

**Request for Information
12-RFI-0004
InTop Flexible Distributed Array Radar (FlexDAR)**

I. DISCLAIMER:

This announcement constitutes a Request for Information (RFI) for the purpose of conducting market research for the Integrated Topside (InTop) Flexible Distributed Array Radar (FlexDAR) concept. The RFI is soliciting feedback on the FlexDAR concept and related technology. The RFI is also soliciting information on the capabilities of United States (U.S.) Department of Defense (DoD) companies that might team with companies that have been awarded InTop Indefinite Delivery/Indefinite Quantity (IDIQ) contracts to provide a comprehensive proposal for the FlexDAR concept. Following initial feedback, in an effort to further its market research, the InTop Program Office may conduct an Industry Day (open to U.S DoD contractors only) to allow for exchange of information and provide an opportunity for potential subcontractors to network/coordinate in an effort to create subcontracting arrangements. It is the responsibility of any eligible company to monitor Federal Business Opportunities (FedBizOpps) for additional information pertaining to the potential Industry Day.

This RFI does not constitute a Request for Proposals (RFP), a Request for Quote (RFQ) or an indication that the Government will contract for any of the requirements discussed in this notice. Information on the specific topics of interest is provided in the following sections of this announcement. Neither the Office of Naval Research (ONR) nor any other part of the federal government will be responsible for any cost incurred by responders in furnishing this information.

II. BACKGROUND:

ONR established the InTop Program to develop and demonstrate common radio frequency (RF) apertures and supporting subsystems capable of performing multiple functions to support multiple warfare areas. The objective is to increase the warfighting capability while reducing the number of single function RF systems required on Navy ships and submarines.

Eighteen contractors were awarded IDIQ contracts under Request for Proposal (RFP) N00014-09-R-0002 dated 30 January 2009. InTop IDIQ contracts were awarded in three categories: "Niche Provider" contractors, "System Developer" contractors and "Systems Integration" contractors. Only the eighteen contractors awarded an InTop IDIQ contract, regardless of their award category, will be eligible to submit a proposal as the prime contractor under the potential FlexDAR requirement. However, any of the InTop-qualified contractors may subcontract with any other DoD contractor (including non-IDIQ qualified contractors). If an InTop contractor subcontracts with other DoD contractor(s), the proposal for that subcontracting arrangement must be submitted by the InTop qualified contractor.

Objective

ONR is seeking comments on the InTop Program Office's concept for the development of two fully digital, network-coordinated phased array radar/communications apertures, also known as the Front-End (FE) subsystem. These apertures will subsequently be integrated with a Back-End (BE) signal and data processing subsystem to be developed by the Navy. The concept being investigated is to construct two identical sensors (radar/communication) that will be installed in the Chesapeake Bay area and connected by a high data rate communication link. These systems would be used to demonstrate several important advantages of network-linked, distributed sensors as described in this RFI.

The proposed pair of network-coordinated sensors would be designed to demonstrate the following:

- **Increased detection and firm-track range**
 - Two (2) radars provide up to 1.4 times detection range and two (2) times area coverage
 - Four (4) radars provide up to 2 times detection range and four (4) times area coverage
- **Improved electronic protection**
 - Multistatic jammer triangulation
 - Polarization diversity
- **Improved tracking through simultaneous multistatic dwells**
 - Track continuity, accuracy, tracking through maneuvers, closely spaced tracks, target identification (ID)
- **Improved detection of targets in clutter**
 - Polarization diversity
 - Increased Signal to Noise Ratio (SNR) and Spur Free Dynamic Range (SFDR) (many Analog to Digital Converters (ADCs) and Digital to Analog Converters (DACs))
- **Support operation during Emissions Control (EMCON)**
 - Bi-static operation
- **Use of the aperture to Transmit/Receive network data**
 - Minimize and potentially eliminate the need for an external data link
- **Improved availability**
 - Element-level vs. subarray-level failures (graceful degradation)

In order to demonstrate these concepts, the proposed radars would include the following technologies and features:

