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Broad Agency Announcement NNA12ZD0001K

BROAD AGENCY ANNOUNCEMENT

EDISON SMALL SATELLITE FLIGHT DEMONSTRATION MISSIONS

OFFICE OF THE CHIEF TECHNOLOGIST

EXECUTIVE SUMMARIES DUE
March 4, 2012

PROPOSALS DUE
May 20, 2012

Issued: February 2, 2012

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AMES RESEARCH CENTER

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INTRODUCTION

The National Aeronautics and Space Administration's (NASA) Office of the Chief Technologist (OCT) within its Space Technology Program has established the Edison Small Satellite Flight Demonstration Program (Edison) to accelerate the development of small spacecraft capabilities for NASA, commercial, and other space sector users. The objectives of the Edison Program are to:

- Identify candidate small spacecraft technologies with game-changing and/or crosscutting potential and validate these technologies via spaceflight;

- Regularly and affordably demonstrate these and other small spacecraft technologies in the space environment;

- Improve or create new small spacecraft capabilities for lower cost and/or advanced satellite communication, remote observation, space physics, and other applications; and

- Demonstrate new small spacecraft capabilities that constitute new satellite and spacecraft applications and architectures.

As a secondary objective, Edison missions are intended to provide key technology and capability investments that incubate and enhance the market for small spacecraft. Considering the current high costs for access to space, NASA and the OCT Space Technology Program (STP) views the maturation and the move towards using smaller spacecraft to perform future science, exploration and commercial space missions as a the key driving approach to improved affordability and an expansion of the market. Their small size means that they are less expensive to build and launch, offering the potential, both to improve the affordability of future missions, and to create science,

exploration and commercial missions never before possible. Lowering the threshold for accessing space, further allows NASA to engage the next generation of technologists and scientists, as well as the expanding small-space community, including small businesses and university researchers. Under this view, a long-term goal of the Edison program is to create a vibrant and robust small spacecraft business environment and industry.

This announcement solicits proposals for the flight validation of new small spacecraft technologies and capabilities. Under this program, NASA intends to enter into agreements with private industry, academia, and/or federal laboratories to conduct these demonstration flights. Once demonstrated, or flight validated, it is expected that these technologies and capabilities will be infused into missions for NASA, other government agencies or US commercial space enterprises. A major requirement for successful proposals to this solicitation is a compelling infusion strategy that ensures that the proposed technology will find active utility after the completion of the flight demonstration mission.

This solicitation constitutes a Broad Agency Announcement (BAA) as contemplated by Federal Acquisition Regulation (FAR) 35 and the NASA FAR Supplement (NFS) 1835 (both are available at http://prod.nais.nasa.gov/far/ . The types of award instruments expected to result from this BAA are stated in Section II.

NASA reserves the right to select for award all, some, or none of the proposals in response to this announcement. NASA provides no funding for reimbursement of proposal development costs. Technical and cost proposals (or any other material) submitted in response to this BAA will not be returned.

NASA's safety policy prioritizes safety to protect: (1) the public, (2) astronauts and pilots, (3) the NASA workforce (including contractor employees working on NASA contracts), and (4) high-value equipment and property. NFS 1852.223-70 defines safety as the freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

I. PROGRAM STRUCTURE

1. Approach: This BAA is soliciting proposals, via a two-step process, for the Edison Small Satellite Flight Demonstration Program. The first step includes submission of Executive Summaries for small spacecraft missions and concepts, as described in Section IV, Executive Summary and Proposal Information. Following the review of Executive Summaries, the second step is an invitation from NASA to submit full proposals based on the instructions in Section IV.

The small spacecraft demonstration missions under the Edison Program are intended to flight-validate mission capabilities or small spacecraft subsystem technologies with game-changing and/or crosscutting potential and mature them from a Technology Readiness Level (TRL) of 5 or 6 to TRL of 7 or above. Appendix A provides

definitions for NASA's Technology Readiness Levels. Game-changing technologies are defined as subsystems or mission capabilities that are a major advance over the current state-of-the-art, or that represent the creation of a previously non-existent small spacecraft capability. Crosscutting technologies are defined as subsystems or mission capabilities with applicability to more than one potential small spacecraft user, including NASA Mission Directorates or other civil, commercial, and/or national security users. Appendix B lists the technology focus areas for crosscutting small spacecraft subsystem technologies and mission capabilities requiring flight-validation for which NASA is currently interested in receiving Edison Program proposals.

NASA anticipates that these Edison small spacecraft demonstration missions will be launched as secondary payloads or hosted payloads with other spacecraft missions, but may eventually include dedicated launches as primary payloads on very small launch vehicles, if and when these launch vehicles come into existence. Proposers may request NASA's assistance in securing a Government-furnished launch or hosted payload opportunity. Appendix C lists typical orbits, interfaces, and accommodations for Government-furnished secondary launch and hosted payload capabilities. Proposers may also propose their own primary or secondary launch accommodations, or hosted payload capability. Additional information about the Edison Program eligibility and proposals can be found in Sections III and IV.

2. Schedule and Funding

Under the Edison Program, NASA anticipates two types of demonstration missions: Subsystem Flight Validation (SFV) missions and Mission Capability Demonstrations (MCDs).

SFV missions take advantage of the accessibility and affordability of small spacecraft to rapidly flight-validate novel small spacecraft subsystems without necessarily attempting to demonstrate an overall mission capability. MCDs advance the state-of-the-art capabilities in small spacecraft, demonstrating how small spacecraft can be used to perform more capable or less costly missions than larger spacecraft or even to create new mission capabilities. Appendix B provides more details on the focus areas for this solicitation for flight validation missions and mission capability demonstrations.

