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UNIVERSITY  
NANOSATELLITE  
PROGRAM

# **Space Dynamics Laboratory (SDL) Request for Proposals for the Government Fiscal Year (GFY) 2024 Mission Concept University Nanosatellite Program (UNP)**

## **Request for Proposals**

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# **Space Dynamics Laboratory (SDL) Request for Proposals (RFP) for the Government Fiscal Year (GFY) 2024 University Nanosatellite Program (UNP) Mission Concept-2024**

## **1. INTRODUCTION**

The Space Dynamics Laboratory (SDL), in support of the Air Force Office of Scientific Research (AFOSR), the Air Force Research Laboratory<sup>1</sup> Space Vehicles Directorate (AFRL/RV), and the National Aeronautics and Space Administration (NASA) announces a GFY 2024 competition for research to promote and sustain university research and education focused on small satellites and related technologies. Eligible and interested universities are encouraged to submit a proposal in accordance with the criteria in this Request for Proposal (RFP). The AFOSR manages the basic research investment for the U.S. Air Force (USAF) and Space Force (USSF). As a part of the AFRL, AFOSR's technical experts foster and fund research within the AFRL, universities, and industry laboratories to ensure the transition of research results in support of USAF needs.

Founded in 1999, the University Nanosatellite Program (UNP) is a federally-funded research program funding small satellite projects at U.S. universities. The intention of the Mission Concept – 2024 (MC-2024) program is two-fold: to provide systems engineering training to students to prepare them for the industrial workforce and to develop small satellite expertise at U.S. universities.

Founded in 2009, NASA's CubeSat Launch Initiative (CSLI) provides launch opportunities for U.S. CubeSat developers who build small satellite payloads that fly as auxiliary payloads on previously planned launches, commercial missions to low Earth Orbit, as well as International Space Station (ISS) deployments. CSLI enables broad access to space, launching to date over 160 CubeSats into orbit, selected from over 105 different organizations from 40+ states, Washington DC and Puerto Rico. CSLI's goal is to provide pathways to conduct on-orbit research in the areas of science, exploration, technology development, and education.

NASA Kennedy Space Center's (KSC) Exploration Research & Technology Programs directorate prepares ISS payloads for commercial flights, develops In-Situ Resource Utilization (ISRU), surface systems, spaceport technologies, and researches ways to grow plants in space. It also engages university Principal Investigators (PIs) to work with KSC PIs and helps universities get involved in developing small satellites.

The Missile Defense Agency (MDA) has roots going back to 1983 and is a research, development, and acquisition agency that works on ballistic missile defense systems for the United States and its allies.

Founded in 2021, the United States Space Force's Space Warfighting Analysis Center (SWAC) investigates shaping the space acquisitions strategy. It does this by conducting analysis, modeling, wargaming and experimentation that yield operational concepts and force design recommendations to the Space Force.

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<sup>1</sup> AFRL-2023-6419

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In support of AFRL, AFOSR, NASA, SWAC, and the MDA, SDL is seeking unclassified, fundamental research proposals that do not contain proprietary information. Multiple awards are expected to be made.

SDL will not issue paper copies of this announcement. SDL and the sponsoring Government agencies involved in this program reserve the right to select and award contracts for all, some, or none of the proposals received in response to this announcement. SDL shall provide no funding for direct reimbursement of proposal development costs. No material submitted in response to this RFP will be returned.

## 2. FUNDING OPPORTUNITY DESCRIPTION

The objective of the UNP is to promote and sustain university research and education focused on small satellites and related technologies. The primary outcome of individual projects funded under this program is to mature non-traditional space research institutions through an educational program that leads students and professors through mission concept definition of a small satellite while learning how to follow a systems engineering process to mature that concept. Program topics include but are not limited to: the systems engineering process, objectives and success criteria, requirements and constraints, trade studies, technical performance budgets, small satellite overviews, design reviews, hands-on exercises, university student lab set up and maintenance, etc.

Secondary objectives are to foster research in enabling technologies for small satellites and the design of experiments that can be performed by small satellites in orbit.

Initial awards will be for a 4-month summer period and include educational and program review activities offered by SDL, AFRL/RV, AFOSR, and NASA.

The following is a list of small satellite research areas of interest. Please note that the list is by no means comprehensive. Proposers are encouraged to propose innovative technologies or experiments not included below.

