Space Dynamics Laboratory (SDL) Request for Proposals for the Government Fiscal Year (GFY) 2022 University Nanosatellite Program (UNP) and Space Solar Power Incremental Demonstrations and Research (SSPIDR) Technology Insertion 1 (TI-1)

Request for Proposals

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Space Dynamics Laboratory (SDL) Request for Proposals (RFPs) for the Government Fiscal Year (GFY) 2022 University Nanosatellite Program (UNP) and Space Solar Power Incremental Demonstrations and Research (SSPIDR) Technology Insertion 1 (TI-1)

1. INTRODUCTION

The Space Dynamics Laboratory (SDL), in support of the Air Force Office of Scientific Research (AFOSR), the Air Force Research Laboratory Space Vehicles Directorate (AFRL/RV), and the Naval Research Laboratory (NRL), announces a GFY 2022 opportunity for U.S. universities to collaborate with the Space Solar Power Incremental Demonstrations and Research (SSPIDR) project. Eligible and interested universities are encouraged to submit a proposal in accordance with the criteria in this 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.

The University Nanosatellite Program (UNP), in collaboration with the SSPIDR project, are introducing this RFP. Technology Insertion 1 (TI-1) is intended to provide university students systems engineering education in space technology and capability integration by means of research, engineering, technical development, analysis, integration, test, and evaluation for critical technology elements applicable to SSPIDR.

In support of AFRL and NRL, SDL is seeking unclassified proposals that do not contain proprietary information. It is expected that one award will 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

2.1 BACKGROUND

Founded in 1999, the UNP is a federally funded research program funding small satellite projects at U.S. universities. The intention of the 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. The UNP is part of the President's STEM education portfolio and is monitored by the National Science and Technology Council as mandated under the America Competes Reauthorization Act of 2010.

SSPIDR is a Congressionally funded project for maturing the necessary technologies to develop a space-based solar power transmission capability. This potential prototype system will use high-efficiency solar cells to collect the sun's energy and convert it to radio frequency (RF) for transmission to a receiving station on earth. After collection on the ground, that RF can then be converted back into power and provided to expeditionary forces operating in unimproved areas (e.g., forward operating bases). To fully achieve the envisioned capability, there are immense technical challenges that must be overcome. The SSPIDR project consists of multiple incremental demonstrations, such as Arachne, the keystone flight experiment.

Arachne consists of an ESPAStar bus with hosted payloads that will test a small, but scalable array of "sandwich modules". The sandwich modules will collect solar energy, convert it to RF, and direct it to a rectenna to measure the incident power.

The selected university will design, build, test, deliver, and operate a 6U CubeSat as outlined within this RFP. The CubeSat is expected to serve as a power beaming receiver for Arachne, ultimately, demonstrating novel free-space RF power beaming capabilities while in orbit.

2.2 SYNOPSIS

UNP, in collaboration with SSPIDR, is planning a space-to-space RF power beaming demonstration of a single 6U CubeSat deployed from a Planetary Systems Corp. Canisterized Satellite Dispenser (CSD) mounted aboard Arachne in Low Earth Orbit (LEO). Capabilities to be demonstrated are: 1) the ability to host and monitor a payload that will receive and record RF power and time data aboard the CubeSat during initial deployment and tumble; and 2) the ability to store and then downlink payload and CubeSat state data to the ground during the life of the mission.

The primary outcomes expected of the university project funded under TI-1 are the design, fabrication, and functional testing of a small satellite capable of accomplishing the mission, hosting the payload, and meeting the spacecraft design requirements contained herein; as well as the creation and execution of an operations plan to downlink, store, and deliver the collected payload and bus data specified herein. Due to possible unforeseen delays in launch scheduling, this may also require the creation of extended training materials and a detailed sustainment operations manual such that a completely new university team, that does not include the original operations plan creators, can carry out operations. Secondary objectives are to promote and sustain university focused research and education on small satellites and related technologies.

Initial funding will be for a 4-month period and will include educational and program review activities offered by SDL, AFRL/RV, NRL, and AFRL support contractors. At the end of this period, a Design Review 2 milestone will be held to determine the design's ability to meet requirements for space launch and mission operation. If the design is found to be feasible for launch and operations, additional funding can be requested to take it through critical design, assembly, integration, delivery, and operations.

