Call 003 – Multi-Band, Multi-Orbit Communication Experiments
Amendment 01
16 October 2023

Advanced Research Announcement (ARA) with Calls - FA8650-17-S-9300
Defense Experimentation Using Commercial Space Internet (DEUCSI)

Federal Agency Name: Air Force Research Laboratory (AFRL) - Integrated Capabilities Directorate

Proposal Due Date and Time: Proposals will be accepted any time after 8:00am Dayton, OH local time on 31 Jan 2022 and before 4:00pm Dayton, OH local time on 15 Dec 2023.

Anticipated Award Date: Variable, depending on proposal submission date. See below, Section 4 Schedule / Period of Performance

Anticipated Number of Awards: Estimate 2-5 Other Transaction Agreements and/or Contracts.

Anticipated Funding: See below, Section 6 Cost Objective/Funding Constraint

Agreement/Contract Number: TBD (FA2385-23-X-XXXX)

1. Statement of Objectives (SOO)/Description of Technical Areas:

Background/Scope:

Consistent with the overall approach for establishing path agnostic communications using the commercial space internet described in the overarching Advanced Research Announcement (ARA) FA8650-17-S-9300, this Call seeks to establish the ability to communicate with military platforms via multiple commercial space internet (CSI) constellations in various orbital regimes using common user terminal hardware elements. An important aspect of using CSI capabilities effectively and affordably for defense purposes is the ability to switch between space internet providers as operational and business needs change. This includes using spacecraft constellations in different orbit regimes, such as low-, medium-, and geosynchronous earth orbits (LEO, MEO, GEO) to access favorable geometry and/or performance characteristics for particular situations. It also includes quickly and effectively switching among commercial space internet services in different frequency bands to access favorable spectrum and/or to failover between constellations when one becomes available. In some cases, it may be advantageous to access multiple constellations simultaneously and split traffic between them. Finally, in some cases it may be beneficial to utilize common hardware elements to communicate with both commercial space internet constellations as well as military communications systems in order to provide even greater flexibility in communications paths while minimizing deployment of

constellation-specific hardware. The Department of the Air Force (DAF) wishes to conduct experiments in vendor flexibility across multiple bands and orbits to understand methods by which the government may position itself to affordably and efficiently leverage multiple providers of space internet services.

This Call seeks experimentation to enable communications through multiple CSI constellations from common user terminals or user terminal elements. This includes access to the necessary hardware, software, and commercial space internet signals to perform experiments in this area. Solutions that are capable of operation on a single satellite constellation are NOT of interest under this Call. Solutions that smartly integrate multiple 1-vendor commercial terminals to create a low-cost, and highly flexible capability are of interest to this Call. Solutions that can quickly integrate new commercial vendors as they enter the marketplace are encouraged. Ideally, the approach for adding new vendors should be achievable in the field and not require a terminal replacement. There is no preference from the government for implementation via a software-based, ASIC-based, hybrid or any other solution so long as it achieves the objectives stated above.

The government's interest in flexibly applying multi-vendor hardware elements to utilize CSI on military platforms is illustrated by the following use cases.

Use Case 1: Arctic Communications (fixed and mobile)

The Government is no longer seeking solutions for Arctic Communications. While communications around the globe, including the Arctic region, are still of high interest, all funds intended solely for Arctic Communications have been allocated. Therefore, the Government is no longer seeking proposals specifically for Arctic Communications.

Use Case 2: Airborne Communications

The government requires satellite communications services that are both globally available and highly reliable. Because military assets may be required to operate anywhere on the globe, they must be able to communicate at high rates in any operating area without major hardware configuration changes. In addition, bidirectional communications must be constantly available and persistent, in spite of potential outages or degradations that may affect any individual constellation.

