



FUNDING OPPORTUNITY ANNOUNCEMENT **OVERVIEW INFORMATION**

This is a special Funding Opportunity Announcement (FOA) sponsored by the Air Force Office of Scientific Research (AFOSR). AFOSR recognizes that future areas of research may not fall within its existing portfolio structure and has initiated the Create the Future Independent Research Effort (CFIRE) to stimulate research activity in such areas.

AFOSR anticipates making at least four (4) awards of approximately \$750,000 to \$1,500,000 per year per award for a maximum of three years. All funding projects are based on availability of funds.

Proposers are encouraged to confer with the designated AFOSR Program Officer(s) prior to submitting a full proposal. We will evaluate proposals using an internal review panel. AFOSR reserves the right to select and fund all, some, or none of the proposals from one, two, or all of the topics below.

White papers briefly summarizing the proposing institution's ideas are encouraged but not required. Submit white papers to our whitepaper portal, which is linked below. The topic points of contact (POCs) will coordinate to provide feedback to white papers.

The proposals will need to include a data management plan, outlining how samples and data collected in the program will be stored and managed. This includes but is not restricted to issues such as: standards for data and metadata collection, content and format, data archiving, database management, and data sharing within, outside the awardee and beyond the lifetime of the grant. This precondition is modeled on the National Science Foundation Data Management Plan requirement (e.g. https://nsf.gov/eng/general/ENG_DMP_Policy.pdf).

Hyperlinks have been embedded within this document and appear as underlined, and or blue-colored words in the midst of paragraphs. The reader may “jump” to the linked section within this document by “clicking” (CTRL + CLICK, or CLICK).

SUMMARY FUNDING OPPORTUNITY INFORMATION

1. FEDERAL AWARDING AGENCY NAME

Air Force Office of Scientific Research
875 North Randolph Street, STE 325, Room 3112
Arlington, VA 22203

2. FUNDING OPPORTUNITY TITLE

Fiscal Year (FY) 2023 Create the Future Independent Research Effort

3. ANNOUNCEMENT TYPE

Initial Announcement

4. FUNDING OPPORTUNITY NUMBER

FOA-AFRL-AFOSR-2023-0001

5. CATALOG OF FEDERAL DOMESTIC ASSISTANCE (CFDA) NUMBER

12.800 Air Force Defense Research Sciences Program

6. KEY DATES

Pre-proposal inquiries and questions must be received in writing by electronic mail to the address(es) listed under section G.2. of this FOA not later than **14 December 2022 at 11:59 PM Eastern Time** to be considered. The Government will respond to any pre-proposal inquiries or questions via public posting no later than COB on 21 December 2022.

White papers must be received by submitting to

<https://community.apan.org/wg/afosr/p/submitawhitepaper> by **20 January 2023 at 11:59 PM Eastern Time** to be considered. White paper evaluation is meant to initially assess the capability of a proposed effort and is NOT a selection process. White papers must be no more than 3 pages in length. References and CV/bios will not count against the page limit. White papers should minimally articulate:

1. An initial list of members of the proposed team with a short bio or CV for each (CVs and/or bios will not count against page limit)
2. The main technical components of the proposed research and how it aligns with the goals of the solicitation.
3. The specific proposed activities with a demonstrated understanding of the basic science needs.

Government will respond on white paper determination before COB on **3 February 2023**.

Proposals must be received electronically through Grants.gov by **17 March 2023 at 11:59 PM Eastern Time** to be considered.

We anticipate that we will notify proposers of selection or non-selection for award no later than 1 May 2023.

TABLE OF CONTENTS

A.	PROGRAM DESCRIPTION	8
1.	ASTRODYNAMICS	9
2.	MATERIALS FOR QUANTUM INFORMATION SCIENCE	10
3.	SYNTHETIC BIOLOGY	13
4.	TECHNICAL DETAILS OF PROPOSED RESEARCH	14
B.	FEDERAL AWARD INFORMATION	15
C.	ELIGIBILITY INFORMATION.....	15
1.	ELIGIBLE APPLICANTS.....	15
a.	Qualified and Responsible United States Educational Institutions.....	15
b.	HBCU/MI, Tribal College and University Applicants Encouraged	15
c.	University Affiliated Research Centers (UARCs).....	16
d.	Ineligible Entities.....	16
2.	COST SHARING OR MATCHING	16
3.	OTHER	16
a.	Acknowledgment of Support and Disclaimer Requirements.....	16
b.	Expectation of Public Dissemination of Research Results	16
c.	Representation for Tax Delinquency, Felony Conviction and Internal Confidentiality Agreements.....	17
d.	Conflict of Interest.....	17
e.	Research Personnel Facility Access Requirements and Restrictions.....	18
D.	APPLICATION AND SUBMISSION INFORMATION	18
1.	ADDRESS TO REQUEST APPLICATION PACKAGE.....	18
2.	CONTENT AND FORM OF APPLICATION SUBMISSION	18
a.	Pre-proposal Inquiries and Questions	18
b.	The Application as a Whole	18
c.	Proposal Format.....	21
d.	Proposal Length	21
e.	No Confidential or Proprietary Information	22
f.	Electronic Form and Proposal Attachments	22
3.	GRANTS.GOV APPLICATION SUBMISSION AND RECEIPT PROCEDURES.....	22
a.	Electronic Delivery	22

b. How to Register to Apply through Grants.gov	22
4. COMPONENT PIECES OF THE APPLICATION	26
a. SF 424 (R&R) Application for Federal Assistance	26
b. Representation for Tax Delinquency, Felony Conviction, and Internal Confidentiality Agreements	27
c. SFLLL Disclosure of Lobbying Activities Form	27
d. Certification Regarding Lobbying Form	27
e. R&R Other Project Information Form	28
f. R&R Publicly Releasable Project Summary / Abstract	28
g. Project Narrative	29
h. Bibliography and References Cited	31
i. R&R Senior / Key Person Profile Form	31
j. R&R Budget Form	32
k. R&R Sub award Budget Form	32
l. Budget Justification	33
m. R&R Project / Performance Site Locations Form	34
n. Data Management Plan (Required)	34
o. R&R Personal Data Form	35
5. INFORMATION YOU MUST SUBMIT IF SELECTED FOR POSSIBLE AWARD	35
6. UNIQUE ENTITY IDENTIFIER, CAGE, AND SYSTEM FOR AWARD MANAGEMENT (SAM)	35
a. SAM Registration Required	35
b. SAM Exemption or Exceptions Not Available Under This Announcement	36
c. Questions about SAM Registrations and Updates	36
d. Consequences of Non-Compliance with SAM Registration Requirements	36
7. SUBMISSION DATES AND TIMES	36
a. Pre-Proposal Inquiries and Questions Deadline	36
b. How Submission Time for Pre-Proposal Inquiries and Questions is Determined	36
c. Effect of Missing Pre-Proposal Inquiries and Questions Deadline	37
d. Proposal Submission Deadline	37
e. How Proposal Submission Time is Determined	37
f. Grants.gov Tracking Number is Application Receipt	37
g. Effect of Missing the Proposal Submission Deadline	37

8. INTERGOVERNMENTAL REVIEW	37
9. FUNDING RESTRICTIONS	38
a. Proposal Preparation Costs	38
b. Air Force Office of Scientific Research No-cost Extension (NCE) Policy	38
c. Prohibition on Contracting with Entities that Require Certain Internal Confidentiality Agreements or Statements--Representation	38
d. Other Submission Requirements	39
E. APPLICATION REVIEW INFORMATION.....	39
1. CRITERIA	39
a. Principal Evaluation and Selection Criteria.....	39
b. Additional Evaluation and Selection Criteria	40
2. REVIEW AND SELECTION PROCESS.....	40
a. Merit-based, Competitive Procedures.....	40
b. Cost Analysis for Reasonableness and Realism	40
3. DISCLOSURE OF ADMINISTRATIVE PROCESSING BY CONTRACTOR PERSONNEL	40
4. NO GUARANTEED AWARD.....	41
F. FEDERAL AWARD ADMINISTRATION INFORMATION.....	41
1. SELECTION NOTICES	41
a. Electronic Notification.....	41
b. Selection for Possible Award Does Not Authorize Work.....	41
2. AWARD NOTICES.....	41
a. Federal Award Document.....	41
b. Electronic Federal Award Distribution.....	41
3. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS.....	41
a. Reporting of Matters Related to Recipient Integrity and Performance.....	41
b. Agency Review of Risk Posed by Applicants	42
c. Cross-Cutting National Policy Requirements.....	42
d. Acknowledgment of Research Support	43
e. Disclaimer Language for Research Materials and Publications	43
f. Uniform Administrative Requirements, Cost Principles, and Audit Requirements	43
g. DoD Research and Development General Terms and Conditions.....	43
h. Conditions of Award for Recipients Other Than Individuals	44
i. Minimum Record Retention Requirements	44

4. REPORTING.....	44
a. Monitoring and Reporting Program Performance	44
b. Technical Performance Report Format.....	44
c. Department of Defense (DD) Form 882 Report of Inventions and Subcontracts.....	45
d. Standard Form (SF) 425 Federal Financial Report.....	45
e. Electronic Payment Requests and Electronic Payment	45
f. Property Reports	45
g. Other Reports.....	46
h. Electronic Submission of Reports	46
G. AGENCY CONTACTS	46
1. TECHNICAL INQUIRES AND QUESTIONS	46
2. GENERAL INQUIRIES AND QUESTIONS.....	47
H. OTHER INFORMATION.....	47
1. OMBUDSMAN	47
2. GRANTS AND CONTRACTING OFFICERS AUTHORITY	48
3. ADDITIONAL FUNDING OPPORTUNITIES	48

A. PROGRAM DESCRIPTION

The Create the Future Independent Research Effort (CFIRE) seeks to ensure the future technological superiority of the DOD by cultivating emerging areas of research at institutions of higher education (hereafter referred to as “universities”) today. The topic areas that we seek to support with this FOA are independent from those described in our open BAA (Research Interests of the Air Force Office of Scientific Research) and do not fall completely within any one research program. We seek to support multidisciplinary research efforts, creating synergies to speed DoD-relevant research and development.

Basic and applied research are defined in the DoD Financial Management Regulation:

Basic research is systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. It includes all scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs. It is farsighted high payoff research that provides the basis for technological progress (DoD 7000.14-R, vol. 2B, chap. 5, para. 050201.B).