3. MISSION OVERVIEW

3.1 MISSION SCOPE

AFRL is interested in advancing several technology areas through focused and strategic Air Force investments. Notably, investments have been made in the advancement of a space-based system that can harvest solar energy, convert that energy to RF, and wirelessly transmit to a rectenna (rectified antenna). This solar-to-RF power conversion and beaming capability will enable energy to be beamed anywhere as needed, such as other satellites in orbit. This mission will encompass a demonstration in LEO where Arachne will beam solar-to-RF power to a 6U

CubeSat that will record and measure the incident power received. AFRL intends to demonstrate multiple concepts with this mission, including but not limited to: 1) the ability to direct RF power over space from one distinct satellite to another, 2) the ability for a satellite to receive RF power regardless of its ability to control attitude, and 3) the ability for solar-to-RF converted power to be directed to a satellite without active feedback or precise knowledge of its position. Proving these concepts enables the potential to demonstrate the future utility of using directed RF to supplement and perhaps one day ultimately replace/augment satellite power generation systems.

3.2 MISSION OBJECTIVES

This mission will fulfill the following primary objectives:

1. Collect and store received RF power data from a CubeSat hosted payload during deployment and separation/drift to demonstrate the ability to direct RF power over space from one distinct satellite to another.
2. Transmit all collected and stored data from CubeSat bus and payload to ground to deliver to AFRL for processing.

In addition to the above objectives, the following secondary objectives have been identified:

1. Observe how RF power is affected by separation through collection of position data from CubeSat during deployment and drift.
2. Collect and store CubeSat attitude data to relate received RF power variations to CubeSat attitude during deployment and drift.

3.3 MISSION OVERVIEW

This mission will consist of Arachne and a 6U CubeSat in LEO. Arachne will provide and host a CSD to host the CubeSat within during initial operations. Arachne, an ESPAStar satellite, hosts a prime payload called the Space Solar Power RF Integrated Tile Experiment (SSPRITE) that will feature a deployable structure populated with an array of ‘sandwich modules’ for RF power beaming. Arachne will signal the CubeSat to power on and begin automatically recording data via signals through the CSD separation electrical connection. Arachne will then deploy the CubeSat and start beaming RF power toward it sometime after deployment and during drift. The CubeSat will be recording payload data consisting of RF received power and payload run time. Additionally, the CubeSat will also be tasked with collecting and storing its attitude and position data during this stage of the mission. After data collection is complete, the CubeSat will downlink its recorded data to the ground. Upon successful downlink of data, and delivery of data to AFRL, the mission will be complete.

3.4 CONCEPT OF OPERATIONS (CONOPS)

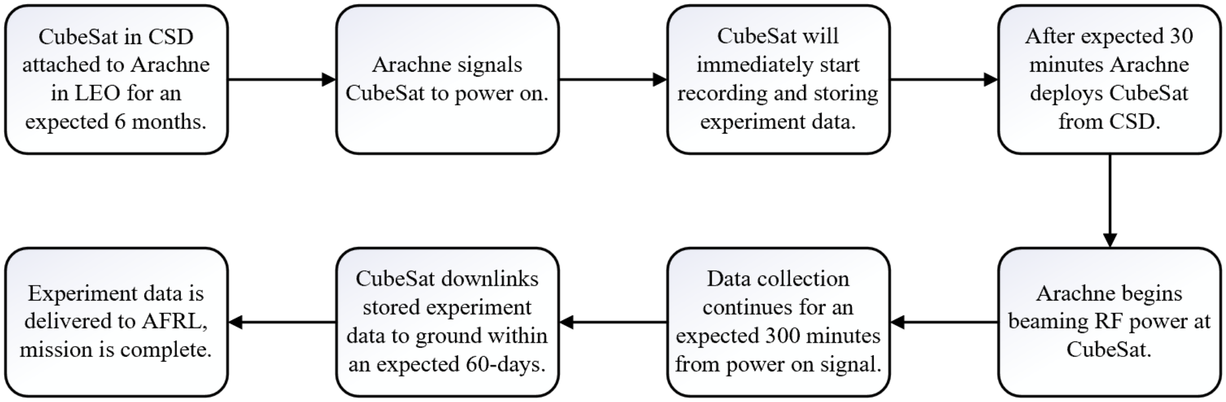

Figure 1. CONOPS Flow Diagram

3.5 MISSION ARCHITECTURE

This mission is expected to demonstrate space-to-space RF power beaming. The mission architecture was chosen such that the design and implementation of the RF power receiving CubeSat would be straightforward in its ability to meet the design/delivery schedule contained in Section 5.1. The architecture includes onboard sensors that provide CubeSat position and attitude. Attitude control will not be necessary to meet mission objectives, therefore there is no control included in the mission architecture. Primary Telemetry Tracking and Control (TT&C) and mission data delivery radio may be selected by the university, provided the radio selected can transmit and receive on an already established ground network such as Kongsberg Satellite Services (KSat), Atlas Space Operations, etc.

