Broad Agency Announcement

Biomanufacturing: Survival, Utility, and Reliability beyond Earth (B-SURE)

BIOLOGICAL TECHNOLOGIES OFFICE

HR001122S0010

November 22, 2021

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PART I: OVERVIEW INFORMATION

- **Federal Agency Name –** Defense Advanced Research Projects Agency (DARPA), Biological Technologies Office (BTO)
- **Funding Opportunity Title –** Biomanufacturing: Survival, Utility, and Reliability beyond Earth (B-SURE)
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  - Proposers' Day: **November 29, 2021**
    https://sam.gov/opp/11e2b325ec2a4f8db05919c996b9ed42/view
- **Concise description of the funding opportunity:** The Biomanufacturing: Survival, Utility, and Reliability beyond Earth (B-SURE) program will investigate fundamental research questions critical to the development and future realization of biomanufacturing capabilities in space. To accomplish this goal, B-SURE will collect data on the microbial utilization of space-based alternative feedstocks, optimization of microbial growth in variable gravities, and mitigation strategies for identified effects of galactic cosmic radiation on microbial growth and bioproduction.
- **Anticipated individual awards –** Multiple awards are anticipated.
- **Types of instruments that may be awarded –** Procurement contract, cooperative agreement, or other transaction.
- **Agency contact**

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PART II: FULL TEXT OF ANNOUNCEMENT

1. Funding Opportunity Description

This publication constitutes a Broad Agency Announcement (BAA) as contemplated in Federal Acquisition Regulation (FAR) 6.102(d)(2) and 35.016 and 2 CFR § 200.203. Any resultant award negotiations will follow all pertinent law and regulation, and any negotiations and/or awards for procurement contracts will use procedures under FAR 15.4, Contract Pricing, as specified in the BAA.

The Defense Advanced Research Projects Agency (DARPA) is soliciting innovative research proposals to investigate the biological foundations for biomanufacturing beyond Earth using in-situ resources. B-SURE will evaluate basic biological questions related to alternative feedstock utilization by microbial systems and how variable gravity and galactic cosmic radiation (GCR) impact cellular performance of common biomanufacturing host organisms. By addressing these areas, B-SURE will provide critical information and data on the future of biomanufacturing beyond Earth.

1.1. BACKGROUND INFORMATION

The Department of Defense (DoD) has a role in orbital and lunar missions as defined by the US Space Force (USSF) Space Capstone Publication[i]. To succeed in this role, there is a critical DoD need for the continued development and expansion of orbital manufacturing to enable and ensure supply chain resiliency, sustained technological superiority, and asset security and repair for current and future operations.

Biomanufacturing holds the potential to sustainably produce molecules and materials critical to national security with reduced reliance on traditional chemical synthesis precursors, components of which are fossil fuel derived. B-SURE aims to answer foundational biological questions that will enable the future use of biomanufacturing beyond Earth. To lay the groundwork for the ambitious goal of on-demand manufacturing for spaceflight applications, B-SURE will conduct research to establish the feasibility of biomanufacturing in space. To accomplish this aim, B-SURE will investigate three critical components: 1) How microbial systems can utilize alternative feedstocks such as carbon dioxide (CO_2), human waste streams, and regolith for growth and production performance; 2) How engineered biological systems function in variable gravity; and 3) How engineered biological systems function under increased GCR burdens. In addition, terrestrial analog environments that replicate gravity and radiation properties will be evaluated for their ability to predict fermentation performance in extraterrestrial environments. Finally, using data collected during the program, B-SURE will develop economic models to determine the utility of biomanufacturing as a viable approach to in-space manufacturing.

These three critical components provide the foundation to understand how, and under what circumstances, biology and biomanufacturing can provide on-demand manufacturing for spaceflight applications. The B-SURE program is seeking proposals to address these fundamental questions in order to accelerate the pace of innovation in the field, and generate critical data to inform the utility and reliability of biomanufacturing beyond Earth.

1.2. PROGRAM OVERVIEW

Proposals should address foundational biological questions to expand the potential for future biomanufacturing applications. Biological and predictive modeling questions are designed to inform the three fundamental areas, and performers will pursue individual tracks to address each challenge independently. Performers investigating alternative feedstock consumption will define minimal energy, nutrient, and purity requirements, as well as profile the metabolic conversion of these inputs to their cellular usage. Investigation into cellular growth and performance in variable gravity and high radiation environments will help understand the impact of these conditions on the industrially relevant strains *S. cerevisiae and E. coli*, in addition to other microbes. Finally, the performers will develop new models for the space economy to determine under what circumstances biomanufacturing would compete with (economically, logistically, etc.) or exceed traditional manufacturing practices on future spaceflight missions.

The utilization of alternative feedstocks (AF), working toward the goal of complete In-Situ Resource Utilization (ISRU), is a critical advantage that biological systems offer over traditional chemical or additive manufacturing and will be important for space manufacturing where resources are at a premium. Resources produced by humans and human activity that are generally considered waste (e.g., CO_2, black and grey water, food waste, and biodegradable plastics), and local resources such as sunlight and regolith (See Table 2), could be used by microbial systems to derive energy for production. Waste streams from the fermentation processes themselves can become important local resources. Recycling of fermentation byproducts (even partially) such as broth for subsequent runs and utilizing spent biomass as a nutrient source would be another important way to reduce waste that is generated locally, as well as reduce the amount of launched resources required for space-based biomanufacturing. B-SURE aims to understand how much and at what purity level a locally available feedstock could be consumed to minimize resupply and maximize supply chain resiliency, even if microbial strains continue to use a percentage of traditional feedstocks in combination with alternative feedstocks. In addition to the above alternative feedstock examples, there may be additional resources that can be explored and justified toward a future goal of total ISRU platforms in space.

The physical properties of spaceflight are unique, making it critical that the survival and reliability of microbial strains in the context of a potential in-space biomanufacturing capability are fully understood. B-SURE will evaluate how variable gravity and GCR impact biomanufacturing microbial host strains. Microgravity and GCR are two of the most significant differences between conditions in spaceflight and conditions on Earth, both of which have unpredictable effects on a given microbe and its engineered metabolism. Additionally, the levels of gravity and GCR vary tremendously depending on the location in space, requiring evaluation of microbial strains at multiple relevant gravitational and radiation levels. For example, the International Space Station (ISS) is partially shielded by the Earth's magnetic field and receives less GCR than a similar hypothetical facility in cislunar orbit. Spaceflight analogs (such as high-altitude balloons or the ISS National Laboratory), microgravity analogs (such as a clinostat or rotating wall vessel[ii]), and/or radiation analogs (such as the NASA space radiation laboratory at Brookhaven National Lab) are examples of facilities capable of testing and demonstrating microbial host strain capabilities for molecule production in spaceflight-like conditions.

Predictive models and projections of the growing space economy that incorporate insights and data from the B-SURE program will help determine under what circumstances and conditions biomanufacturing could play a role in manufacturing beyond Earth. Proposers are expected to identify projected trade-offs, costs, or logistical dynamics under which space-based biomanufacturing could offer advantages over space-based synthetic chemistry, additive manufacturing, or launched terrestrially manufactured materials to inform future development of orbital manufacturing capabilities. B-SURE will focus on the constraints living systems will face due to the unique physical conditions of space, in the form of radiation and gravity, which may impact their productivity. Combined with biological experimentation, modeling, and projections will inform a holistic understanding of the ranges of conditions beyond Earth that would determine whether biomanufacturing is a viable manufacturing methodology.

1.3. PROGRAM STRUCTURE

B-SURE will be an 18-month effort organized into three tracks. Intermediate and end-of-program milestones, outlined in this BAA, will be required at 9 and 18 months, respectively, to evaluate progress throughout the program. Proposers will design experiments to respond to and answer the Biological and Modeling Questions outlined for each track in this BAA. At 9 months, performers should produce updated biological experimentation parameters and modeling outcomes for the 18-month milestone informed by the experimental and modeling results to that point. These parameters and modeling outcomes will be used to determine appropriate end-of-program metrics that will be approved by the DARPA Program Manager as final deliverables for month 18. Quantitative metrics to assess technical performance towards milestones will be established by the proposer and agreed upon by DARPA (see Section 1.4 for details).

Proposals may be directed to any single track. Proposer teams interested in pursuing multiple tracks should submit a unique proposal for each track to be evaluated independently. If selected for multiple tracks, a proposer should have a teaming arrangement with sufficient labor allocated to meet the aggressive milestones for each track.

- Track 1 – Alternative Feedstock Utilization: determine which alternative feedstocks can be consumed by host organisms and at what quantity and purity levels.
- Track 2 – Variable Gravity: determine the impact of variable gravity on cellular performance in the context of biomanufacturing parameters and how terrestrial analogs predict on orbit molecule production.
- Track 3 – Variable Radiation: determine the impact of variable radiation (GCR) on cellular performance in the context of biomanufacturing parameters and how terrestrial analogs predict on orbit molecule production.

To address the key biological questions for each track, proposers must use both *Saccharomyces cerevisiae* and *Escherichia coli* as microbial host organisms, as well as at least one other organism based on selected track (track and additional host organism selected at the discretion of the proposer). As a proxy for the biomanufacturing productivity of the organism under non-terrestrial conditions, each host organism will be modified to produce a simple quantifiable protein or small molecule reporter such as green fluorescent protein or violacein. B-SURE is focused on generating foundational data for the future of biomanufacturing beyond Earth. To this end, proposers are

encouraged to select commonly used and industrially relevant host organisms; however any host organisms that achieve relevant program metrics are allowed.

Table 1: Organisms

Required organisms	• *Saccharomyces cerevisiae* • *Escherichia coli*
Potential additional organisms – proposers must choose at least one. *This list is descriptive not prescriptive; proposers are encouraged to use organisms they are familiar with to ensure program metrics are accomplished in a timely manner.*	• *Yarrowia lipolytica* • *Corynebacterium glutamicum* • *Bacillus subtilis* • *Schizosaccharomyces pombe* • *Synechococcus elongatus* • *Synechocystis sp* • *Thermosynechococcus elongatus* • *Clostridium acetobutylicum* • *Rhodococcus sp* • *Mycobacterium sp* • *Vibrio natriegens* • *Geobacter sulfurreducens* • *Geobacter metallireducens* • *Shewanella oneidenis* • *Deinococcus radiodurans*

Each track has biological and economic/logistic modeling questions to be addressed for all selected organisms to predict a range of independent, controlled parameters in which biomanufacturing may be viable. By month 9, biological and modeling questions for each track are designed to outline the final program metrics, culminating in projections of the viability of biomanufacturing in a space economy by 18 months. Each track must be pursued separately to understand the unique requirements of each variable. However, data analysis and modeling may be strengthened by compiling and integrating information across tracks. Therefore, proposals must include a description of a plan to share data with teams internally to the B-SURE performer community to support any proposed integrated modeling. As needed, data sharing plans to facilitate exchange will be formalized in an Associate Contractor Agreement (ACA), which is described in Section 8.2.

1.3.1 Track 1: Alternative Feedstock Utilization

In the context of B-SURE, AF refers to materials on orbit that are currently considered waste materials produced as a result of human activity or local natural resources such as sunlight and regolith. The primary goal of Track 1 is to understand which alternative feedstocks can be utilized by a given host organism and to produce foundational data to inform future ISRU and biomanufacturing in space. Therefore, proposers are encouraged to investigate the breadth of resources available in space and what contaminants might be associated with these resources. Common fermentation sugars and nutrients are not considered alternative feedstocks unless they have been recycled for reuse. While there are currently no biomanufacturing processes in space and no subsequent biomanufacturing waste streams, these can be considered an alternative

feedstock if they become available locally after an initial biomanufacturing run. Table 2 lists example AFs, but proposers are not limited to the AFs listed in this Table. Proposers must propose at least three (3) AFs (one from each group in Table 2) and test them in the required organisms *Saccharomyces cerevisiae* and *Escherichia coli*, as well as at least one proposer selected host organism to ensure program metrics are accomplished. Therefore, proposers are expected to test a minimum of three (3) AFs in three host organisms while addressing the following Biological and Predictive Modeling Questions to inform final metrics:

Biological questions:

1. How much of the alternative feedstock can be consumed by a host organism? What percentage of the alternative feedstock can host organisms be engineered to consume while producing protein or small molecule reporter?
2. How pure does the alternative feedstock need to be for efficient consumption and reporter molecule production?
3. How are components of alternative feedstocks utilized to support cellular metabolism?

Predictive Modeling Questions:

1. How much of the selected resource(s) is/are available, or predicted to be available, in-situ for current or planned infrastructure on the Lunar surface and orbit, Martian surface and orbit, and low earth orbit (LEO/ISS)?
2. Using current technologies, how much energy and time are required for harvest, storage, and preparation for microbial consumption (if required) of the resource?
3. Based on data sets from B-SURE, what percentage of total feedstock could be composed of an alternative feedstock and still maximize microbial growth and molecule production while still being economically and logistically viable?
4. Based on data sets from B-SURE, is efficiency of resource consumption equivalent to the resources required to harvest, store, and prepare the feedstock? At what point do resource contamination or impurity levels diminish any biomanufacturing advantage?