Subsystem Flight Validation missions under the Edison Program are limited to those that can complete design, development, test, and evaluation phases in two years or less, before the launch, flight operations and data analysis phase. A review is required at the end of the design phase for authority to proceed to the development, test and evaluation phase. A second review is required at the end of the development, test and evaluation phase for authority to proceed to the launch and operations phase. Total NASA funding for all phases of any SFV project under the Edison Program, from design through launch and operations, is limited to a maximum of $10 million. SFV mission proposals that require less than $10 million are highly encouraged.

MCDs under the Edison Program are limited to three years for design, development, test, and evaluation before launch, operations and data analysis. A review is required at the end of the design phase for authority to proceed to the development, test and evaluation phase. A second review is required at the end of the development, test and evaluation phase for authority to proceed to the launch and operations phase. Total NASA funding for all phases of any MCD project under the Edison Program is limited to a maximum of $15 million. MCD mission proposals that require less than $15 million are highly encouraged.

One or more Edison missions may be selected if they can be accommodated within the funding available for Edison Program activities in FY 2012 and beyond.

Proposers may propose, or NASA may require, additional authority-to-proceed milestones. Proposers should propose their desired funding phasing, but proposers may need to re-plan during negotiations if NASA is not able to accommodate, or does not agree with the proposed phasing.

II. GENERAL INFORMATION

1. **Agency Name:** NASA, Office of the Chief Technologist (OCT)

2. **Research Opportunity Title:** Edison Small Satellite Flight Demonstration Missions

4. **Program Name:** NASA Edison Small Satellite Flight Demonstration Missions Program

5. **Key Dates:**

a)	Release Date:	February 2, 2012
b)	Executive Summaries Due:	March 4, 2012, 11:59 PM EST
c)	Letters to proposers:	March 30, 2012 (TARGET)
d)	Proposals Due:	May 20, 2012, 11:59 PM EST (TARGET)
e)	Selection Date:	July 2012 (TARGET)
f)	Award Date:	September 2012 (TARGET)

6. **Selecting Official:** Michael Gazarik, Director of Space Technology Programs

7. **Points of Contact:**

   All questions shall be directed to the cognizant NASA Contracting Officer as specified below. All questions shall be submitted by email only within fourteen days of BAA release. Questions and responses will be posted on the web by an amendment to the BAA at http://nspires.nasaprs.com/. Inquiries by telephone or in person will not be accepted.

POC: Rachel Khattab
Email: rachel.khattab@nasa.gov

8. Types of Instruments That May Be Awarded:

Offerors may propose either a Firm Fixed Price (FFP) or Cost Plus Fixed Fee (CPFF) (or no fee) contract in response to this solicitation**.** However, only one type of contract vehicle may be proposed. Offerors proposing a cost-reimbursement contract must have an accounting system capable of accurately collecting, segregating and recording costs by contract, normally demonstrated through a Government audit or review. All Edison contract(s) will have a base period from the Authority to Proceed (ATP) through the Preliminary Design Review (PDR) or equivalent, with a separate contract option for development, test and evaluation, and a final option for launch, operations and data analysis. The decision on whether to exercise an option will take into account contractor performance to date, NASA priorities and available funding.

An appropriate interagency or intra-agency agreement will be used for awardees of Federal entities.

Award is contingent upon successful negotiation of an acceptable contract vehicle after selection.

9. Additional Information:

a) The government's ability to make awards is contingent upon the availability of appropriated funds.

b) NASA will not issue paper copies of this announcement. Technical and cost proposals or any other material submitted in response to this BAA will not be returned.

c) Use and Disclosure of Proposal Information: Except as provided below, information contained in proposals will be used for evaluation purposes only. In order to maximize protection of trade secrets or other information that is confidential or privileged, proposers should identify such information in their proposals using restrictive notices. In any event, information contained in proposals will be protected to the extent permitted by law.

d) Offerors should be aware of two related Space Technology programs, but should note that these are outside the scope of this BAA. Proposing on more than one of these Space Technology Programs simultaneously (or with overlapping timeframes) is permitted, provided the proposed efforts are appropriate for the

targeted programs and the proposer can carry out all proposed efforts, if selected.

The Technology Demonstration Mission (TDM) Program within the Space Technology, Crosscutting Capability Demonstrations Division develops and conducts space technology demonstrations with game-changing and crosscutting potential for the government and commercial sectors. Technology maturation is from TRL 5 to TRL 7.

The Game Changing Development (GCD) Program within the Space Technology Program, Game Changing Division develops technologies and capabilities that radically change how future aerospace missions are carried out, or even conceived. This program will have focused project areas to rapidly develop technologies from TRL 3-4 to 5 or 6.

e) Additional information about all OCT programs is available on the OCT website at http://www.nasa.gov/oct.

f) NASA Mission Directorate Points of Contact for discussions concerning technology demonstration missions of interest to the Mission Directorates and for discussions concerning cost contribution opportunities are listed below.

Aeronautics Research Mission Directorate:
Anthony Strazisar
anthony.j.strazisar@nasa.gov
(216) 433-5881

Human Exploration and Operations Mission Directorate:
Jason Crusan
jason.crusan@nasa.gov
(202) 358-0635

Science Mission Directorate:
Mike Moore
michael.r.moore@nasa.gov
(202) 358-2408

g) The NASA Procurement Ombudsman Program is available under this solicitation as a procedure for addressing concerns and disagreements. The clause at NASA FAR Supplement (NFS) 1852.215-84 (“Ombudsman”) is incorporated into this solicitation. The cognizant ombudsman is: Deborah L. Feng, NASA Ames Research Center, M/S 200-9, Moffett Field, CA 94035-0001,

telephone (650)604-0256, email: Deborah.L.Feng@nasa.gov.

