Call 002 – Vendor Flexibility Experiments

Defense Experimentation Using Commercial Space Internet (DEUCSI)

Proposal Due Date and Time: Proposals will be accepted any time after 8:00am Dayton, OH local time on 28 Jan 2019 and before 4:00pm Dayton, OH local time on 31 Oct 2021.

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

Anticipated Number of Awards: Estimate 2-4 Other Transaction Agreements and/or Contracts

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

Agreement/Contract Number: TBD (FA8650-19-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 Air Force platforms via multiple commercial space internet (CSI) constellations 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. For example, as the commercial space internet marketplace evolves, it is conceivable that new vendors will enter the market and existing vendors will exit. It is also highly likely that commercial offerings will change over time in regards to technical performance (e.g. data rates) and business arrangements (e.g. competitive commercial pricing between vendors). On a more tactical scenario, an Air Force pilot using the space internet may wish to change vendors in flight to access a more favorable spectrum or geometry. The Air Force wishes to conduct experiments in vendor flexibility to understand methods by which the government may position itself to affordably and efficiently leverage multiple commercial providers of space internet.

There are multiple methods that could be considered to achieve the desired flexibility. One potentially viable approach already under consideration is to use a multitude of single-vendor antennas, radios, and modems that would be removed / installed on each Air Force platform according to operational and business needs. This approach is expected to be experimentally assessed via activities resulting from previous Calls under this ARA and the accompanying Open Two-Step ARA, and

should not be proposed in response to this call. A second potentially viable approach for achieving vendor flexibility, and the subject of this Call, is to utilize flexible, adaptable hardware capable of interfacing with multiple commercial space internet vendors. To that end, this Call seeks experimentation to enable communications through two or more 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.

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

Use Case 1: Standard aircraft

While installation of any new equipment on an aircraft is subject to size, weight, and power considerations, these considerations are general in nature and not particularly stressing for many aircraft in the Air Force inventory. This use case is relatively flexible and forgiving in terms of interface requirements. That is, CSI equipment of various shapes and sizes can be integrated without major detrimental impact on the aircraft's primary mission. Examples of aircraft types that may fit this description include, but are not limited to, transport aircraft (e.g. C-17, C-130, V-22), tankers (e.g. KC-135, KC-46), and battle management platforms (e.g. AWACS).

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. Terminal elements of interest for this use case include, but are not limited to, antennas, radios, modems, and the associated equipment and software needed to integrate them into a functional system. Implementations that provide the capability to 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 large fleets of diverse aircraft. Offerors should therefore consider both the recurring cost of hardware and the ease of integration onto a number of different airframe types.

Use Case 2: Specially constrained aircraft

For certain types of Air Force aircraft, unique constraints exist and limit the ability to integrate general-purpose CSI terminals such as those described in Use Case 1. Typical constraints for Use Case 2 include significant restrictions in volume available for CSI equipment (such as on small aircraft) and the inability to modify an aircraft's outer mold line (such as on high-performance aircraft). In such cases, antennas and radio systems are typically highly-integrated with the platform and, in general, cannot be removed or replaced to accommodate interoperability with CSI. Increasingly, however, constrained platforms such as those of interest for Use Case 2 are adopting highly capable antennas capable of operating over frequency ranges applicable to several CSI options. Open radio architectures under consideration for these platforms will offer the ability to integrate third-party transceivers or

waveforms while interfacing with the rest of the aircraft systems. Utilizing CSI on such platforms therefore requires that CSI terminal elements adhere to the open radio architecture approaches and be compatible with (or adaptable to) the multi-functional antennas onboard the aircraft.

For Use Case 2, the Government seeks to experiment with CSI implementations that utilize a government-specified antenna solution and open radio architecture approaches. Use Case 2 seeks hardware, software, and experimentation to achieve high-data rate, two-way communications over CSI constellations while using government-specified (and, depending on availability, government-furnished) antennas and open radio architecture approaches. Vendor flexibility may be achieved via implementation of CSI modems/transceivers on open radio architecture compliant hardware elements (aka “cards”) that can be readily removed and replaced in favor of another vendor’s card OR by incorporation of multi-vendor capability on a single card OR via hosting of appropriate CSI capabilities (e.g. software-defined waveforms) on existing flexible radio elements.