3.6 PAYLOAD

3.6.1 Functional Description

The payload, which will be designed and manufactured by the NRL, will be hosted aboard the CubeSat. The expected design consists of six individual rectenna panels and a Payload On-Board Computer (POBC) for recording data. The panels are expected to be roughly 1U by 2U in dimension and are intended to be mounted on each face of the CubeSat. The POBC will collect RF power data from the rectenna panels as well as run time and will stream this data to the CubeSat Command and Data Handling Unit (CDH). Additionally, the POBC will also store this data using its own onboard memory allowing the CubeSat CDH to access for storage and transfer to ground. There is no specific payload envelope/segment of the spacecraft defined currently. However, all six rectennas will need to be accommodated by the spacecraft on all six faces.

3.6.2 Design Schedule

During the development of the CubeSat bus, the payload will also be under development. The payload will be developed along the following schedule.

- Detailed Payload Interface Control Document (ICD) released by January 2022
- Payload Engineering Model (EM) provided to university team May 2022 (DR2)

- Payload Flight Model (FM) provided to university team by Oct 2022 (DR3)

3.7 MISSION CONSTRAINTS AND REQUIREMENTS

Due to the unique nature of this mission with respect to regular UNP cycle missions, several additional constraints and requirements have been identified in order to assure viable bus design and overall mission success. The following are CubeSat bus requirements and constraints critical for this mission.

1. The CubeSat shall be designed to meet the dimensions specified in Planetary Systems CSD datasheet for a 6U payload deployer.
2. Capable of powering on at the receipt of a signal from Arachne via CSD separation connector.
3. Able to provide an expected 1500 mW of power via 5V regulated supply to the payload during the entire 400 minute expected duration of the experiment after being powered off within the canister attached to Arachne for an expected period of 6 months (no external power provided).
4. Capable of communicating with the payload using UART serial communication for payload data streaming.
5. Able to operate in a tumble during the entire duration of the experiment.
6. Able to produce, collect, and store position and attitude data as soon as available after powerup.
7. Able to transfer and store an expected 20 MB of data from the payload using an SPI SD card interface protocol after experiment is completed.
8. Able to downlink all mission critical data within an expected 60-day period after experiment.
9. Meet all other programmatic design and launch requirements contained herein.

4. GOVERNMENT REFERENCE DESIGN

4.1 SPACE VEHICLE

As stated, one of the primary outcomes expected of the university project funded under this UNP/SSPIDR TI-1 is the design, fabrication, and functional testing of a straightforward 6U CubeSat meeting the requirements contained within this RFP. To assist in accomplishing this, the following government reference design is provided.

4.1.1 Vehicle Description

This reference vehicle is a straightforward 6U tab-based CubeSat matching the dimensions specified for a Planetary Systems Corp. CSD. The space vehicle features six separate 1U by 2U (rough dimension) rectenna panels mounted on each face. It features two separate 2U by 2U solar panels mounted on each of the larger faces. It also accommodates a surface mounted GPS patch antenna, and a turnstile type TT&C radio antenna with dual deployable tape spring antennas (see Figure 2).

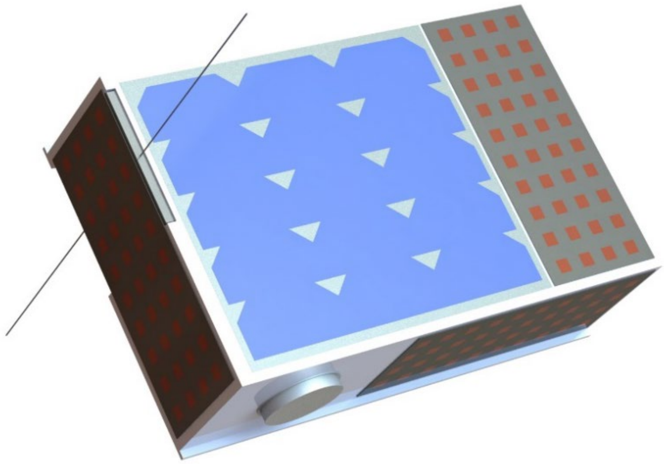

Figure 2. Reference Design Bus Exterior

4.1.2 Space Vehicle Capabilities

4.1.2.1 General Capabilities

- Capable of operating in a tumble with no active Attitude Determination and Control System (ADCS) throughout its operational life
- Able to power up while inhibited in CSD after receiving activation signal
- Automatically begins recording GPS data at power up
- Does not require external power generation to complete the experiment

