

**STRATEGIC & SPECTRUM MISSIONS ADVANCED RESILIENT TRUSTED SYSTEMS
(S²MARTS)
REQUEST FOR SOLUTIONS (RFS)**

in support of the
**Inertial Measurement Unit (IMU) as a Navigational Tool for Hypersonic
Weapons Systems
PROTOTYPE PROJECT**

Project No. 21-03

All prospective respondents must be members of the NSTXL consortium.

- 1. Project Title:** Inertial Measurement Unit (IMU) as a Navigational Tool for Hypersonic Weapons Systems
- 2. Prototype Project Sponsor/Requiring Activity:** Naval Surface Warfare Center (NSWC) Crane, Advanced Concepts, Code GXPM
- 3. Contracting Activity:** Naval Surface Warfare Center (NSWC) Crane, Code 022

4. Project Background & Current Capability:

Inertial measurement units (IMUs) are common in Department of Defense (DoD) systems ranging from shipboard weapons to aircraft and missiles. IMUs measure and calculate attitude, angular rates, velocity, and position. Inertial navigation systems (INS) and Global Positioning System (GPS) based navigation systems rely on IMU output to perform navigation control.

IMUs have a long history of applications and technology refinement. New DoD systems, notably hypersonic vehicles, require the performance of current IMU technology, but with reduced size, weight, and power (SWaP). Specifically, it is desired that an IMU with comparable specifications to top-performing IMUs is designed to minimize volume required within the vehicle.

Specific technology areas and/or domains impacted by this prototype project will include hypersonics, missile defense solutions, aircraft, and small satellites. The IMU as a Navigational Tool for Hypersonic Weapon Systems will inform and advance the DoD's portfolio of future weapons and sensors by combining and evaluating IMUs in a novel weapon system application.

IMUs, in conjunction with inertial navigation systems (INS) and/or GPS, are essential to navigation and control. Current IMUs are capable of approximately +/- 1080 deg/sec gyro and +/- 40g accelerometer operating ranges. The use of IMUs on missiles and other vehicles are not constrained by the same stringent size requirements as a hypersonic vehicle. Currently, IMUs of 8 cu. in (approx. 2 in. on a side) are already developed and in use but, as the size is reduced, there are concerns with accuracy and quality of data. It is desired that an IMU with comparable

or improved performance is designed while reducing the SWaP, with emphasis on volume reduction of the IMU for the hypersonic vehicle.

5. Desired End-State Objective(s) & Success Criteria:

The goal of the IMU as a Navigational Tool for Hypersonic Weapon Systems prototype project, is to develop, miniaturize, and demonstrate a hypersonic-capable IMU with performance comparable to or better than current IMU technology while reducing SWaP, specifically focusing on minimizing the volume required within the hypersonic vehicle. The IMU shall be capable of withstanding harsh hypersonic conditions.

The resulting prototype hardware will be integrated first into sub-scale, developmental flight test, such as on a sounding rocket, and finally into a full-scale test. It will provide geo-referencing position determination. Integration into both developmental flight testing and full-scale flight testing will require low SWaP to permit integration.

Acceptance criteria will include a technology solution that is achievable, demonstrable, and able to be integrated while meeting the following system objectives. The IMU objectives are to design a navigational tool for hypersonics weapon systems that has minimum performance requirements equal to +/- 1080 deg/sec gyro and +/- 40g accelerometer operating ranges with reduced SWaP, or a demonstrable path to achieve these goals. Characterization of the effects of radiation will also be required.

For a prototype to be considered successful, the performer will conduct a live demonstration of the prototype hardware and software performance in relevant and actual flight environments, design updates to meet final form factor requirements, and production plan. The length of the project is estimated not to exceed three years. However, the project’s period of performance will be based on the performer’s proposed schedule. Partial solutions will not be considered for award.