h) Protests to NASA/Service of Protests: Offerors may submit a protest under 48 CFR Part 33 (FAR Part 33) directly to the Contracting Officer (CO). As an alternative to the CO's consideration of a protest, a potential offeror may submit the protest to the Assistant Administrator for Procurement, who will serve as or designate the official responsible for conducting an independent review. Protests requesting an independent review shall be addressed to Assistant Administrator for Procurement, NASA Office of Procurement, Washington, DC 20546-0001. Protests, as defined in section 33.101 of the FAR, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served to the CO (addressed as follows) by obtaining written and dated acknowledgment of receipt from Rachel Khattab, Contracting Officer, M/S 241-1, NASA/ARC, Moffett Field, CA 94035-0001. The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

III. ELIGIBILITY INFORMATION

1. Prospective offerors from any category of U.S. organizations or institutions are welcome to respond to this solicitation. Competition is full and open. Specific categories of organizations and institutions that may respond include, but are not limited to, educational, industrial**,** and not-for-profit organizations, Federally Funded Research and Development Centers (FFRDCs), University Affiliated Research Centers (UARCs), NASA Centers, and other government agencies. Small businesses, universities, including Historically Black Colleges and Universities (HBCUs) and Other Minority Institutions (OMIs), small disadvantaged businesses (SDBs), veteran-owned small businesses, service disabled veteran-owned small businesses, HUBZone small businesses, and women-owned small businesses (WOSBs) are also encouraged to participate. Proposals are welcome from partnership combinations from any of the above categories.

Federally Funded Research and Development Centers (FFRDCs) must provide a letter on letterhead from their sponsoring organization citing the specific authority establishing their eligibility to propose to government solicitations and compete with industry, and compliance with the associated FFRDC sponsor agreement and terms and conditions. This information is required for FFRDCs proposing to be prime or subcontractors.

2. Participation by non-U.S. organizations in this program is welcome, but subject to NASA's policy on no exchange of funds. Foreign proposals or U.S. proposals with foreign participation shall be processed in accordance with NFS 1835.016-70. In addition, the following guidelines are applicable

to foreign proposers.

a. Teaming by non-U.S. organizations in proposed efforts is permitted but subject to NASA's policy on foreign participation. NFS 1835.016-70, foreign participation under Broad Agency Announcements (BAAs), provides policy and guidelines for foreign participation in this activity. NASA's policy is to conduct research with foreign entities on a cooperative, no-exchange-of-funds basis (see NASA Policy Directive (NPD) 1360.2, Initiation and Development of International Cooperation in Space and Aeronautics Programs). NASA does not fund foreign research proposals or foreign research efforts that are part of U.S. research proposals and will not do so pursuant to this announcement (further information on foreign participation is provided in Section 1.6 of the NASA NRA and CAN Guidebook for Proposers at http://www.hq.nasa.gov/office/procurement/nraguidebook/).

b. Should a U.S proposal with foreign participation be selected, NASA's Office of International and Interagency Relations will arrange with the sponsoring foreign agency or funding/sponsoring institution for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency or funding/sponsoring institution will each bear the cost of discharging their respective responsibilities.

c. Restrictions involving China. Proposals must not include bilateral participation, collaboration, or coordination with China or any Chinese-owned company or entity, whether funded or performed under a no-exchange-of-funds arrangement. In accordance with Public Law 112-55, Section 539(a), NASA is restricted from funding any NASA contract, grant, or cooperative agreement action (including new awards and continuing awards) that involves the bilateral participation, collaboration, or coordination with China or any Chinese-owned company or entity, whether funded or performed under a no-exchange-of-funds arrangement. Proposals involving bilateral participation, collaboration, or coordination in any way with China or any Chinese-owned company, whether funded or performed under a no-exchange-of-funds arrangement, may be ineligible for award.

d. Proposals that require procurement of launch services from foreign launch vehicles in order to access space will not be considered for funding.

e. Any Space Act Agreements to be awarded to Foreign Institutions will be processed in accordance with NPD 1050.1I.

IV. EXECUTIVE SUMMARY AND PROPOSAL INFORMATION

This solicitation is structured in two steps. Step 1 requires the submission of an Executive Summary and Step 2 requires the submission of a full Proposal. All Executive Summaries that are received by the deadline and comply with instructions and format will be reviewed. An offeror will not proceed to Step 2 if an Executive Summary does not meet the requirements below and those offerors will be notified by letter. If an Executive Summary meets the requirements below, the offeror will receive a letter of invitation to submit a full Proposal for Step 2.

Only those offerors receiving a letter of invitation based on the review of the Executive Summary can submit a Proposal. NASA expects this process will prevent unproductive proposal preparation for flight demonstration missions that are unsuitable for funding under this particular BAA. All invited proposals received by the deadline and meeting format, structure, and content requirements will be reviewed and evaluated. Acceptance of an Executive Summary and an invitation to submit a Proposal is not an assurance that the proposal will be selected for an award.

As detailed in Appendix D, all Executive Summaries and Proposals shall be submitted by electronic means, and only via the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) at: http://nspires.nasaprs.com/external/

All proposers must register at the NSPIRES website prior to submittal of the Executive Summary. Early registration is encouraged.

Notices of Intent are not requested and will not be reviewed.

Step 1: Executive Summary Content and Instructions

The Executive Summary shall include a title page and a narrative description of the proposed concept.

The Title Page must include: project title; proposer's name, organizational affiliation, telephone number, email address, and mailing address; the names of any partner organizations and their mailing addresses; the type of mission (Subsystem Flight Validation or Mission Capability Demonstration); and the Technology Focus Area(s) addressed by the proposal.

The narrative shall explain the demonstration mission and operations concept and describe the capability and/or subsystem technology to be demonstrated. It should describe the spacecraft mass and size, the associated ground systems, proposed launch vehicle (if known), orbit requirements, minimum mission duration, and any other special features of the concept. All text must be 12-point font or larger. Graphics and illustrations may be included but any labels or text included in

illustrations must be 12-point font or larger.