Table 2: Alternative feedstock groups and examples.

Group 1	**Group 2**	**Group 3**
• Carbon dioxide • Grey water • Fermentation waste (biomass and/or broth) • Sunlight	• Plastic waste (food wrappers/packaging or 3d-printed material) • Food waste • Black water or human urine	• Lunar Regolith • Martian Regolith

1.3.2 Track 2: Variable Gravity

The primary goal of Track 2 is to determine the constraints on microbial host organism physiology and performance under non-Earth gravity (G) conditions using analog environments. As a proxy for the biomanufacturing productivity of the organism under non-terrestrial gravity conditions, each host must produce a simple quantifiable protein or molecule reporter such as green fluorescent protein. Proposers must use both *Saccharomyces cerevisiae* and *Escherichia coli* as host

organisms, as well as at least one (1) additional organism (selected at the discretion of the proposer) to ensure program metrics are accomplished. Proposers are expected to evaluate performance at a minimum of two analogs of non-terrestrial gravity (See Table 3) while addressing the following Biological and Predictive Modeling Questions:

Biological Questions:

1. Does non-terrestrial gravity impact microbial physiology/performance in a manner that significantly impacts reporter molecule production? Based on defined host organism stress responses, how is fermentation affected and can this be exploited to improve performance or increase molecule production?
2. Do terrestrial gravity analogs recapitulate physiology changes ascribed to non-terrestrial gravity in a predictive manner for reporter molecule production?
3. What are key differences in physiology between prokaryotic and eukaryotic production strain performance outside of the context of the 1G environment?

Predictive Modeling Questions:

1. Does impact of variable gravity-induced stress response on fermentation indicate that the approaches are scalable and could produce useful volumes of biomanufacturing products on a relevant timescale?
2. Based on B-SURE biological data, what are the tradeoffs between engineering hosts to have higher performance in low G environments compared to the addition of infrastructure to induce artificial gravity in low G environments?
3. Using terrestrial analog environments, can a predictive and species generalizable transfer function be built to predict biomanufacturing performance in true low G environments?

Table 3: Gravity Levels

Location	Acceleration due to Gravity
International Space Station (cis lunar example)	~0 m/s^2
Lunar Surface	1.62 m/s^2
Martian Surface	3.72 m/s^2

1.3.3 Track 3: Variable Radiation

The primary goal of Track 3 is to determine the effects of GCR on microbial production strain physiology and performance. As a proxy for the biomanufacturing productivity of the organism under GCR environments, each host must produce a simple quantifiable protein or small molecule reporter such as green fluorescent protein or violacein. Proposers must use both *Saccharomyces cerevisiae* and *Escherichia coli* as hosts, as well as at least one (1) additional organism (selected at the discretion of the proposer) to ensure program metrics are accomplished. Proposers are expected to test a minimum of two radiation conditions that represent GCR, using varying ions or intensities (e.g., simulating a solar storm vs. lunar surface vs. ISS conditions). Proposers should justify their choice of conditions and explain why the chosen conditions are suitable to test and

understand the impact on biomanufacturing in space. In addition, proposers should address the following Biological and Predictive Modeling Questions:

Biological Questions:

1. How does GCR affect fermentation performance? Can radiation resistance mechanisms and pathways be identified and engineered into production strains?
2. How long can a given production strain be expected to maintain genetic integrity in terms of production output when exposed to GCR encountered in a specific radiation condition? Can a production strain be expected to remain unmutated for the time required for a production run?
3. What fitness cost is associated with engineering radiation resistance into production strains (impact on OD/growth rate/titer)? How does this translate to a reduction (if any) in molecule production? Do radiation resistance pathways have inhibitory effects on target molecule production or titers beyond fitness costs?

Predictive Modeling Questions:

1. What are example scenarios and subsequent relevant timescales for biomanufacturing production runs in a space environment?
2. How would different environments in space (e.g., ISS vs. moon vs. Mars) impact physiology and performance? Do these align with existing terrestrial analog environments?
3. What are the tradeoffs between engineering hosts to have better performance in high radiation environments compared to the addition of more radiation shielding material?

1.4. PROGRAM METRICS

Quantitative performance metrics will vary for each track. Proposers to the B-SURE program are required to define ambitious, specific, and quantitative metrics in support of program goals, including intermediate metrics (e.g., every 4.5 months or sooner) to help further evaluate progress. Minimal milestones are included below – and may serve as the minimum basis for determining whether satisfactory progress is being made to warrant continuation of the effort. Models may draw from data in all three tracks. Final metrics, based on model output, are to be determined as a part of the 9-month deliverables and are subject to DARPA approval.

1.4.1 Track 1: Alternative Feedstock Utilization

The primary goal of Track 1 is to understand the parameters of AFs that can support industrially relevant biomanufacturing strains in order to provide foundational data to inform future ISRU and space-based biomanufacturing goals. Toward that end, proposers are encouraged to collect data on a wide range of common biomanufacturing microbial host strains and how they could be adapted to consume alternative feedstocks. It is expected that not all hosts will be able to consume all feedstocks. All teams are required to test *Saccharomyces cerevisiae* and *Escherichia coli* given the widespread use of these strains for industrial biomanufacturing applications and to allow for cross team comparison of data, plus a minimum of one (1) additional host to be selected by the proposer. Furthermore, B-SURE requires that each team select one (1) AF from each group in Table 2 for testing. Therefore, there are a minimum of nine combinations (three host organisms and three (3)

AFs) that must be tested. However, it is anticipated that the milestones and metrics outlined below can be best accomplished by initially screening a wider range of hosts and AFs, beyond what is explicitly required. Understanding the bounds and variable levels of microbial AF consumption within a wide range of hosts are important foundational questions B-SURE aims to answer. In addition, by the end of the program, performers must deliver two host/AF combinations that derive the majority (>50%) of their nutrients from AF, and a single host that can derive the majority (>50%) of their nutrients from a combination of two distinct AFs. To ensure the reliability and repeatability of each deliverable, the data must be averaged over a minimum of four biological replicates, where each run cannot take longer than 10 days. To retain industrial relevance, all milestones and metrics must be achieved using fermentation tanks, or an industrial equivalent specific to the host (growth in microplates is not of interest). As a proxy for biomanufacturing productivity, each host must contain a simple quantifiable protein or molecule reporter such as green fluorescent protein or violacein. While no explicit reporter metrics are prescribed, the goal of the program is to provide foundational data to inform which hosts and AFs could be used to produce industrially relevant quantities of products beyond Earth. Therefore, maximizing reporter output is critical as long as those efforts are generalizable to the biomanufacturing potential of the host. Metabolic optimizations that only apply to the reporter molecule, and would not benefit future biomanufacturing goals, are not of interest. Metabolic engineering and/or laboratory evolution approaches are required.

Understanding the space economy and how biomanufacturing plays into that future is a key component of the B-SURE program. Consumption of local resources for manufacturing goals could greatly reduce the resupply and/or launch costs of a future biomanufacturing platform beyond Earth. However, it is not clear under what circumstances biomanufacturing using in-situ alternative resources is viable as a manufacturing alternative. The goal of the modeling and space economy questions is to better understand the ways in which biomanufacturing can offer a significant advantage to traditional manufacturing (beyond Earth) or the launching of finished materials that are produced on Earth. These modeling projections are intended to help identify appropriate metrics for the final program deliverables. For example, the final deliverables require >50% consumption of an AF. However, if the modeling projections suggest that a viable level of AF consumption is greater than 63%, the final deliverable will be adjusted to >63%.

Table 4: Track 1 – Alternative Feedstock Utilization Milestones and Metrics

Minimal acceptable Biological metrics (BIO) and modeling metrics (MOD)

Time	Milestones and Metrics
Month 4.5	Establish biological baselines, demonstrate initial consumption and identify in-situ availability: 1. (BIO) Demonstrate fermentation baseline (growth rate, final optical density (OD), reporter signal) of at least three host organisms. 2. (BIO) Measure AF consumption, growth rate, and reporter output of all selected feedstocks in all selected hosts. 3. (BIO) Demonstrate four host/AF combinations where AF consumption is >25% of total nutrients and with a final OD >10.

	4. (MOD) Determine how much of the selected AFs are available in-situ at all current and planned sites*.
Month 9	Understand AF purity constraints and model the economics of AF consumption in situ: 1. (BIO) Determine AF purity level requirements to avoid impacts on consumption, doubling time, biomass accumulation, and reporter output for at least four host/AF combinations that met or exceeded month 4.5 metrics. 2. (MOD) Model how much consumption is required for the approach to be viable. 3. (MOD) Project the maximum and minimum ratios of AF feedstocks (including combinations of multiple AFs) to traditional feedstocks that could be consumed to maximize microbial growth and molecule production. 4. (MOD) Project/model how much time and energy are required for harvest, storage and preparation of in-situ resource at required purity. 5. Determine metrics for final deliverables.
Final Deliverable – Month 18	Increase AF consumption, biomass accumulation and understand metabolic flux: 1. (BIO) Demonstrate two host/AF combinations where AF consumption is >50% of total nutrients and final OD >20 (or higher, commensurate with model projections). 2. (BIO) Demonstrate one host/2AF combination where total AF consumption is >50% of total nutrients and final OD >20 (or higher, commensurate with model projections). 3. (BIO) Trace metabolic pathways of all AFs in all final deliverable combinations. 4. (MOD) Document and describe which AF and organism combinations are best suited for continued ISRU research with particular emphasis on the bounds of biomanufacturing viability and current technological limitations.

* If fermentation waste is selected as an AF, project how much waste would be generated by a 1k-25k L sized reactor in a hypothetical low Earth orbit facility.

1.4.2 Track 2: Variable Gravity

The primary goal of Track 2 is to determine the constraints on microbial production strain physiology and performance under non-terrestrial gravity conditions. Specifically, this track will focus on how low gravity environments affect common biomanufacturing host growth rates and productivity. All teams are required to test *Saccharomyces cerevisiae* and *Escherichia coli* and to allow for cross team comparison of data, plus a minimum of one (1) additional host to be selected by the proposer. Furthermore, B-SURE requires that each team select two different low gravity levels (suggestions listed above in Table 3) to better understand the host/gravity landscape and inform future biomanufacturing efforts beyond Earth. Therefore, there are a minimum of six combinations (three hosts and two G levels) that must be tested. However, it is anticipated that the milestones and metrics outlined below can be best accomplished by initially screening a wider range of hosts and gravities beyond what is explicitly required. B-SURE aims to understand the bounds and potential impacts on cellular performance in low G in a wide range of hosts. In addition, by program end, proposers must demonstrate two host/G combinations that deliver higher growth and reporter signal production in low G compared to 1G. To ensure the reliability and repeatability of each deliverable, the collected data must be averaged over a minimum of four

biological replicates, where each run cannot take longer than 10 days. As a proxy for biomanufacturing productivity, each host must contain a simple quantifiable protein or molecule reporter such as green fluorescent protein or violacein. While no explicit reporter metrics are prescribed, the goal of the program is to provide foundational data to inform what hosts could be used to produce industrially relevant quantities of product beyond Earth. Therefore, maximizing reporter output is critical as long as those efforts are generalizable to the biomanufacturing potential of the host. Metabolic optimizations that only apply to the reporter molecule, and would not benefit future biomanufacturing goals, are not of interest. Metabolic engineering and/or laboratory evolution approaches are required.

Proposals are expected to either 1) provide thorough data and justification demonstrating an analog environment's ability to mimic true low gravity in the context of biomanufacturing for host physiology and molecule productivity; or 2) incorporate cost-effective plans for execution of experiments and data collection in true low gravity to provide comparison datasets to Earth based analog environments.

Understanding the potential role of biomanufacturing in space is a key part of the B-SURE program. As lower gravity is one of the biggest differences beyond Earth, B-SURE aims to understand how biomanufacturing hosts are impacted by environmental differences and what adaptations (genetic or hardware) can be made to maximize cellular bioproduction. Modeling will provide projections of genetic or hardware perturbations that would result in improved performance, economic and logistical tradeoffs of such decisions, and identification of appropriate metrics for the final deliverable. For example, the final deliverables describe cellular performance improvements of 50% over baseline performance in 1G in microgravity. However, if the modeling projections suggest that adding ¼ G of artificial gravity would be more beneficial than any metabolic engineering efforts, then the gravity levels of the final deliverables will be increased by ¼ G.

Table 5: Track 2 – Variable Gravity Milestones and Metrics

Minimal acceptable Biological metrics (BIO) and modeling metrics (MOD)

Time	Milestones and Metrics
Month 4.5	Establish biological baseline and identify genetic targets: 1. (BIO) Demonstrate fermentation baseline at 1g (growth rate, final OD, reporter output) of at least three host organisms. 2. (BIO) Measure growth rate, final OD, and reporter output of at least three hosts in at least two low G levels. 3. (BIO) Identify genetic targets for improved cellular performance in low G. 4. (MOD) How is performance impacted by different G levels and taxonomy?
Month 9	Demonstrate improved cellular performance in variable gravity and deliver: 1. (BIO) Utilize genetic changes to demonstrate a 25% improvement in final OD (minimum of 10 OD) and reporter output in four combinations (host x G) over one G performance.