6. Project Deliverables:

#	Deliverable(s)	Description	Frequency	Delivery Method
1	Monthly Status Report	Report summarizing the project’s process and event/actions completed during the previous month which includes financial and risk managements	1/Month	Encrypted Electronic submission
2	Task Integrated Master Schedule (IMS)	Provide a task IMS to track and plan milestone progress.	1/Month	Encrypted Electronic submission
3	System Requirements Document and System Requirements Review (SRR)	The requirements document shall contain all pertinent requirements for the IMU	Once, when Government approves	Encrypted Electronic submission and SRR TBD

4	Performance and Radiation Characterization	Report summarizing the proposed IMU on performance and radiation characterization	Once	Encrypted Electronic submission
5	Preliminary Design Review (PDR)	Will include design validation	Once, when Government approves	Encrypted Electronic submission and PDR TBD
6	Critical Design Review	A CDR shall be conducted on the proposed solution	Once, when Government approves	TBD
7	Preliminary Development Unit (PDU)	The unit will comply with design reviews	Once, when Government approves	Encrypted Electronic submission
8	Technology Readiness Review (TRR)	A TRR shall be produced highlighting relevant test plans	Once, when Government approves	Encrypted Electronic submission
9	Engineer Design Unit (EDU)	Unit designed and approved for flight test	Once	TBD
10	Environmental Qualification Tests	Conduct appropriate environmental tests IAW Government requirements	As required	Encrypted Electronic submission
11	Operational Environment Report	Environment report based on results of environmental tests	Once	Encrypted Electronic submission
12	Flight Test	The IMU shall be tested as part of a flight test to be determined by Government	Once	TBD
13	Production Readiness Review	A PRR shall be conducted on the proposed solution	Once, when Government approves	TBD
14	Final Report	The report will provide details on objectives, goals, and milestones of the program, and provide successes in regard to position, accuracy, size, weight, and power (SWaP) of the IMU. It will also provide follow-on needs and requirements	Once	Encrypted Electronic submission

7. Current Project Budget: \$ 12,000,000

This value represents what is currently available for the subject project at the time of the RFS release. This value is subject to change but is being provided for planning purposes.

Respondents should propose a cost that reflects that respondent's approach and not use the budgetary estimate only. Respondents are encouraged to clearly explain how much of their solution can be developed for the advertised amount or a lesser amount. Capabilities or project phases that will require additional funding beyond the project budget must be identified at Section 10(b)(iii)(6) herein.

8. Security Classification, Respondent Restrictions, and other required compliances:

This RFS has been released under Distribution Statement A: *Approved for public release.*

This project encompasses the following restrictions:

- a. Security Classification: SECRET (Personnel and Safeguarding) is required at time of award.
- b. ITAR Compliance is required at the time of proposal submission.
- c. Respondents are limited to domestic companies based in the United States only; Subcontractors/teaming partners may not include foreign entities.
- d. Section 889(a)(1)(B) Prohibition on Contracting with Entities Using Certain Telecommunications and Video Surveillance Services or Equipment – Offeror shall provide their representation in RFS Attachment b.

9. Level of Data Rights Requested by the Government:

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.

10. RFS and Response Process:

a. The following is requested from all respondents:

	Technical Response	Price Response
Page Maximum	20	8

For written submissions, the following formatting guidelines shall be followed by respondents:

- 10-point font (or larger) for all response narratives; smaller type may be used in figures and tables but must be clearly legible.
- Single-spaced, single-sided (8.5 by 11 inches).
- Margins on all sides (top, bottom, left, and right) should be at least 1 inch.
- Page limitations shall not be circumvented by including inserted text boxes/pop-ups or internet links to additional information. Such inclusions are not acceptable and will not be considered as part of the response
- Files must be submitted in PDF and/or Microsoft Word formats only. Price volumes may be submitted in an editable, unlocked Excel file

b. Each submittal **must include** (i) a Cover Page, (ii) a Technical Response, and (iii) a Price Response that each align to the instructions below:

- i. Cover Page: (Not included within page count) The cover page shall include the company's name, Commercial and Government Entity (CAGE) Code (if available), level of facility clearance (if available), address, primary point of contact, business size, and status of U.S. ownership.