Applied research is systematic study to understand the means to meet a recognized and specific need. It is a systematic expansion and application of knowledge to develop useful materials, devices, and systems or methods. It may be oriented, ultimately, toward the design, development, and improvement of prototypes and new processes to meet general mission area requirements. Applied research may translate promising basic research into solutions for broadly defined military needs, short of system development. This type of effort may vary from systematic mission-directed research beyond that in Budget Activity 1 to sophisticated breadboard hardware, study, programming and planning efforts that establish the initial feasibility and practicality of proposed solutions to technological challenges. It includes studies, investigations, and non-system specific technology efforts. The dominant characteristic is that applied research is directed toward general military needs with a view toward developing and evaluating the feasibility and practicality of proposed solutions and determining their parameters. Applied research precedes system specific technology investigations or development. Program control of the applied research program element is normally exercised by general level of effort. Program elements in this category involve pre-Milestone B efforts, also known as Concept and Technology Development phase tasks, such as concept exploration efforts and paper studies of alternative concepts for meeting a mission need (DoD 7000.14-R, vol. 2B, chap. 5, para. 050201.C).

Detailed descriptions and the government point(s) of contact can be found below. The descriptions are intended to provide the applicant a frame of reference and are not meant to be restrictive to the possible approaches and component solutions to achieving the goals of the topic and the program. Innovative ideas addressing these research topics are highly encouraged.

Proposals from an investigator team from multiple university departments and universities are warranted to assemble the expertise necessary to address the topics. Teams are also highly encouraged to leverage industry collaborations, where appropriate, to demonstrate an ability to

develop solutions that can be eventually applied to a specific application. Proposals shall name one Principal Investigator (PI) as the responsible technical point of contact. Similarly, one institution shall be the primary awardee for the purpose of award execution. The PI shall come from the primary institution. The relationship among participating institutions and their respective roles, as well as the apportionment of funds including sub-awards, if any, shall be described in both the proposal text and budget.

The schedule for this announcement is given in Section B, Award Information.

In fiscal year 2023, we seek proposals in three topic areas: Astrodynamics, Materials for Quantum Information Science, and Synthetic Biology. Each is described in the following section.

1. ASTRODYNAMICS

Title: Navigation, Reachability, and Control for Cislunar in the Face of Stringent Constraints

Background: In its departure from traditional Air Force priorities, the US Space Force has expressed a deep interest in the utilization of space beyond the geosynchronous orbit (XGEO) and cislunar orbit regimes for future missions. However, these orbital regimes come with their own challenges and complexities that heavily differentiate them from traditional regimes at lower altitudes. These challenges include:

1. The complex solution landscape of possible orbits is generated by the gravitational fields for a 3-body problem and has five libration points (three unstable and 2 neutrally stable) rather than a single focus in the 2-body problem. Orbits around libration points tend not to be rectilinear (i.e., they are bent and not in a plane) nor shaped like conic sections, and as an object moves away from these points, it experiences chaos associated with the 3- and higher number-body problems. Lack of rectilinearity opens opportunities for interesting orbit design concepts, but also adds complexity for visualization of orbits or a standard set of coordinates (i.e., no two-line element, or TLE type parameters) across all possible orbits to define orbits and position on those orbits. Furthermore, it is of interest to not only orbit about libration points but between them or around multiple points. Additionally, due to their chaotic nature, these orbits tend not to recur (i.e., the object may never come back to the same point in the sky).
2. While the USSF has a wide assortment of radar and optical sensor sites, such sensors are not amenable to the distances involved in the cislunar regime, and the geometry of chaotic cislunar orbits prevents easy orbit determination even if signals are available. Currently, only sparse data exists to validate the majority of cislunar space and that sparse data is often incomplete, infrequent, and corrupted.
3. Additional complications, such as lower computation power on-orbit and a lack of understanding of how to control, track, and maintain custody of space assets in cislunar under these constraints remain challenges to this operational environment.

Objective: This topic seeks a mathematical and computational theory to enable tools for future space domain awareness in cislunar space which may include satellites, constellations and defunct objects--some from hostile actors.

Research Concentration Areas: Contributions from mathematics (control and estimation theory, numerical analysis, optimization, and dynamical systems and celestial mechanics), computer science, remote sensing, and space weather physics. Specific research topics within these areas that are of interest are:

- 1) *A formal set of coordinates that is amenable to estimation and navigation algorithms for orbit position and valid for the class of all Cislunar orbits.*
- 2) *Forward and backward reachability of possible orbits under uncertainty of initial and terminal conditions for active and defunct objects.*
- 3) *Method of absolute and relative navigation (initial and current orbit determination) without GPS/GNSS orbits around and away from libration points.*
- 4) *Understanding of environmental impact on uncertainty, and accuracy of dynamics.*
- 5) *Formal verification of high- and low-level tasks and avoidance of bad trajectory sets under uncertainty.*
- 6) *On-board continuous thrust trajectory prediction, planning, and control under constraints and uncertainty for autonomous missions away from libration points.*

Anticipated Resources: It is anticipated that awards under this topic will total an average of \$1.5M per year for 3 years, supporting up to six faculty researchers. Exceptions warranted by specific proposal approaches should be discussed with the Program Officers during the white paper phase of the solicitation.

AFOSR Topic Chiefs:

Primary: Drs. Frederick Leve (frederick.leve@us.af.mil)

Additional: Michael Yakes (michael.yakes@us.af.mil) and Fariba Fahroo (fariba.fahroo@us.af.mil).

Please email all topic chiefs with any technical inquiries you may have, but address your proposal to the primary topic chief.

2. MATERIALS FOR QUANTUM INFORMATION SCIENCE

Title: Materials for Quantum Information Science (M-QIS)

Background Many current Air Force and Space Force challenges exist due to the limitations of materials. This topic area focuses on understanding the fundamental atomic structure and/or microstructure, process, physical properties, and performance of materials in order to create novel materials with disruptive capabilities relevant for the Air and Space Force. The objective is to discover scientific pathways for designing resilient materials with tailorable properties for quantum information science. This objective includes designing revolutionary approaches to accelerate discovery and technological deployment of materials for quantum information science applications. The following research concentration areas highlight the philosophy of function, environment and state of the materials that could create disruptive transformations in quantum information science and technology. The space environment introduces particular constraints, including but not limited to radiation hardness and temperature variations, that are not typical of terrestrial applications. In all research concentration areas, an overarching common trend is the need for both theoretical and experimental techniques that can aid design and processing of materials.

Objective The Materials for Quantum Information Science (M-QIS) supports multidisciplinary research efforts, ideally creating synergies to speed DoD-relevant research and development, with the goal of addressing “Materials and Fabrication”, one of the major impediments to the advancement of Quantum Information Science.¹

Research Concentration Areas

¹ “ [Advancing Quantum Information Science: National Challenges and Opportunities](https://www.quantum.gov/wp-content/uploads/2020/10/2016_NSTC_Advancing_QIS.pdf)”

- **Material design with atomic and atom-like defects for quantum information science and technology**

This research concentration area focuses on point defects, atomic and atom-like defects, in solid state hosts that offer quantum coherence. Materials that have excellent quantum coherence facilitate quantum bit (qubit) storage times and can be utilized as experimental platforms to manipulate and measure the qubit states. If the point defects enable long lived spin coherence, they can be used variety of sensor applications, could have pivotal role for quantum network application, and could have unforeseen applications in quantum information technology. Given that spin coherence is a critical parameter for any quantum system, the main aim of this specific topic area is the identification, design, fabrication (materials growth and implantation) and characterization of hosts and defects. This research concentration area seeks projects with strong ties between computational materials science approaches using first principles theory and experimental materials synthesis and characterization, with synergistic feedback between theory and experiment. Areas of interest include, but are not limited to, the understanding and predictive design of three-dimensional materials whose atomic and molecular structure, bonds, and defects can facilitate superb quantum behavior (i.e. coherence, spin dynamics, etc.); study of effects from influences such as elastic properties, vibrations, surfaces, and interfaces on the desired quantum behavior of the material; and exploitation of materials properties and phenomena to mitigate sources of decoherence and enhance material performance.

This concentration area embraces materials and processing science approaches to fabricate ultrahigh purity host materials with unintentional defect concentrations less than parts per billion. Careful choice of source materials and processing techniques would allow exploitation of wide-band gap materials in which nuclear spins can be eliminated or significantly reduced. In addition to the challenge to satisfy the purity requirements for quantum technologies that are more stringent than many other applications, wide band gap material design considerations require foundational studies for the challenge of finding desirable point defects. The wide bandgap materials present practical design obstacles as the Fermi level (i.e. the chemical potential of the electron) has a wider range of available energies, which directly influences the formation of the desired defects and all other charged native and impurity defects. The approaches may require understanding unwanted compensation of defects, explanation unidentified optical signatures, or prevention of reaching a target charge state for a target defect. Understanding and control of competing, coexisting, and intertwined order or state is of great importance to drive and manipulate quantum affects (coherence, entanglement). In addition to wide band gap materials with low magnetic noise (stable spin –zero isotopes), host materials consisting of elements from group II (e.g. Mg, Ca), group XIV (e.g. -C, Si) and group XVI (e.g. O, S) and associate point defects are of interest.

In recognition of the tremendous importance of purity considerations, this research concentration area also includes a wide range of material processing activities and discovery of advanced processing techniques that can lead to a new and ultra-pure materials with the highest possible coherence times. The transformative breakthrough has not originated from the investigations of materials in equilibrium state but at the margins of the thermodynamic equilibrium. In this context, this topic area also embraces materials and processing science approaches that are far from the thermodynamic equilibrium domain. It is also interested in new materials that are not previously foreseen but that have the potential for high coherence time.

- **Topological Material design for quantum information science and technology**

The band topology of some materials has led to discovery of topological insulator (TIs) in which the surface states host a family of extraordinary physical phenomena such as quantum Hall Effect, which promises novel electronic, spintronic and photonic devices with low power and high speed. The

introduction of magnetism to TIs offers great opportunity to extraordinary quantum phenomena such as quantized anomalous Hall effect (QAHE), topological magnetoelectric effect and Majorana fermions. The Majorana fermion is a leading theoretical candidate for implementing topological qubits for quantum computing that doesn't require quantum error correction. With the prediction and discovery of quantum phenomena in magnetic topological insulators, the need for synthesizing new compounds and improving the crystallinity is critical to open up the exploration and control of physical phenomena in magnetic TIs.