- **Technology exploitation**
 - All-digital Transmit/Receive (T/R) module (every element digitization)
 - Digitization of (up to) the entire radar bandwidth
 - Full digital beamforming on Transmit and Receive
 - Provides multiple independent beams
 - Highly integrated T/R module electronics
 - Lowers part count; cost
 - Improves RF chain "flatness"; reduces array calibration complexity
 - Use of distributed clocks / Local Oscillators (LOs) locked to a low drift Global Positioning System (GPS) time standard
 - Addresses Radar-to-radar time/frequency synchronization
 - Improved system phase noise/spurs through the integration of multiple LOs
- **Affordability**
 - Modular / Scalable / Open Architecture
 - All digital interfaces
 - Software defined functionality
 - Simplified hardware upgrades

Additional information about the proposed system design is provided in the Functional Description Document (FDD) and the Key System Requirements (KSR) Document. The FDD is intended to provide a qualitative description of the proposed system in order to bound the design space to the relevant demonstration objectives. The KSR document is intended to provide the minimum set of quantitative technical requirements for the system to meet the desired performance objectives. Proposed designs that depart from these documents are acceptable, if justification for the departure is provided and all key demonstration objectives are maintained in the proposed departure.

III. SPECIFIC INFORMATION OF INTEREST

Responses to this RFI should:

- 1) Provide a system or subsystem level (for offerors not providing a full system design) notional design of at least one option (multiple options may be presented) that is designed to satisfy all of the objectives stated above.

System designs should include, but not be limited to, the following information:

- a) Description of the overall FE system architecture
- b) Listing of key enabling technologies that are used
 - i) What is the current Technology Readiness Level (TRL) of each component / technology? The Technology Readiness Assessment (TRA) Guidance document, dated April 2011 and found at the following website (<http://www.acq.osd.mil/ddre/publications/docs/TRA2011.pdf>), includes TRL definitions. Use those definitions for identifying the TRL.
- c) Estimates of key performance parameters for the proposed system
- d) Description of any departures from the requirements in the KSR and FDD documents and the reason for the departure

Subsystem designs should include, but not be limited to, the following information:

- a) Description of the subsystem being proposed and the general system architecture that would support use of this subsystem.
- b) Listing of key enabling technologies that are used
 - i) What is the current Technology Readiness Level (TRL) of each component / technology? The Technology Readiness Assessment (TRA) Guidance document, dated April 2011 and found at the following website (<http://www.acq.osd.mil/ddre/publications/docs/TRA2011.pdf>), includes TRL definitions. Use those definitions for identifying the TRL.
- c) Estimates of key performance parameters for the proposed subsystem
- d) Description of any departures from the requirements in the KSR and FDD documents and the reason for the departure

- 2) Although this RFI is primarily interested in the current capabilities to produce a test-bed distributed sensor, there is also considerable interest in the migration path for the demonstrated capabilities of the test-bed system to a fielded tactical system. To that end, responses should also include an assessment of the following:

- a) The capabilities of the notional system (as designed) to be used in a tactical shipboard environment.
- b) The design changes that would need to be made to transition to a fully tactical shipboard system and the ways they could be implemented within the proposed notional system architecture
- c) Some of the key attributes of a tactical system would include, but not be limited to:
 - i) Full hemispherical coverage
 - ii) Radar sensitivity
 - iii) Superior performance against slow moving targets in a high clutter environment
 - iv) Electromagnetic Interference protection against both in-band and out-of-band interference
 - v) Reliability and maintainability

- 3) The proposed test-bed FE is intended to be used not only as a single radar antenna, but also as an antenna that may be partitioned to perform multiple simultaneous independent functions (radar, communications, EW). With this in mind, the response should address the following questions:
 - a) How does the proposed notional design support the partitioning of the array into multiple independent apertures?
 - b) Can the notional design support simultaneous transmit and receive functions in adjacent partitions?
- 4) One of the significant challenges associated with the design of this test-bed system is the ability of the FE Controller to process and communicate with sufficient speed to maintain real-time operations, with minimal latency to support track loop closure. Responses should address the planned FE Controller architecture including the expected throughput and latency requirements that would be required and supported.