For this use case, the Government seeks to experiment with CSI terminal implementations that provide for switching between CSI services from different vendors with little or no hardware modification. The Government seeks solutions that provide for communications with multiple communications constellations in LEO, MEO, and GEO orbits. In order to maximize the number and types of constellations with which Government aircraft can communicate, solutions that can operate across multiple frequency bands (e.g., Ku and Ka) are preferred. Experiments that demonstrate an ability to utilize government-owned waveforms (e.g., protected tactical waveform) and spacecraft, in addition to commercial waveforms and constellations, may be considered. Implementations that provide

the capability to rapidly introduce new CSI vendors after terminal hardware deployment are also of interest. The Government seeks to experiment with configurations that may be cost-effectively deployed to medium- (tens) or large-sized (hundreds) fleets of aircraft. Offerors should therefore consider the recurring cost of hardware, the ease of installation or deployment, sustainment approach, and the rate at which particular solutions can be manufactured and fielded. In order to empirically assess these factors, the government expects to test multi-orbit, multi-constellation communications on at least 5 different aircraft types. A single hardware implementation does not necessarily need to address every potential aircraft type however, because the Government seeks to test CSI services on many types of aircraft, solutions that can be affordably implemented on multiple aircraft types are potentially advantageous. It is expected that 1 prototype will be fielded for each aircraft type under evaluation, however offerors may propose additional prototypes for a given aircraft if this is needed to accurately assess the operational capability and life-cycle costs.

The use cases described above illustrate particular applications of interest to the Government, but they are not all-inclusive. Novel, innovative approaches for achieving multi-band, multi-orbit communications flexibility across a range of government platforms are highly responsive to this call. Offerors with approaches that do not fit the use cases described herein are encouraged to discuss the idea with the Technical Point of Contact (TPOC) found at 9.d. of this Call, prior to developing a full proposal. Please note, open communication with the TPOC is both allowed and encouraged.

For all use cases, the government intends to provide access to government operating locations and selected aircraft, and the government will select aircraft, or other vehicles, for test based on availability, technical suitability, cost effectiveness, and government discretion.

For all use cases, the government is soliciting experiments that implement multi-band, multi-constellation satellite communications in militarily relevant environments. For the purpose of this Call, militarily relevant means that mobile (e.g., airborne) communications terminals should be tested while installed on military vehicles operating in their intended environment (e.g., in flight). Proposals that culminate in laboratory tests of components or systems are not responsive to this Call.

Technical Objectives:

The Government seeks innovative experimentation, including the requisite hardware, software, and access to CSI signals, to meet the following technical objectives:

A. (Use Case 1) DELETED.

B. (Use Case 2) Establish broadband connectivity between one or more Air Force aircraft and two or more commercial space internet providers from

common user terminals. Establish an ability to switch between constellations in LEO, MEO, and GEO orbits across multiple frequency bands. Parameters of interest that should be considered in the experimentation and quantitatively measured, as applicable, include:

a. Affordability, including both recurring cost and factors driving the government's implementation cost.
b. Ability to communicate with more than one CSI constellation, including the ability to track and handoff between low earth orbit satellites, and to cover the requisite technical parameters (e.g., frequency, polarization, gain, waveform compatibility, etc.)
c. Time to switch between different constellations and/or service providers.
d. Service disruptions (e.g., dropped packets or similar metrics) when switching between constellations.
e. Versatility, including the ability to affordably and effectively reconfigure for communications with different CSI vendors. Offerors should also consider their ability to adapt to potential future CSI vendors.
f. Frequency and orbital diversity (e.g., LEO, MEO, GEO)
g. Time and complexity of terminal installation.
h. Airworthiness, including appropriate testing and documentation to enable integration on AF aircraft.

C. Measure technical performance parameters to quantify the data transfer performance of the connections between Air Force or government partner platforms via two or more commercial space internet providers while using common user terminal hardware elements. At a minimum, measurements should include:
   a. Data transfer rate (bandwidth)
   b. Latency
   c. Bit error rate
   d. Link margin
   e. Time to switch between constellations, frequencies, waveforms, and/or networks.

