Commerce Export Regulation (15 C.F.R. §§ 730-774).

#### **D. DESIRED LEVEL OF DATA RIGHTS**

Government Purpose Rights: The right to use, modify, reproduce, release, perform, display, or disclose technical data within the Government without restriction. This also includes the rights to release or disclose technical data outside the Government and authorize persons to whom release or disclosure has been made to use, modify, reproduce, release, perform, display, or disclose technical data for United States government purposes. This level of restriction is set at five-years but may be negotiated & tailored to a specific project. The five-year period, or such other period that may be negotiated, would commence upon execution of the agreement that required development of the items, components, or processes or creation of the data. The performer will have the exclusive right, including the right to license others, to use technical data in which the Government has obtained government purpose rights under this agreement for any commercial purpose during the five-year period. Upon expiration of the five-year period (or other negotiated length of time), the Government will receive unlimited rights in the technical data and computer software.

#### **E. PROCESS OVERVIEW & INSTRUCTIONS**

##### **1. Submission Process for Questions & Proposals**

###### **a. Questions**


To submit any questions, visit the opportunities page at [www.nstxl.org/opportunities](http://www.nstxl.org/opportunities), select the “Current” tab, locate the respective project, and select “Submit a Question”. Please refer to Page 1 for associated deadlines.

###### **b. Proposals**

To submit your proposal, visit the opportunities page at [www.nstxl.org/opportunities](http://www.nstxl.org/opportunities), select the “Current” tab, locate the respective project, and select the “Submit Proposal” link. You must have an active account and be logged-in to submit your response.

Respondents are solely responsible for the timeliness of their submission and are cautioned that late submissions will not be accepted for evaluation. It is strongly recommended that interested parties submit their proposal as early as possible to uncover any potential technical or account issues. Please notify NSTXL immediately ([membership@nstxl.org](mailto:membership@nstxl.org)) if technical issues occur during the submission process and/or if confirmation related to membership status is required. Please refer to Page 1 for associated deadlines.

**2. Proposal Structure & Assessment Methodology**

	(1) Initial Review	>>>	(2) Selection
ANTICIPATED TIMELINE*	<b>Due:</b> 07/27/2022, 12:00 PM ET		<b>Award:</b> 09/2022
TECHNICAL	<b>FULL TECHNICAL PROPOSAL</b>  <b>Task A Page Limit: 25</b> <b>Task B Page Limit: 15</b>  <b>Format: MS Word</b>		<b>Award of                  Prototype Level                  Project</b>
PRICE	<b>FULL PRICING PROPOSAL</b>  <b>Task A Page Limit: 7</b> <b>Task B Page Limit: 7</b>  <b>Format: MS Excel for pricing information;                  MS Word for supporting narratives</b>		

*\*Anticipated dates are subject to change and are provided for planning purposes only.*

NSTXL will notify & invite Government-selected respondents to participate in a follow-on assessment/downselect pending the outcome of the Government’s review of initial responses. Additional detail regarding the follow-on assessment will be provided at that time. Respondents who are not selected for follow-on assessments will also be notified of their status accordingly.

**3. Format Detail**

- a. 12-point font (or larger) for all response narratives; smaller type may be used in figures and tables but must be clearly legible.
- b. Page size of 8.5 x 11 inches.
- c. The following items are not included within the page count: Cover page, Table of Contents, supporting Foreign Owned, Controlled, or Influenced (FOCI) documentation, and Section 889 Representation.

**4. Contents of Response (Cover Page, Technical Response, Price Response)**

- a. Proposal Cover Pages **must** identify the following:
  - Company name
  - Confirmation of active NSTXL Membership (e.g., “Verified NSTXL Member”)

*Reminder: Contact [membership@nstxl.org](mailto:membership@nstxl.org) with any questions or requests for confirmation.*