	2. (MOD) What stress response factors or other physiological response to low G could be co-opted to increase the biomanufacturing potential of the hosts? 3. (MOD) How much gravity (even partial) could be added to low G environments to improve performance? Under what circumstances is adding artificial gravity more economically and logistically viable than additional metabolic engineering?
Final Deliverable Month 18	Optimize cellular physiology for low G bioproduction: 1. (BIO) Demonstrate a 50% improvement in performance in final OD (minimum of 12 OD) and reporter output in microgravity and 1/6th G in two hosts commensurate with model projections from month 9. 2. (MOD) Build predictive transfer function of analog to low G performance that is generalizable to other biomanufacturing hosts.

1.4.3 Track 3: Variable Radiation

The primary goal of Track 3 is to determine the constraints on microbial production strain physiology and performance under variable and/or high radiation conditions such as those found in the presence of galactic cosmic radiation. Specifically, this track will focus on how common biomanufacturing hosts would fare in radiation environments and how their productivity is impacted. All teams are required to test *Saccharomyces cerevisiae* and *Escherichia coli* and to allow for cross team comparison of data, plus a minimum of one additional host to be selected by the proposer. Furthermore, B-SURE requires that each team select two different high radiation levels to better understand the host/radiation landscape and to inform future biomanufacturing efforts beyond Earth. Therefore, there are a minimum of six combinations (three hosts by two Rad levels) that must be tested. However, it is anticipated that the milestones and metrics outlined below can be best accomplished by initially screening a wider range of hosts and radiation levels beyond what is explicitly required. B-SURE aims to understand the bounds and potential impacts on cellular performance in variable radiation levels (whether low or high) in a wide range of hosts. In addition, by the end of the program, proposers must demonstrate two host/radiation combinations that deliver higher growth and reporter output in higher radiation compared to Earth levels. To ensure the reliability and repeatability of each deliverable, the collected data must be averaged over a minimum of four biological replicates, where each run cannot take longer than 10 days. As a proxy for biomanufacturing productivity, each host must contain a simple quantifiable protein or molecule reporter such as green fluorescent protein or violacein. While no explicit reporter metrics are prescribed, the goal of the program is to provide foundational data to inform what hosts could be used to produce industrially relevant quantities of product beyond Earth. Therefore, maximizing reporter output is critical as long as those efforts are generalizable to the biomanufacturing potential of the host. Metabolic optimizations that only apply to the reporter molecule, and would not benefit future biomanufacturing goals, are not of interest. Metabolic engineering and/or laboratory evolution approaches are required.

Understanding the space economy and the role of biomanufacturing in a future state is a key part of the B-SURE program. As high and variable radiation is one of the biggest differences beyond Earth, B-SURE aims to understand how biomanufacturing hosts are impacted by this environmental difference and what adaptations (genetic, hardware, duration of biomanufacturing

run) can be made to maximize cellular bioproduction. Modeling will provide projections of genetic or hardware perturbations that would result in improved performance, economic and logistical tradeoffs of such decisions, and identification of appropriate metrics for the final deliverable. For example, the final deliverables describe cellular performance improvements of 50% over baseline performance on Earth in less than 10 days. However, if the modeling projections suggest that the cellular damage sustained by eight days of high radiation exposure would negatively impact performance, the final deliverable must be accomplished in less than eight days per run.

Table 6: Track 3 – Variable Radiation Milestones and Metrics

Minimal acceptable Biological metrics (BIO) and modeling metrics (MOD)

Time	Milestones and Metrics
Month 4.5	Establish biological baseline and identify genetic targets: 1. (BIO) Demonstrate fermentation baseline under terrestrial conditions (growth rate, final OD, reporter signal) of at least three host organisms. 2. (BIO) Measure growth rate, final OD, and reporter output of at least three hosts in at least two high radiation levels. 3. (MOD) Identify genetic targets for improved cellular performance in high radiation. Identify genetic regions that are more sensitive to radiation than others.
Month 9	Understand physiological response to high radiation in biomanufacturing hosts 1. (BIO) Demonstrate a 25% improvement in final OD (minimum of 10 OD) and reporter output in four combinations (host x rad) over Earth radiation performance. 2. (MOD) How is performance impacted by different radiation levels and taxonomy? 3. (MOD) How much radiation can be absorbed before biomanufacturing performance is impacted? 4. (MOD) What are the timescales necessary to maintain genetic stability in models of industrial fermentation in space? 5. (MOD) What stress response factors or other physiological responses to high radiation could be co-opted to increase the biomanufacturing potential of the hosts?
Final Deliverable Month 18	Demonstrate biomanufacturing of a reporter under high radiation. 1. (BIO) Demonstrate a 50% improvement in performance in final OD (minimum of 12 OD) and reporter output in two high radiation levels in two hosts commensurate with model projections from month 9. 2. (MOD) How much shielding (even partial) could be added to high radiation environments to improve performance or remove the need for any metabolic engineering?

1.5. GENERAL REQUIREMENTS

Regardless of the specific organism, approach, and Track(s) pursued, proposers to the B-SURE program must address each of the following:

Teaming
Proposers are responsible for assembling a complete team that has technical expertise, capabilities, and facilities to address all requirements of the program and have significant experience in the research and development of engineered organisms, spaceflight conditions, and spaceflight analogs. Describe any formal teaming agreements that are required to execute this program. Proposers must identify team members or vendor sources required to achieve alternative feedstock consumption, variable gravity, or variable radiation milestones. All teams are encouraged to identify a Project Manager to serve as the primary point of contact to communicate with the DARPA Program Manager and Contracting Officer Representative, coordinate effort across performer team, organize regular performer meetings or discussions, facilitate data sharing, and ensure timely completion of milestones and deliverables. For teams that are not physically co-located, proposers must articulate how logistical challenges will be overcome to ensure smooth collaboration and an integrated work product.

Data Sharing and Associate Contractor Agreements (ACA)
DARPA anticipates that a large amount of data will be generated under this program by each performer. Data analysis and modeling will be strengthened by compiling and integrating information across performers and tracks. Therefore, proposals must include the description of a plan to share data with teams internally to the B-SURE performer group. As needed, data sharing plans to facilitate exchange will then be formalized in an ACA (See Section 8.0), to be included in the contract or agreement awarded. Performers will be encouraged to share data externally with the broader research community, and may include plans for external data sharing in the milestones, metrics and deliverables.

Ethical, Legal, and Societal Implications (ELSI)
Future potential biomanufacturing in orbit or on planetary bodies poses unique ethical, legal, and social concerns. As an emerging technology, DARPA anticipates that the challenges of biomanufacturing in space will need guidance to inform technology development. Topics to be considered may initially include, but are not limited to:

1. Metabolic engineering for extreme conditions such as microgravity and radiation exposure will likely be required to enable microbial production strain growth and bioproduction performance beyond Earth.
2. Questions surrounding potential generation of new biological materials pose concerns for planetary protection and forward or backward contamination, which is strictly monitored.
3. The Outer Space Treaty requires efforts in space to be for peaceful purposes, aligning to compliance with the Biological Weapons Convention (BWC). Aligning with the aim of B-SURE the Treaty includes an exemption for R&D. Molecules will not be designed to cause harm or for anti-material applications.

4. DoD funding of this technology may engender a perception of the militarization of space which must be acknowledged and addressed to enable trust in the technology.
5. Availability and access to resources for future human populations in space and the subsequent effects on the space economy may shift as ISRU increases and technology advances, changing supply chain calculations and perceptions of space sustainability.

DARPA maintains its commitment to ensuring that efforts funded under this BAA adhere to ethical and legal regulations currently in place for Federally and DoD-funded research. Program development will be discussed with an advisory body, or group of external advisors, with expertise in ethical issues and emerging technologies. DARPA will engage experts to address potential ethical, legal, and societal implications of the proposed technology throughout the program to share data being generated from the foundational biological questions posed by B-SURE and to communicate the potential future of biomanufacturing in space, including the viability of contributing to in-space manufacturing and its impact on the future space economy.

Proposers to this BAA are encouraged to integrate ELSI expertise and advice to analyze and inform model projections and products, enabling new models for the space economy to address issues such as ISRU, planetary protection, and space sustainability in any criteria for further technology development. With this additional information, models may support communication strategies, mitigate risks to technology misuse, respond to stakeholder concerns, and inform potential transition to both military and civilian end users. Proposers should allocate time and expect regular communications with DARPA and its external advisors regarding data analytics, models, and ELSI, as well as incorporate this input into project plans and technology development.

Transition Strategy
B-SURE will address fundamental questions to enable assessment of the suitability for biomanufacturing to contribute to space-based manufacturing. Proposers are encouraged to present a plan for further testing and development of organisms that demonstrate adaptability to space conditions for biomanufacturing. It is anticipated that the B-SURE production strains will be suitable for industrial biomanufacturing and licensing to improve terrestrial and space-based commercial uses of alternative feedstocks and engineered microbes. Information and technology advancements will be shared with stakeholders, including but not limited to Air Force, Space Force, and NASA, and provide enabling technologies for potential future DARPA efforts that address applied challenges identified by B-SURE.

Deliverables
All products, material, and otherwise that will be provided to the Government as outcomes from conducted research should be defined as part of the proposal. Performers should reserve time and budget to fulfill obligations for travel to review meetings and the transmission of report documentation.

- Monthly financial reports: Performers are required to provide financial status updates. These reports should be in the form of an editable MS Excel file and should provide financial data, including but not limited to the following: program spend plan by phase and task, incurred program expenditures to date by phase and task, and invoiced program

expenditures to date by phase and task. The prime performer is to include information for itself and all subawardees/subcontractors.

- Monthly technical progress reports: Each month (or as close to as scheduling permits), performers are required to provide research updates. These reports should be in the form of a standardized slide presentation provided to DARPA and discussed with the program management team via teleconference. Length and detail level should be at the discretion of the Program Manager.
- Quarterly technical reports: The reports shall be prepared and submitted in accordance with the procedures contained in the award document.
- Semi-Annual Reviews: Leadership from each performer team (with additional key personnel at the discretion of the Principal Investigator (PI)) will be required to present research progress in person, twice annually. The purpose of these reviews is to ensure adequate engagement with the DARPA team to discuss details that might otherwise fall outside the scope of a routine technical brief and provide opportunities to discuss progress towards milestones and scientific goals, any ongoing technical or programmatic challenges that must be overcome to achieve the overarching goals of the program.
- Final Program Report: When the final funding phase closes out, performer teams will provide a final report that summarizes all research activities, outcomes, and molecular mechanisms discovered during the program. Proposers are encouraged to present a plan for further testing and development of organisms that demonstrate adaptability to space conditions for biomanufacturing.
- Any publications, research presentations, or patent applications that result from the research pursued as part of the B-SURE program.

2. Award Information

2.1. GENERAL AWARD INFORMATION

Multiple awards are possible. The amount of resources made available under this BAA will depend on the quality of the proposals received and the availability of funds.

The Government reserves the right to select for negotiation all, some, one, or none of the proposals received in response to this solicitation and to make awards without discussions with proposers. The Government also reserves the right to conduct discussions if it is later determined to be necessary. If warranted, portions of resulting awards may be segregated into pre-priced options. Additionally, DARPA reserves the right to accept proposals in their entirety or to select only portions of proposals for award. In the event that DARPA desires to award only portions of a proposal, negotiations may be opened with that proposer. The Government reserves the right to fund proposals in phases with options for continued work, as applicable.

The Government reserves the right to request any additional, necessary documentation once it makes the award instrument determination. Such additional information may include, but is not limited to, Representations and Certifications (see Section VI.B.2., "Representations and Certifications"). The Government reserves the right to remove proposers from award consideration

should the parties fail to reach agreement on award terms, conditions, and/or cost/price within a reasonable time, and the proposer fails to timely provide requested additional information. Proposals identified for negotiation may result in a procurement contract, cooperative agreement, or other transaction, depending upon the nature of the work proposed, the required degree of interaction between parties, whether or not the research is classified as Fundamental Research, and other factors.

Proposers looking for innovative, commercial-like contractual arrangements are encouraged to consider requesting Other Transactions. To understand the flexibility and options associated with Other Transactions, consult http://www.darpa.mil/work-with-us/contract-management#OtherTransactions.
In accordance with 10 U.S.C. § 2371b(f), the Government may award a follow-on production contract or Other Transaction (OT) for any OT awarded under this solicitation if: (1) that participant in the OT, or a recognized successor in interest to the OT, successfully completed the entire prototype project provided for in the OT, as modified; and (2) the OT provides for the award of a follow-on production contract or OT to the participant, or a recognized successor in interest to the OT.

In all cases, the Government contracting officer shall have sole discretion to select award instrument type, regardless of instrument type proposed, and to negotiate all instrument terms and conditions with selectees. DARPA will apply publication or other restrictions, as necessary, if it determines that the research resulting from the proposed effort will present a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense. Any award resulting from such a determination will include a requirement for DARPA permission before publishing any information or results on the program. For more information on publication restrictions, see the section below on Fundamental Research.