1. Enabling technologies in advancement of the small satellite platform
2. Small satellite communications (improved performance, reduced size, weight, and power (SWaP), path agnostic communications, etc.)
3. Enabling technologies in advancement of formation flying
4. Satellite distributed network technologies including but not limited to: space-ground networks, improved cyber security, enhanced cryptography especially for mesh networks
5. Laser communications and associated capabilities
6. Autonomy (operations, decision making, image/event recognition)

A sampling of NASA's Science Mission Directorate's areas of interest can be found at these links:

- <https://www1.grc.nasa.gov/space/pesto/> (See needed technologies sections.)
- [https://apd440.gsfc.nasa.gov/tech\\_gap\\_priorities.html](https://apd440.gsfc.nasa.gov/tech_gap_priorities.html)
- Earth Science (See relevant areas): <https://esto.nasa.gov>

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- Astrophysics:  
<https://apd440.gsfc.nasa.gov/images/tech/ABTRCoverandPage092519Final.pdf>
  - Additional information on the space technology framework will be continually added and updated here: <https://techport.nasa.gov/framework>

A sampling of NASA Space Technology Mission Directorate areas of interest associated with small satellites can be found here:

- <https://www.nasa.gov/smallspacecraft/>

For this program, the term “small satellite” will be used to indicate satellites conforming to masses up to 50kg. Teams are highly encouraged to propose missions conforming to the CubeSat form factor (1U-12U), but missions requiring larger form factors are acceptable. Teams will receive guidance on the form factor required for their mission, as well as guidance on altering the mission to fit a realistic form factor. For this reason, the form factor proposed is not strictly limited. If a team is proposing a CubeSat mission, design conforming to the latest CubeSat Design Specification is high recommended, which as of this writing is CDS 14.1. Teams should also be familiar with the safety requirements outlined in LSP-REQ-317.01 Rev B. Additional resources can be found at <https://www.nasa.gov/content/cubesat-launch-initiative-resources>. The performance of research funded by this announcement is expected to be fundamental, as defined by DoD Directive 5230.24 and DoD Instruction 5230.27, which describe contracted fundamental research in a DoD context as follows:

*“Contracted Fundamental Research. Includes [research performed under] grants and contracts that are (a) funded by budget Category 6.1 (“Research”), whether performed by universities or industry or (b) funded by budget Category 6.2 (“Exploratory Development”) and performed on-campus at a university. The research shall not be considered fundamental in those rare and exceptional circumstances where the 6.2-funded effort presents a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies that are unique and critical to defense, and where agreement on restrictions have been recorded in the contract or grant.”*

### **3. AWARD INFORMATION**

SDL anticipates issuing Fixed Price Level-of-Effort subcontracts to universities and each project will likely be funded at a minimum of \$40,000 for the summer months. Projects may receive a larger award as funding allows. These funds enable the participating universities to cover student travel/fees to events (including SmallSat Conference as referenced in Section 5.2.8), housing and rental car during the internship in Albuquerque, PI time, and minimally may be used towards the proposed mission. In addition to the subcontract, internships for approximately three (3) students from each school will be offered and paid through SDL for the MC-2024 program effort.

### **4. ELIGIBILITY**

This competition is open only to, and full proposals are to be submitted only by, U.S. institutions of higher education (universities). This includes DoD institutions of higher education, with degree-granting programs in science and/or engineering.

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In support of (*or in alignment with*) the following Executive Orders (EO) (listed in chronological order), consideration will be given to institutions that would further the goals of the EOs in advancing educational equity, excellence, and economic opportunity for minority-serving institutions:

- EO 14041: Advancing Educational Equity, Excellence, and Economic Opportunity through Historically Black Colleges and Universities
- EO 14031: Advancing Equity, Justice, and Opportunity for Asian Americans, Native Hawaiians, and Pacific Islanders
- EO 14045: Advancing Educational Equity, Excellence, and Economic Opportunity for Hispanics
- EO 14049: Advancing Educational Equity, Excellence, and Economic Opportunity for Native Americans and Strengthening Tribal Colleges and Universities

SDL, AFRL/RV, AFOSR, and NASA strongly encourage proposals from the following types of minority-serving institutions, as identified by the U.S. Department of Education Eligibility Matrix and curated by NASA at the following link:

[https://www.nasa.gov/sites/default/files/atoms/files/edu\\_nasa\\_msi\\_list\\_2022\\_2023.pdf](https://www.nasa.gov/sites/default/files/atoms/files/edu_nasa_msi_list_2022_2023.pdf)

- Alaska Native and Native Hawaiian-Serving Institutions (ANNH)
- American Indian Tribally Controlled Colleges and Universities (TCCU)
- Asian American and Native American Pacific Islander-Serving Institutions (AANAPISI)
- Hispanic-Serving Institutions (HSI)
- Historically Black Colleges and Universities (HBCU)
- Native American-Serving Nontribal Institutions Program (NASNTI)
- Predominately Black Institutions (PBI)

## **5. APPLICATION AND SUBMISSION INFORMATION**

This announcement may be accessed from the Internet at <http://universitynanosat.org>. See “Electronic Submission” in Section 5.1.2.