- Commercial and Government Entity (CAGE) Code (if available)
- Level of facility clearance (if available)
- Street Address
- Primary Point of Contact (with title, email address and phone number)
- Government Cognizant Security Office (CSO) responsible for monitoring the company's National Industrial Security Program Standards compliance (with address, email address and phone number)
- Company's security officer point of contact (with title, email address and phone number)
- All locations where work will be performed
- Business Size
- Business Type (Traditional or Non-Traditional)
- Status of U.S. ownership
- If the proposed approach requires any exceptions to this RFS
- If the proposed approach addressed all RFS objectives or a partial subset of the RFS objectives
- The applicable 10 U.S.C. § 4022 eligibility criteria (select **one** of the following)
  - There is at least one nontraditional defense contractor or nonprofit research institution participating to a significant extent in the project;
  - All significant participants in the transaction other than the Federal Government are small businesses (including small businesses participating in a program described under section 9 of the Small Business Act (15 U.S.C. § 638)) or nontraditional defense contractors; OR
  - At least one third of the total cost of the project is to be provided by sources other than the Federal Government.



**What is a nontraditional defense contractor?**

An entity that is not currently performing and has not performed, for at least the one-year period preceding the solicitation of sources by the Department of Defense for the procurement or transaction, any contract or subcontract for the Department of Defense that is subject to full coverage under the cost accounting standards (CAS).

*Review 48 CFR § 9903.201-1 for a list of CAS exemptions.*

**b.** Technical responses must address the following topics:

TOPIC	INSTRUCTIONS
<p><b>Solution Narrative &amp; Project Schedule</b></p>	<ul style="list-style-type: none"> <li>• Respondents must identify significant assumptions that influenced technical aspects the proposed solution and/or any assumptions that may affect technical performance in the future</li> <li>• Describe the approach used to design/deliver a unique prototype solution for the prototype technology objectives.</li> </ul>



	<ul style="list-style-type: none"> <li>• Include a discussion on schedule and the timing of all project deliverable(s) and other critical milestones</li> <li>• Responses that only address a critical element of the total solution being sought, often referred to as a “partial solution”, must be clearly identified as such.</li> <li>• If the proposed approach will require exception to any aspect of this solicitation, to include attachments, respondents must clearly identify those exceptions within the Technical Volume of their response. All respondents are encouraged to review the baseline S<sup>2</sup>MARTS Performer’s Agreement available within the NSTXL Members Portal (nstxl.org).</li> <li>• Outlining the project tasks to be performed along with schedule milestones and delivery dates required for successful completion. Note: Cost information should not be included in this section.</li> </ul>
<p style="text-align: center;"><b>Team Overview</b></p>	<ul style="list-style-type: none"> <li>• Identify each subcontractor and include the following: <ul style="list-style-type: none"> <li>– Summary of their role in support of the proposed concept</li> <li>– Commercial and Government Entity (CAGE) Code (if available)</li> <li>– Level of Facility Clearance (if available)</li> <li>– Address</li> <li>– Point of contact (with title, email address and phone number)</li> <li>– Business size</li> <li>– Business Type (Traditional or Nontraditional)</li> <li>– Status of U.S. ownership</li> </ul> </li> </ul> <p><i>Reminder: The responsibility to provide ample proof regarding <b>nontraditional participation to a significant extent</b> lies with the respondent and has a direct correlation to award eligibility.</i></p>
<p style="text-align: center;"><b>Level of Data Rights Proposed</b></p>	<ul style="list-style-type: none"> <li>• The rights offered should be displayed in a manner that allows for ease of discussion in determining trade-offs and potential options for long-term sustainability of the deliverables of this effort.</li> <li>• If rights are being asserted at a level <b>less than</b> the Government’s desired level, respondents must provide detail explaining the specific rationale for the assertion.</li> <li>• Any items previously developed with federal funding (and utilized in support of the proposed solution) should clearly identify all individual components funded by the Government and the recipient of the deliverables.</li> <li>• If commercial software is proposed as part of the prototype solution, all applicable software licenses must be identified and included with the response. Note that any software license term or condition inconsistent with federal law will be negotiated out of the license.</li> </ul>
<p style="text-align: center;"><b>Explanation Supporting Eligibility for Award of a Prototype OTA</b></p>	<ul style="list-style-type: none"> <li>• Provide rationale to support the specific eligibility condition that permits award of an Other Transaction to the proposed performer/team.</li> <li>• The responsibility to provide ample proof regarding <i>nontraditional defense contractor participation to a significant extent; small business or nontraditional defense contractor status; or any cost sharing arrangement</i> lies with the respondent and has a direct correlation to award eligibility.</li> </ul>