Respondents shall also identify the applicable 10 U.S.C. § 2371b eligibility criteria related to the response (*please identify only one*):

- There is at least one nontraditional defense contractor (*defined below*) or nonprofit research institution participating to a significant extent in the project; **OR**
- 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.

Note: A *Nontraditional Defense Contractor* is defined as 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 (DOD) for the procurement of transaction, any contract or subcontract for the DOD that is subject to full coverage under the cost accounting standards prescribed pursuant to 41 U.S.Code § 1502 and the regulations implementing such section.

ii. Technical Response:

Responses should be constructed to align with the order of the instructions below (1 - 8).

1. Solution Narrative: Respondents shall describe the approach used to design/deliver a unique prototype solution for the prototype technology objectives defined in RFS Section 5, Desired End-State Objective(s), to include any attachments. While these focus areas are of significant importance, responses will be considered as a whole. No pricing shall be included in the technical response.

The Solution Narrative must also include a discussion on schedule and the timing of all deliverable(s) to include those outlined within RFS Section 6, Project Deliverables.

2. Explanation Supporting Eligibility for Award of a Prototype OTA:

Respondents shall provide rationale to support the specific condition that permits award of an OTA to the proposed prime contractor/performer. The onus of proof to support *nontraditional participation to a significant extent; small business or nontraditional defense contractor status; or any cost sharing arrangement* lies with the respondent and has a direct correlation to award eligibility.

3. Foreign Owned, Controlled, or Influenced (FOCI) Documentation (if applicable): Documentation may include, but is not limited to: 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. It is recommended companies who fall within the FOCI category visit <https://www.dss.mil> for additional guidance and instruction.
4. Government Furnished Property or Information: Respondents must clearly identify if its proposed solution depends on Government Furnished Information (GFI) / Government Furnished Property (GFP) or other forms of Government support (i.e. laboratory or facility access), etc.

If so, the response must specify the GFI/GFP required. Respondents must clearly identify if its proposed solution depends on GFI/GFP or other forms of Government support be provided, the impact to the solution if the requested

information/property/asset is not available, and will confirm the details with the respondent prior to any proposal revisions or selection, if applicable.

5. Mandatory Compliance with Restrictions: Respondents must address the restrictions identified within RFS Section 8, Security Classification, Respondent Restrictions, and other Required Compliance, and explain how each regulation or standard is currently, or will be met.
6. Task Description Document (Not Included Within Page Count): Respondents must provide a Task Description Document (TDD) outlining the project tasks to be performed along with schedule milestones and delivery dates required for successful completion. It is anticipated that, if selected, the proposed TDD will be incorporated into the resultant OTA. Respondents are encouraged to be concise but thorough when outlining their TDD. The TDD may be submitted as an appendix or a separate file as part of the proposal.
7. Summary of Subcontractor Participation (if applicable): Respondents must identify all subcontractors involved and their role within the performance of the proposed concept. The information must include the following:
 - a. Subcontractor company name, Commercial and Government Entity (CAGE) Code (if available), level of facility clearance (if available), address, primary point of contact, business size, and status of U.S. ownership.
 - b. If the subcontracted company's involvement is considered significant, rationale supporting the significance must be present within the narrative. The onus of proof to support participation to a significant extent or any cost sharing arrangement lies with the respondent and has a direct correlation to award eligibility.
 - c. If applicable, Foreign Owned, Controlled, or Influenced (FOCI) Mitigation Documentation shall be provided for subcontractors and will not count towards the page count.
8. Data Rights Assertions and Level of Rights Proposed:
 - a. 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.
 - b. If rights are being asserted at a level less than the Government's desired level of allocation (see RFS Section 9, Level of Data Rights Requested by the Government), respondents must provide detail explaining the specific rationale for the assertion. Please also review (iii) Price Response, (5) below for additional requirements related to data rights pricing.