In magnetic topological insulators, tuning of topological surface states and band structures leads to quantized Hall effect without the presence of an external magnetic field, the phenomena known as QAHE. Thus far, many early efforts have been focused on introducing the magnetism to TIs through two distinct approaches: magnetic doping and proximity effects. The predicted QAHE was first observed experimentally in Cr doped (Bi, Sb)₂Te₃ thin film by molecular beam epitaxy (MBE). Nonetheless, experimental difficulties (to name a few: the magnetic and microstructural disorders, interfacial stoichiometry and defects, extrinsic carriers and others) have been challenging to overcome. In comparison, there are few currently known intrinsic magnetic topological insulators--among them the tetradymite-type compound MnBi₂Te₄ is the most investigated. In the last few years, many exciting discoveries such as QAHE phenomena, magnetic and topological phase transition have been reported on in MnBi₂Te₄ single-crystal flakes and its close relative compounds and superlattices.

In order to further understand magnetic topological insulators, we are in the need of synthesized intrinsic magnetic topological insulators with the goal of the discovery of new compounds and the increase of the critical temperature for QAHE. The realization of magnetic topological insulators requires a coordinated investigation by a team of experts to advance capabilities to synthesis of high-quality materials with predictable control over stoichiometry and disorder. In addition, the design of intrinsic magnetic topological insulators also requires the understanding of lattice symmetry and chemical consideration for magnetic ground states of topological systems. Finally, observed physical phenomena should be unambiguous and attributable to the underlying electronic structures.

Subareas in this concentration area include, but are not limited to:

1. Prediction and modeling of novel intrinsic magnetic topological insulators
2. Synthesis and characterization of crystallinity and disorders in single crystal or thin films
3. Verification of band structures and topological transport phenomena.
4. Raising the critical temperature for QAHE in known intrinsic magnetic insulators will also be considered.

Note: This program does not focus on plasmonic or optoelectronic devices, or metamaterials.

Anticipated Resources: It is anticipated that awards under this topic will be between approximately \$750,000 and \$1,500,000 each per year, supporting multiple faculty (no more than 6 per project) from different disciplines as (co-) principal investigators. Exceptions warranted by specific proposal approaches should be discussed with the Program Officers during the white paper phase of the solicitation.

AFOSR Topic Chiefs

Primary: Dr. Jiwei Lu (jiwei.lu@us.af.mil)

Additional: Dr. Ali Sayir (ali.sayir.2@us.af.mil), Dr. Michael Yakes (michael.yakes@us.af.mil), Dr. Grace Metcalfe (grace.metcalfe@us.af.mil)

Please email all topic chiefs with any technical inquiries you may have, but address your proposal to the primary topic chief.

3. SYNTHETIC BIOLOGY

Topic: Extreme ELMs: Harnessing the power of synthetic biology to transfer extremophile resilience into engineered living materials

Background: Biological organism(s) are built from living materials that enable complex functions such as energy generation, healing, adhesion, and byproduct disposal [1]. As engineers and scientists push toward developing better and better synthetic materials, as part of man-made systems, they strive to capture these same properties. Towards this goal and with the rise of synthetic biology, the term engineered living materials (ELMs) was coined to describe a material that combines synthetic materials and biological organisms (bacteria, fungi, algae, etc.) [1]. Encompassing both genetically altered biological organisms, which create their own matrix, and synthetically generated substrates containing cells, this area of research has experienced explosive growth in the last 15 years [1,2]. ELMs have been successful in accelerating wound healing, creating and repairing concrete, and degrading pollutant materials [1,2]. However, sustaining a biological system within a material introduces the complexity of sustaining life; a property not commonly required in purely synthetic materials. This requirement limits the application of ELMs to predominantly moderate environments where temperature, pH, radiation, and hydration are controlled [3]. Recently, a team of researchers showed that using bacterial spores, as opposed to living cells in the manufacture of ELMs, maintained the viability of the material despite exposure to harsh environments including pH, temperature and radiation [3]. They also showed how this advantage enabled adaptive manufacturing techniques to be applied to ELMs resulting in robust and rapid printed materials [3]. As ELMs are being investigated as a material solution for electronics, coatings, and environmentally exposed materials, there is need to create novel approaches to realizing ELMs suitable for extreme environments.

The U.S. Air and Space Forces routinely perform their missions in extreme and sometimes rapidly changing environments. As space might become the battlespace of the future, the need for lightweight, robust, and resilient materials capable of maintaining both equipment and human life within an extraterrestrial environment is critical. Beyond synthetic materials, ELMs that flourish in such environments and perform complex tasks such as producing nutrients/gases, sensing environmental molecules/contaminants, repairing life sustaining materials, and repairing electronic systems would produce a tremendous advantage to enable prolonged manned missions in space. Towards this goal, understanding the basic mechanism(s) of biological survival in extreme environments is required to harness the power of synthetic biology to create controlled biological circuits within ELMs. Scientists have discovered many extremophiles across a multitude of environments and have learned much about their survival mechanism(s), however less is known about how such organism(s) deal with multiple stressors such as those found in an extraterrestrial environment [4]. Recent advancements in synthetic biology, targeting extremophile machinery, have shown success in producing organisms capable of metal bioremediation and biorefineries, (extreme terrestrial environments) [5, 6]. The full realization of synthetic biology built “extremophile” ELMs would represent a monumental achievement in materials science that could have a profound impact on the ability to operate in extreme environments.

Objective: In this effort, we seek to identify the mechanism(s) used by extremophiles within earth environments (which has utility in space-based missions) and translate those mechanism(s) into engineered living materials using synthetic biology tools.

Research Concentration Areas: Suggested research areas include, but are not limited to:

1. Identifying the molecular mechanism(s) of extremophile resiliency
2. Modeling and engineering of extremophile organism(s) using synthetic biology tools to produce non-biological materials
3. Identification of specific micro-organism systems that can sense and respond to material stressors alone or in consortia to enable material survival

4. Assessment of the survival of ELMs in space/aerospace environments
5. Discovery of unique biological sustainment approaches of energy/nutrient harvesting from radiation sources, material substrates, and the environment
6. Translation of those capabilities into target synthetic organism(s)
7. Feasibility of producing novel self-assembled biomimetic materials (e.g. Engineered DNA materials) using a synthetic biological system (modeling and experimentation)

Anticipated Resources: It is anticipated that awards under this topic will total an average of \$1.5M per year for 3 years supporting up to five faculty researchers. Exceptions warranted by specific proposal approaches should be discussed with the Program Officers during the white paper phase of the solicitation.

AFOSR Topic Chiefs:

Primary: Dr. Bennett Ibey (bennett.ibey@us.af.mil)

Additional: Dr. Frederick Leve (frederick.leve@us.af.mil), Dr. Fariba Fahroo, (fariba.fahroo@us.af.mil)

Please email all topic chiefs with any technical inquiries you may have, but address your proposal to the primary topic chief.

References:

- [1] Rodrigo-Navarro, A., Sankaran, S., Dalby, M.J. *et al.* “Engineered living biomaterials” *Nat Rev Mater* **6**, 1175–1190 (2021). <https://doi.org/10.1038/s41578-021-00350-8>
- [2] Srubar WV, “Engineered Living Materials: Taxonomies and Emerging Trends” *Trends in Biotechnology*, Volume 39, Issue 6, 2021, Pages 574-583, ISSN 0167-7799, <https://doi.org/10.1016/j.tibtech.2020.10.009>.
- [3] González LM, Mukhitov N, Voigt CA. “Resilient living materials built by printing bacterial spores.” *Nature Chemical Biology*. 2020 Feb;16(2):126-133. DOI: 10.1038/s41589-019-0412-5. PMID: 31792444.
- [4] Merino N, Aronson H S., Bojanova DP., Feyhl-Buska J, Wong M L., Zhang S, Giovannelli D, “Living at the Extremes: Extremophiles and the Limits of Life in a Planetary Context” *Frontiers in Microbiology* (10) 2019, <https://www.frontiersin.org/articles/10.3389/fmicb.2019.00780>, DOI=10.3389/fmicb.2019.00780
- [5] Zhu Daochen Z, Adebisi Wasiu Adewale AW, Ahmad Fiaz A, Sethupathy S, Blessing D, Jianzhong S “Recent Development of Extremophilic Bacteria and Their Application in Biorefinery” *Frontiers in Bioengineering and Biotechnology* (8), 2020. <https://www.frontiersin.org/articles/10.3389/fbioe.2020.00483> DOI=10.3389/fbioe.2020.00483
- [6] Marques Catarina R. “Extremophilic Microfactories: Applications in Metal and Radionuclide Bioremediation” *Frontiers in Microbiology* (9), 2018 <https://www.frontiersin.org/articles/10.3389/fmicb.2018.01191> DOI=10.3389/fmicb.2018.01191

4. TECHNICAL DETAILS OF PROPOSED RESEARCH

A strong proposal should outline, as specifically as possible, the technical details of the proposed research. In addition, proposals should articulate how research goals align with the research topic being addressed. Because of the breadth of research that spans our challenge categories, it is anticipated that groups that submit proposals will include researchers of diverse technical perspectives and technical backgrounds. Finally, efforts integrating a variety of approaches, with a spectrum ranging from basic to applied, are preferred to those using a single approach, especially as these may provide increased opportunities for technology transfer.

a. Access to DoD Resources

Proposals may request access to AFRL facilities or DoD high performance computing

resources in order to conduct the proposed research. Proposals should make this request in accordance with the instructions given in the D.4.g. Project Narrative section of this announcement. If authorized, there is no cost to the research for these resources. Applicants are advised that routine access of educational institution researchers to AFRL buildings and facilities is limited to U.S. citizens. Individuals eligible for access are subject to background checks.

B. FEDERAL AWARD INFORMATION

Typical annual funding per grant will range from \$750,000 to \$1.5M per year. Any proposer wishing to submit a proposal outside of this range should discuss their research plan with the relevant Program Officer during the whitepaper phase of this FOA. The total amount of funding and resources made available to fund a successful proposal may vary based on the quality of proposals received and funds availability.

The anticipated period of performance is a three-year base period.

AFOSR reserves the right to select and fund for award all, some, part, or none of the proposals received. There is no guarantee of an award.

Our authority for an award under this competition is established at [10 U.S.C. 2192\(b\)\(1\)\(B\) for improvement of education in technical fields](#), and 10 U.S.C. 4001 for basic research. We discuss regulations, terms, and conditions that generally apply to our awards in Section [F. Federal Award Administration Information](#).

C. ELIGIBILITY INFORMATION

1. ELIGIBLE APPLICANTS

a. Qualified and Responsible United States Educational Institutions

You are eligible to submit an application if you are a qualified and responsible educational institution in the United States as defined at 10 U.S.C. 2194. Educational institution means a local educational agency, college, university, or any other nonprofit institution dedicated to improving science, mathematics, and engineering education. No other entities are eligible to submit applications under this competition. However, lead proposals may include participation of for-profit companies through the use of subawards or subcontracts, whichever is determined appropriate in accordance with requirements under 2 CFR 200.331.