	<p style="text-align: center;"><b>Questions regarding eligibility?</b></p> <p>Contact NSTXL and/or review 10 USC 4022 and the DoD Other Transaction Guide for additional information.</p>
<p><b>Foreign Owned, Controlled, or Influenced (FOCI) Information</b> (if applicable)</p>	<ul style="list-style-type: none"> <li>Identify if the primary performer and/or any sub-performers (to include vendors, suppliers, subcontractors, and teaming partners) are considered under FOCI.</li> </ul> <p style="text-align: center;"><b>Supporting documentation may include but is not limited to:</b></p> <p>Standard Form 328 (Certificate Pertaining to Foreign Interest); Listing of Key Management Personnel; an Organizational Chart; Security Control Agreements: Special Security Agreements; and Proxy Agreements or Voting Trust Agreements.</p>
<p><b>Government Furnished Support</b></p>	<ul style="list-style-type: none"> <li>Identify if the proposed solution will be dependent on Government Furnished Property (GFP) or other forms of Government support (i.e. information, schematics, laboratory, or facility access).</li> <li>If the solution is dependent on the Government furnishing specific information or items, describe the impact to the solution if the request cannot be met.</li> <li>All GFP proposed and/or required for the respondent to perform this effort shall provide documentation that the proposed Government property usage has been approved by the cognizant Contracting Officer or Agreements Officer.</li> </ul>
<p><b>Compliance</b></p>	<ul style="list-style-type: none"> <li>Respondents must address each mandatory restriction/requirement identified within this RFS and explain how each regulation or standard is currently or will be met. <ul style="list-style-type: none"> <li>✓ <b>Note:</b> If exceptions to any of the restrictions/compliance requirements exist, respondents must fully explain the basis for the exception and how any correlating risk will be mitigated.</li> </ul> </li> <li>In addition to the mandatory representation included as Attachment 1, respondents <b>must include</b> the following statement within the Compliance section (with the applicable answer checked): <p>“[Company Name] represents that it [ ] <b>will</b>, [ ] <b>will not</b> provide covered telecommunications equipment or services to the Government in the performance of any contract, subcontract or other contractual instrument resulting from this solicitation.”</p> <ul style="list-style-type: none"> <li>✓ <b>Note:</b> If your company <b>will</b> provide covered telecommunications equipment or services, please contact <b>S2MARTS@nstxl.org</b> for additional mandatory disclosures that must be completed &amp; submitted with your response (at least 72 hours in advance of the response deadline).</li> </ul> </li> </ul>
<p><b>Organizational Conflicts of Interest (OCI)</b></p>	<ul style="list-style-type: none"> <li>All responses must disclose and address potential conflicts of interest and any proposed mitigation</li> <li>If OCIs are not present, respondents must include a statement within the Technical Volume that no OCIs are present.</li> </ul>

**5. Contents of Pricing Response**

Note: The Government reserves the right to seek additional detail related to pricing if a conclusive fair & reasonable determination cannot be achieved. Respondents are encouraged to provide thorough & detailed responses (to the maximum extent practicable) to reduce likelihood of schedule delays and increase the Government's understanding of the proposed concept.