The Executive Summary must provide an explanation of how the proposed demonstration mission will satisfy each of the requirements listed below. If an Executive Summary does not contain an explanation of how the proposed project would meet all of these requirements, the offeror will not be invited to proceed to Step 2.

a. The concept is a flight demonstration project as opposed to a ground demonstration or other type of technology development effort.

b. The project involves the demonstration of a new spacecraft capability or substantial improvement in the performance, affordability, reliability, or utility of an existing spacecraft subsystem as opposed to an incremental improvement of an existing subsystem.

c. The demonstration mission relates to one or more capabilities or subsystems for small spacecraft (spacecraft mass less than 180 kg) and employs a small spacecraft or hosted payload for the demonstration mission, as opposed to larger spacecraft or other systems.

d. The project addresses at least one of the three Technology Focus Areas listed in Appendix B.

e. The project does not duplicate the work in any other known projects by the US government or private space enterprises.

f. The project can be accomplished within a total cost to the Edison Program of not more than $10 million for Subsystem Flight Validation missions or $15 million for Mission Capability Demonstration missions, based on the proposer's preliminary cost estimate. This cost <u>includes</u> launch, flight operations and post-mission analysis.

g. The project can be accomplished in no more than two years for Subsystem Flight Validation missions or no more than 3 years for Mission Capability Demonstration missions, based on the proposer's preliminary estimate. This duration <u>does not include</u> launch, flight operations and post-mission analysis.

h. The proposed capability or subsystem technology to be demonstrated will be at a Technology Readiness Level (TRL) of at least 5 at the beginning of the project. (See TRL definitions in Appendix A.)

i. The proposed capability or subsystem technology to be demonstrated can reasonably be expected to advance to a TRL of at least 7 by the completion of the project.

Executive Summary Page Limitations

Executive Summaries shall be no more than five pages (8.5 x 11 inch, with one inch margins on all sides), consisting of one title page and no more that four pages of narrative including graphics. No additional materials will be reviewed. References to electronic media or websites will not be reviewed.

Step 2: Proposal Format and Content

1. **Proposal Submittal and Organization.**

   Submitted proposals shall be single spaced, using 12-point font on white 21.6 x 28 cm (8.5 x 11 inch) background, in single or double columns with at least 1-inch left, right, top, and bottom margins. References to electronic media or websites will not be considered in the evaluation.

   Proposers are required to use the International System of Units (SI) per NASA Policy Directive NPD 8010.2, Use of the Metric System of Measurements in NASA Programs, with English unit equivalents in parentheses.

   Proposals shall be organized into three (3) parts as shown below.

   Part I Technical Concept
   Part II Technical Approach
   Part III Project Plan

2. **Part I: Technical Concept.**

   The proposer shall provide an overview of the technical concept including a summary of capabilities or technologies that will be demonstrated, how they will be measured or assessed, their respective physical characteristics, and how the achievement of the proposed objectives will result in the advancement of small spacecraft technologies and overall utility. In the case of a MCD, the proposer should provide a basis for why the demonstration mission, if executed as planned, will advance small spacecraft technologies and usefulness as research and exploration platforms or components. For SFV demonstrations, provide a rationale on why spaceflight is required to advance the maturity of the proposed subsystem technologies, and how the expected results of the demonstration will be used as validation metrics for the subsystems being demonstrated.

   This section the proposal should also describe:

Infusion Strategy The infusion strategy includes the identification of potential infusion customer or stakeholders, the level of commitment of these customers subsequent to a successful demonstration, and the proposed process for migrating the technology to an operational application. Endorsement or commitment letters from potential infusion customers regarding the post-demonstration use of the technology are encouraged.

Relevance This subtopic addresses the potential impact of the proposed demonstration on NASA mission capabilities. Quantify how the technology would enhance technical performance, improve mission affordability, increase mission reliability and/or extend mission utility for future missions relative to current state-of the art systems. Describe the concept's effectiveness in increasing the capability or potential of small spacecraft or the small spacecraft industry. Also indicate its alignment with NASA technology roadmaps and NASA technology grand challenges. Information on NASA's Technology Areas may be found at:
http://www.nasa.gov/offices/oct/home/roadmaps/index.html.

Uniqueness This includes a description of how the technology is revolutionary or transformational as opposed to incremental or evolutionary. The proposed concept should offer either entirely new small spacecraft capabilities or substantial improvements in the performance or capabilities of existing systems. Describe the transformational / revolutionary nature of the technology and how it would enable entirely new capabilities or missions. The proposed technologies, subsystems, or capabilities for validation should also not duplicate past or ongoing small spacecraft efforts elsewhere in the Government or space sector.

Appropriateness Discuss how the proposed demonstration is within scope for this solicitation in terms of budget and schedule limitations, applicability to small spacecraft, and how it is accomplished through a rideshare, secondary payload, or hosted payload launch opportunity. Discuss the proposed concept's responsiveness to the Technology Focus Areas for this BAA, described in Appendix B. Demonstrate that the technology is at an appropriate entrance TRL (5-6) and will mature adequately to a TRL of 7 or better at the end of the flight demonstration.

3. **Part II: Technical Approach**

The proposer shall describe the proposed design, development, analysis, testing and evaluation; and launch and operations approach, including manufacturing, integration and/or test facilities, and mission operations capabilities required to execute the project. Provide a mission plan and concept of operations describing all major mission elements, including spacecraft bus, secondary or hosted payload accommodation, launch vehicle

(if known) or host spacecraft (if applicable), orbit parameters, the mission sequence of events including mission operations, and data reduction phases.

The proposer shall provide a top-level risk assessment for the proposed concept and approach.