4.1.2.2 Subsystem Capabilities

- Electrical Power System (EPS)
  - Maintains necessary State of Charge (SOC) within main rechargeable and/or primary cells to perform experiment after remaining inside canister for 6 months aboard Arachne.
  - Can be activated while inhibited from an external activation signal. (Activation timelines are characterized in Section 3.4).
  - Solar panels provide power generation for data downlinking after the experiment is completed.
- CDH Unit
  - Records and stores pseudo-ranges, state-estimation, and time from GPS unit; acceleration and angular-velocity from IMU; and RF power and time payload.
- TT&C/Payload Data Radio (including antenna)
  - Omni-directional antenna allows satellite-to-ground communications while space vehicle is tumbling.
  - Two-way radio for commanding satellite and downlinking experiment data.

- Inertial Measurement Unit (IMU).
  - 3 axis accelerometers provide redundant position data.
  - 3 axis gyroscopes provide attitude data.
- GPS (including antenna
  - Capable of supplying raw GPS pseudo-range data without a complete GPS solution, as well as time and state-estimation data when first available.
  - Antenna does not impede the mounting of rectenna payload panels, or deployment from CSD.
- Space Vehicle Structure and Payload Accommodations
  - Simple tabbed 6U CubeSat structure to fit the specifications of a CSD.
  - Mounting accommodations for rectenna panels on all six faces.
- Payload (delivered to university)
  - Records RF received power from all rectennas and run time.
  - Onboard memory for data storage and transfer to CDH for downlink.

4.2 GROUND SUPPORT EQUIPMENT

Ground support equipment for the satellite consists of performance testing equipment, holding fixtures, operational verification equipment, and other lab and supporting devices. This equipment serves to ensure quality of design, verification, and test of the space vehicle for launch and mission viability.

4.3 GROUND SYSTEM

The university shall perform command and control of the spacecraft after deployment and use that to downlink the data. Successful receipt of all collected payload telemetry shall be shown (i.e., some method of confirming all files have successfully been downlinked). The university is responsible for establishing the ground RF and data systems.

5. PROGRAM EXPECTATIONS

5.1 SCHEDULE

Throughout the design life of a satellite, there will be certain milestones, where specific capabilities and thresholds will need to be demonstrated. Specific entrance and exit criteria will be specified at each milestone review. If these criteria are not met, this may be cause for TI-1 to no longer continue. UNP, in collaboration with SSPIDR program, have determined that adherence to the following schedule should ensure timely delivery of the satellite and maximize the probability of success for the mission. An initial amount of funding will be given at Kickoff. If additional funding is required, it can be requested at each review with approval of an updated budget.

Table 1. Satellite Bus Design Milestone Schedule

Event	Date	Location	Expectations	Gate for
Kickoff	January 2022	Albuquerque, NM	Attend event, ensure contract is in place	$200k funding
Design Review 1	March 2022	Virtual	Present initial design focusing on long-lead items	Additional required funding and purchase authority for long-lead items as needed
Design Review 2	May 2022	University on Site	Full initial design. Equivalent to preliminary design review	Additional required funding and full purchase authority.
Design Review 3	October 2022	University on Site	Full final design, equivalent to critical design review	Additional required funding and design approval; test plan approval
Satellite Fabrication Course	October 2022	University on Site	UNP will teach lab practices and hands-on fabrication skills	N/A
Pre-Integration Review	April 2023	University on Site	Fully functional engineering model (functional flatsat + test build)	Additional required funding and flight vehicle build
Pre-Ship Review	September 2023	University on Site	Fully functional flight model	Additional required funding and delivery to AFRL, environmental testing
Delivery to AFRL, environmental testing	September 2023	Kirtland AFB	In-person support for environmental testing at Kirtland AFB	Delivery to Arachne
Delivery to Arachne	January 2024	Kirtland AFB	Possible in-person support for integration to Arachne	Launch
Operations Readiness Review	~1 month prior to experiment	Virtual or at university	Operators trained, ground system tested and functioning	Commencing on-orbit experiment

5.2 DELIVERABLES

In addition to the actual CubeSat bus, the following are deliverables that will be expected from the university:

1. UNP required documents
    a. Delivered at each review throughout TI-1
2. EM of the EPS/CDH for testing with the payload
    a. Delivered before Pre-Integration Review
3. Experiment data and verification of completeness
    a. Delivered after successful downlink
4. CubeSat mass model for Arachne CSD integration and testing
    a. Delivered before Pre-Integration Review

The following will be delivered to the university:

1. Payload ICD/EM/FM
    a. Delivered by NRL following schedule in Section 3.6.2
2. Arachne CSD to CubeSat ICD
    b. Delivered at Kickoff by SSPIDR
3. List of UNP required deliverables
    c. Delivered at Kickoff by UNP

5.3 DESIGN LIFE EXPECTATIONS

It is expected that the design of the satellite bus, software, ground support equipment, and mission operations will span a period of 18 months following the schedule introduced in Section 5.1 (See Table 1). After this 18-month period, the satellite bus will be delivered to AFRL/RV (Kirtland AFB) for environmental testing and integration onto Arachne in preparation for launch. After launch and Arachne initial operations, it is expected that the university team will carry out mission operations of the CubeSat while it is on orbit following the mission operations plan created during the 18-month design period.

5.4 PROGRAM SYNOPSIS

TI-1 calls for a CubeSat bus to meet the specific dispenser, tumble, data handling, and payload hosting requirements contained within this RFP. The payload will be developed along the schedule in Section 3.6.2 and delivered to the university team building the CubeSat bus for integration. Development of the CubeSat bus will follow the schedule outlined in Section 5.1. Design, performance/verification testing, system integration, and flight readiness testing will occur before delivery. Delivery of the completed CubeSat bus will be to the Air Force Research Laboratory. The university retains full ownership of the CubeSat bus and integrated payload. Environmental testing and integration to deployer will occur on-site at AFRL/RV (Kirtland AFB) with the university development team supporting. Mission operations of the CubeSat will be the responsibility of the university team. Operations will be carried out following an operations plan created during the CubeSat design. Due to possible unforeseen delays in launch scheduling, it is possible the operations team may not include any of the original operations plan creators. Data downlinked during operations are under full ownership of the university. It is required that a full copy of the downlinked experiment data will be delivered to AFRL. Experiment data is all data supporting the mission objectives given in Section 3.2.

5.5 QUALITY MANAGEMENT

It is expected that design of the CubeSat bus, ground support equipment, and mission operations will be reviewed by UNP/SSPIDR appointed individuals. This will include review of deliverable documentation, design feasibility, and program timeline. In addition to periodic review, it is expected that the university team will maintain quality control of design document revisioning, test and verification documents, hardware tracking, software versioning, and assembly and process documentation. It is also expected that all flight hardware shall be maintained in a class 100,000 level or better facility as defined in FED-STD-209E.

5.6 TEST REQUIREMENTS/PERFORMANCE CRITERIA

Expectations are that the university team will test each subsystem whether purchased or manufactured in house. These tests shall include performance, operational, functional and verification tests. It is also expected that tests will be performed on all written software at the unit, integration, and stable release levels.

Several functional tests will be expected during integration, including day-in-the-life, complete charge cycle, end-to-end RF communications, and full command deck execution.

It is expected that all environmental tests will be performed at AFRL/RV (Kirtland AFB). This includes a separate thermal cycle test to ensure any related issues are caught early since CONOPS requires the CubeSat bus to remain on orbit for multiple months.

Several performance criteria will be expected to be met for acceptance of the space vehicle. These include executing and passing the five functional tests mentioned above as well as a simulated experiment Hardware in the Loop (HIL) test.

6. AWARD INFORMATION

It is anticipated that SDL will issue Fixed Price Level-of-Effort subcontract to the university. It is anticipated that the project will be funded throughout an 18-month timeframe following the schedule in Section 5.1. This will take the participating university through design, assembly, delivery, and operations of the satellite.

7. ELIGIBILITY

This opportunity is open only to, and full proposals are to be submitted only by, U.S. institutions of higher education (universities), including DoD institutions of higher education, with degree granting programs in science and/or engineering. Due to the nature of working closely with a DoD program, there will be information, hardware, and software that falls under ITAR. Therefore, eligibility will require the submitting university faculty leadership to be U.S. Persons as defined in 22 US Code § 6010.

8. APPLICATION AND SUBMISSION INFORMATION

This announcement may be accessed from the Internet at http://universitynanosat.org. See "Electronic Submission" in Section 8.1.2.

8.1 CONTENT AND FORMAT OF APPLICATION SUBMISSION

8.1.1 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 twenty (20) 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 20 page limit.