We review your application, proposal, and Office of Management and Budget (OMB) designated repositories of government-wide public and non-public data, including comments you have made, as required by 41 U.S.C. 2313 and described in [2 CFR 200.205](#) and [32 CFR 22.410](#) to assess risk posed by applicants, and confirm applicants are qualified, responsible, and eligible to receive an award.

b. HBCU/MI, Tribal College and University Applicants Encouraged

Historically Black Colleges and Universities and Minority Serving Institutions (HBCUs/MSIs) and Tribal Colleges and Universities are encouraged to submit research proposals and join others in submitting proposals. However, no funds under this announcement are reserved or otherwise set-aside for any specific entity type. The Air Force will only use the E.1. Criteria for proposal selection.

c. University Affiliated Research Centers (UARCs)

University Affiliated Research Centers (UARCs) are eligible to submit proposals under this announcement unless their Department of Defense UARC contract precludes the application.

d. Ineligible Entities

None of the following entity types are eligible to submit proposals as primary award recipients under this announcement:

- 1) Federally Funded Research and Development Centers (FFRDCs)
- 2) Individual persons or people
- 3) Federal agencies (to include Military Educational Institutions)
- 4) For-profit institutions

2. COST SHARING OR MATCHING

Cost sharing or matching is neither required nor an evaluation criterion for proposals under this announcement. You may propose voluntary committed or uncommitted cost sharing or matching; for example, additional support for students. Any voluntary committed cost sharing amount will be included in the total award value.

3. OTHER

a. Acknowledgment of Support and Disclaimer Requirements

You must include the F.3.d. Acknowledgment of Research Support on all materials created or produced under our awards. The F.3.e. Disclaimer Language must be included on materials as required. The award document may provide additional instructions about specific distribution statements to use when you provide research materials to us. You are not eligible to submit a proposal if you cannot accept these terms.

b. Expectation of Public Dissemination of Research Results

AFOSR expects public dissemination of research results if you receive an award. This is a basic requirement for unclassified research results.

AFOSR intends, to the fullest extent possible, to make available to the public all unclassified, unlimited peer-reviewed scholarly publications and digitally formatted scientific data arising from research and programs funded wholly or in part by the DoD as described in the OUSD,

AT&L Memorandum, [*“Public Access to Department of Defense-Funded Research”*](#) dated 09 Jul 2014.

AFOSR follows [DoD Directive 5230.24](#) and [DoD Instruction 5230.27](#) policies and procedures to ensure broad dissemination of unclassified research results to the public and within the Government. [The DoD Instruction 5230.27](#) policy and procedures allowing publication and public presentation of unclassified fundamental research results will apply to all research proposed under this competition unless the Program Officer gives you an explicit, written exclusion to these policies with the Grants Officer’s advice and consent. All exclusions must be authorized or required by law and must cite a valid legal authority.

c. Representation for Tax Delinquency, Felony Conviction and Internal Confidentiality Agreements

You must complete the “Representation for Tax Delinquency, Felony Conviction, and Internal Confidentiality Agreements” provided with the Grants.gov package. More specific information about this requirement is provided in section D.4.b.

Your eligibility for funding cannot be determined unless this form is received.

d. Conflict of Interest

1) General Requirement for Disclosure

You and your organization must disclose any potential or actual scientific or non-scientific conflict of interest(s) to us. You must also disclose any potential or actual conflict(s) of interest for any sub recipient you include in your proposal. You must provide enough information for AFOSR to evaluate your disclosure. AFOSR may have to ask you more questions if more information is needed.

At AFOSR’s sole discretion, you may be asked for a conflict of interest mitigation plan after you submit your proposal. Your plan is subject to AFOSR approval.

2) Scientific Conflict of Interest

Scientific collaborations on research and development projects are generally the result of close collaboration prior to the submission of applications for support. Accordingly, virtually all of these collaborations might be considered to include a potential conflict of interest. The potential conflict is mitigated by the disclosure of these collaborations, and the list of current and pending support you provide for senior and key researchers.

You must provide a copy of all peer-reviewed publications developed or produced from research conducted with Air Force funds to the AFOSR Program Officer.

You are not eligible to submit a proposal if you cannot accept these terms.

e. Research Personnel Facility Access Requirements and Restrictions

AFRL contains facilities and equipment that could be useful to this Center. Access to these facilities will be restricted to US citizens.

D. APPLICATION AND SUBMISSION INFORMATION

1. ADDRESS TO REQUEST APPLICATION PACKAGE

All the application forms you need are available electronically on [Grants.gov](https://www.grants.gov). From the “View Grant Opportunity” page, you can click on the “Application Package” tab to download the application package.

You can find the electronic application package on Grants.gov by searching for the announcement number shown on page one. Paper copies of this announcement will not be issued.

Please contact us at afosr.FOA@us.af.mil to request a reasonable accommodation for any accessibility requirements you may have.

2. CONTENT AND FORM OF APPLICATION SUBMISSION

a. Pre-proposal Inquiries and Questions

You are encouraged to contact the Program Officer listed in section G.1. Technical Inquires and Questions before you submit your proposal.

If you need help with general matters, you should contact the individual listed in G.2. General Announcement Questions.

Your pre-proposal inquiries and questions should be submitted not later than **11:59 PM Eastern Daylight Time on 14 December 2022**. AFOSR may not be able to answer questions received later. This is discussed more in section D.7. Submission Dates and Times.

The Program Officer does not have the authority to make commitments for the government. Grants and Contracting Officers acting within their warranted capacity are the only people authorized to make commitments for the Government.

b. The Application as a Whole

You must submit your proposal electronically through Grants.gov. AFOSR will not accept or evaluate any proposal submitted by any means other than through Grants.gov. AFOSR must receive your proposal before the D.7.d. Proposal Submission Deadline.

Family, OMB Number 4040-0001. The SF 424 (R&R) Application for Federal assistance form must be your cover page. No pages may precede the SF 424 (R&R).

You must mark your application with the announcement number.

A summary of what is required for a complete proposal is summarized below:

- The forms and attachments in bold text are required with all applications
- *Some applications* require the attachments in *italics*
- More instructions are provided in D.4. Component Pieces of the Application

R&R FORM, OMB No. 4040-0001	FIELD	ATTACHMENT
SF 424 (R&R) Application for Federal Assistance, including an authorized signature	18.	Certification Regarding Lobbying Form <u>or SF-LLL Disclosure of Lobbying Activities Per instructions in D.4</u>
R&R Other Project Information Form	7.	Project Summary / Abstract
	8.	Project Narrative
	9.	Bibliography & References Cited
	<i>10.</i>	<i>Facilities and Other Resources</i>
	<i>11.</i>	<i>Equipment</i>
	<i>12.</i>	<i>Other Attachments</i>
R&R Senior / Key Person Profile Form (Expanded)		Biographical Sketch
		Current & Pending Support
R&R Personal Data Form		None
R&R Budget Form		Budget Justification
<i>R&R Subaward Budget Attachments Form</i>		<i>Subaward Budget</i>
R&R Project / Performance Site Locations Form		None

The SF 424 (R&R) must include the signature of an authorized representative from your organization. The signature is affixed electronically by Grants.gov upon submission. You are still required to submit any documentation, including disclosure of any unpaid delinquent tax liability or a felony conviction under any Federal law (see FAR 52.209-11). This signature is considered the signature for the application as a whole.

c. Proposal Format

- Paper Size – 8.5 x 11-inch paper
- Margins – 1 inch
- Spacing – Single, 1.5, or 2.0-line spacing
- Font – Times New Roman or Garamond, 12 point
- Page Limitation – No more than twenty-five (25) single-sided pages. The cover page, table of contents, list of references, letters of support, curriculum vitae and list of on-going and pending research support are excluded from the page limitations. The pages of proposals exceeding the page limit may not be included in the evaluation.
- Attachments – Electronic Portable Document Format (PDF)
- Content – As described below

d. Proposal Length

No more than twenty-five (25) single-sided pages. This page count includes the following sections: Project Summary/Abstract, the Project Narrative, and the Bibliography & References. You must not include elaborate brochures, reprints, or presentations beyond those sufficient to present a complete and effective proposal.

AFOSR will not consider more than the maximum number of pages in its evaluation; however, not all pages are counted. This list below is intended to help you understand how to calculate your page count.

NOT INCLUDED IN PAGE COUNT

- SF 424 (R&R) Application for Federal Assistance and all attachments
- R&R Budget and Budget Justification attachments, R&R Other Project Information Form, and all attachments
- R&R Sub award and Budget Justification attachments, R&R Senior / Key Person Profile Form, and all attachments for the personnel
- Documents that support the budget or particular items of cost R&R Project / Performance Site Locations Form
- Optional R&R Personal Data Form

- Budget related information is not included in the page count because AFOSR cannot make an award unless it can determine the cost of your proposal is reasonable and realistic and complies with 2 CFR 200 Subpart E - Cost Principles.
- *Not having enough information in your proposal to understand if your costs are reasonable and realistic is the most common reason awards are delayed.*

e. No Confidential or Proprietary Information

You must not include confidential or proprietary information in your proposal. This was also discussed earlier in section A. Program Description.

AFOSR will not consider your proposal if you include confidential or proprietary information or place restrictive markings on any part of your proposal.

f. Electronic Form and Proposal Attachments

Your application and proposal attachments must be in electronic file formats. You should use the Portable Document Format (PDF) for your attachments.

DO NOT password protect any attachments.

The website http://www.grants.gov/help/download_software.jsp offers a list of file convertors available to convert your documents to the PDF format.

3. GRANTS.GOV APPLICATION SUBMISSION AND RECEIPT PROCEDURES

This section provides the application submission and receipt instructions for AFOSR program applications. Please read the following instructions carefully and completely.

a. Electronic Delivery

AFOSR is participating in the Grants.gov initiative to provide the grant community with a single site to find and apply for grant funding opportunities. AFOSR encourages applicants to submit their applications online through Grants.gov.

b. How to Register to Apply through Grants.gov

Instructions: Read the instructions below about registering to apply for AFOSR funds. Applicants should read the registration instructions carefully and prepare the information requested before beginning the registration process. Reviewing and assembling the required information before beginning the registration process will alleviate last-minute searches for required information.

The registration process can take up to four weeks to complete. Therefore, registration should be done in sufficient time to ensure it does not impact your ability to meet required application submission deadlines.