4. **Part III: Project Plan**

   a. Management Approach. State the methods, organizations, and processes that will be employed to implement the project/mission. Define project milestones and reviews and describe the criteria for proceeding from the design phase to the development, test and evaluation phase; from the development, test, and evaluation phase to the launch and operations phase; and the in-space test, operations and evaluation success criteria. Identify roles and responsibilities, outside or external contributors, the proposed project management structure, and discuss which systems engineering processes will be employed in support of the project. Include a Statement of Work (SOW) that clearly details the scope and objectives of the effort, including subcontracted activities and partner contributions, if any, as well as contract deliverables. A SOW is required for all proposals, including those submitted by Governmental organizations. Modifications to the SOW may be negotiated after selection and will be incorporated into the resultant award instrument. Describe the value proposition offered by the proposed effort, examining the relative project costs versus the projected benefits.

   b. Schedule Provide a project summary schedule that includes major decision or review points, design, development, test, and evaluation phases, and expected launch readiness date. The schedule should indicate schedule dependencies, a critical path and schedule margins, and should be consistent with the proposed budget.

   c. Cost Proposal and Basis of Cost Estimate.

   The Cost Plan shall provide information on the estimated lifecycle costs for the technology system demonstration. Cost information shall be provided in sufficient detail to enable a fair and reasonable assessment of the total cost attributable to the technology system demonstration. The Cost Plan is not included in the proposal page limit. The Cost Plan shall consist of detailed cost data to Work Breakdown Structure (WBS) Level 3 for the development phase through the completion of the system level demonstration and final report.

   Cost contribution from a source other than the NASA Space Technology Program is highly desired and strongly encouraged for Edison projects. Cost contributions can be through in-kind contributions and/or funding

provided after contract award. A signed, dated Letter of Commitment shall be provided from source(s) funding or in-kind contributions outside of the NASA Space Technology Program.

See Table 1-1 for the cost elements template and Appendix E for more detailed instructions. Additional cost charts and tables may be used at the proposer's discretion to illustrate the proposal's cost reasonableness. All costs shall be in U.S. real-year dollars. Real-year dollars are current fiscal year (FY) dollars adjusted to account for inflation in future years. The cost plan shall provide data by U.S. Government FY (October 1 − September 30).

Life cycle costs include all phases of the demonstration mission: planning, hardware development, software development, launch costs, operations, closeout, and disposal.

Proposals shall provide NASA civil service labor estimates in full time equivalent (FTE) terms only and not the priced labor dollars ($). HQ/OCT will use a standard factor to convert NASA FTEs to dollars. As such, NASA FTE requirements are part of the cost evaluation, but are normalized with standardized labor pricing to support evaluation of work requirements.

To ensure proposals are within the Edison Program funding for life cycle costs, NASA Centers should contact the appropriate Center authority for the rate, which will be used for evaluation. NASA civil servant labor costs shall not be included on the NSPIRES cover page. Any non-NASA Federal Government elements of proposals, including the cost of civil service labor, must follow their agency cost accounting standards for full cost, and these costs must be included in the cost plan. If no standards are in effect, the proposers must then follow the Managerial Cost Accounting Standards for the Federal Government as recommended by the Federal Accounting Standards Advisory Board.

Table 1-1 shown below must be used at a minimum to report the cost data described above. Additional methods/tables may be supplied in order to clearly illustrate the cost elements of the proposal. The single biggest item that reduces cost risk is a complete and detailed basis of estimate, including complete cost model input data, vendor quotes, comparisons to similar analogous work, etc.

Cost Table Instructions (See also Appendix E for more details)

Project Phases. The contract base period is defined as the period from contract award to project preliminary design review - PDR (or equivalent milestone). Option 1 is defined from the PDR (or equivalent) to include the development and test phases up until flight

readiness review – FRR (or equivalent). The final option is from FRR (or equivalent) through launch and mission operations and project conclusion.

The Summary of Cost and Basis of Estimate should contain the following direct and indirect elements, as applicable:

DIRECT LABOR HOURS – Show productive hours by individual skill categories

NASA CIVIL SERVICE (CS) LABOR (if applicable) – Show the quantity of civil servant work years (FTEs)

DIRECT LABOR COSTS – The labor costs should be itemized by skill categories. The basis for the rates should be described.

LABOR OVERHEAD – Overhead should be itemized by overhead cost centers (engineering, manufacturing, etc.) as well as by associated rates.

SUBCONTRACTS – Fully identify each effort to be subcontracted, and list the selected or potential subcontractors, locations, amount budgeted/proposed, and types of contracts to be employed. Complete cost/price information is required for all major subcontracts greater than $500,000.

MATERIALS – Complete cost/price information is required for all materials proposed for purchase and equipment over $5,000.

MATERIAL BURDEN RATES - Burden rates must be identified.

TRAVEL – Provide supporting details for destination, purpose, number of people per trip, transportation costs, per diem costs, and miscellaneous costs.

OTHER DIRECT COSTS - List all costs not otherwise included and provide bases for pricing.

GENERAL AND ADMINISTRATIVE (G&A) EXPENSE – G&A expense represents the institution's general and executive offices and other miscellaneous expenses related to business. G&A expense should be itemized by cost pool, and rates should be documented.

COST OF MONEY (COM) – COM represents interest on borrowed funds invested in facilities. COM should be itemized by indirect pools and overhead centers. Rates should be documented.

PROFIT/FEE – Document the basis, rate, and amount of profit/fee.

PROPOSAL COST/PRICE – Total for all items above.

USE OF GOVERNMENT FACILITIES – Estimate the cost of the use of Government testing, integration and evaluation facilities or services. These costs must be included in the total project cost, although the transfer of funds will be made either through an internal NASA transfer or an Interagency Acquisition. If the offeror intends to use non-Government facilities, include the costs with the other elements as appropriate.

LAUNCH/LAUNCH SERVICES – If launch services are to be provided by NASA or another Government agency, estimate the costs here. If launch services are to be provided by the proposer or a commercial entity, include the costs with the other elements as appropriate.

SPONSORED FUNDING FROM NASA MISSION DIRECTORATES (if applicable)

CONTRIBUTIONS FROM NON-NASA SOURCES (if applicable) – See Appendix F

TOTAL PROJECT COST – Total of all items above.