A supplementary data package containing details on representative open radio architecture approaches and flexible antennas is available to Qualified US Contractors, as defined by DoDD 5230.25. Interested offerors who wish to receive the supplementary package may request it by contacting the Technical and Contracting POCs listed in this call and providing a copy of their valid DD Form 2345, Militarily Critical Technical Data Agreement. It should be noted that the details in the supplementary package are representative of applicable open radio architecture and antenna approaches, however other similar approaches may be considered if in the best interest of the government.

The use cases described above are for illustrative purposes only. Novel, innovative approaches for achieving multi-vendor flexibility to utilize the CSI across the range of AF 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 allowable and encouraged.

For both use cases, the government intends to provide access to Air Force operating locations, selected aircraft, and, as applicable and necessary, special test equipment as government furnished equipment (GFE). While the government will select aircraft for test based on availability, technical suitability, cost effectiveness, and government discretion, offerors are encouraged to suggest preferred aircraft types for test of their proposed solutions.

<u>Technical Objectives:</u>

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) Establish broadband connectivity between one or more Air Force aircraft and two or more commercial space internet providers from common user terminal elements, including antennas, radios, and modems. 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 (such as complexity of aircraft integration, required reconfiguration in order to function with different third party radios, etc.)
    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. 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.
    d. Airworthiness, including appropriate testing and documentation to enable integration on AF aircraft.

B. (Use Case 2) Establish broadband connectivity to one or more CSI constellations using hardware that is compatible with open radio architecture standards. Example open radio standards are included in the supplementary data package, although other standards may be considered if in the best interest of the government.

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

Proposals that address Use Case 1 or Use Case 2, but not both, are responsive to this Call. An offeror does not need to develop solutions for both Use Cases. Solutions that provide multi-vendor flexibility in accessing CSI, but which do not fit in either Use Case 1 or 2, are 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 communications experiments.
b. Software: Not required, but may be applicable depending on an offeror's selected technical approach.

c. Hardware: One or more user terminal elements (radio/modem/antenna) 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 28 January 2019 and before 31 October 2021. 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 May 2019

End of Technical PoP: No later than December 2022

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 for experimentation with commercial space internet spacecraft. The specific aircraft selected will be at the Government's discretion, but will have the following characteristics and capabilities available for use:

   a. 28 VDC electrical power
   b. 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.

   Note that offerors may request that Government aircraft be operated at appropriate geographic locations to facilitate effective experimentation with partially-populated commercial space internet constellations, if necessary.

B. Open radio architecture chassis and suitable antenna: If radio/modem cards conforming to open radio architecture standards are proposed in order to meet the technical objectives of Use Case 2 (see Section 1), the government may make available an appropriate open radio chassis and antenna conforming to the applicable standards. While the Government's decision regarding which type of open radio architecture chassis and antenna to make available will be based on availability, suitability, and government discretion, offerors are encouraged to recommend appropriate hardware for test of their particular offering.

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 aircraft will be desired.

6. Cost Objective/Funding Constraint:

The government anticipates awarding multiple (2-4) agreements/contracts, each with a value of approximately $0.5-7M, 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.

	FY19	FY20	TOTAL
AFRL/SDPE	$1,000,000	$4,000,000	$5,000,000
TOTAL	$1,000,000	$4,000,000	$5,000,000

**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 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: Activities under this Call are expected to be unclassified, however classified activities may be possible, 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 and two (2) hard copies of their proposals. One electronic version of your technical proposal,

SOW, and cost proposal must be submitted with the hard copy of the proposals and must match the hard copy. 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 may be submitted via CD delivered together with your hardcopy proposal or to the contracting and technical POCs listed below via the AMRDEC SAFE secure file transfer system, which can be accessed at: * https://safe.amrdec.army.mil/safe/[1] (see note 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) 904-4004
Email: brian.beal.1@us.af.mil

Address contracting questions to:
Mr. Michael Wafzig, AFRL/RQKDA (Primary)
Phone: (937) 713-9979
Email: michael.wafzig@us.af.mil

Or

Mr. Joel Watson, AFRL/RQKD (Secondary)
Phone: (937) 713-9813
Email: joel.watson@us.af.mil

[1] Note: As of this writing, the AMRDEC SAFE service is down and there is no estimate for when or if it will return to operations. Offerors should make provisions for submitting the electronic version of their proposal via CD in the event that AMRDEC SAFE in non-operable at the time of proposal submission.

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).

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.