### **5.1 CONTENT AND FORMAT OF APPLICATION SUBMISSION**

#### **5.1.1 Proposal Format**

The required full proposal format is as follows:

- Paper Size - 8.5 x 11 inch
- Margins - 1 inch
- Spacing - single or double spaced
- Font - Times New Roman, 12 point
- Page Limit - no more than fifteen (15) single-sided pages of program description (pages in excess of the page limit will not be evaluated)
- NOTE: Budgetary information is not included in the 15 page limit

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### **5.1.2 Electronic Submission**

Proposals must be received as an Adobe Acrobat (pdf) file at <http://universitynanosat.org/solicitation> by 4:00 PM, EDT, 9 February 2024

Late proposals will **not** be considered for this UNP cycle.

### **5.1.3 Contact Information**

Please submit any comments or questions about a technical research area or the procedures for submission of a proposal, along with your contact information (name, university, email, phone number), to [info@universitynanosat.org](mailto:info@universitynanosat.org).

## **5.2 PROPOSAL OUTLINE**

### **5.2.1 Abstract**

Include a concise (not to exceed 500 words) abstract that describes the research objective, technical approach, anticipated outcome, and impact of the specific research. In the header of the abstract, include the PI and name of university.

### **5.2.2 Project Narrative**

Clearly describe the research, including the objective and approach to be performed, keeping in mind the evaluation criteria listed in this announcement. Also briefly indicate whether the intended research will result in environmental impacts outside the laboratory, and how the proposer will ensure compliance with environmental statutes and regulations.

### **5.2.3 Statement of Objectives**

Describe the actual research to be completed, including goals and objectives, on one page entitled “Statement of Objectives.” Active verbs should be used in this statement (for example, “conduct” research into a topic, “investigate” a problem, “determine” to test a hypothesis). This section should not contain proprietary information.

### **5.2.4 Impact**

Clearly describe the expected impact of the research on the university, the appropriate field of science or engineering, and/or the DoD and NASA. Additionally, address the potential of the research on current technologies, systems, methods, approaches, etc. The benefit(s) to the DoD and NASA and the ability of the basic (6.1) research to be transitioned to applied (6.2) research may be addressed in this section as well.

### **5.2.5 Research Effort**

Describe in detail the research to be performed. State the objectives and approach and their relationship to comparable objectives in progress elsewhere. Additionally, state knowledge in the field and include a bibliography and a list of literature citations. Discuss the nature of the expected results. The adequacy of this information will influence the overall evaluation. Proposals for renewal of existing support must include a description of progress if the proposed objectives are related.



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### 5.2.6 Senior/Key Personnel Profile

The principal purpose of the requested information is for review of those persons who will perform the proposed research. For the PI and each of the senior staff, provide a short biographical sketch and estimate of time that the PI and other senior professional personnel will devote to the research.

### 5.2.7 Facilities

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

### 5.2.8 Milestone Schedule

Below is a 4-month nominal MC-2024 program schedule.

Event	Expected Date	Attendees Expected
Award Announcement	Feb 2024	--
Kickoff Meeting at Kennedy Space Center, Florida	May 20 – 24, 2024	PI and students
Students arrive in Albuquerque (first day to report, June 3)	June 1 – 2, 2024	Students
System Concept Review in Albuquerque, NM	Jun 27 – 28, 2024	Students
System Requirements Review in Albuquerque, NM	July 10 – 11, 2024	Students
Final Event in Albuquerque, NM	July 18, 2024	PI and students
Student estimated departure from Albuquerque	July 19 – 21, 2024	Students
SmallSat Conference Logan, UT	Aug 3 – 8, 2024	PI and students HIGHLY encouraged

## 6. APPLICATION REVIEW

### 6.1 EVALUATION CRITERIA

Proposals will be evaluated under four principal selection criteria of equal importance, as follows:

1. Educational impact (both undergraduate and/or graduate) of the project
2. University impact/development
3. Participation of minority-serving institutions, as identified by executive orders, and how the proposed work will impact a diverse set of students
4. NASA/DoD relevance (Ref. Section 2 - list of small satellite research areas of interest)

The technical and cost information will be analyzed simultaneously during the evaluation process.

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## **6.2 REVIEW AND SELECTION**

Proposals submitted under this announcement will be evaluated by a scientific review process involving personnel at SDL, AFRL, AFOSR, NASA, MDA and/or by outside evaluators retained by AFRL or AFOSR. Employees of commercial firms under contract to the Government may be used to administratively process proposals. These support contracts include nondisclosure agreements prohibiting their contractor employees from disclosing any information submitted by other contractors.

Full proposals will be selected on a competitive basis by a panel of experts from SDL, AFRL, NASA, MDA and from external entities after consideration of the recommendation of the scientific reviews.

## **6.3 AWARD NOTICES**

Should your proposal be selected for award, the PI will receive a letter from SDL stating this information. This is not an authorization to begin work. Your business office will be contacted by the SDL contracting officer to negotiate the terms of your subcontract.

## **7. DELIVERABLES**

The Contract Deliverable is a final technical report.

The UNP guides each of the student teams through the satellite analysis, design and build process according to the Milestone Schedule in Section 5.2.8. Appropriate satellite design deliverables packages are associated with each of these major reviews.