- c. Any items previously developed with federal funding (and used for the proposed solution) should clearly identify all individual components funded by the Government and the recipient of the deliverables.
- d. 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.

iii. Price Response:

The price response shall be submitted as a separate file from the technical response. No pricing details shall be included in the technical response. This project will employ a Fixed Price with Payable Milestones pricing structure:

1. 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.
2. In order to support the Government's evaluation of fair and reasonable pricing, the respondent shall delineate the key pricing components, and show clear traceability to the phases and/or milestones of the Technical Response. At a minimum, key pricing components include Labor Total(s), Other Direct Costs/Material Total(s), License prices and Subcontractor price(s). Data should be segregated by each key objective, milestone, and/or phase proposed.
3. Include a brief narrative that explains your pricing structure and maps the proposed prices to the solution's technical approach.
4. Including a Basis of Estimate to support your pricing may substantially expedite evaluation of your response.
5. If limited or restricted rights are being asserted within the response, a table that includes prices for both Government Purpose Rights and Unlimited Rights for any limited or restricted item must be included.
6. Any additional features or capabilities that extend beyond the currently requested core technical objectives shall be separately priced for the Government's consideration. Pending funding availability and need, the Government may fund these advanced features at a later date.

11. Evaluation Process and Methodology:

- a. Individual responses will be evaluated with consideration given to:

- i. Demonstrated expertise and overall technical merit of the response;
 - ii. Feasibility of implementation; and
 - iii. Total project risk as it relates to the technical focus areas, price and schedule
- b. 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 as stated in RFS Section 5, Desired End-State Objectives, as well as the ability to fulfill the objectives in this RFS.
- c. The Government will award this project, via S²MARTS (Agreement No. N00164-19-9-0001), to the respondent(s) whose solution is assessed to be the most advantageous to the Government, when price, schedule, technical risks, the 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.
- d. The proposed project price, schedule, and intellectual property/data rights assertions will be considered as aspects of the entire response when weighing risk and reward. The assessment of risks is subjective and will consider all aspects of the proposed solution. Respondents are responsible for identifying risks within their submissions, as well as providing specific mitigating solutions.
- e. 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.

12. 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.

13. Attachments

- a. Section 889 Prohibition and Reporting

b. Section 889 Verification and Representation

14. Important Dates

- a. Questions related to this RFS shall be submitted no later than 12:00 PM EDT on Tuesday, November 10, 2020.
To submit any questions, visit the opportunities page at www.nstxl.org/opportunities, select the “Current” tab, locate the respective project, and select “Submit a Question”.
- b. Proposals submitted in response to this RFS are due no later than 12:00 PM EDT Monday, December 7, 2020.
- c. To submit your proposal, visit the opportunities page at 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.
- d. RFS Respondents must be active members of the consortium at the time of proposal submission.

15. Additional Project Information

- a. The Government intends to award one Other Transaction Agreement as a result of this RFS; however, more than one award may be made if determined to be in the Government’s best interest. The Government also reserves the right to not select any of the solutions proposed.
- b. 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.
- c. The United States Navy, specifically Naval Surface Warfare Center, Crane Division, has release authority on any publications related to this prototype project.
- d. Unsuccessful respondents will be notified, however, debriefings for this project are not required nor planned at this time.

- e. If resource-sharing is proposed in accordance with 10 U.S. Code § 2371b(d)(1)(C), then the non-Federal amounts counted as provided, or to be provided, by parties other than the Federal Government may not include costs that were incurred before the date on which the OT agreement becomes effective. Costs offered as a resource-share that were incurred for a project after the beginning of negotiations, but prior to the date the OT agreement becomes effective, may be counted as non-Federal amounts if and to the extent that the Agreements Officer determines in writing that: (1) the party other than the Federal Government incurred the costs in anticipation of the OT agreement; and (2) it was appropriate for the entity to incur the costs before the OT agreement became effective in order to ensure the successful implementation of the OT agreement.
- f. Certain types of information submitted to the Department 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.
- g. 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 4. 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>.
- h. Export controls (if applicable): 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).