D. Experimentally characterize the ability to communicate properly secured data including, but not limited to, real-time voice, imagery, and video. For the purposes of this Call, "properly secured" means the use of National Security Agency (NSA) approved cryptographic techniques and/or equipment suitable for use up to the Top-Secret level.

Solutions that provide multi-vendor, multi-orbit, multi-band flexibility in accessing CSI, but which do not fit Use Case 2, may be responsive to this Call and should be discussed with the TPOC prior to proposal submission.

2. Deliverable Items:

a. Data Items: Test data for airborne or ground-based communications experiments.
b. Software: Not required but may be applicable depending on an offeror's selected technical approach.
c. Hardware: Multiple user terminals for interfacing with commercial space internet spacecraft.
d. Other: Interface control document(s) for delivered hardware; airworthiness documentation.
e. Final Report and Technical reports describing test results.

3. Data Rights Desired:
The government desires Unlimited Rights for all technical data, non-commercial software (NCS), and NCS documentation developed using government funds, however due to the desired use of commercially developed space internet technologies in this program more restrictive data rights are anticipated and will be considered where appropriate. The desired, but negotiable, data rights are:

(1) Technical Data: Unlimited Rights
(2) Non-Commercial Software (NCS): Unlimited Rights
(3) NCS Documentation: Unlimited Rights
(4) Commercial Computer Software Rights: Customary License

4. Schedule/Period of Performance:

The ability of the Government to experiment with the use of the commercial space internet is dependent on the development, launch, and operation of commercial space internet constellations using non-government funding. As such, the government is flexible on the start date and duration of awards under this solicitation in order to maximize the probability of success of each individual effort. Although start date is a secondary consideration, the technical period of performance for any individual effort under this solicitation is estimated to be approximately 12-30 months. An additional three (3) months are allocated for preparation and review of the final report, resulting in an overall estimated period of performance of approximately 15-33 months. This period of performance is provided as an estimate only. Offerors should propose a schedule that is executable and maximizes the probability of achieving the technical objectives of this Call.

Due to the Government's desire to be flexible regarding the schedule of technical efforts so as to best accommodate evolving commercial schedules, the proposal open period and acceptable project start dates will be similarly flexible. Proposals will be accepted any time after 31 January 2022 and before 15 December 2023. Each proposal submitted will be evaluated individually against the criteria listed below in Section 10.a. Individual evaluations will commence on, or around, the time of proposal receipt and notifications concerning recommendation for award will occur approximately 30 days from proposal submission.

The following dates represent desired limits on the earliest start date and latest end date for technical efforts under this Call.

Project Kickoff: No earlier than March 2022
End of Technical PoP: No later than June 2027

5. Government Furnished Property/Equipment:

The Government will make available, at no cost to the offeror, the following items:

A. One or more aircraft: The government will provide operation of one or more test aircraft (or rotorcraft) for experimentation with commercial space internet spacecraft. The specific aircraft selected will be at the Government's discretion but will have the ability to integrate an offeror's antenna(s) in a sky-facing orientation. Mounting approaches and locations will be at the government's discretion and may vary based on aircraft type.

B. One or more ground vehicle(s): The government will provide operation of one or more test vehicle(s) for experimentation with commercial space internet spacecraft. The specific vehicle(s) selected will be at the Government's discretion but will have the ability to integrate an offeror's antenna(s) in a sky-facing orientation. Mounting approaches and locations will be at the government's discretion and may vary based on vehicle type.

C. DELETED.

The locations at which these items will be available, and the durations for which they will be available, will be determined based on availability, government discretion, and the offeror's request. Offerors should note in their proposal the anticipated timeframe when access to Government platforms will be desired, although actual timeframes will be mutually agreed during program execution.

Note that all Government platforms will be operated by Government personnel, and possession of the platforms will not be transferred to the Offeror. Therefore, these items will not be denoted as Government Furnished Equipment in contracts resulting from this Call.