2.2. FUNDAMENTAL RESEARCH

It is DoD policy that the publication of products of fundamental research will remain unrestricted to the maximum extent possible. National Security Decision Directive (NSDD) 189 defines fundamental research as follows:

> 'Fundamental research' means basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons.

As of the date of publication of this solicitation, the Government expects that program goals as described herein may be met by proposers intending to perform fundamental research and does not anticipate applying publication restrictions of any kind to individual awards for fundamental research that may result from this solicitation. Notwithstanding this statement of expectation, the Government is not prohibited from considering and selecting research proposals that, while perhaps not qualifying as fundamental research under the foregoing definition, still meet the solicitation criteria for submissions. If proposals are selected for award that offer other than a fundamental research solution, the Government will either work with the proposer to modify the

proposed statement of work to bring the research back into line with fundamental research or else the proposer will agree to restrictions in order to receive an award.
University or non-profit research institution performance under this solicitation will include effort categorized as fundamental research. In addition to Government support for free and open scientific exchanges and dissemination of research results in a broad and unrestricted manner, the academic or non-profit research performer or recipient, regardless of tier, acknowledges that such research may have implications that are important to U.S. national interests and must be protected against foreign influence and exploitation. As such, the academic or non-profit research performer or recipient agrees to comply with the following requirements:

(a) The University or non-profit research institution performer or recipient must establish and maintain an internal process or procedure to address foreign talent programs, conflicts of commitment, conflicts of interest, and research integrity. The academic or non-profit research performer or recipient must also utilize due diligence to identify Foreign Components or participation by Senior/Key Personnel in Foreign Government Talent Recruitment Programs and agree to share such information with the Government upon request.

i. The above described information will be provided to the Government as part of the proposal response to the solicitation and will be reviewed and assessed prior to award. Generally, this information will be included in the Research and Related Senior/Key Personnel Profile (Expanded) form (SF-424) required as part the proposer's submission through Grants.gov.

1. Instructions regarding how to fill out the SF-424 and its biographical sketch can be found through Grants.gov.

ii. In accordance with USD(R&E) direction to mitigate undue foreign influence in DoD-funded science and technology, DARPA will assess all Senior/Key Personnel proposed to support DARPA grants and cooperative agreements for potential undue foreign influence risk factors relating to professional and financial activities. This will be done by evaluating information provided via the SF-424, and any accompanying or referenced documents, in order to identify and assess any associations or affiliations the Senior/Key Personnel may have with foreign strategic competitors or countries that have a history of intellectual property theft, research misconduct, or history of targeting U.S. technology for unauthorized transfer. DARPA's evaluation takes into consideration the entirety of the Senior/Key Personnel's SF-424, current and pending support, and biographical sketch, placing the most weight on the

Senior/Key Person's professional and financial activities over the last 4 years. The majority of foreign entities lists used to make these determinations are publicly available. The DARPA Countering Foreign Influence Program (CFIP) "Senior/Key Personnel Foreign Influence Risk Rubric" details the various risk ratings and factors. The rubric can be seen at the following link: https://www.darpa.mil/attachments/092021DARPACFIPRubric.pdf

iii. Examples of lists that DARPA leverages to assess potential undue foreign influence factors include, but are not limited to:

1. Executive Order 13959 "Addressing the Threat From Securities Investments That Finance Communist Chinese Military Companies": https://www.govinfo.gov/content/pkg/FR-2020-11-17/pdf/2020-25459.pdf
2. The U.S. Department of Education's College Foreign Gift and Contract Report: College Foreign Gift Reporting (ed.gov)
3. The U.S. Department of Commerce, Bureau of Industry and Security, List of Parties of Concern: https://www.bis.doc.gov/index.php/policy-guidance/lists-of-parties-of-concern
4. Georgetown University's Center for Security and Emerging Technology (CSET) Chinese Talent Program Tracker: https://chinatalenttracker.cset.tech
5. Director of National Intelligence (DNI) "World Wide Threat Assessment of the US Intelligence Community": 2021 Annual Threat Assessment of the U.S. Intelligence Community (dni.gov)
6. Various Defense Counterintelligence and Security Agency (DCSA) products regarding targeting of US technologies, adversary targeting of academia, and the exploitation of academic experts: https://www.dcsa.mil/

DARPA's analysis and assessment of affiliations and associations of Senior/Key Personnel is compliant with Title VI of the Civil Rights Act of 1964. Information regarding race, color, or national origin is not collected and does not have bearing in DARPA's assessment.

University or non-profit research institutions with proposals selected for negotiation that have been assessed as having high or

very high undue foreign influence risk, will be given an opportunity during the negotiation process to mitigate the risk. DARPA reserves the right to request any follow-up information needed to assess risk or mitigation strategies.

iv. Upon conclusion of the negotiations, if DARPA determines, despite any proposed mitigation terms (e.g. mitigation plan, alternative research personnel), the participation of any Senior/Key Research Personnel still represents high risk to the program, or proposed mitigation affects the Government's confidence in proposer's capability to successfully complete the research (e.g., less qualified Senior/Key Research Personnel) the Government may determine not to award the proposed effort. Any decision not to award will be predicated upon reasonable disclosure of the pertinent facts and reasonable discussion of any possible alternatives while balancing program award timeline requirements.

(b) Failure of the academic or non-profit research performer or recipient to reasonably exercise due diligence to discover or ensure that neither it nor any of its Senior/Key Research Personnel involved in the subject award are participating in a Foreign Government Talent Program or have a Foreign Component with an a strategic competitor or country with a history of targeting U.S. technology for unauthorized transfer may result in the Government exercising remedies in accordance with federal law and regulation.

i. If, at any time, during performance of this research award, the academic or non-profit research performer or recipient should learn that it, its Senior/Key Research Personnel, or applicable team members or subtier performers on this award are or are believed to be participants in a Foreign Government Talent Program or have Foreign Components with a strategic competitor or country with a history of targeting U.S. technology for unauthorized transfer , the performer or recipient will notify the Government Contracting Officer or Agreements Officer within 5 business days.

1. This disclosure must include specific information as to the personnel involved and the nature of the situation and relationship. The Government will have 30 business days to review this information and conduct any necessary fact-finding or discussion with the performer or recipient.

2. The Government's timely determination and response to this disclosure may range anywhere

from acceptance, to mitigation, to termination of this award at the Government's discretion.

3. If the University receives no response from the Government to its disclosure within 30 business days, it may presume that the Government has determined the disclosure does not represent a threat.

ii. The performer or recipient must flow down this provision to any subtier contracts or agreements involving direct participation in the performance of the research.

(c) Definitions

i. Senior/Key Research Personnel

1. This definition would include the Principal Investigator or Program/Project Director and other individuals who contribute to the scientific development or execution of a project in a substantive, measurable way, whether or not they receive salaries or compensation under the award. These include individuals whose absence from the project would be expected to impact the approved scope of the project.

2. Most often, these individuals will have a doctorate or other professional degrees, although other individuals may be included within this definition on occasion.

ii. Foreign Associations/Affiliations

1. Association is defined as collaboration, coordination or interrelation, professionally or personally, with a foreign government-connected entity where no direct monetary or non-monetary reward is involved.

2. Affiliation is defined as collaboration, coordination, or interrelation, professionally or personally, with a foreign government-connected entity where direct monetary or non-monetary reward is involved.

iii. Foreign Government Talent Recruitment Programs

1. In general, these programs will include any foreign-state-sponsored attempt to acquire U.S. scientific-funded research or technology through foreign government-run or funded recruitment programs that target scientists, engineers, academics,

researchers, and entrepreneurs of all nationalities working and educated in the U.S.

2. Distinguishing features of a Foreign Government Talent Recruitment Program may include:

    a. Compensation, either monetary or in-kind, provided by the foreign state to the targeted individual in exchange for the individual transferring their knowledge and expertise to the foreign country.

    b. In-kind compensation may include honorific titles, career advancement opportunities, promised future compensation or other types of remuneration or compensation.

    c. Recruitment, in this context, refers to the foreign-state-sponsor's active engagement in attracting the targeted individual to join the foreign-sponsored program and transfer their knowledge and expertise to the foreign state. The targeted individual may be employed and located in the U.S. or in the foreign state.

    d. Contracts for participation in some programs that create conflicts of commitment and/or conflicts of interest for researchers. These contracts include, but are not limited to, requirements to attribute awards, patents, and projects to the foreign institution, even if conducted under U.S. funding, to recruit or train other talent recruitment plan members, circumventing merit-based processes, and to replicate or transfer U.S.-funded work in another country.

    e. Many, but not all, of these programs aim to incentivize the targeted individual to physically relocate to the foreign state. Of particular concern are those programs that allow for continued employment at U.S. research facilities or receipt of U.S. Government research funding while concurrently receiving compensation from the foreign state.

3. Foreign Government Talent Recruitment Programs DO NOT include:

a. Research agreements between the University and a foreign entity, unless that agreement includes provisions that create situations of concern addressed elsewhere in this section,

b. Agreements for the provision of goods or services by commercial vendors, or

c. Invitations to attend or present at conferences.

iv. Conflict of Interest

1. A situation in which an individual, or the individual's spouse or dependent children, has a financial interest or financial relationship that could directly and significantly affect the design, conduct, reporting, or funding of research.

v. Conflict of Commitment

1. A situation in which an individual accepts or incurs conflicting obligations between or among multiple employers or other entities.

2. Common conflicts of commitment involve conflicting commitments of time and effort, including obligations to dedicate time in excess of institutional or funding agency policies or commitments. Other types of conflicting obligations, including obligations to improperly share information with, or withhold information from, an employer or funding agency, can also threaten research security and integrity and are an element of a broader concept of conflicts of commitment.

vi. Foreign Component

1. Performance of any significant scientific element or segment of a program or project outside of the U.S., either by the University or by a researcher employed by a foreign organization, whether or not U.S. government funds are expended.

2. Activities that would meet this definition include, but are not limited to:

a. Involvement of human subjects or animals;

b. Extensive foreign travel by University research program or project staff for the

purpose of data collection, surveying, sampling, and similar activities;

c. Collaborations with investigators at a foreign site anticipated to result in co-authorship;

d. Use of facilities or instrumentation at a foreign site;

e. Receipt of financial support or resources from a foreign entity; or

f. Any activity of the University that may have an impact on U.S. foreign policy through involvement in the affairs or environment of a foreign country.

3. Foreign travel is not considered a Foreign Component.

vii. Strategic Competitor

1. A nation, or nation-state, that engages in diplomatic, economic or technological rivalry with the United States where the fundamental strategic interests of the U.S are under threat.

Proposers should indicate in their proposal whether they believe the scope of the research included in their proposal is fundamental or not. While proposers should clearly explain the intended results of their research, the Government shall have sole discretion to determine whether the proposed research shall be considered fundamental and to select the award instrument type. Appropriate language will be included in resultant awards for non-fundamental research to prescribe publication requirements and other restrictions, as appropriate. This language can be found at http://www.darpa.mil/work-with-us/additional-baa.

For certain research projects, it may be possible that although the research to be performed by a potential awardee is non-fundamental research, its proposed subawardee's effort may be fundamental research. It is also possible that the research performed by a potential awardee is fundamental research while its proposed subawardee's effort may be non-fundamental research. In all cases, it is the potential awardee's responsibility to explain in its proposal which proposed efforts are fundamental research and why the proposed efforts should be considered fundamental research.

3. Eligibility Information

3.1. ELIGIBLE APPLICANTS

All responsible sources capable of satisfying the Government's needs may submit a proposal that shall be considered by DARPA.

3.1.1. Federally Funded Research and Development Centers (FFRDCs) and Government Entities

FFRDCs

FFRDCs are subject to applicable direct competition limitations and cannot propose to this solicitation in any capacity unless they meet the following conditions. (1) FFRDCs must clearly demonstrate that the proposed work is not otherwise available from the private sector. (2) FFRDCs must provide a letter, on official letterhead from their sponsoring organization, that (a) cites the specific authority establishing their eligibility to propose to Government solicitations and compete with industry, and (b) certifies the FFRDC's compliance with the associated FFRDC sponsor agreement's terms and conditions. These conditions are a requirement for FFRDCs proposing to be awardees or subawardees.

Government Entities

Government Entities (e.g., Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations. Government Entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority and contractual authority, if relevant, establishing their ability to propose to Government solicitations and compete with industry. This information is required for Government Entities proposing to be awardees or subawardees.

Authority and Eligibility

At the present time, DARPA does not consider 15 U.S.C. § 3710a to be sufficient legal authority to show eligibility. While 10 U.S.C.§ 2539b may be the appropriate statutory starting point for some entities, specific supporting regulatory guidance, together with evidence of agency approval, will still be required to fully establish eligibility. DARPA will consider FFRDC and Government Entity eligibility submissions on a case-by-case basis; however, the burden to prove eligibility for all team members rests solely with the proposer.