If individual applicants are eligible to apply for this grant funding opportunity, refer to: <https://www.grants.gov/help/html/help/index.htm#t=Register%2FGrantsgovVariationsForIndividualApplicants.htm>

Organization applicants can find complete instructions here: <https://www.grants.gov/applicants/organization-registration.html>

- 1) ***Obtain a UEI Number:*** All entities applying for funding, including renewal funding, must have a Unique Entity Identifier (UEI). Applicants must enter the UEI number in the data entry field labeled "UEI" on the SF-424 form. Transition to the Unique Entity Identifier (UEI) from DUNS is underway; grants.gov has deployed forms compatible with the UEI. In April 2022, DUNS numbers were depreciated, the UEI is required.

The federal government stopped using the DUNS number to uniquely identify entities registered in the System for Award Management (SAM). At that point, entities doing business with the federal government will use a Unique Entity Identifier (UEI) created in SAM.gov. They will no longer have to go to a third-party website to obtain their identifier. Active registrants will have their UEI assigned and viewable within SAM.gov; there is no action for registered entities to take at this time.

This transition allows Federal Agencies to streamline the entity identification and validation process, making it easier and less burdensome for entities to do business with the federal government.

For more detailed instructions for obtaining a UEI number, refer to: <https://sam.gov/content/entity-registration>

- 2) ***Register with SAM:*** In addition to having a UEI number, organizations applying online through Grants.gov must register with the System for Award Management (SAM). All organizations must register with SAM in order to apply online. Failure to register with SAM will prevent your organization from applying through Grants.gov.

For more detailed instructions for registering with SAM, refer to: <https://www.grants.gov/web/grants/applicants/organization-registration/step-2-register-with-sam.html>.

- 3) **Create a Grants.gov Account:** The next step in the registration process is to create an account with Grants.gov. Applicants must know their organization's UEI number to complete this process. Completing this process automatically triggers an email request for applicant roles to the organization's E-Business Point of Contact (EBiz POC) for review. The EBiz POC is a representative from your organization who is the contact listed for SAM. To apply for grants on behalf of your organization, you will need the Authorized Organizational Representative (AOR) role.

For more detailed instructions about creating a profile on Grants.gov, refer to: <https://www.grants.gov/help/html/help/index.htm#t=LoginAndMyAccount%2FAddProfile.htm>

- 4) **Authorize Grants.gov Roles:** After creating an account on Grants.gov, the EBiz POC receives an email notifying them of your registration and request for roles. The EBiz POC will then log in to Grants.gov and authorize the appropriate roles, which may include the AOR role, thereby giving you permission to complete and submit applications on behalf of the organization. You will be able to submit your application online any time after you have been approved as an AOR.

For more detailed instructions about creating a profile on Grants.gov, refer to: <https://www.grants.gov/help/html/help/Register/AddProfile.htm>

- 5) **Track Role Status:** To track your role request, refer to: <https://www.grants.gov/applicants/registration/track-role-status.html>
- 6) **Electronic Signature:** When applications are submitted through Grants.gov, the name of the organization's AOR that submitted the application is inserted into the signature line of the application, serving as the electronic signature. The EBiz POC **must** authorize individuals who are able to make legally binding commitments on behalf of the organization as an AOR; **this step is often missed and it is crucial for valid and timely submissions.**

c. How to Submit an Application to AFOSR via Grants.gov

Grants.gov applicants can apply online using Workspace. Workspace is a shared, online environment where members of a grant team may simultaneously access and edit different web forms within an application. For each funding opportunity announcement (FOA), you can create individual instances of a workspace.

Below is an overview of applying on Grants.gov. For access to complete instructions on how to apply for opportunities, refer to: <https://www.grants.gov/web/grants/applicants/apply-for-grants.html>

Create a Workspace

Creating a workspace allows you to complete it online and route it through your organization for review before submitting.

Complete a Workspace

Add participants to the workspace, complete all the required forms, and check for errors before submission.

- 1) Adobe Reader: If you decide not to apply by filling out web forms you can download individual PDF forms in Workspace so that they will appear similar to other Standard or administering agency forms. The individual PDF forms can be downloaded and saved to your local device storage, network drive(s), or external drives, then accessed through Adobe Reader.

NOTE: Visit the Adobe Software Compatibility page on Grants.gov to download the appropriate version of the software at:

<https://www.grants.gov/web/grants/applicants/adobe-software-compatibility.html>

- 2) Mandatory Fields in Forms: In the forms, you will note fields marked with an asterisk and a different background color. These fields are mandatory fields that must be completed to successfully submit your application.
- 3) Complete SF-424 Fields First: The forms are designed to fill in common required fields across other forms, such as the applicant name, address, and UEI number. To trigger this feature, an applicant must complete the SF-424 information first. Once it is completed, the information will transfer to the other forms.

Submit a Workspace

An application may be submitted through workspace by clicking the Sign and Submit button on the Manage Workspace page, under the Forms tab. Grants.gov recommends submitting your application package at least 24-48 hours prior to the close date to provide you with time to correct any potential technical issues that may disrupt the application submission.

Track a Workspace

After successfully submitting a workspace package, a Grants.gov Tracking Number (GRANTXXXXXXXX) is automatically assigned to the package. The number will be listed on the Confirmation page that is generated after submission.

For additional training resources, including video tutorials, refer to:

<https://www.grants.gov/web/grants/applicants/applicant-training.html>

Applicant Support: Grants.gov provides applicants 24/7 support via the toll-free number 1-800-518-4726 and email at support@grants.gov. For questions related to the specific grant opportunity, contact the number listed in the application package of the grant you are applying for.

If you are experiencing difficulties with your submission, it is best to call the Grants.gov Support Center and get a ticket number. The Support Center ticket number will assist the administering agency with tracking your issue and understanding background information on the issue.

4. COMPONENT PIECES OF THE APPLICATION

a. SF 424 (R&R) Application for Federal Assistance

The SF 424 (R&R) Application for Federal assistance form must be your cover page. No pages may precede the SF 424 (R&R).

Complete all required fields in accordance with the “pop-up” instructions on the SF 424 (R&R) form. The completion of most fields is self-explanatory. You can turn on Grants.gov “Help Mode” to provide additional instructions for forms. “Help Mode” is turned on by the icon with the pointer and question mark at the top of the form.

Below are AFOSR special instructions for completion of several SF 424 (R&R) form fields in your application:

FIELD INSTRUCTION	
2.	You may leave “Applicant Identifier” blank
3.	You may leave “Date Received by State” and “State Application Identifier” blank
9.	You must list Air Force Office of Scientific Research as the reviewing agency if Grants.gov has not pre-populated this answer
16.	You should check “No.” and “Program is Not Covered by Executive Order 12372”
17.	Select “I Agree” to certify that all statements in the proposal, your Representation for Tax Delinquency, Felony Conviction, and Internal Confidentiality Agreements are true, complete, and accurate to the best of your knowledge. <i>See section F.3. Administrative and National Policy Requirements for more information and links to the full text of these items.</i>

18. You must attach the completed D.4.b. Representation for Tax Delinquency, Felony Conviction, and Internal Confidentiality Agreements.
You must attach the completed lobbying certification as described in section D.4.c. Lobbying Certification and SFLLL Disclosure of Lobbying Activities.
You may have to attach the completed SFLLL Disclosure of Lobbying Activities if you have lobbying activity that you must disclose.

b. Representation for Tax Delinquency, Felony Conviction, and Internal Confidentiality Agreements

You must attach this representation to field 18 of the SF 424 (R&R). This attachment is not included in your page count.

You must complete and attach the “Representation for Tax Delinquency, Felony Conviction, and Internal Confidentiality Agreements” provided with the Grants.gov package. AFOSR cannot make an award if this information is not provided.

- 1) If you answer “is” a corporation with a felony conviction and/or “is” a corporation with a felony conviction on this representation, you may not be eligible for an award if your proposal is selected. You should contact us right away to discuss your situation to find out if you can submit your application.
- 2) If you do not attach this form to the SF 424, AFOSR may request the representation after you submit your application, but we are not required to do so. AFOSR may deem your application ineligible for selection by citing an authority listed or referenced in DoD Class Deviation (CD) 2016-O0002 or CD 2015-O0005 and make an award to someone else.

c. SFLLL Disclosure of Lobbying Activities Form

When required, attach this disclosure to field 18 of the R&R Other Project Information Form. This attachment is not included in your page count.

If you have lobbying activity that you must disclose under [31 U.S.C. 1352](#) as implemented by the DoD at 32 CFR Part 28, you must attach the completed SFLLL Disclosure of Lobbying Activities.

You can find instructions for completing this form at <https://www.gsa.gov/forms-library/disclosure-lobbying-activities>

d. Certification Regarding Lobbying Form

Grant awards require a certification of compliance with a national policy mandate concerning lobbying. Grant applicants shall provide this certification by electronic submission of SF424 (R&R) as a part of the electronic proposal.

e. R&R Other Project Information Form

Complete this form as indicated. You must include all necessary attachments described below. This form is included in your page count.

FIELD INSTRUCTIONS	
1, 1a.	You must address all prospective human subject involvement by answering these questions. Additional documentation pursuant to National Policy and U.S. Air Force standards is required for all proposals with human research or involvement.
2, 2a.	You must address all prospective animal subject and/or recombinant deoxyribonucleic acid (rDNA) involvement by answering these questions. Additional documentation pursuant to National Policy and U.S. Air Force standards is required for all proposals with animal or rDNA research or involvement.
4a.	For any proposal that has an actual or potential impact on the environment, answer yes and provide the answers and attachments required for fields 4b,4c, and 4d. Additional documentation in accordance with National Policy and U.S. Air Force standards is required for any proposal with an actual or potential impact on the environment.
9.	Attach your D.4.h. Bibliography and References Cited
7.	Attach your D.4.f. Publicly Releasable Abstract
8.	Attach your D.4.g. Project Narrative
10.	Attach a Facilities and Other Resources description document here if you need to supplement your D.4.g. Project Narrative facilities and resources section.
11.	You may supplement your D.4.i. Budget Justification by attaching an Equipment Justification here. Do not duplicate information included on your budget justification. If you attach an Equipment Justification, make sure you reference the attachment in your budget justification.
FIELD INSTRUCTION	

f. R&R Publicly Releasable Project Summary / Abstract

You must attach the Project Summary / Abstract to field 7 of the R&R Other Project Information form. This attachment is included in your page count.

- 1) You must provide a concise abstract of 300 words or less with your proposal. You must mark this abstract publicly releasable. Your abstract should use terms the public can understand to describe the research objective, technical approach, anticipated outcome, and potential impact of the specific research.