Table 1-1 Cost Data Template

	FY12			FY13			FY14			FY15		
Element	Hours	Rate	Cost	Hours	Rate	Cost	Hours	Rate	Cost	Hours	Rate	Cost
Base Period												
Direct Labor												
NASA CS Labor												
Labor O/H												
Subcontracts												
Materials												
Material Burden												
Travel												
Other Direct Costs												
G&A												
COM												
Fee/Profit												
Total Base Cost/Price												
Option 1												
Direct Labor												
NASA CS Labor												
Labor O/H												
Subcontracts												

Materials												
Material Burden												
Travel												
Other Direct Costs												
G&A												
COM												
Fee/Profit												
Total Option 1 Cost/Price												
Option 2												
Direct Labor												
NASA CS Labor												
Labor O/H												
Subcontracts												
Materials												
Material Burden												
Travel												
Other Direct Costs												
G&A												
COM												
Fee/Profit												
Total Option 2 Cost/Price												
Use of Gov't Facilities (if applicable)												
Gov't Launch/Launch Services (if applicable)												
Sponsored funding from NASA Mission Directorates (if applicable)												
Non-NASA Contributions (if applicable)												
Total Project Cost/Price												

Offerors must use the following WBS template to report the various cost elements of the proposed flight demonstration mission. Where a certain WBS

element is not applicable, provide justification for the exclusion or modification of that WBS element.

WBS #	WBS Element
1.0	Project Management
2.0	Systems Engineering
3.0	Safety and Mission Assurance
4.0	Technology(s) and Payload(s)
5.0	Spacecraft
6.0	Mission Operations
7.0	Launch Vehicle Services
8.0	Ground Systems
9.0	Integration and Test

Submission of cost or pricing data, as defined in FAR 15.401, is required if the proposal exceeds $700,000, in accordance with FAR 15.406-2. The offeror shall acknowledge that the cost plan submitted in response to the BAA is for proposal evaluation and selection purposes, and that following selection and during negotiations leading to a definitive contract, the offeror may be required to resubmit or execute all certifications and representations required by law and regulation. The final negotiated cost plan shall be incorporated into the resulting contract.

The Cost/Price Plan must be submitted in PDF format in NSPIRES; however, submittal of the Cost/Price Plan in Excel is also requested, with calculations formulae intact to allow traceability of the cost proposal numbers across the prime and subcontractors. If the PDF submission differs from the Excel submission, the PDF will take precedence. The Excel file must be submitted on a compact disk, no later than the proposal due date in NSPIRES, to the Contracting Officer: Rachel Khattab, NASA Ames Research Center, M/S 241-1, Bldg 241, room 212 (for delivery), Moffett Field, CA 94035-0001. Excel files must be fully readable on a PC computer and will not be returned.

d. Key Personnel. Provide information regarding the qualifications, capabilities and experience of the proposed key personnel (the use of resumes is encouraged). Resumes are not included in the proposal page count but are limited to no more than 2 pages per key individual. Key personnel are those skilled, experienced, professional and technical personnel essential for successful accomplishment of the proposal objectives, such as the project manager, system engineer, team leader, etc.

e. Past Performance of Offeror's Team. Provide recent (within the past three (3) years) relevant past performance information for previous work or experience in the field being proposed for both the offeror and any

subcontractors or partners over $100,000. For each contract and subcontract, provide the following:

- Contract Number
- Name of Contracting Agency
- Program Manager (or point of contact familiar with performance) and Telephone Number
- Contracting Officer and Telephone Number
- Synopsis of Work Performed
- Contract Type
- Total Contract Value

f. Proposed Government-Furnished Equipment or Facilities (If Applicable). Proposers are expected to provide all facilities, equipment, laboratories, and/or real property necessary for the performance of the proposed effort. The proposed use of Government furnished equipment or Government owned facilities, other than integration, test and experiment facilities, must be included in the Offeror's proposal and approved in advance by the cognizant Government official.

g. Proposed Launch Accommodations or Host Spacecraft. Identify, as specifically as possible, the orbital/launch requirement(s) or hosted payload opportunity for the proposed Edison mission, including orbital altitude, inclination or other parameters, secondary or hosted payload accommodation, adaptor(s) required, associated costs for each, and launch readiness date (if known). Appendix C provides a list of typical orbits and accommodations for potential Government-furnished secondary and hosted payload opportunities that may be of interest to Edison proposers.

h. Small and Small Disadvantaged Business Subcontracting

a. Offerors are advised that NASA is subject to statutory goals to allocate a fair portion of its contract dollars to small businesses and subcategories of small businesses as defined in 52.219-8 and 52.226-2 of the FAR, including Small Disadvantaged Business concerns (SDBs), Women owned Small Businesses (WOSBs), Service Disabled Veteran owned small businesses (SDVOSB), Historically Black Colleges and Universities (HBCUs), and Other Minority Institutions (OMIs). Offerors are encouraged to assist NASA in achieving these goals by using best efforts to involve these entities as subcontractors to the fullest extent consistent with efficient performance of their missions.

b. Offerors are advised that, by law, FAR clause 52.219-9 applies to NASA prime contracts with organizations other than small business concerns (including non-profit organizations and universities) that

offer subcontracting possibilities and exceed $650,000. Accordingly, offerors proposing to receive contracts that exceed $650,000 are required to submit a small business subcontracting plan with all of the elements listed in FAR 19.704. This plan shall be submitted with the proposal, and is subject to negotiation after selection. It is not included in the proposal page count. Failure to submit an acceptable plan will make the offeror ineligible for award.

c. Acceptable plans will address the participation goals and quality and level of work performed by small business concerns overall, as well as that performed by the various categories of small business concerns listed in FAR 52.219-9.

i. Safety and Health Plan In accordance with NFS 1823.7001, an acceptable Safety and Health Plan will be required for incorporation into any resulting award. The plan shall meet the requirements of NFS 1852.223-70 and shall be requested after selection but prior to award. It should not be submitted with the proposal.

