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PROGRAM

Space Dynamics Laboratory (SDL) Request for Proposals for the Government Fiscal Year (GFY) 2025 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) 2025 University Nanosatellite Program (UNP) Mission Concept-2025

1. INTRODUCTION

The Space Dynamics Laboratory (SDL), in support of the Air Force Research Laboratory¹ Space Vehicles Directorate (AFRL/RV), and the National Aeronautics and Space Administration (NASA) announces a GFY 2025 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).

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 – 2025 (MC-2025) 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, successfully launching to date over 160 CubeSats into orbit, selected from over 100+ 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.

In support of AFRL, 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

¹ AFRL-2025-0123

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, 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
- Earth Science (See relevant areas): <https://esto.nasa.gov>
- 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 highly 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 \$45,000 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), 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, independent of the \$45,000 awarded, through SDL internships for the MC-2025 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.

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

5.1.2 Electronic Submission

Proposals must be received as an Adobe Acrobat (pdf) file at <http://universitynanosat.org/solicitation> by **2:00 PM, EDT, 7 February 2025**

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.

5.2 PROPOSAL OUTLINE

5.2.1 Executive Summary (included in page count)

Include an executive summary which clearly describes the research, including the objectives and approach to be performed, keeping in mind the evaluation criteria listed in this announcement. In the header of the narrative, include the PI and name of university.

5.2.2 Statement of Objectives (included in page count)

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.

5.2.3 Impact (included in page count)

Clearly describe the expected impact of the research on the university and its curriculum, 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. If there are plans to have additional students working at the university over the summer, describe their engagement and level of involvement.

5.2.4 Research Effort (included in page count)

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.

5.2.5 Senior/Key Personnel Profile (included in page count)

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.

5.2.6 Facilities (included in page count)

Describe facilities available for performing the proposed research and any additional facilities or equipment the organization proposes to acquire at its own expense. University facilities are important to note if you plan to have remote students working over the summer in tandem with those in Albuquerque. Provide details on the application of remote collaboration and mission design. 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.

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 (e.g., Hands-on Learning, Interdisciplinary Learning, Innovation and Research, Career Preparation, Enhanced Engagement and Motivation, Educational Outreach)
2. University impact/development (e.g., Access to Enhanced Research and Development, Strengthening University-Industry Partnerships, Infrastructure and Capability Building for Future Missions, Encouraging Innovation and Entrepreneurship)
3. 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.

6.2 REVIEW AND SELECTION

Proposals submitted under this announcement will be evaluated by a scientific review process involving personnel at SDL, AFRL, NASA, SWAC, MDA and/or by outside evaluators retained by AFRL. 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, SWAC, 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. Appropriate satellite design deliverables packages are associated with each of these major reviews.

7.1 MILESTONE SCHEDULE

Below is a 4-month nominal MC-2025 program schedule.

Event	Expected Date	Attendees Expected
Award Announcement	March 2025	--
Kickoff Meeting at Kennedy Space Center, Florida	May 19 th – 23 rd , 2025	PI and students
Students arrive in Albuquerque (first day to report, June 2)	May 31 st - June 1 st , 2025	Students
System Concept Review in Albuquerque, NM	June 26 th - 27 th , 2025	Students
System Requirements Review in Albuquerque, NM	July 9 th – 10 th , 2025	Students
Final Event in Albuquerque, NM	July 17 th , 2025	PI and students
Student estimated departure from Albuquerque	July 18 th – 20 th , 2025	Students
SmallSat Conference Salt Lake City, UT	Aug 11 th – 13 th , 2025	PI and students HIGHLY encouraged