3.1.2. Non-U.S. Organizations

Non-U.S. organizations and/or individuals may participate to the extent that such participants comply with any necessary nondisclosure agreements, security regulations, export control laws, and other governing statutes applicable under the circumstances.

3.2. ORGANIZATIONAL CONFLICTS OF INTEREST

FAR 9.5 Requirements

In accordance with FAR 9.5, proposers are required to identify and disclose all facts relevant to potential OCIs involving the proposer's organization and *any* proposed team member (subawardee, consultant). Under this Section, the proposer is responsible for providing this disclosure with each proposal submitted to the solicitation. The disclosure must include the proposer's, and as applicable, proposed team member's OCI mitigation plan. The OCI mitigation plan must include a description of the actions the proposer has taken, or intends to take, to prevent the existence of conflicting roles that might bias the proposer's judgment and to prevent the proposer from having unfair competitive advantage. The OCI mitigation plan will specifically discuss the disclosed OCI in the context of each of the OCI limitations outlined in FAR 9.505-1 through FAR 9.505-4.

Agency Supplemental OCI Policy

In addition, DARPA has a supplemental OCI policy that prohibits contractors/performers from concurrently providing Scientific Engineering Technical Assistance (SETA), Advisory and Assistance Services (A&AS) or similar support services and being a technical performer. Therefore, as part of the FAR 9.5 disclosure requirement above, a proposer must affirm whether the proposer or *any* proposed team member (subawardee, consultant) is providing SETA, A&AS, or similar support to any DARPA office(s) under: (a) a current award or subaward; or (b) a past award or subaward that ended within one calendar year prior to the proposal's submission date.

If SETA, A&AS, or similar support is being or was provided to any DARPA office(s), the proposal must include:

- The name of the DARPA office receiving the support;
- The prime contract number;
- Identification of proposed team member (subawardee, consultant) providing the support; and
- An OCI mitigation plan in accordance with FAR 9.5.

Government Procedures

In accordance with FAR 9.503, 9.504 and 9.506, the Government will evaluate OCI mitigation plans to avoid, neutralize or mitigate potential OCI issues before award and to determine whether it is in the Government's interest to grant a waiver. The Government will only evaluate OCI mitigation plans for proposals that are determined selectable under the solicitation evaluation criteria and funding availability.

The Government may require proposers to provide additional information to assist the Government in evaluating the proposer's OCI mitigation plan.

If the Government determines that a proposer failed to fully disclose an OCI; or failed to provide the affirmation of DARPA support as described above; or failed to reasonably provide additional information requested by the Government to assist in evaluating the proposer's OCI mitigation plan, the Government may reject the proposal and withdraw it from consideration for award.

3.3. COST SHARING/MATCHING

Cost sharing is not required; however, it will be carefully considered where there is an applicable statutory condition relating to the selected funding instrument. Cost sharing is encouraged where there is a reasonable probability of a potential commercial application related to the proposed research and development effort.

4. Application and Submission Information

4.1. ADDRESS TO REQUEST APPLICATION PACKAGE

This announcement, any attachments, and any references to external websites herein constitute the total solicitation. If proposers cannot access the referenced material posted in the announcement found at http://www.darpa.mil, contact the administrative contact listed herein.

4.2. CONTACT AND FORM OF APPLICATION SUBMISSION

All submissions, including abstracts and proposals, must be written in English with type no smaller than 12-point font. Smaller font may be used for figures, tables, and charts. The page limitation includes all figures, tables, and charts. All pages shall be formatted for printing on 8-1/2 by 11-inch paper. Margins must be 1-inch on all sides. Copies of all documents submitted

must be clearly labeled with the DARPA BAA number, proposer organization, and proposal title/proposal short title.

4.2.1. Proposal Abstract Format

Proposers are strongly encouraged to submit an abstract in advance of a proposal to minimize effort and reduce the potential expense of preparing an out of scope proposal. DARPA will respond to abstracts providing feedback and indicating whether, after preliminary review, there is interest within BTO for the proposed work. DARPA will attempt to reply within 14 calendar days of receipt. Proposals may be submitted irrespective of comments or feedback received in response to the abstract. Proposals are reviewed without regard to feedback given as a result of abstract review. The time and date for submission of proposal abstracts are specified in Part I above.

The abstract is a concise version of the proposal comprising a maximum of **8** pages, including all figures, tables, and charts. All submissions must be written in English with type no smaller than 12-point font. Smaller font may be used for figures, tables, and charts. All pages shall be formatted for printing on 8-1/2 by 11-inch paper. Margins must be 1-inch on all sides. Copies of all documents submitted must be clearly labeled with the DARPA BAA number, proposer organization, and proposal abstract title.

The page limit does NOT include:

- Official transmittal letter (optional);
- Cover sheet;
- Executive summary slide;
- Resumes; and
- Bibliography (optional).

Abstracts must include the following components:

A. Cover Sheet (does not count towards page limit): Include the administrative and technical points of contact (name, address, phone, fax, e-mail, lead organization). Also include the BAA number, title of the proposed project, primary subcontractors, estimated cost, duration of the project, and the label "ABSTRACT."

B. Goals and Impact: Clearly describe what is being proposed and what difference it will make (qualitatively and quantitatively), including brief answers to the following questions:

1. What is the proposed work attempting to accomplish or do?
2. How is it done today? And what are the limitations?
3. What is innovative in your approach, and how does it compare to the current state-of-the-art (SOA)?
4. What are the key technical challenges in your approach, and how do you plan to overcome these?
5. Who will care, and what will the impact be if you are successful?
6. How much will it cost, and how long will it take?

C. Executive Summary Slides: The slide template is provided as **Attachment 1** to the BAA posted at https://beta.SAM.gov. Use of this template is required.

D. Technical Plan: Outline and address all technical areas and challenges inherent in the approach and possible solutions for overcoming potential problems. This section should provide specific objectives, metrics, and milestones at intermediate stages of the project to demonstrate a plan for accomplishment of the program goals. Propose additional appropriate qualitative and quantitative metrics specific to the approach, as needed. Outline of intermediary milestones should occur at no greater than 4.5-month increments.

- Describe and justify the selection of host organism(s) and relevant reporter to measure biomanufacturing performance in the chosen track.
- Describe and justify the track-specific testing source or testing capability to be used to simulate a space condition.
- If proposing to Track 1, describe and justify selection of alternative feedstocks for each group and support any predicted microbial consumption and metabolic performance, providing data if available.
- If proposing to Track 2, describe and justify the two levels of gravity selected for testing and support any predicted microbial performance, providing data if available.
- If proposing to Track 2, describe and justify any planned launches to generate comparison data for biomanufacturing performance measurements in an analog environment, or provide data to support the equivalency of the analog to space conditions.
- If proposing to Track 3, describe and justify the two levels of radiation selected for testing and support any predicted microbial performance, providing data if available.
- Outline the costs associated with biological and modeling categories of experiments, specifically identifying costs associated with testing capabilities, analog environments, or launch costs, as appropriate.
- Outline a plan for further testing, advanced development, and transition of alternative feedstocks or engineered microbes to industrial biomanufacturing following completion of the program.

E. Management and Capabilities: Provide a brief summary of expertise of the team, including subcontractors and key personnel.

A principal investigator for the project must be identified, and a description of the team's organization. All teams are strongly encouraged to identify a Project Manager/Integrator to serve as the primary point of contact to communicate with the DARPA Program Manager and Contracting Officer's Representative, coordinate the

effort across co-performer, vendor, and subcontractor teams, organize regular performer meetings or discussions, facilitate data sharing, and ensure timely completion of milestones and deliverables.

Include a description of the team's organization including roles and responsibilities. Team member descriptions should address the Technical Plan and delineate individuals to avoid duplication of efforts.

Describe the organizational experience in this area, existing intellectual property required to complete the project, and any specialized facilities to be used as part of the project. List Government-furnished materials or data assumed to be available. Describe any specialized facilities to be used as part of the project, the extent of access to these facilities, and any biological containment, biosafety, and certification requirements.

F. Cost and Schedule: Provide a cost estimate for resources over the proposed timeline of the project, broken down by two 9-month program halves and major cost items (e.g., labor, materials, etc.). Include cost estimates for each potential subcontractor (may be a rough order of magnitude).

G. Resumes (do not count towards page limit): Include no more than two (2) resumes, one of which must be from/for the Principal Investigator.

H. Bibliography (Optional, does not count towards page limit): If desired, include a brief bibliography with links to relevant papers and reports. The bibliography should not exceed two (2) pages.

4.2.2. Proposal Format

As soon as the evaluation of all proposals is complete, the proposer will be notified that (1) the proposal has been selected for funding pending award negotiations, in whole or in part, or (2) the proposal has not been selected. These official notifications will be sent via e-mail to the Technical POC and Administrative POC identified on the proposal coversheet.

All full proposals must be in the format given below. Proposals shall consist of two volumes: 1) **Volume I, Technical and Management Proposal**, and 2) **Volume II, Cost Proposal.** All submissions must be written in English with type no smaller than 12-point font. A smaller font may be used for figures, tables, and charts. The page limitation includes all figures, tables, and charts. All pages shall be formatted for printing on 8-1/2 by 11- inch paper. Margins must be 1-inch on all sides. Copies of all documents submitted must be clearly labeled with the DARPA BAA number, proposer organization, and proposal title/proposal short title. Volume I, Technical and Management Proposal, may include an attached bibliography of relevant technical papers or research notes (published and unpublished) which document the technical ideas and approach upon which the proposal is based. Copies of not more than three (3) relevant papers may be included with the submission. The bibliography and attached papers are not included in the page counts given below. The submission of other supporting materials along with the proposals is strongly discouraged and will not be considered for review. **The maximum page count for Volume 1 is**

20 pages. The official transmittal letter is not included in the page count. Volume I should include the following components:

NOTE: Non-conforming submissions that do not follow the instructions herein may be rejected without further review.

a. Volume I, Technical and Management Proposal

Section I. Administrative

A. Cover Sheet (LABELED "PROPOSAL: VOLUME I"):

1. BAA number (HR001122S0010);
2. Lead organization submitting proposal (prime contractor);
3. Type of organization, selected from among the following categories: "LARGE BUSINESS," "SMALL DISADVANTAGED BUSINESS," "OTHER SMALL BUSINESS," "HBCU," "MI," "OTHER EDUCATIONAL," OR "OTHER NONPROFIT";
4. Proposer's reference number (if any);
5. Other team members (if applicable) and type of business for each;
6. Proposal title;
7. Technical point of contact (Program Manager or Principle Investigator) to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax, e-mail;
8. Administrative point of contact (Contracting Officer or Award Officer) to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax, e-mail;
9. Award instrument requested: cost-plus-fixed-free (CPFF), cost-contract—no fee, cost sharing contract – no fee, or other type of procurement contract (*specify*), cooperative agreement, or other transaction;
10. Place(s) of performance, including all subcontractors and consultants;
11. Period of performance;
12. Total funds requested from DARPA, total funds requested per phase and the amount of any cost share (if any);
13. Proposal validity period; AND
14. Date proposal was submitted.

Information on award instruments is available at http://www.darpa.mil/work-with-us/contract-management.

B. Official Transmittal Letter.

C. Executive Summary Slides: The slide template is provided as **Attachment 1** to the BAA posted at https://SAM.gov. Use of this template is required.

D. Specific Program Plan: Provide a summary list of technical information as requested in **Attachment 2** to the BAA posted at https://SAM.gov. Use of this Excel template is required.

Section II. Detailed Proposal Information

A. Executive Summary: Provide a synopsis of the proposed project, including answers to the following questions:

- What is the proposed work attempting to accomplish or do?
- How is it done today, and what are the limitations?
- What is innovative in your approach?
- What are the key technical challenges in your approach, and how do you plan to overcome these?
- Who or what will be affected, and what will be the impact if the work is successful?
- How much will it cost, and how long will it take?

B. Goals and Impact: Clearly describe what the team is trying to achieve and the difference it will make (qualitatively and quantitatively) if successful. Describe the innovative aspects of the project in the context of existing capabilities and approaches, clearly delineating the uniqueness and benefits of this project in the context of the state of the art, alternative approaches, and other projects from the past and present. Describe how the proposed project is revolutionary and how it significantly rises above the current state-of-the-art. Describe the deliverables associated with the proposed project and any plans to commercialize the technology, transition it to a customer, or further the work.

C. Technical Plan: Outline and address technical challenges inherent in the approach and possible solutions for overcoming potential problems. This section should provide appropriate measurable milestones (quantitative if possible) at intermediate stages of the program to demonstrate progress, plan for achieving the milestones, and must include a simple process flow diagram of their final system concept. The technical plan should demonstrate a deep understanding of the technical challenges and present a credible (even if risky) plan to achieve the program goal. Discuss mitigation of technical risk.

D. Management Plan: Provide a summary of expertise of the team, including any subcontractors, and key personnel who will be doing the work. A Principal Investigator (PI) for the project must be identified, along with a description of the team's organization, including the breakdown by Technical Area. All teams are strongly encouraged to identify a Project Manager/Integrator to serve as the primary point of contact to communicate with

the DARPA Program Manager and Contracting Officer's Representative, coordinate the effort across co-performer, vendor, and subcontractor teams, organize regular performer meetings or discussions, facilitate data sharing, and ensure timely completion of milestones and deliverables.