8.1.2 Electronic Submission

Proposals must be received in .pdf format at http://universitynanosat.org/solicitation by 4:00 PM, EDT, 1 October 2021.

Late proposals will **not** be considered for this project.

8.1.3 Contact Information

Please submit any comments or questions about the government reference design or the procedures for submission of a proposal, along with your contact information (name, university, email, phone number), to info@universitynanosat.org.

8.2 PROPOSAL OUTLINE

8.2.1 Abstract

Include a concise (not to exceed 500 words) abstract that describes the design, technical approach, anticipated outcome, and educational impact of the project. In the header of the abstract, include the principal investigator and name of university.

8.2.2 Project Overview

Clearly describe the proposed design, including the programmatic approach to ensuring the design is completed on time and within budget. Keeping in mind the evaluation criterion listed in this RFP, indicate how the proposed design will fulfill those criteria.

Clearly describe the design, 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.

8.2.3 Statement of Work

Describe the actual work that will be completed by the university team, including sub-system research, hardware acquisition, verification and performance testing, education and training, assembly and integration, mission operations design and analysis, and mission data delivery. Include this on one page entitled "Statement of Work." This section should not contain proprietary information.

8.2.4 Senior/Key Personnel Profile

The principal purpose of the requested information is for evaluation of the qualifications of those persons who will oversee the proposed design. For the principal investigator and each of the senior staff, provide a short biographical sketch and an abbreviated list of significant publications (vitae).

List the estimate of time that the principal investigator and other senior professional personnel will devote to the project. This shall include information pertaining to other commitments of time, such as sabbatical or extended leave; and proportion of time to be devoted to this project and to other projects/research. Awards may be terminated if the principal investigator severs connections with the proposing organization or is unable to continue active participation in the project. State the number of graduate students for whom each senior staff member is responsible. If the principal investigator or other key personnel are currently engaged in projects/research under other auspices, or expect to receive support from other agencies for this project during the time proposed for this effort, state the title of the other projects/research, the proportion of time to be devoted to it, the amount of support, name of agency, dates, etc. Send any changes in this information as soon as they are known.

8.2.5 Facilities

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

8.2.6 Equipment

List special test equipment or other property required to perform the proposed project.

Segregate items to be acquired with award funds from those to be furnished by the Government. When possible and practicable, give a description or title and estimated cost of each item. When information on individual items is unknown or not available, group the items by class and estimate the values. In addition, state why it is necessary to acquire the property.

Justify the need for each equipment item. Additional facilities and equipment will not be provided. Include the proposed life expectancy of the equipment and whether it will be integrated with a larger assemblage of apparatus. If so, state who owns the existing apparatus and who would own the equipment integrated into such larger assemblage or apparatus.

8.2.7 Budget Request

Estimate the total project cost. Categorize funds by year and provide separate annual budgets for the project. The budget proposal should include a budget justification for the entire expected 18-months, clearly explaining the need for each item. Keep in mind this is an estimate, additional funding can be requested with a refined budget at each review in the schedule found in Section 5.1.

8.2.8 Milestone Schedule

Provide a project milestone schedule over the 18-month period of performance that aligns with the projected program schedule contained in the program overview section of this RFP.

9. APPLICATION REVIEW

9.1 EVALUATION CRITERIA

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

1. Technical simplicity and programmatic viability of the proposed design. Including cost, timeframe, and developmental complexity
2. How well it meets the operational and mission design requirements stated in the RFP
3. Educational impact (both undergraduate and/or graduate) of the project

Other evaluation criteria used in the technical reviews, which are of lesser importance than the principal selection criteria are:

1. Experience of key personnel, including the design and operations team

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

9.2 REVIEW AND SELECTION

Proposals submitted under this announcement will be evaluated by a review process involving personnel at SDL, NRL, AFRL, AFOSR, and/or by outside evaluators retained by AFRL or AFOSR. Employees of commercial firms under contract to the Government may be used to review 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, NRL, AFRL and from external entities after consideration of the recommendation of the reviews.

9.3 AWARD NOTICES

Should your proposal be selected for award, the principal investigator 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.

10. DELIVERABLES

The following reports are required: annual and final technical reports, financial reports, and final patent reports. Copies of publications and presentations should be submitted.

The University Nanosatellite Program will guide the university team through the satellite analysis, design and build process according to the Milestone Schedule in Section 5.1. Appropriate satellite design deliverables packages are associated with each of these major reviews and are included in Section 5.2.