TOPIC	INSTRUCTIONS
<b>Price Breakdown</b>	<ul style="list-style-type: none"> <li>• Delineate key pricing components and show clear traceability to the phases and/or milestones of the Technical Response. At a minimum, key pricing components include:               <ul style="list-style-type: none"> <li>- Labor Total(s), Other Direct Costs/Material Total(s), any license prices/fees, and subcontractor/vendor/sub-performer price(s).</li> </ul> </li> <li>• Data should must be organized &amp; clearly identified by technical objective, milestone, and/or phase proposed (if phasing is applicable). For planning considerations, the presumed start date 11/1/2022 and include a monthly breakout by task and/or phase.</li> </ul>
<b>Supporting Narrative</b>	<ul style="list-style-type: none"> <li>• Include a brief narrative that explains your pricing structure and maps the proposed prices to the solution's technical approach.</li> </ul>
<b>Payable Milestone Schedule</b>	<ul style="list-style-type: none"> <li>• The overall total price should be divided among severable increments that align to a proposed milestone payment schedule. Milestones are not required to match actual expenditures but should realistically align to the effort expended or products delivered. For planning considerations, note that a milestone Certificate of Completion will be required receipt of payment.</li> <li>• The proposed milestone payment schedule shall be provided in a columnar/table format with the following column headers: Task/Milestone; Timeline/date; and Payment Value. Milestones payments shall align with a meaningful project event.</li> </ul> <p>If assistance is needed, please contact our team.</p>
<b>Innovation &amp; Scalability</b> <i>(if applicable)</i>	<ul style="list-style-type: none"> <li>• Any additional features or beneficial capabilities that extend beyond the currently requested technical objectives shall be separately priced for the Government's consideration.</li> </ul>
<b>Price Impacts of Data Assertions</b> <i>(if applicable)</i>	<ul style="list-style-type: none"> <li>• If limited or restricted rights are being asserted within the response, provide a table that includes prices if the Government elects to purchase increased level of rights.</li> </ul>
<b>Supporting Information</b>	<ul style="list-style-type: none"> <li>• Inclusion of supporting information, such as a Basis of Estimate, may substantially expedite evaluation of your response.</li> </ul>

**F. Solution Review & Assessment**

Compliant responses will be evaluated with consideration given to:

**Demonstrated understanding and overall technical merit of the response;**  
**Feasibility of implementation; and,**  
**Total project risk (related to technical focus areas, price, schedule and/or compliance)**

- The Government will evaluate the degree to which the proposed solution provides a thorough, flexible, and sound approach in response to the prototype technical objectives. While the technology objectives are of significant importance, responses will be considered as a whole. In addition to Government evaluators, a contractor advisor will be providing support during source selection reviewing technical responses. The advisor is

with Booze Allen Hamilton, CAGE 1E4G2, Arlington, VA. An administrative support contractor will be providing support during source selection from Amentum, Cage 1FDG9, Odon, Indiana. If a respondent would like the contractor to sign a Non-Disclosure Agreement before having access to the proposal, attach a copy of the Non-Disclosure Agreement to the submission package. This Non-Disclosure Agreement will not be included within page count.

- The Government will select the prototype-level performer and award this project, via NSTXL, to the respondent(s) whose solution is assessed to be the most advantageous to the Government, when price, schedule, technical potential, level of data rights, and other factors are considered. The Government reserves the right to award to a respondent that does not meet all the requirements of the RFS.
- The Government reserves the right to reject a submission and deem it ineligible for consideration if the response is incomplete and/or does not clearly provide the requested information.
- Debriefings will not be provided.

#### **G. Additional Project Information**

- Acceptable responses not selected for the immediate award will be retained by NSTXL & the Government for possible future execution and funding. The non-selected proposals will be considered as viable alternatives for up to 36 months. If a proposal (that was not previously selected) is determined to be a suitable alternative, the company will be contacted to discuss any proposal updates and details of a subsequent project award.
  - Respondents whose proposals are not selected for the initial award shall not contact the Government or NSTXL to inquire about the status of any ongoing effort as it relates to the likelihood of their company being selected as a future alternative.
- The United States Navy, specifically Naval Surface Warfare Center, Crane Division, maintains release authority on any and all publications or press releases related to this prototype project.
- Unsuccessful respondents will be notified by NSTXL, however, debriefings for this project will not be provided.
- Certain types of information submitted during the RFS and award process of an OT are exempt from disclosure requirements of 5 U.S.C. §552 (the Freedom of Information Act or FOIA) for a period of five years from the date the Department receives the information. It is recommended that respondents mark business plans and technical information that are to be protected for five years from FOIA disclosure with a legend identifying the documents as being submitted on a business confidential basis.
- No classified data shall be submitted within the proposal. To the extent that the project involves DoD controlled unclassified information, respondents must comply with DoDI 8582.01 and DoDM 5200.01 Volume 3. Respondents must implement the security requirements in NIST SP 800-171 for safeguarding the unclassified internal information system; and must report any cyber incidents that affect the controlled unclassified information directly to DoD at <https://dibnet.dod.mil>.