Proposal Page Limitations

The proposal page limitations are as follows:

Edison proposals shall not exceed 25 pages in length, except for items specifically identified as not included in the page count listed below:

A. Cost plan data, as specified in Section IV, Step 2, part 4c, and Appendix E. Cost information provided should be limited only to exhibits and data essential to meet the BAA requirements.
B. Resumes of Key Personnel. Limit of two (2) pages per individual.
C. Past Performance of Offeror's Team. Limit of 5 pages total.
D. Letters of Commitment from external collaborators or contributors.
E. Government Furnished Equipment Plans and Approvals (if applicable)
F. Small Business Subcontracting Plan (if applicable)

Note: Information included in the pages not subject to the page limitation will only be considered if it is the requested information for those pages. For example, technical approach details included in the Letters of Commitment or Cost Plan will not be evaluated.

Proposal Evaluation Criteria

Proposals will be evaluated using the criteria listed below:

I. Technical Concept

Concepts will be assessed to ensure their overall compatibility with the Edison Small Spacecraft Demonstration Program in general, and this solicitation specifically. The evaluation of the Technical Concept will include the following four factors.

Infusion Strategy NASA will evaluate the strength and thoroughness of the proposed strategy to identify potential infusion customer or stakeholders, and the associated level of commitment of these customers subsequent to a successful demonstration. The clarity of the proposer's demonstration of an adequate process for migrating the technology to an operational application will also be evaluated.

Relevance of the Proposed Technology NASA will evaluate the degree of the potential impact of the proposed demonstration on NASA mission capabilities, as well as its alignment to the NASA technology roadmaps and NASA technology grand challenges. The proposal will be evaluated on the projected quantified improvements, relative to the state-of-the-art, in the following areas: technical mission performance, mission affordability, mission reliability and/or extended mission utility. Clear demonstration of the means to increase the capability or potential of small spacecraft or the small spacecraft industry will be assessed.

Uniqueness of the Proposed Concept NASA will evaluate the proposal's indication of how the concept or technology is revolutionary or transformational as opposed to incremental or evolutionary. The extent to which the proposed concept enables entirely new small spacecraft capabilities or substantial improvements in the performance or capabilities of existing systems will be considered, as well as the degree to which the concept does not duplicate ongoing small spacecraft efforts elsewhere in the Government or space sector.

Appropriateness of the Proposed Concept NASA will evaluate the compatibility of the proposed demonstration with this solicitation in terms of budget and schedule limitations. NASA will also evaluate the proposal's responsiveness to the Technology Focus Areas for this BAA, described in Appendix B. In addition, the applicability of the concept to small spacecraft and related launch accommodations as a "rideshare," secondary, or hosted payload launch opportunity will be evaluated. NASA will evaluate the proposal's demonstration that the technology is at an appropriate entrance TRL (5-6) and will mature adequately to a TRL of at least 7 by the end of the flight demonstration.

II. Technical Approach

The proposed overall technical approach for all phases of the technology demonstration effort will be evaluated on its technical feasibility and overall technical strength. The evaluation will consider factors such as demonstration objectives, mission capability, technology maturation status, mission plan, development approach, mission requirements, and demonstration operations. The proposed design, development, analyses, testing and evaluation, and launch and operations approach, including manufacturing, integration and/or test facilities required to execute the mission/project will be evaluated. The proposer's mission plan, including spacecraft bus, secondary or hosted payload accommodation, launch vehicle and host spacecraft (if applicable), concept of operations and risk assessment will be evaluated. Factors also considered will be the proposers' understanding of the processes, products, and activities required to accomplish development and integration of all elements, and the associated maturity of the project's risk assessment.

Requests to use or proposed use of Government furnished equipment or facilities for testing, integration or experimentation, as well as requests to use or proposed use of Government launch accommodations or host spacecraft will be evaluated in terms of technical feasibility and risk.

III. Project Plan

The proposal will be evaluated on the appropriateness and completeness of the overall project schedule and cost (including the cost to NASA) considering the level of risk the project represents, both technically and programmatically. These criteria will also consider the realism and value of any non-NASA contributions to the proposed project.

Specific criteria for the Project Plan include:

- **Management Approach** The management plan will be evaluated on its clarity and consistency with the scope of work proposed. In addition, it will be evaluated on its completeness, encompassing all aspects of the flight demonstration project and management processes used to oversee outside vendors, subcontractors, and collaborators as well as internal processes. NASA will evaluate the completeness, quality, and thoroughness of the SOW and proposed deliverables and milestones. The proposer's criteria for proceeding from the design phase to the development, test and evaluation phase; from the development, test, and evaluation phase to the launch and operations phase; and success criteria for in-space test, operations and evaluation will also be evaluated.

- **Technological Value Proposition** The proposal will be evaluated for the technological impact that the concept represents against the cost of the

entire proposal (value analysis). This implies that larger missions (in scope and cost) must demonstrate a larger technological impact and advancement potential. Therefore, smaller missions (under the $10-15M cost limit) are strongly encouraged. Similarly, proposals that include cost contributions from sources external to the NASA Space Technology Program will be evaluated favorably under this criterion, assuming they demonstrate an increased value proposition for NASA.

- **Cost and Schedule Realism** The proposed cost plan and schedule will be evaluated for realism and reasonableness considering the scope of work proposed. The methods and rationale used to develop the estimated cost, and the discussion of cost risks, will be assessed. The proposal will be reviewed to determine if the costs proposed are based on realistic assumptions, reflect a sufficient understanding of the technical goals and objectives of the BAA, and are consistent with the proposer's technical approach (to include the proposed Statement of Work). At a minimum, this will involve review and evaluation, at the prime and subcontract level, of the type and number of labor hours proposed as well as the types and kinds of materials, equipment and fabrication costs proposed.