- 2) Your abstract header should include the Program Officer's name and office symbol from section G.1. Technical Inquiries and Questions below.
- 3) If you receive an award, AFOSR must publish your abstract to a searchable website available to the general public in accordance with Public Law 113-235. The website address is <https://dodgrantawards.dtic.mil/grants>.

g. Project Narrative

You must attach the Project Narrative to field 8 of the R&R Other Project Information Form. The narrative must be complete and self-contained to qualify for review. This attachment is included in your page count.

You must clearly describe the research, including the research objective and approach. Your project narrative will be evaluated using the criteria listed in section E.1. Criteria. You should show strength in as many of the evaluation and selection areas as practicable to demonstrate maximum competitiveness.

You shall describe any environmental impacts of your research outside the laboratory in any appropriate narrative section, including how you will ensure compliance with environmental statutes and regulations.

Your narrative shall include the following elements:

1) Statement of Objectives

You must your proposed research on a single page titled "Statement of Objectives." AFOSR may decide to incorporate your statement of objectives into the award instead of incorporating the whole technical proposal.

You should use active verbs when you prepare the statement of objectives, e.g., "conduct" research in a subject area, "investigate" a problem, "determine" to test a hypothesis.

2) Research Effort

(a) You should describe the research you plan in detail. State the research objectives and approach, and the relationship and comparable objectives to research progress elsewhere. Describe your research team's knowledge in the field and provide a bibliography and list of literature citations. Discuss the nature of the expected results.

(b) The adequacy of this information will influence the overall evaluation in accordance with the criteria and procedures specified in section E. Application

Review Requirements.

3) Principal Investigator (PI) and Senior Personnel Time

(a) You must provide an estimate of time the principal investigator and other senior professional personnel will devote to the research. Your estimate must include information pertaining to the proportion of time anticipated devoted to this research, to other research, and to other commitments of time such as sabbatical, extended leave, and teaching duties.

(b) State the number of graduate students for whom each senior staff member is responsible.

(c) If your principal investigator or other key personnel have current, pending, or expected research supported by other sponsors or agencies during the period you seek our support, state the title of the other research, the proportion of time to be devoted to it, the amount of support, name of agency, dates, etc.

You must attach a list of Current and Pending Support for each person listed on the D.4.i. R&R Senior / Key Person Profile Form. Each abstract should include research title, objectives, approach, and budget for both present and pending research projects.

Send any changes to this information to us as those changes become known.

4) Your Facilities

(a) Describe the facilities available for performing the proposed research, and any additional facilities or equipment the organization proposes to acquire at its own expense for the work.

(b) Indicate any government-owned facilities that will be used. Indicate any government-owned equipment possessed presently that will be used. The facilities contract number, or in absence of a facilities contract, the specifics of the facilities or equipment, and the number of the award under which they are accountable are required.

5) Government Furnished Equipment

You may list any special Government-owned property or test equipment required to complete the research. When possible and practicable, give a description or title for each item, the current location, and an estimated cost as applicable. If you do not have information about individual items, group items you require by class and provide an estimate of values.

6) High-Performance Computing Requirements

You may be eligible to use DOD high-performance computing resources at no cost to your research. You should address utilization of this program if you need high-performance computing cycles to meet the needs of your research. This program provides access to a range of state-of-the-art high-performance computing assets and user training opportunities that can be used in some of our awards; special terms and conditions apply. You can review the details, capabilities, and requirements of the program at <http://www.hpc.mil>.

AFOSR Program Officers will help you establish an account if your proposal is selected for an award and can answer questions before you submit your proposal.

7) Disclosure of Foreign National and Dual Citizenship Personnel

As described in section C.3.e. Research Personnel Facility Access Requirements and Restrictions, you must identify any planned foreign national personnel, including information to support permanent resident status with work authorization. The following foreign national personal data must be included:

- Full name and any other names used;
- Country or countries of citizenship;
- Date and place of birth;
- Permanent Resident Card (Green Card) type; and
- Green Card issue and expiration date.

h. Bibliography and References Cited

You must attach your narrative Bibliography and References to field 9 of the R&R Other Project Information Form. This attachment is included in your page count.

i. R&R Senior / Key Person Profile Form

You must attach a short biographical sketch and list of significant publications (vitae) for each Senior / Key Person. You must also attach a list of current and pending support as discussed in Principal Investigator (PI) and Senior Personnel Time. This form is not included in your page count.

You must list all key persons proposed for the research on the R&R Senior/Key Person Profile Form. Key persons are generally the PI, any Co-PIs, and senior staff. This information is used to evaluate the qualifications of you and your research team.

To evaluate compliance with Title IX of the Education Amendments of 1972 (20 U.S.C.A

subsection 1681 Et. Seq.), the 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 STEM 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. To enable this assessment, each applicant must include this form completed as indicated.

The Degree Type and Degree Year Fields will be used by DoD as the source for career information. In addition to the required fields on the form, applicants must complete these two fields for all individuals that are identified as having the project role of PD/PI or Co-PD/PI on the form. Additional senior/key persons can be added by selecting the "Next Person" button.

j. R&R Budget Form

This form is not included in your page count.

You shall provide all information requested. You must estimate the total research project cost.

You must categorize funds by year and provide separate annual budgets for projects lasting more than one year.

A budget justification must be attached.

You must include enough budget related information in your proposal to support your costs as reasonable and realistic, and in compliance with 2 CFR 200 Subpart E - Cost Principles.

Not having enough information in your proposal to understand if your costs are reasonable and realistic is the most common reason awards are delayed.

k. R&R Sub award Budget Form

This form is not included in your page count. Attachments to this form are not included in your page count.

If you plan any sub award(s), you must provide a budget and budget justification using the same requirements established for your prime budget and budget justification.

AFOSR cannot make an award to you unless we can determine the sub award cost is reasonable and realistic and complies with 2 CFR 200 Subpart E – Cost Principles.

Not having enough information in your sub award budget(s) or budget justification(s) can cause significant delays for awards.

I. Budget Justification

This attachment is not included in your page count.

You must provide a detailed budget justification for each year that clearly explains the need for each item. The entire budget justification and supporting documentation must be combined into a single file and attached to field K of the R&R Budget Form.

- 1) You should itemize travel. State the purpose of each trip proposed, the number of trips, the number of travelers, the destination, the duration, and the basis for calculating costs such as airlines and hotels.

Below is a sample of the travel portion:

TRAVEL	Unit	Trips	Travelers	Nights	Days	Unit Cost	Total Travel
Airfare	Round trip	1	1			\$900.00	\$900.00
Lodging	day	1	1	3		\$75.00	\$225.00
Per Diem	day	1	1		3	\$40.00	\$120.00
Automobile Rental	day	1	1		3	\$45.00	\$135.00
Subtotal Travel		4	4	3		\$1,060	\$1,380.00

- 2) You should itemize materials, supplies, and equipment. List all material/equipment by type and kind with associated costs. Indicate what your costs are based on, such as vendor quotes, historical data and/or engineering estimates. **You should include vendor quotes and/or catalog pricing data.**
- 3) If you have any sub award(s), you should describe how you determined sub award costs were determined fair and reasonable. Your business office usually makes this determination.

DHHS/ONR Rate Agreement:

- 4) If you use a Government rate agreement to propose indirect cost rates and/or fringe benefit rates, you should attach a copy of the agreement you used.

5) Helpful Cost Principal Reference Information

- a. [2 CFR 200, Subpart E – Cost Principles](#)
- b. General Provisions for Selected Items of Cost in [2 CFR 200.420 through 2 CFR 200.475](#)

m. R&R Project / Performance Site Locations Form

This form is not included in your page count.

You shall complete all information as requested. You must include the ZIP+4 for each performance location you list.

n. Data Management Plan (Required)

This attachment is not included in your page count

A Data Management Plan is required with your application. Attach your Data Management Plan to field 12 of the R&R Other Project Information Form.

Your “Data Management Plan” should be two (2) pages or less in length and discuss:

- The types of data, software, and other materials to be produced in the course of the project, and include a notation marking items that are publicly releasable;
- How the data will be acquired;
- Time and location of data acquisition if they are scientifically pertinent;
- How the data will be processed;
- The file formats and the naming conventions that will be used;
- A description of the quality assurance and quality control measures during collection, analysis, and processing;
- If existing data are to be used, a description of their origins;
- A description of the standards to be used for data and metadata format and content;
- Plans and justifications for archiving the data;
- The timeframe for preservation; and
- If for legitimate reasons the data cannot be preserved, the plan must include a justification citing such reasons.

o. R&R Personal Data Form

This attachment is not included in your page count.

To evaluate compliance with Title IX of the Education Amendments of 1972 (20 U.S.C. A subsection 1681 Et. Seq.), The 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 STEM disciplines. To enable this assessment, each applicant must include this form completed as indicated.

This form will be used by DoD as the source of demographic information, such as gender, race, ethnicity, and disability information for the Project Director/Principal Investigator and all other persons identified as Co-Project Director(s)/Co-Principal Investigator(s). Each application must include this form with the name fields of the Project Director/Principal Investigator and any Co-Project Director(s)/Co-Principal Investigator(s) completed; however, provisions of the demographic information in the form is voluntary. If completing the form for multiple individuals, each Co-Project Director/Co-Principal Investigator can be added by selecting the “Next Person” button. The demographic information, if provided, will be used for statistical purposes only and will not be made available to merit reviewers. Applicants who do not wish to provide some or all of this information should check or select the “Do not wish to provide” option.

5. INFORMATION YOU MUST SUBMIT IF SELECTED FOR POSSIBLE AWARD

The AFOSR Grants Officer may request additional necessary information from you during negotiations, or as required to inform their consideration for award.

You must respond promptly.

If you do not fully comply with our information requests by the time AFOSR is ready to make an award, AFOSR may determine that you are not qualified to receive an award and use that determination as a basis for making an award to another applicant.

Foreign national personnel may be asked to provide a copy of the front and back of their green card by secure means such as <https://safe.amrdec.army.mil/safe/>.

If your proposal includes human, animal, or rDNA use or involvement, you must submit all documentation requested during negotiations or you may not receive an award.

6. UNIQUE ENTITY IDENTIFIER, CAGE, AND SYSTEM FOR AWARD MANAGEMENT (SAM)

a. SAM Registration Required

As required in [2 CFR 25.110](#) all applicants, unless exempted, must:

- 1) Be registered in [SAM.gov](#) before submitting its application;
- 2) Provide a valid unique Entity Identifier; and
- 3) Continue to maintain an active SAM registration with current information at all times any Federal award is active, or any application is under consideration by a Federal awarding agency.

A Commercial and Government Entity (CAGE) code is obtained or specified as part of the SAM registration process. A CAGE code is required.

b. SAM Exemption or Exceptions Not Available Under This Announcement

AFOSR will not issue an Agency level exemption to SAM registration under 2 CFR 25.110(d)(1) for applicants under this announcement.