6. Cost Objective/Funding Constraint:

The government anticipates awarding multiple (2-5) agreements/contracts, each with a value of approximately $1-40M, although deviations from this range are possible if in the best interest of the government.

A sample funding profile, per award is shown below. Note that deviations from this example profile are anticipated and acceptable. Offerors should propose desired funding profiles that best meet the solicitation objectives.

FY23	FY24	FY25	TOTAL
$10,000,000	$12,000,000	$5,000,000	$27,000,000

**Please Note: This funding profile is an estimate only and not a contractual obligation for funding. All funding is subject to change due to Government discretion and funding availability. Potential offerors should be aware that due to unanticipated budget fluctuations funding in any or all areas may change with little or no notice.*

7. Management Objective:

Allow the selected contractors flexibility to manage cost, schedule, and performance of this contracted effort.

8. OPSEC/Safety/Classification:

a. OPSEC: General Operations Security (OPSEC) procedures, policies and awareness are required in an effort to reduce program vulnerability from successful adversary collection and exploitation of critical information. OPSEC will be applied throughout the life cycle of any award resulting from this solicitation.

b. SAFETY**:** The following requirements must be incorporated into all contracts and agreements resulting from this Call:

1. Must comply with all federal, state, local, and Air Force safety and environmental regulations.
2. Must comply with system safety requirements contained in MIL-STD 882E, Section 4 "General Requirements" for any deliverable systems or hardware. Must identify safety-critical components of those systems or hardware, and software interfaces with those components. Must test and verify the safety-critical hardware and software for safety acceptance.

c. PROGRAM SECURITY CLASSIFICATION: In some cases, activities under this Call may be unclassified, however classified activities are expected, particularly for Use Case 2, and will be addressed accordingly.

9. Proposal Submission:

a. Content and Form of Proposal Submission: Reference ARA with Calls, FA8650-17-S-9300.

b. General Instructions:
Number of Proposal Copies: Offerors must submit one (1) electronic copy of their proposals. One electronic version of your technical proposal, SOW, and cost proposal must be submitted. The electronic version of your technical proposal and SOW must be submitted in Microsoft WORD. It is recommended that the electronic version of your cost proposal be submitted in Microsoft EXCEL. The electronic version of all proposal elements shall be submitted to the contracting

and technical POCs listed below via the DoD SAFE secure file transfer system, which can be accessed at: https:safe.apps.mil. If needed, an invitation to submit files via DoD SAFE may be obtained by requesting one from the contracting POC listed below.

Do not submit classified information via the above instructions. Offerors are encouraged to keep all elements of their proposal at the unclassified level, however if an offeror has a need to submit classified information, please contact the Technical POC identified below for instructions.

c. Technical/Management Proposal:
Page Limitations: The technical proposal shall not exceed a total of **25 pages**, inclusive of all text, tables, charts, illustrations, flowcharts, drawings, diagrams, indices, photographs, foldouts, appendices, attachments, resumes, etc. The technical proposal should be formatted in accordance to overarching ARA with Calls instructions. The cost proposal has no page limitation.

d. Technical and Contracting Points of Contact:

Address technical questions to:
Dr. Brian Beal, AFRL/RQ
Phone: (937) 656-1805
Email: brian.beal.1@us.af.mil

Dr. Greg Spanjers, AFRL/RS
Phone: (937) 656-1893
Email: gregory.spanjers@us.af.mil

Address contracting questions to:
Mr. Doug McCreary, AFRL/PZLDB (Primary)
Phone: (937) 713-9974
Email: Douglas.McCreary.1@us.af.mil

10. Proposal Review Information:

a. Evaluation Criteria:

Technical:

(1) Soundness of the offeror's technical approach including whether the proposal identifies major technical risks, clearly defines feasible mitigation efforts, and demonstrates related experience and qualifications of technical personnel. Soundness of the offeror's technical approach includes the offeror's understanding of the commercial space internet marketplace, technologies, and trends influencing the viability of the proposed approach.