IV. SUBMISSION INSTRUCTIONS and FORMATTING REQUIREMENTS

- 1) Information responses should be from U.S. DoD contractors only and should not exceed twenty-five pages not including cover page. Responses should be typed in 12-point Times New Roman font, single spaced, with 1-inch margins.
- 2) The following is a suggested submission organization:
 - a) A notional system design and analysis of capabilities as described in Section III entitled, "Specific Information of Interest".
 - b) The response should include the RFI number, company name and address and technical point of contact, with email address and telephone number.
 - c) No cost or pricing information should be provided. Any cost or pricing information received will be deleted and destroyed.
- 3) The Government intends to review all responses received and may use the responses to refine the FlexDAR requirement and develop a solicitation. The government may also provide feedback on technologies of particular interest.
- 4) Responses will not be shared outside the U.S. Government and U.S. Government support contractors.
- 5) If proprietary information is submitted, it must be marked at the paragraph level to indicate those specific paragraphs that contain proprietary information.
- 6) Responses will not be returned.
- 7) All responses should be unclassified. If desired, a classified supplement may be submitted separately. See paragraph number 10) below for mailing instructions for classified supplements.
- 8) Responses should be received no later than 03 May 2012 at 2:00 PM Eastern Daylight Time. Any response received after this date may be considered but may not be included in subsequent refinement of the FlexDAR requirement and development of a solicitation.
- 9) Unclassified responses should be in PDF format and emailed to the following:

Betsy DeLong at betsy.delong@navy.mil
Mark Busse at mark.busse@nrl.navy.mil
Lynn Christian at lynn.christian@navy.mil
Greg Tavik at greg.tavik@nrl.navy.mil

10) Classified Supplement Mailing Instructions:

Classified supplements shall be submitted directly to the attention of ONR's Document Control Unit at the following address:

OUTSIDE ENVELOPE (no classification marking):

Office of Naval Research
Document Control Unit
ONR Code 43
875 North Randolph Street
Arlington, VA 22203-1995

INNER ENVELOPE (stamped with the overall classification of the material):

"FlexDAR Responses"
Office of Naval Research
Attn: Ms Betsy DeLong
ONR Code: 31
875 North Randolph Street
Arlington, VA 22203-1995

- 11) Copies of the FDD and KSR documents will be made available to DoD and U.S. DoD contractors only upon request.

V. SLIDES TO BE SHARED WITH INDUSTRY

In an effort to facilitate subcontracting opportunities, if a responder would like the government to provide nonproprietary, unclassified ideas related to the FlexDAR effort to the eighteen IDIQ holders, please include no more than five slides in Microsoft PowerPoint as a supplement to your response and indicate that this PowerPoint material may be shared with the InTop IDIQ contract awardees. The government may allow time for a company representative to brief these slides at a future Industry Day should one be held.

VI. SUBCONTRACTING OPPORTUNITIES

The InTop Program Office will provide a list of the InTop IDIQ contract awardees including contact information to any U.S. DoD contractors interested in pursuing subcontracting opportunities. Notify Lynn Christian at Lynn.Christian@navy.mil to request the list.

VII. REQUESTS

U.S. DoD contractors interested in receiving the FDD, the KSR and/or the List of InTop IDIQ contract holders should email their request to Lynn Christian at Lynn.Christian@navy.mil .

Include with your request, your name, company name, company cage code, telephone number, email address and the contract number of a current U.S. DoD contract held by your company.

VIII. QUESTIONS

Questions of a technical nature regarding this RFI may be sent to the following Technical Point of Contact:

Mark Busse
Code 5307
Naval Research Laboratory
4555 Overlook Avenue, SW
Washington, DC 20375
Email: Mark.Busse@nrl.navy.mil

Responses to questions received under this RFI will be posted to the following webpages:

- Federal Business Opportunities (FedBizOpps) Webpage - <https://www.fbo.gov/>
- ONR Request for Information Webpage - <http://www.onr.navy.mil/Contracts-Grants/Funding-Opportunities/Requests-for-Information.aspx>