You must comply with SAM registration requirements and include a UEI and CAGE code on your application or AFOSR cannot make an award.

c. Questions about SAM Registrations and Updates

You can get questions about SAM registration and entity updates answered by live chat at <https://www.fsd.gov/fsd-gov/home.do> and telephone at (866) 606-8220 or (324) 206-7828. Top help topics for SAM.gov are available at https://www.fsd.gov/fsd-gov/learning-center-system.do?sysparm_system=SAM.

d. Consequences of Non-Compliance with SAM Registration Requirements

AFOSR cannot make an award to you unless you comply with SAM requirements. If you are non-compliant, AFOSR may determine you are not qualified to receive an award and use that determination to make an award to someone else as authorized by 2 CFR 25.205(b). You cannot receive payments without an active SAM record and CAGE code.

7. SUBMISSION DATES AND TIMES

a. Pre-Proposal Inquiries and Questions Deadline

You must submit all pre-proposal inquiries and questions not later than **14 December 2022** at 11:59 PM Daylight Time. Responses will be emailed by **21 December 2022** at 11:59 PM.

b. How Submission Time for Pre-Proposal Inquiries and Questions is Determined

AFOSR uses the date and time stamp on your email to determine when you submitted pre-proposal correspondence. These emails should be directed to the contact listed at the end of this

FOA for general inquiries and questions (aleah.parker@us.af.mil)

c. Effect of Missing Pre-Proposal Inquiries and Questions Deadline

AFOSR will not provide responses or answers to late inquiries or questions.

d. Proposal Submission Deadline

AFOSR must receive your white paper by **20 January 2023** at 11:59 PM Eastern time for it to be considered.

AFOSR must receive your proposal electronically through Grants.gov not later than **17 March 2023** at 11:59 PM Eastern time to be considered for selection. This is the final due date. AFOSR recommends that you submit applications early.

You are responsible for making sure your application is submitted, received, and validated by Grants.gov before the application deadline. If you submit your application late, your proposal is not eligible for consideration.

e. How Proposal Submission Time is Determined

AFOSR uses the system-generated Grants.gov time stamp to determine when you submitted your successfully validated proposal. Grants.gov policies and procedures for application submission and processing apply. *AFOSR will only accept applications submitted electronically through Grants.gov.*

f. Grants.gov Tracking Number is Application Receipt

Grants.gov generates a confirmation page when you submit your application. A second confirmation is provided by email when your application has passed Grants.gov validations and the status is updated from received to validated.

The confirmation page includes a system-generated Grants.gov tracking number; this serves as your receipt. You should keep a copy of all confirmations.

You can verify the submission time and application status with your tracking number through Grants.gov at <https://www.grants.gov/applicants/track-my-application.html>.

g. Effect of Missing the Proposal Submission Deadline

Grants.gov will not accept your proposal after the submission deadline. AFOSR will not accept proposals submitted other than electronically through Grants.gov.

8. INTERGOVERNMENTAL REVIEW

N/A - This program is excluded from coverage under Executive Order (E.O.) 12372.

9. FUNDING RESTRICTIONS

a. Proposal Preparation Costs

AFOSR will not reimburse proposal or application costs under this FOA. Your proposal or application preparation costs are not considered an allowable direct charge to any award under this announcement.

b. Air Force Office of Scientific Research No-cost Extension (NCE) Policy

AFOSR grants NCE's only in situations in which the extension is truly warranted and properly documented. AFOSR requires prior written approval to extend the period of performance, without additional funds, beyond the expiration date of the grant. For an extension to be granted recipients are to provide notice in writing, and with the supporting reasons, and revised expiration date, at least **thirty (30)** days prior to the expiration of the award, and Standard Form (SF) 425 Federal Financial Report with amount of remaining funds. In no event will the period of performance be extended merely for the purpose of using unobligated balances. Institutions should make every effort to ensure work is completed on time. If an institution deems an NCE is truly warranted, it should submit its request for an extension and supporting reasons to the relevant Program Officer. You should make every effort to ensure work is completed on time.

c. Prohibition on Contracting with Entities that Require Certain Internal Confidentiality Agreements or Statements--Representation

- a) *Definition.* As used in this provision—
“Internal confidentiality agreement or statement”, “subcontract”, and “subcontractor”, are defined in the clause at 52.203-19, Prohibition on Requiring Certain Internal Confidentiality Agreements or Statements.
- b) In accordance with section 743 of Division E, Title VII, of the Consolidated and Further Continuing Appropriations Act, 2015 (Pub. L. 113-235) and its successor provisions in subsequent appropriations acts (and as extended in continuing resolutions), Government agencies are not permitted to use funds appropriated (or otherwise made available) for agreements with an entity that requires employees or sub recipients of such entity seeking to report waste, fraud, or abuse to sign internal confidentiality agreements or statements prohibiting or otherwise restricting such employees or sub recipients from lawfully reporting such waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.
- c) The prohibition in paragraph (b) of this provision does not contravene requirements applicable to Standard Form 312, (Classified Information Nondisclosure Agreement),

Form 4414 (Sensitive Compartmented Information Nondisclosure Agreement), or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

- d) Representation. By submission of its offer, the Grantor represents that it will not require its employees or sub recipients to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting such employees or sub recipients from lawfully reporting waste, fraud, or abuse related to the performance of a Government agreement to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information (e.g., agency Office of the Inspector General).
- e) Agreement with the representation above will be affirmed by checking the “I agree” box in block 17 of the SF424 as part of the electronic proposal submitted via Grants.gov.

d. Other Submission Requirements

If Grants.gov rejects your electronic application submission for any reason, you must correct all errors and resubmit your application before the D.7.d. Proposal submission deadline.

E. APPLICATION REVIEW INFORMATION

1. CRITERIA

You should show strength in as many of the evaluation and selection areas as practicable to demonstrate maximum competitiveness.

a. Principal Evaluation and Selection Criteria

The two (2) principal selection criteria are specified in 32 CFR 22.315(c). The principal selection criteria are of equal importance to each other. The combined principal selection criteria are more important than the additional evaluation and selection criterion. The principal selection criteria are:

- The technical merits of the proposed research.
- Potential relationship of the proposed research and development to Department of Defense missions. This will be assessed based on the merits of the proposed collaboration plan and the potential for transition to AFRL development efforts.

b. Additional Evaluation and Selection Criteria

An additional evaluation criterion is shown below. This criterion is less important than the combined principal selection criteria.

- The applicant, principal investigator, team leader, and key personnel qualifications, capabilities, related experience, facilities, and research techniques considered individually and in combination that are integral to achieving DoD objectives for this program.

No further criteria or criterion will be used for proposal selection

2. REVIEW AND SELECTION PROCESS

a. Merit-based, Competitive Procedures

Proposals will be subjected to a peer or programmatic review. The peer review will use internal and external reviewers to assess technical merit and Air Force relevance of the proposal.

The programmatic review assesses the technical quality of the proposal, relevance of the proposed research to the portfolio descriptions in this FOA, relevance of the work to Air Force and DoD needs, and the potential of the research balanced against the available funding resources of a given portfolio. Selection for award consideration will be made based on the outcome of these reviews.

AFOSR anticipates selecting proposals for possible funding on a competitive basis according to 10 USC 2361, and 10 USC 2374 using the merit-based, competitive procedures described in 32 CFR 22.315, incorporated here by reference.

You should show strength in as many of the evaluation and selection areas as practicable to demonstrate maximum competitiveness.

b. Cost Analysis for Reasonableness and Realism

If your proposal is selected for possible award, AFOSR will analyze the cost of the work for realism and reasonableness. The cost of your proposal is considered but is not an evaluation factor or criterion.

AFOSR must make sure the costs you propose are reasonable, realistic, and allocable to this work before AFOSR can make an award. All costs must be allowable to be reasonable. AFOSR may analyze your technical and cost information at the same time.

3. DISCLOSURE OF ADMINISTRATIVE PROCESSING BY CONTRACTOR PERSONNEL

AFOSR use support contractor personnel to help it with administrative proposal processing. The contractor personnel are employees of commercial firms that have a contract with AFOSR. AFOSR makes sure all of its support contracts include nondisclosure agreements that prohibit disclosure of any information you submit to other parties.

4. NO GUARANTEED AWARD

AFOSR does not guarantee that any award will be made under this competition.

F. FEDERAL AWARD ADMINISTRATION INFORMATION

1. SELECTION NOTICES

a. Electronic Notification

If your proposal is selected for possible award, an email will be sent to the principal investigator.

b. Selection for Possible Award Does Not Authorize Work

Our selection notice **is not** an authorization to start work and **is not** an award guarantee. AFOSR will contact your business office to get answers to any questions it has about your proposal and negotiate specific award terms. Negotiations may result in funding levels that are less than those in the proposal.

2. AWARD NOTICES

a. Federal Award Document

A grant or contract signed by a warranted Grants or Contracting Officer is the only official notice that an award has been made.

b. Electronic Federal Award Distribution

AFOSR sends award documents to your business office by email. This is called award distribution. AFOSR always ask your business office to forward the award to the Principal Investigator indicated on the award document.

3. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS

a. Reporting of Matters Related to Recipient Integrity and Performance

You must report recipient integrity and performance information as required by [Appendix XII to 2 CFR Part 200](#)– Award Term and Condition for Recipient Integrity and Performance Matters, incorporated here by reference. You should read the full text of this award term now using the link above to make sure you understand our requirements. You can also find this

term at <http://www.ecfr.gov>.

b. Agency Review of Risk Posed by Applicants

- 1) AFOSR must review information available about you and entities included in your proposal through the Office of Management and Budget (OMB) designated repositories of government- wide eligibility qualification and financial integrity information. Our risk review is required by 41 U.S.C. 2313 and includes both public and non-public information. You must be qualified as described at 32 CFR 22.415 Standards to receive an award.
- 2) AFOSR must consider the non-public segment of the [Federal Awardee Performance and Integrity Information System \(FAPIIS\)](#) for all awards exceeding the current simplified acquisition threshold of \$250,000.
- 3) At a minimum, the information in the system for a prior Federal award recipient must demonstrate a satisfactory record of executing programs or activities under Federal grants, cooperative agreements, or procurement awards; and integrity and business ethics. We will consider any comments you provide, in addition to the other information in the designated integrity and performance system, when making our risk judgment about your integrity, business ethics, and record of performance under Federal awards.
 - a. AFOSR may make an award to a recipient who does not fully meet our standards as described at 2 CFR 200.205(a)(2) if it is determined that the information is not relevant to the current Federal award under consideration or there are specific conditions that can appropriately mitigate the effects of the non- Federal entity's risk in accordance with 2 CFR 200.208 Specific conditions.
- 4) AFOSR must comply with the guidelines on government-wide suspension and debarment described in 2 CFR 200.213, and must require you to comply with these provisions for all work AFOSR funds.