(2) Relevance and impact of the proposed technical effort on the overall goals and objectives stated in the ARA with Calls.

(3) The offeror's understanding of the scope of the technical effort.
(4) The potential to transition the results of the technical effort to future Government needs.

Cost/Price: The cost evaluation includes the realism of the proposed cost. Cost/Price is a substantial factor but ranked as the second order of priority. (If an offeror proposes the use of GFP other than any GFP identified in the ARA, and that proposed GFP provides the offeror an unfair competitive advantage, then FAR 45.202 requires rental equivalent be applied to the Cost Factor for evaluation purposes only).

Certified Cost & Pricing Data: Adequate price competition (APC), as defined in FAR 15.403-1(c)(1)(i), is not anticipated. If the threshold for a negotiated contract is equal to or expected to exceed $2,000,000, submission of certified cost or pricing data shall be required. In accordance with FAR 15.403-4(b)(1), when certified cost or pricing data are required, the offeror shall submit to the contracting officer (and require subcontractors and/or interdivisional transfers or prospective subcontractors and/or interdivisional transfers submit to the prime contractor or appropriate subcontractor tier) the following:

a. A certificate of current cost or pricing data, in the format specified in FAR 15.406-2, certifying to the best of its knowledge and belief, the cost or pricing data were accurate, complete, and current as of the date of agreement on price or, if applicable, an earlier date agreed upon between the parties as close as practicable to the date of agreement on price.
b. Certified Cost & Pricing Data is not applicable to Other Transaction type (Non-FAR Based) awards.

b. Review and Selection Process:

Based on the evaluation, proposals will be categorized as Selectable or Not Selectable (see definitions below). The selection of one or more sources for award will be based on the evaluation, as well as importance to agency programs and funding availability.

(1) **Selectable:** Proposals are recommended for acceptance if sufficient funding is available. May require additional development.

(2) **Not Selectable:** Even if sufficient funding existed, the proposal should not be funded.

Note: The Government reserves the right to award some, all, or none of proposals. When the Government elects to award only a part of a proposal, the selected part may be categorized as Selectable, though the proposal as a whole may not merit such a categorization.

No other evaluation criteria will be used.

Prior to award of a potentially successful offer, the Contracting Officer will make a determination regarding price reasonableness.

11. Award Administration Information

a. Award Notices: Offerors will be notified whether their proposal is recommended for award on or about 30 working days from date of proposal submission. The notification is not to be construed to mean the award is assured, as availability of funds and successful negotiations are prerequisites to any award.

b. Administrative and National Policy Requirements: Refer to Section 12.

c. Reporting: For reporting requirements and frequency, refer to Section 2.

12. Additional Information:

a. Export Control: Information involved in this effort is subject to Export Control (International Traffic in Arms Regulation (ITAR) 22 CFR 120-131, or Export Administration Regulations (EAR) 15 CFR 710-774). A Certified DD Form 2345, Militarily Critical Technical Data Agreement, is required to be submitted with proposal.

b. Export-Controlled Items: As prescribed by DFARS 225.7901-4, DFARS 252.225-7048, "Export-Controlled Item (JUN 2013)" is contained in this solicitation. This clause shall be contained in ALL resulting contracts. Any resulting agreement will include a term and condition to address the same.

c. Foreign Participation: Foreign participation is not authorized. Foreign Nationals (FNs) can be employed by the US Prime Contractor or Sub-Contractor; however, FNs will be limited to Public Domain information unless the contractor has obtained the proper License or Technical Assistance Agreement that authorizes disclosure of CMI and/or CUI to foreign entities pursuant to the Department of State's ITAR or Department of Commerce's EAR. Public Domain information is defined as information that is releasable to the general public and sometimes referred to as open-source material. Examples include but are not limited to newspapers, magazines and information posted on the internet. Any proprietary information will have to be appropriately protected.