Provide a clear description of the team's organization including an organization chart that includes, as applicable: the programmatic relationship of team members; the unique capabilities of team members; the task responsibilities of team members, the teaming strategy among the team members; and key personnel with the amount of effort to be expended by each person during each year. Provide a detailed plan for coordination, including explicit guidelines for interaction among collaborators/subcontractors of the proposed effort. Include risk management approaches. Describe any formal teaming agreements that are required to execute this program.

E. Capabilities: Describe organizational experience in relevant subject area(s), existing intellectual property, specialized facilities, and any Government-furnished materials or information. Describe any specialized facilities to be used as part of the project, the extent of access to these facilities, and any biological containment, biosafety, and certification requirements. Discuss any work in closely related research areas and previous accomplishments.

F. Statement of Work (SOW) NOT INCLUDED IN PAGE COUNT: The SOW should provide a detailed task breakdown, citing specific tasks for each Technical Area, and their connection to the milestones and program metrics. Each phase of the program should be separately defined. The SOW must not include proprietary information. It is encouraged, though not required, to use the SOW template provided as **Attachment 3**. SOW is not included in the Volume 1-page count.

For each task/subtask, provide:

- A detailed description of the approach to be taken to accomplish each defined task/subtask.
- Identification of the primary organization responsible for task execution (prime contractor, subcontractor(s), consultant(s), by name).
- A measurable milestone, i.e., a deliverable, demonstration, or other event/activity that marks task completion. Include completion dates for all milestones. Include quantitative metrics.
- A definition of all deliverables (e.g., data, reports, software) to be provided to the Government in support of the proposed tasks/subtasks.

It is recommended that the SOW be developed so that each Technical Area and Phase of the program is separately defined.

G. Schedule and Milestones: Provide a detailed schedule showing tasks (task name, duration, work breakdown structure element as applicable, performing organization), milestones, and the interrelationships among tasks. The task structure must be consistent with that in the SOW. Measurable milestones should be clearly articulated and defined in time relative to the start of the project.

H. Technology Transfer Plan: Provide information regarding the types of partners (e.g., government, private industry) that will be pursued and submit a timeline with incremental milestones toward successful engagement. The plan should include a description of how DARPA will be included in the development of potential technology transfer relationships. If the Technology Transfer Plan includes the formation of a start-up company, a business development strategy must also be provided.

a. Volume II, Cost Management Proposal

Cover Sheet (LABELED "PROPOSAL: VOLUME II"):

1. BAA Number (HR001122S0010);
2. Lead organization submitting proposal;
3. Type of organization, selected among the following categories: "LARGE BUSINESS", "SMALL DISADVANTAGED BUSINESS", "OTHER SMALL BUSINESS", "HBCU", "MI", "OTHER EDUCATIONAL", OR "OTHER NONPROFIT";
4. Proposer's reference number (if any);
5. Other team members (if applicable) and type of business for each;
6. Proposal title;
7. Technical point of contact (Program Manager or Principal Investigator) to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), electronic mail (if available);
8. Administrative point of contact (Contracting Officer or Award Officer) to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax (if available), and electronic mail (if available);
9. Award instrument requested: cost-plus-fixed-free (CPFF), cost-contract—no fee, cost sharing contract – no fee, or other type of procurement contract (*specify*), cooperative agreement, or other transaction;
10. Place(s) of performance, including all subcontractors and consultants;
11. Period of performance;
12. Total funds requested from DARPA, total funds requested per phase (as defined in Table 1), and the amount of any cost share (if any);
13. Name, address, and telephone number of the proposer's cognizant Defense Contract Management Agency (DCMA) administration office (*if known)*;

14. Name, address, and telephone number of the proposer's cognizant Defense Contract Audit Agency (DCAA) audit office (*if known*);
15. Date proposal was prepared;
16. Data Universal Numbering System (DUNS) number (http://www.dnb.com/get-a-duns-number.html);
17. Taxpayer ID number (https://www.irs.gov/Individuals/International-Taxpayers/Taxpayer-Identification-Numbers-TIN);
18. Commercial and Government Entity (CAGE) code (https://cage.dla.mil/Home/UsageAgree);
19. Proposal validity period

NOTE: Non-conforming submissions that do not address one Track or follow the instructions herein may be rejected without further review.

The Government requires that proposers use the provided MS Excel™ DARPA Standard Cost Proposal Spreadsheet in the development of their cost proposals. A customized cost proposal spreadsheet may be an attachment to this solicitation. If not, the spreadsheet can be found on the DARPA website at http://www.darpa.mil/work-with-us/contract-management (under "Resources" on the right-hand side of the webpage). All tabs and tables in the cost proposal spreadsheet should be developed in an editable format with calculation formulas intact to allow traceability of the cost proposal. This cost proposal spreadsheet should be used by the prime organization and all subcontractors. In addition to using the cost proposal spreadsheet, the cost proposal still must include all other items required in this announcement that are not covered by the editable spreadsheet. Subcontractor cost proposal spreadsheets may be submitted directly to the Government by the proposed subcontractor via e-mail to the address in Part I of this solicitation. **Using the provided cost proposal spreadsheet will assist the Government in a rapid analysis of your proposed costs and, if your proposal is selected for a potential award, speed up the negotiation and award execution process**.

(1) Total program, per half (1st 9-month period, and 2nd 9-month period), and per task cost broken down by major cost items to include:
   i. **Direct labor** – provide an itemized breakout of all personnel, listed by name or TBD, with labor rate (or salary), labor hours (or percent effort), and labor category. All senior personnel must be identified by name.
   ii. **Materials and Supplies** – itemized list which includes description of material, quantity, unit price, and total price. If a material factor is used based on historical purchases, provide data to justify the rate.
   iii. **Equipment** – itemized list which includes description of equipment, unit price, quantity, and total price. Any equipment item with a unit price over $5,000 must include a vendor quote.
   iv. Travel – provide an itemized list of travel costs to include purpose of trips, departure and arrival destinations, projected airfare, rental car and per GSA approved diem, number of travelers, number of days); provide screenshots from travel website for proposed airfare and rental car, as

applicable; provide screenshot or web link for conference registration fee and note if the fee includes hotel cost. Conference attendance must be justified, and explain how it is in the best interest of the project. **Plan for two (2) DARPA program review meetings per year.**

v. **Other Direct Costs (e.g., computer support, clean room fees) –** Should be itemized with costs or estimated costs. Backup documentation and/or a supporting cost breakdown is required to support proposed costs with a unit price over $5,000. An explanation of any estimating factors, including their derivation and application, must be provided. Please include a brief description of the proposers' procurement method to be used.

vi. **Other Direct Costs** – Consultants: provide executed Consultant Agreement that describes work scope, rate and hours.

vii. **Indirect costs** including, as applicable, fringe benefits, overhead, General and Administrative (G&A) expense, and cost of money (see university vs. company specific requirements below).

viii. **Indirect costs specific to a University performer:** (1) **Fringe Benefit Rate** (provide current Department of Health and Human Services (DHHS) or Office of Naval Research (ONR) negotiated rate package; if calculated by other than a rate, provide University documentation identifying fringe costs by position or HR documentation if unique to each person); (2) **F&A Indirect Overhead Rate** (provide current DHHS or ONR negotiated rate package); (3) **Tuition Remission** (provide current University documentation justifying per-student amount); and (4) **Health Insurance/Fee** (provide current University documentation justifying per student amount, if priced separately from fringe benefits with calculations included in the EXCEL cost file).

Indirect costs specific to a Company performer: (1) **Fee/Profit** (provide rationale for proposed fee/profit percentage using criteria found in DFARS 215.404-70); and (2) **Fringe Benefit/Labor OH/Material OH/G&A Rates** (provide current Forwarding Pricing Rate Proposal (FPRP) or DCMA/DCAA Forward Pricing Rate Recommendation or Agreement (FPRR or FPRA). If these documents are not available, provide company historical data, preferably two years, minimum of one, to include both pool and expense costs used to generate the rates).

(2) A summary of total program costs by half (1st 9-month period, and 2nd 9-month period), and task.

(3) An itemization of Subcontracts. All subcontractor cost proposal documentation must be prepared at the same level of detail as that required of the prime. Subcontractor proposals should include Interdivisional Work Transfer Agreements (IWTA) or evidence of similar arrangements (an IWTA is an agreement between multiple divisions of the same organization). The prime proposer is responsible for compiling and providing all subcontractor proposals for the Procuring Contracting Officer (PCO). The proposal must show how subcontractor costs are applied to each phase and task. If consultants are to be used, proposer must provide consultant agreement or another document that verifies the proposed loaded daily/hourly rate.

(4) An itemization of any information technology (IT) purchase (including a letter stating why the proposer cannot provide the requested resources from its own funding), as defined in FAR Part 2.101.
(5) A summary of projected funding requirements by month for all phases of the project.
(6) A summary of tasks that have animal or human use funding.
(7) The source, nature, and amount of any industry cost-sharing. Where the effort consists of multiple portions that could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each.
(8) Identification of pricing assumptions of which may require incorporation into the resulting award instrument (e.g., use of Government Furnished Property/Facilities/Information, access to Government Subject Matter Expert/s, etc.).
(9) Any Forward Pricing Rate Agreement, DHHS rate agreement, other such approved rate information, or such documentation that may assist in expediting negotiations (if available).
(10) Proposers with a Government acceptable accounting system who are proposing a cost-type contract must submit the DCAA document approving the cost accounting system.

Per FAR 15.403-4, certified cost or pricing data shall be required if the proposer is seeking a procurement contract award per the referenced threshold, unless the proposer requests and is granted an exception from the requirement to submit cost or pricing data. Certified cost or pricing data" are not required if the proposer proposes an award instrument other than a procurement contract (e.g., a grant, cooperative agreement, or other transaction.)

Subawardee Proposals

The awardee is responsible for compiling and providing all subawardee proposals for the Procuring Contracting Officer (PCO)/Grants Officer (GO)/Agreements Officer (AO), as applicable. Subawardee proposals should include Interdivisional Work Transfer Agreements (ITWA) or similar arrangements. Where the effort consists of multiple portions which could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each.

All proprietary subawardee proposal documentation, prepared at the same level of detail as that required of the awardee's proposal and which cannot be uploaded with the proposed awardee's proposal, shall be provided to the Government either by the awardee or by the subawardee organization when the proposal is submitted. Subawardee proposals submitted to the Government by the proposed subawardee should be submitted via e-mail to the address in Section I.

Other Transaction (OT) Requests

All proposers requesting an OT must include a detailed list of milestones for each half of the program. Each milestone must include the following:

- milestone description,
- completion criteria,

- due date, and
- payment/funding schedule (to include, if cost share is proposed, awardee and Government share amounts).

It is noted that, at a minimum, milestones should relate directly to accomplishment of program technical metrics as defined in the BAA and/or the proposer's proposal. Agreement type, expenditure or fixed-price based, will be subject to negotiation by the Agreements Officer. Do not include proprietary data.

4.2.3. Additional Proposal Information

Proprietary Markings

Proposers are responsible for clearly identifying proprietary information. Submissions containing proprietary information must have the cover page and each page containing such information clearly marked with a label such as "Proprietary" or "Company Proprietary." NOTE: "Confidential" is a classification marking used to control the dissemination of U.S. Government National Security Information as dictated in Executive Order 13526 and should not be used to identify proprietary business information.

Unclassified Submissions

DARPA anticipates that submissions received under this BAA will be unclassified. However, should a proposer wish to submit classified information, an *unclassified* e-mail must be sent to the BAA mailbox requesting submission instructions from the Technical Office Program Security Officer (PSO). If a determination is made that the award instrument may result in access to classified information, a Security Classification Guide (SCG) and/or DD Form 254 will be issued by DARPA and attached as part of the award.

Disclosure of Information and Compliance with Safeguarding Covered Defense Information Controls

The following provisions and clause apply to all solicitations and contracts; however, the definition of "controlled technical information" clearly exempts work considered fundamental research and therefore, even though included in the contract, will not apply if the work is fundamental research.
DFARS 252.204-7000, "Disclosure of Information"
DFARS 252.204-7008, "Compliance with Safeguarding Covered Defense Information Controls"
DFARS 252.204-7012, "Safeguarding Covered Defense Information and Cyber Incident Reporting"
The full text of the above solicitation provision and contract clauses can be found at http://www.darpa.mil/work-with-us/additional-baa#NPRPAC.
Compliance with the above requirements includes the mandate for proposers to implement the security requirements specified by National Institute of Standards and Technology (NIST) Special Publication (SP) 800-171, "Protecting Controlled Unclassified Information in Nonfederal Information Systems and Organizations" (see https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-171r2.pdf) and DoDI 8582.01 that are in effect at the time the solicitation is issued.

For awards where the work is considered fundamental research, the contractor will not have to implement the aforementioned requirements and safeguards. However, should the nature of the work change during performance of the award, work not considered fundamental research will be subject to these requirements.