These provisions restrict Federal awards, sub-awards and contracts with certain parties that are debarred, suspended or otherwise excluded from or ineligible for participation in Federal programs or activities.

c. Cross-Cutting National Policy Requirements

You must comply with all applicable national policy requirements as a condition of award. Key national policy requirements may be found in the [DoD Research and Development General Terms and Conditions \(DoD T&C\)](#); and,

[Appendix B to 32 CFR Part 22 – Suggested Award Provisions for National Policy Requirements that Often Apply](#), incorporated here by reference.

d. Acknowledgment of Research Support

You must acknowledge support provided by the Government in all materials based on or developed under our awards. The requirement extends to copyrighted and non- copyrighted materials published or displayed in any medium.

The following language must be used unless the award document provides different instructions:

“This material is based upon work supported by the Air Force Office of Scientific Research under award number FAXXXX-XX-X-XXXX”.

You must require any sub-recipients or subcontractors under your award to include this acknowledgment, too.

e. Disclaimer Language for Research Materials and Publications

Some materials based on or developed under our awards must include special disclaimer language. You must include this language in all materials except scientific articles or papers published in scientific journals unless your award document provides different instructions: *“Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the U.S. Department of Defense.”*

f. Uniform Administrative Requirements, Cost Principles, and Audit Requirements

Our grants are governed by the guidance in [Title 2, Code of Federal Regulations \(CFR\) Part 200](#), “Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards” as modified and supplemented by the Department of Defense’s (DoD) interim implementation in 2 CFR Part 1103 [79 FR 76047, December 19, 2014] and 2 CFR Part 1125. Provisions of [Chapter 1, Subchapter C of Title 32, CFR](#), “DoD Grant and Agreement Regulations” other than parts 32 and 33 continue to be in effect and apply as stated.

These regulations are incorporated by reference into this announcement.

g. DoD Research and Development General Terms and Conditions

Our domestic grants are subject to the current (at time of award) “DoD Research and Development General Terms and Conditions” (DoD T&C) found at [DoD Research and Development General Terms and Conditions](#).

These terms and conditions are incorporated by reference into this announcement. We can provide a generic model grant or cooperative agreement upon request.

If we publish updated terms and conditions, the updated terms and conditions may apply to any grant made under this announcement.

h. Conditions of Award for Recipients Other Than Individuals

You must agree to comply with the requirements at [2 CFR Part 182, Subpart B “Requirements for Recipients Other Than Individuals”](#) as a condition of award.

i. Minimum Record Retention Requirements

You must keep records related to our awards for at least three years after completion and the final Federal Financial Report is submitted. This requirement is described further in [2 CFR 200.333](#), incorporated here by reference. The DoD T&C [OAR Article II. Records retention and access](#) describes additional requirements.

Sometimes records must be retained for more than three years.

4. REPORTING

a. Monitoring and Reporting Program Performance

All of our awards require at least annual and final technical performance reports as required in [2 CFR 200.328](#). The DoD T&C [REP Article I. Performance reporting](#) will apply to grant or cooperative agreement awards. Some of our awards require more frequent technical reports.

You must provide your reports on time. Our awards include a schedule specifying the latest date for submission of each required report. Failure to provide required reports, or providing reports after required due dates, could lead to being considered ineligible for future awards.

b. Technical Performance Report Format

- (1) Federal-wide Research Progress Performance Report (RPPR) Format (All grant awards)

We now use the [Federal-wide Research Progress Performance Report \(RPPR\)](#) for annual and final research performance reports. The reporting requirements will be detailed in the grant award documents.

- (2) ANSI Standard Z39.18-2005 (all non-grant awards)

Use the AFRL Scientific & Technical Reports – Preparation, Presentation and Preservations Format Guidelines (June 2010) for your final report unless your

award states different requirements. You can download the AFRL standard guide from the Related Documents tab in Grants.gov for this announcement.

c. Department of Defense (DD) Form 882 Report of Inventions and Subcontracts

(1) Invention Reports

- (a) You must provide at least a final invention report on DD Form 882. We may ask for annual reports. Our award documents specify the due date. You can get the form at

<http://www.dtic.mil/whs/directives/forms/eforms/dd0882.pdf>.

- (b) You must submit invention reports even if you do not have a patent to report.

(2) Sub-Award and Subcontract Reporting

You must use the DD Form 882 to tell us about any subawards or subcontracts. Your award will provide specific instructions. You can get the form at

<http://www.dtic.mil/whs/directives/forms/eforms/dd0882.pdf>.

d. Standard Form (SF) 425 Federal Financial Report

Our awards require a final SF 425 Federal Financial Report. You can get the form at <https://www.grants.gov/forms/post-award-reporting-forms.html>.

- 1) If you request any advance payment(s) under your award, you must submit quarterly SF 425 reports for the life of the grant. Our awards include specific instructions.
- 2) You do not have to submit quarterly SF 425 reports if you only request payments by reimbursement.

e. Electronic Payment Requests and Electronic Payment

You must register to use Wide Area Work Flow (WAWF) for payment. Payment requests shall be made electronically using an SF270 through the WAWF application in the Procurement Integrated Enterprise Environment (PIEE) e-Business Suite at <https://piee.eb.mil/>. The website includes registration instructions. All payments must be made using the electronic funds transfer (EFT) method.

If you have WAWF or PIEE questions or problems, you can get help by telephone at (866) 618-5988, or by electronic mail at disa.global.servicedesk.mbx.eb-ticket-requests@mail.mil, or via the Internet at:

<https://piee.eb.mil/xhtml/unauth/web/homepage/vendorCustomerSupport.xhtml>

f. Property Reports

If AFOSR furnishes any property owned by the Government under an award, you must submit periodic property status reports as described in [2 CFR 200.329](#) and further implemented by the DoD T&C REP Article III. Reporting on Property.

g. Other Reports

Our Program Officers may ask for informal technical reports as needed. AFOSR uses these informal reports for program purposes, such as preparation for meetings and other technical purposes. AFOSR highly recommends you provide this information in a timely manner by electronic mail directly to the Program Officer.

h. Electronic Submission of Reports

You must plan on submitting reports electronically. **You must submit most reports through the internet application detailed in the grant award document.** Some reports must be sent using electronic mail. Our award documents provide specific instructions that you must follow.

G. AGENCY CONTACTS

1. TECHNICAL INQUIRES AND QUESTIONS

You should submit all questions in writing by electronic mail. You should include the FOA number in the subject line.

If you submit a question by telephone call, fax message, or other means, you may not receive a response.

You should include the announcement number in the subject line.

Topic 1: Astrodynamics

DR. FREDERICK LEVE, AFOSR/RTA
Email: frederick.leve@us.af.mil

DR. MICHAEL YAKES, AFOSR/RTB
Email: michael.yakes@us.af.mil

DR. FARIBA FAHROO, AFOSR/RTA
Email: fariba.fahroo@us.af.mil

Topic 2: Materials for Quantum Information Science

DR. JIWEI LU, AFOSR/RTB
Email: jiwei.lu@us.af.mil

DR. ALI SAYIR, AFOSR/RTB
Email: ali.sayir.2@us.af.mil

DR. MICHAEL YAKES, AFOSR/RTB

Email: michael.yakes@us.af.mil

DR. GRACE D. METCALFE, AFOSR/RTB

E-mail: grace.metcalfe@us.af.mil

Topic 3: Synthetic Biology

DR. BENNETT IBEY, AFOSR/RTB2

E-mail: bennett.ibey@us.af.mil

DR. FREDERICK LEVE, AFOSR/RTA

Email: frederick.leve@us.af.mil

DR. FARIBA FAHROO, AFOSR/RTA

Email: fariba.fahroo@us.af.mil

2. GENERAL INQUIRIES AND QUESTIONS

You must send all general questions about this announcement to us by email. Your questions will generally be consolidated with other questions and posted on Grants.gov so everyone gets the same information. AFOSR may provide an individual response by email if your question does not apply to anyone else.

MS. ALEAH L. PARKER, AFOSR/RBK

GRANTS OFFICER

Email: aleah.parker@us.af.mil

MS. DENISE M. JOHNSON, AFOSR/RBK

GRANTS OFFICER

Email: denise.johnson.19@us.af.mil

H. OTHER INFORMATION

1. OMBUDSMAN

(a) An ombudsman has been appointed to hear and facilitate the resolution of concerns from offerors, potential offerors, and others for this acquisition. When requested, the ombudsman will maintain strict confidentiality as to the source of the concern. The existence of the ombudsman does not affect the authority of the program officer, grants officer, contracting officer, or source selection official. Further, the ombudsman does not participate in the evaluation of proposals, the source selection process, or the adjudication of protests or formal grant or contract disputes. The ombudsman may refer the party to another official who can resolve the concern.

(b) Before consulting with an ombudsman, interested parties must first address their concerns, issues, disagreements, and/or recommendations to the grants or contracting officer for resolution. Consulting an ombudsman does not alter or postpone the timelines for any other processes (e.g., agency level bid protests, GAO bid protests, requests for debriefings, employee-employer actions, contests of OMB FOA-AFRL-AFOSR-2023-0001 Amendment 0001

Circular A-76 competition performance decisions).

(c) If resolution cannot be made by the GO, concerned parties may contact the AFRL Ombudsman, Director of Contracting, HQ AFRL/PK. The AFRL Alternate Ombudsman is the Deputy Director of Contracting, HQ AFRL/PK. Please send an email to afrl.pk.workflow@us.af.mil with the subject of "Ombudsman".

(d) The ombudsman has no authority to render a decision that binds the agency.

(e) Do not contact the ombudsman to request copies of the solicitation, verify offer due date, or clarify technical requirements. Such inquiries shall be directed to the grants or contracting officer.

2. GRANTS AND CONTRACTING OFFICERS AUTHORITY

Grants and Contracting Officers acting within their warranted capacity are the only individuals legally authorized to make commitments or bind the Government.

No other individuals are authorized to make commitments or otherwise bind us.

3. ADDITIONAL FUNDING OPPORTUNITIES

AFOSR posts new funding opportunities throughout the year looking for today's breakthrough science for tomorrow's Air Force. You can find more information about Air Force Office of Scientific Research interests and funding opportunities on our website at <http://www.wpafb.af.mil/afrl/afosr>. confirm this hyperlink if this the correct website!

Thank you for your interest in this announcement.