Human Subjects Research (HSR)/Animal Use

Proposers that anticipate involving human subjects or animals in the proposed research must comply with the approval procedures detailed at http://www.darpa.mil/work-with-us/additional-baa, to include providing the information specified therein as required for proposal submission.

Approved Cost Accounting System Documentation

Proposers that do not have a Cost Accounting Standards (CAS) complaint accounting system considered adequate for determining accurate costs that are negotiating a cost-type procurement contract must complete an SF 1408. For more information on CAS compliance, see http://www.dcaa.mil/cas.html. To facilitate this process, proposers should complete the SF 1408 found at http://www.gsa.gov/portal/forms/download/115778 and submit the completed form with the proposal.

Small Business Subcontracting Plan

Pursuant to Section 8(d) of the Small Business Act (15 U.S.C. § 637(d)) and FAR 19.702(a)(1), each proposer who submits a contract proposal and includes subcontractors might be required to submit a subcontracting plan with their proposal. The plan format is outlined in FAR 19.704.

Section 508 of the Rehabilitation Act (29 U.S.C. § 749d)/FAR 39.2

All electronic and information technology acquired or created through this BAA must satisfy the accessibility requirements of Section 508 of the Rehabilitation Act (29 U.S.C. § 749d)/FAR 39.2.

Intellectual Property

All proposers must provide a good faith representation that the proposer either owns or possesses the appropriate licensing rights to all intellectual property that will be utilized under the proposed effort.

For Procurement Contracts

Proposers responding to this BAA requesting procurement contracts will need to complete the certifications at DFARS 252.227-7017. See http://www.darpa.mil/work-with-us/additional-baa for further information. If no restrictions are intended, the proposer should state "none." The table below captures the requested information:

Technical Data Computer Software To be Furnished With Restrictions	Summary of Intended Use in the Conduct of the Research	Basis for Assertion	Asserted Rights Category	Name of Person Asserting Restrictions
(LIST)	(NARRATIVE)	(LIST)	(LIST)	(LIST)

For All Non-Procurement Contracts

Proposers responding to this BAA requesting a Cooperative Agreement, Technology Investment Agreement, or Other Transaction for Prototypes shall follow the applicable rules and regulations governing these various award instruments, but, in all cases, should appropriately identify any potential restrictions on the Government's use of any Intellectual Property contemplated under the award instrument in question. This includes both Noncommercial Items and Commercial Items. Proposers are encouraged to use a format similar to that described in the section above. If no restrictions are intended, then the proposer should state "NONE."

System for Award Management (SAM) and Universal Identifier Requirements

All proposers must be registered in SAM unless exempt per FAR 4.1102. FAR 52.204-7, "System for Award Management" and FAR 52.204-13, "System for Award Management Maintenance" are incorporated into this solicitation. See http://www.darpa.mil/work-with-us/additional-baa for further information.
International entities can register in SAM by following the instructions in this link: https://www.fsd.gov/sys_attachment.do?sys_id=c08b64ab1b4434109ac5ddb6bc4bcbb8.

4.2.4. Submission Information

DARPA will acknowledge receipt of all submissions and assign an identifying control number that should be used in all further correspondence regarding the submission. DARPA intends to use electronic mail correspondence regarding HR001122S0010. Submissions may not be sent by fax or e-mail; any so sent will be disregarded.

Submissions will not be returned. An electronic copy of each submission received will be retained at DARPA and all other non-required copies destroyed. A certification of destruction may be requested, provided the formal request is received by DARPA within 5 days after notification that a proposal was not selected.

For abstract and proposal submission dates, see Part I., Overview Information. Submissions received after these dates and times may not be reviewed.

Abstracts and Full Proposals requesting procurement contracts or OTs sent in response to HR001122S0010 may be submitted via DARPA's BAA Website (https://baa.darpa.mil). Visit the website to complete the two-step registration process. Submitters will need to register for an Extranet account (via the form at the URL listed above) and wait for two separate e-mails containing a username and temporary password. After accessing the Extranet, submitters may then create an account for the DARPA BAA website (via the "Register your Organization" link along the left side of the homepage), view submission instructions, and upload/finalize the abstract. Proposers using the DARPA BAA Website may encounter heavy traffic on the submission deadline date; it is highly advised that the submission process be started as early as possible.

All unclassified concepts submitted electronically through DARPA's BAA Website must be uploaded as zip files (.zip or .zipx extension). The final zip file should be no greater than 50 MB in size. Only one zip file will be accepted per submission. Classified submissions and proposals requesting or cooperative agreements should NOT be submitted through DARPA's BAA Website (https://baa.darpa.mil), though proposers will likely still need to visit https://baa.darpa.mil to register their organization (or verify an existing registration) to ensure the BAA office can verify and finalize their submission.

Technical support for BAA Website may be reached at BAAT_Support@darpa.mil, and is typically available during regular business hours, (9:00 AM- 5:00 PM EST Monday – Friday).

Proposers using the DARPA BAA Website may encounter heavy traffic on the submission deadline date; it is highly advised that the submission process be started as early as possible.

For Cooperative Agreements only:

Proposers requesting cooperative agreements must submit proposals through one of the following methods: (1) electronic upload per the instructions at https://www.grants.gov/applicants/apply-for-grants.html (DARPA-preferred); or (2) hard-copy mailed directly to DARPA. If proposers intend to use Grants.gov as their means of submission, then they must submit their entire proposal through Grants.gov; applications cannot be submitted in part to Grants.gov and in part as a hard-copy. Proposers using Grants.gov do not submit hard-copy proposals in addition to the Grants.gov electronic submission.

Submissions: In addition to the volumes and corresponding attachments requested elsewhere in this solicitation, proposers must also submit the three forms listed below.

Form 1: SF 424 Research and Related (R&R) Application for Federal Assistance, available on the Grants.gov website at https://apply07.grants.gov/apply/forms/sample/RR_SF424_2_0-V2.0.pdf. *This form must be completed and submitted.*

To evaluate compliance with Title IX of the Education Amendments of 1972 (20 U.S.C. § 1681 et.seq.), the Department of Defense (DoD) is collecting certain demographic and career information to be able to assess the success rates of women who are proposed for key roles in applications in science, technology, engineering or mathematics disciplines. In addition, the National Defense Authorization Act (NDAA) for FY 2019, Section 1286, directs the Secretary of Defense to protect intellectual property, controlled information, key personnel, and information about critical technologies relevant to national security and limit undue influence, including foreign talent programs by countries that desire to exploit United States' technology within the DoD research, science and technology, and innovation enterprise. This requirement is necessary for all research and research-related educational activities. The DoD is using the two forms below to collect the necessary information to satisfy these requirements. Detailed instructions for each form are available on Grants.gov.

Form 2: The Research and Related Senior/Key Person Profile (Expanded) form, available on the Grants.gov website at https://apply07.grants.gov/apply/forms/sample/RR_KeyPersonExpanded_3_0-V3.0.pdf, will be used to collect the following information for all senior/key personnel, including Project

Director/Principal Investigator and Co-Project Director/Co-Principal Investigator, whether or not the individuals' efforts under the project are funded by the DoD. The form includes 3 parts: the main form administrative information, including the Project Role, Degree Type and Degree Year; the biographical sketch; and the current and pending support. The biographical sketch and current and pending support are to be provided as attachments:

- Biographical Sketch: Mandatory for Project Directors (PD) and Principal Investigators (PI), optional, but desired, for all other Senior/Key Personnel. The biographical sketch should include information pertaining to the researchers:
    - Education and Training.
    - Research and Professional Experience.
    - Collaborations and Affiliations (for conflict of interest).
    - Publications and Synergistic Activities.
- Current and Pending Support: Mandatory for all Senior/Key Personnel including the PD/PI. This attachment should include the following information:
    - A list of all current projects the individual is working on, in addition to any future support the individual has applied to receive, regardless of the source.
    - Title and objectives of the other research projects.
    - The percentage per year to be devoted to the other projects.
    - The total amount of support the individual is receiving in connection to each of the other research projects or will receive if other proposals are awarded.
    - Name and address of the agencies and/or other parties supporting the other research projects
    - Period of performance for the other research projects.

Additional senior/key persons can be added by selecting the "Next Person" button at the bottom of the form. Note that, although applications without this information completed may pass Grants.gov edit checks, if DARPA receives an application without the required information, DARPA may determine that the application is incomplete and may cause your submission to be rejected and eliminated from further review and consideration under the solicitation. DARPA reserves the right to request further details from the applicant before making a final determination on funding the effort.

Form 3: Research and Related Personal Data, available on the Grants.gov website at https://apply07.grants.gov/apply/forms/sample/RR_PersonalData_1_2-V1.2.pdf. *Each applicant must complete the name field of this form, however, provision of the demographic information is voluntary. Regardless of whether the demographic fields are completed or not, this form must be submitted with at least the applicant's name completed.*

Grants.gov Submissions: Grants.gov requires proposers to complete a one-time registration process before a proposal can be electronically submitted. First-time registration can take between three (3) business days and four weeks. For more information about registering for Grants.gov, see http://www.darpa.mil/work-with-us/additional-baa.

Proposal abstracts will not be accepted if submitted via Grants.gov.

Hard copy Submissions: Proposers electing to submit cooperative agreement proposals as hard copies must complete the SF 424 R&R form (Application for Federal Assistance), available on the Grants.gov website (https://apply07.grants.gov/apply/forms/sample/SF424_2_1-V2.1.pdf).

Failure to comply with the submission procedures may result in the submission not being evaluated. DARPA will acknowledge receipt of complete submissions via email and assign control numbers that should be used in all further correspondence regarding proposals.

4.3. FUNDING RESTRICTIONS

Not applicable.

4.4. OTHER SUBMISSION INFORMATION

DARPA will post a consolidated Frequently Asked Questions (FAQ) document. To access the posting go to http://www.darpa.mil/work-with-us/opportunities. A link to the FAQ will appear under the HR001120S0043 summary. Submit your question(s) via e-mail to B-SURE@darpa.mil.

5. Application Review Information

5.1. EVALUATION CRITERIA

Proposals will be evaluated using the following criteria, listed in descending order of importance: 5.1.1 Overall Scientific and Technical Merit; 5.1.2 Potential Contribution and Relevance to the DARPA Mission; 5.1.3 Cost Realism; and 5.1.4 Proposer's Capability and/or Related Experience.

5.1.1. Overall Scientific and Technical Merit

The proposed technical approach is innovative, feasible, achievable, and complete.
The proposed technical team has the expertise and experience to accomplish the proposed tasks. Task descriptions and associated technical elements provided are complete and in a logical sequence with all proposed deliverables clearly defined such that a final outcome that achieves the goal can be expected as a result of award. The proposal identifies major technical risks, and planned mitigation efforts are clearly defined and feasible. The timeline for achieving major milestones is aggressive but rationally supported with a clear description of the requirements and risks. The proposer's prior experience in similar efforts must clearly demonstrate an ability to deliver products that meet the proposed technical performance within the proposed budget and schedule. The proposed team has the expertise to manage the cost and schedule.

5.1.2. Potential Contribution and Relevance to the DARPA Mission

The potential contributions of the proposed effort are relevant to the national technology base. Specifically, DARPA's mission is to make pivotal early technology investments that create or prevent strategic surprise for U.S. National Security.

5.1.3. Cost Realism

The proposed costs are realistic for the technical and management approach and accurately reflect the technical goals and objectives of the solicitation. The proposed costs are consistent with the proposer's Statement of Work and reflect a sufficient understanding of the costs and level of effort needed to successfully accomplish the proposed technical approach. The costs for the prime proposer and proposed subawardees are substantiated by the details provided in the proposal (e.g., the type and number of labor hours proposed per task, the types and quantities of materials, equipment and fabrication costs, travel and any other applicable costs and the basis for the estimates).

It is expected that the effort will leverage all available relevant prior research in order to obtain the maximum benefit from the available funding. For efforts with a likelihood of commercial application, appropriate direct cost sharing may be a positive factor in the evaluation. DARPA recognizes that undue emphasis on cost may motivate proposers to offer low-risk ideas with minimum uncertainty and to staff the effort with junior personnel in order to be in a more competitive posture. DARPA discourages such cost strategies.

5.1.4. Proposer's Capabilities and/or Related Experience

The proposer's prior experience in similar efforts clearly demonstrates an ability to deliver products that meet the proposed technical performance within the proposed budget and schedule. The proposed team has the expertise to manage the cost and schedule. Similar efforts completed or ongoing by the proposer in this area are fully described, including identification of other Government sponsors. The proposed team demonstrates access to resources and testing facilities for the selected track. The proposed team identifies and mitigates potential technical, cost, and schedule risks.

5.2. REVIEW OF PROPOSALS

Review Process

It is the policy of DARPA to ensure impartial, equitable, comprehensive proposal evaluations based on the evaluation criteria listed in Section V.A. and to select the source (or sources) whose offer meets the Government's technical, policy, and programmatic goals.

DARPA will conduct a scientific/technical review of each conforming proposal. Conforming proposals comply with all requirements detailed in this solicitation; proposals that fail to do so may be deemed non-conforming and may be removed from consideration. Proposals will not be evaluated against each other since they are not submitted in accordance with a common work statement. DARPA's intent is to review proposals as soon as possible after they arrive; however, proposals may be reviewed periodically for administrative reasons.

Award(s) will be made to proposers whose proposals are determined to be the most advantageous to the Government, consistent with instructions and evaluation criteria specified in the BAA herein, and availability of funding.

Handling of Source Selection Information

DARPA policy is to treat all submissions as source selection information (see FAR 2.101 and 3.104) and to disclose their contents only for the purpose of evaluation. Restrictive notices notwithstanding, during the evaluation process, submissions may be handled by support contractors for administrative purposes and/or to assist with technical evaluation. All DARPA support contractors performing this role are expressly prohibited from performing DARPA-sponsored technical research and are bound by appropriate nondisclosure agreements.

Subject to the restrictions set forth in FAR 37.203(d), input on technical aspects of the proposals may be solicited by DARPA from non-Government consultants/experts who are strictly bound by the appropriate non-disclosure requirements.

Federal Awardee Performance and Integrity Information (FAPIIS)

Per 41 U.S.C. § 2313, as implemented by FAR 9.103 and 2 CFR § 200.205, prior to making an award above the simplified acquisition threshold, DARPA is required to review and consider any information available through the designated integrity and performance system (currently FAPIIS). Awardees have the opportunity to comment on any information about themselves entered in the database, and DARPA will consider any comments, along with other information in FAPIIS or other systems, prior to making an award.

Countering Foreign Influence Program (CFIP)

DARPA's CFIP is an adaptive risk management security program designed to help protect the critical technology and performer intellectual property associated with DARPA's research projects by identifying the possible vectors of undue foreign influence. The CFIP team will create risk assessments of all proposed Senior/Key Personnel selected for negotiation of a fundamental research grant or cooperative agreement award. The CFIP risk assessment process will be conducted separately from the DARPA scientific review process and adjudicated prior to final award.

6. Award Administration Information

6.1. SUBMISSION STATUS NOTIFICATIONS

Proposal Abstracts and Full Proposals submitted in response to HR001122S0010 will be evaluated following the submission deadlines listed in Part 1. DARPA will respond as described below. These official notifications will be sent via e-mail to the Technical Point of Contact (POC) and/or Administrative POC identified on the submission coversheet.

6.1.1. Proposal Abstracts

DARPA will respond to abstracts with a statement as to whether DARPA is interested in the idea. If DARPA does not recommend the proposer submit a full proposal, DARPA will provide feedback to the proposer regarding the rationale for this decision. Regardless of DARPA's response to an abstract, proposers may submit a full proposal. DARPA will review all conforming full proposals using the published evaluation criteria and without regard to any comments resulting from the review of an abstract.

6.1.2. Full Proposals

As soon as the evaluation of all conforming proposals is complete, the proposer will be notified that (1) the proposal has been selected for funding pending award negotiations, in whole or in part, or (2) the proposal has not been selected. These official notifications will be sent via e-mail to the Technical POC and Administrative POC identified on the proposal coversheet.

6.2. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS

6.2.1. Meeting and Travel Requirements

There will be a program kickoff meeting (likely virtual) and all key participants are required to attend. Performers should also anticipate one program-wide PI meeting in the Arlington, VA vicinity, and periodic site visits at the Program Manager's discretion. Proposers shall include, within the content of their proposal, details and costs of any travel or meetings they deem to be necessary throughout the course of the effort, to include periodic status reviews by the government.

6.2.1. Solicitation Provisions and Award Clauses, Terms and Conditions

Solicitation clauses in the FAR and DFARS relevant to procurement contracts and FAR and DFARS clauses that may be included in any resultant procurement contracts are incorporated herein and can be found at http://www.darpa.mil/work-with-us/additional-baa.

6.2.2. Controlled Unclassified Information (CUI) and Controlled Technical Information (CTI) on Non-DoD Information Systems

Further information on Controlled Unclassified Information on Non-DoD Information Systems is incorporated herein can be found at http://www.darpa.mil/work-with-us/additional-baa.

6.2.3. Representations and Certifications

In accordance with FAR 4.1102 and 4.1201, proposers requesting a procurement contract must complete electronic annual representations and certifications at https://www.sam.gov/.
In addition, all proposers are required to submit for all award instrument types supplementary DARPA-specific representations and certifications at the time of proposal submission. See http://www.darpa.mil/work-with-us/reps-certs for further information on required representation and certification depending on your requested award instrument.

6.2.4. Terms and Conditions

For terms and conditions specific to grants and/or cooperative agreements, see the DoD General Research Terms and Conditions (latest version) at http://www.onr.navy.mil/Contracts-Grants/submit-proposal/grants-proposal/grants-terms-conditions and the supplemental DARPA-specific terms and conditions at http://www.darpa.mil/work-with-us/contract-management#GrantsCooperativeAgreements.

6.3. REPORTING

See "Deliverables" in Section 1.5.

6.4. ELECTRONIC SYSTEMS

6.4.1. Wide Area Work Flow (WAWF)

Performers will be required to submit invoices for payment directly to https://wawf.eb.mil, unless an exception applies. Performers must register in WAWF prior to any award under this BAA.

6.4.2. I-EDISON

The award document for each proposal selected for funding will contain a mandatory requirement for patent reports and notifications to be submitted electronically through i-Edison (http://public.era.nih.gov/iedison).

7. Agency Contacts

Administrative, technical or contractual questions should be sent via e-mail to the mailbox listed below.

Points of Contact
The BAA Coordinator for this effort may be reached at:
B-SURE@darpa.mil
DARPA/BTO
ATTN: HR001122S0010
675 North Randolph Street
Arlington, VA 22203-2114

For information concerning agency level protests see http://www.darpa.mil/work-with-us/additional-baa#NPRPAC.

8. Other Information

8.1. PROPOSERS DAY

DARPA will host a virtual Proposers Day in support of the B-SURE program on November 29, 2021. The purpose is to provide potential proposers with information on the B-SURE program, promote additional discussion on this topic, address questions, provide a forum to present their capabilities, and encourage team formation.

Interested proposers are not required to attend to respond to the B-SURE BAA, and relevant information and materials discussed at Proposers Day will be made available to all potential proposers in the form of a FAQ posted on the DARPA Opportunities Page.

DARPA will not provide cost reimbursement for interested proposers in attendance. An online registration form and various other meeting details can be found at the registration website, https://events.sa-meetings.com/B-SUREProposersDay.

Participants are required to register no later than **November 24, 2021**. This event is not open to the Press. The Proposers Day will be open to members of the public who have registered in advance for the event; there will be no onsite registration.

Proposers Day Point of Contact:
B-SURE@darpa.mil
ATTN: DARPA-SN-21-50

8.2. ASSOCIATE CONTRACTOR AGREEMENTS

This same or similar language may be included in procurement contract awards against HR001122S0010. Awards other than FAR based contracts may contain similar agreement language:

(a) It is recognized that success of the B-SURE research effort depends in part upon the open exchange of information between the various Associate Contractors involved in the effort. This language is intended to ensure that there will be appropriate coordination and integration of work by the Associate Contractors to achieve complete compatibility and to prevent unnecessary duplication of effort. By executing this contract, the Contractor assumes the responsibilities of an Associate Contractor. For the purpose of this ACA, the term Contractor includes subsidiaries, affiliates, and organizations under the control of the contractor (e.g., subcontractors).

(b) Work under this contract may involve access to proprietary or confidential data from an Associate Contractor. To the extent that such data is received by the Contractor from any Associate Contractor for the performance of this contract, the Contractor hereby agrees that any proprietary information received shall remain the property of the Associate Contractor and shall be used solely for the purpose of the B-SURE research effort. Only that information which is received from another contractor in writing and which is clearly identified as proprietary or confidential shall be protected in accordance with this provision. The obligation to retain such information in confidence will be satisfied if the Contractor receiving such information utilizes the same controls as it employs to avoid disclosure, publication, or dissemination of its own proprietary information. The receiving Contractor agrees to hold such information in confidence as provided herein so long as such information is of a proprietary/confidential or limited rights nature.

(c) The Contractor hereby agrees to closely cooperate as an Associate Contractor with the other Associate Contractors on this research effort. This involves as a minimum:

(1) maintenance of a close liaison and working relationship;

(2) maintenance of a free and open information network with all Government-identified associate Contractors;

(3) delineation of detailed interface responsibilities;

(4) entering into a written agreement with the other Associate Contractors setting forth the substance and procedures relating to the foregoing, and promptly providing the Agreements Officer/Procuring Contracting Officer with a copy of same; and,

(5) receipt of proprietary information from the Associate Contractor and transmittal of Contractor proprietary information to the Associate Contractors subject to any applicable proprietary information exchange agreements between associate contractors when, in either case, those actions are necessary for the performance of either.

(d) In the event that the Contractor and the Associate Contractor are unable to agree upon any such interface matter of substance, or if the technical data identified is not provided as scheduled, the Contractor shall promptly notify the DARPA B-SURE Program Manager. The Government will determine the appropriate corrective action and will issue guidance to the affected Contractor.

(e) The Contractor agrees to insert in all subcontracts hereunder which require access to proprietary information belonging to the Associate Contractor, a provision which shall conform substantially to the language of this ACA, including this paragraph (e).

(f) Associate Contractors for the B-SURE research effort include:

Contractor	Tracks

9. APPENDIX 1 – Volume II checklist

Volume II, Cost Proposal
Checklist and Sample Templates

The following checklist and sample templates are provided to assist the proposer in developing a complete and responsive cost volume. Full instructions appear in Section 4.2.2 of HR001120S0043. This worksheet must be included with the coversheet of the Cost Proposal.

1. Are all items from Section 4.2.2 (Volume II, Cost Proposal) of **HR001120S0043** included on your Cost Proposal cover sheet?
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]
   If reply is "No", please explain:

2. Does your Cost Proposal include (1) a summary cost buildup by Phase, (2) a summary cost buildup by Year, and (3) a detailed cost buildup of for each Phase that breaks out each task and shows the cost per month?
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   If reply is "No", please explain:

3. Does your cost proposal (detailed cost buildup #3 above in item 2) show a breakdown of the major cost items listed below:
   Direct Labor (Labor Categories, Hours, Rates)
   f○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   Indirect Costs/Rates (i.e., overhead charges, fringe benefits, G&A)
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   Materials and/or Equipment
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   Subcontracts/Consultants
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   Other Direct Costs
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   Travel
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   If reply is "No", please explain:

4. Have you provided documentation for proposed costs related to travel, to include purpose of trips, departure and arrival destinations and sample airfare?
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   If reply is "No", please explain:

5. Does your cost proposal include a complete itemized list of all material and equipment items to be purchased (a priced bill-of-materials (BOM))?
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   If reply is "No", please explain:

6. Does your cost proposal include vendor quotes or written engineering estimates (basis of estimate) for all material and equipment with a unit price exceeding $5000?
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   If reply is "No", please explain:

7. Does your cost proposal include a clear justification for the cost of labor (written labor basis-of-estimate (BOE)) providing rationale for the labor categories and hours proposed for each task?
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   If reply is "No", please explain:

8. Do you have subcontractors/consultants? If YES, continue to question 9. If NO, skip to question 13.
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

9. Does your cost proposal include copies of all subcontractor/consultant technical (to include Statement of Work) and cost proposals?
   ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

   If reply is "No", please explain:

10. Do all subcontract proposals include the required summary buildup, detailed cost buildup, and supporting documentation (SOW, Bill-of-Materials, Basis-of-Estimate, Vendor Quotes, etc.)?
    ○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

    If reply is "No", please explain:

11. Does your cost proposal include copies of consultant agreements, if available?

○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

If reply is "No", please explain:

12. If requesting a FAR-based contract, does your cost proposal include a tech/cost analysis for all proposed subcontractors?
○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

If reply is "No", please explain:

13. Have all team members (prime and subcontractors) who are considered a Federally Funded Research & Development Center (FFRDC), included documentation that clearly demonstrates work is not otherwise available from the private sector AND provided a letter on letterhead from the sponsoring organization citing the specific authority establishing their eligibility to propose to government solicitations and compete with industry, and compliance with the associated FFRDC sponsor agreement and terms and conditions.
○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

If reply is "No", please explain:

14. Does your proposal include a response regarding Organizational Conflicts of Interest?
○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

If reply is "No", please explain:

15. Does your proposal include a completed Data Rights Assertions table/certification?
○ **YES** ○ **NO** **Appears on Page(s)** [Type text]

If reply is "No", please explain:

10. References

[i] Space Capstone Publication, *Spacepower* (SCP); Headquarters United States Space Force; June 2020

[ii] Higginson, E. E., Galen, J. E., Levine, M. M., & Tennant, S. M. (2016). Microgravity as a biological tool to examine host–pathogen interactions and to guide development of therapeutics and preventatives that target pathogenic bacteria. *Pathogens and disease*, *74*(8).