- **Key Personnel and Past Performance** The qualifications, skills and experience of key individuals proposed will be evaluated for suitability to perform the work proposed. Also, relevant past performance information for previous work or experience in the field being proposed for both the offeror and any major subcontractors will be considered under this criterion.

- **Small Business Subcontracting Plan** Small business subcontracting plans, if required, will be evaluated for acceptability, taking into consideration the participation goals and quality and level of work performed by small business concerns overall, as well as that performed by the various categories of small business concerns listed in FAR 52.219-9.

The proposal evaluation criteria, Technical Concept, Technical Approach and Project Plan, are weighted approximately equally. Final selections will be made based on successful evaluation of the proposal (based on the evaluation criteria) as well as program balance as determined by the Selection Official.

V. LATE SUBMISSIONS

Executive summaries submitted after the due date and time for receipt will not be accepted. Proposals submitted after the date and time established in the letter of invitation to propose will not be accepted.

VI. EVALUATION PANEL

1. **Government Personnel.** Potential offerors are notified that government technical experts drawn from NASA and other Federal agencies may participate in the evaluation of the proposals. All government personnel participating in evaluation are bound by applicable statutes and regulations to protect proprietary and source-selection information.

2. **Non-Government Personnel.** NASA also intends to draw subject matter experts from industry, academia, or relevant organizations to contribute to the evaluation of the proposals. Such persons shall be screened for potential conflicts of interest prior to participating in the proposal reviews. These evaluators will be bound by appropriate non-disclosure agreements to protect proprietary and source-selection information.

3. **Support Personnel.** The Government may use selected support personnel to assist in providing both technical expertise and administrative support regarding proposals from this announcement. These support contractors will be bound by the terms of their contracts and appropriate non-disclosure agreements to protect proprietary and source-selection information.

VII. AWARD INFORMATION

1. Multiple Awards. NASA plans to award one or more contracts and/or interagency and intra-agency agreements that represent the best-integrated portfolio for the Government in accordance with the evaluation criteria. NASA is seeking participants for this program that are capable of supporting the goals described in this announcement. Offerors are encouraged to be creative in their technical and management processes and approaches in order to meet their goals in the most cost-effective manner possible.

2. Period of Performance. Period of performance of the awards will be as follows:

- Base period for formulation and design plus two (2) options, one for development, test and evaluation, and a second for launch and operations. The length of the base period should not exceed one year for any Edison Program award. The length of base period and first option are not to exceed two (2) years total for SFV missions and three (3) years total for MCDs. The length of the launch and operations phase is not expected to exceed one year for either type of mission.

3. Award Date. The anticipated start date is September 17, 2012.

4. **Funding Allocation.** Funding allocation of the awards will be limited as follows:

   - Total NASA funding for an Edison Program mission may range up to $10 million for SFV missions and up to $15 million for MCDs.

5. **Federal Acquisition Regulation.** Any Contracts resulting from this BAA will be awarded and administered in accordance with the Federal Acquisition Regulation (FAR and NASA FAR Supplement).

6. **Patent and Data Rights**: Intellectual property provisions applicable to contract awards are subject to the provisions of the Federal Acquisition Regulation (FAR) and the NASA FAR Supplement (NFS) (available at http://prod.nais.nasa.gov/far). When the awardee is a college, university, nonprofit organization or small business firm, FAR clause 52.227-11 as modified by NFS 1852.227-11 and FAR clause 52.227-14 as modified by NFS 1852.227-14 shall apply. When the awardee is a large business firm, NFS clause 1852.227-70 and FAR clause 52.227-14 as modified by NFS 1852.227-14 will apply.

   Offerors shall complete FAR Provision 52.227-15 Representation of Limited Rights Data and Restricted Computer Software and include it in the proposal. NASA may include FAR Clause 52.227-16 Additional Data Requirements in the resulting contract if appropriate.

7. **Title and Rights in Property.** A goal of the Edison Program is to facilitate the commercialization of space – a stated purpose of NASA under the National Aeronautics and Space Act of 1958, as amended – by accelerating the development of small spacecraft capabilities for NASA, commercial, and other space sector users. During negotiations, offerors should identify where title to property acquired for Edison Program activities is critical to their commercialization efforts. NASA will determine whether title to property will remain with offerors for a specified period to be negotiated at the time of award.

8. **ITAR Regulations.** The Edison Program is subject to the restrictions imposed by Export Administration Regulations (EAR) and International Traffic in Arms Regulations (ITAR). It is incumbent upon the offeror to assure the protection and nondisclosure of relevant intellectual property, including requirements of the EAR and ITAR. U.S. offerors should be aware that hardware, software, or related materials and services, including technical data, may be subject to U.S. export control laws, including the U.S. Export Administration Act, the Arms Export Control Act, and their associated regulations. It is incumbent upon the U.S. offeror to strictly comply with all U.S. export control laws, and when applicable, assume the responsibility for obtaining export licenses, or other export authority, as

may be required. Under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts are generally considered "Defense Articles" on the United States Munitions List and are, therefore, subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130. It is the offeror's responsibility to determine whether any proposal information is subject to the provisions of ITAR, and to comply with the provisions of ITAR. Information about U.S. export regulations is available at http://www.pmddtc.state.gov/ and http://www.bis.doc.gov/.

9. **Deliverables.** All deliverable items shall be documented, negotiated and agreed upon prior to contract award.

- Periodic deliverables will consist of monthly reports providing project status, including resources expended, and technical issues and problems. There will be a final report for each phase: (1) design; (2) development, test, and evaluation; and (3) launch and operations. Each report should include the plan for transition to the next phase. The format, content, schedule and delivery of these reports will be defined during contract negotiations.

- An Infusion Report (IR) will be required from all Edison projects prior to the Design phase review. The IR will identify stakeholders and potential customers for the demonstrated technology. It will also collect stakeholder requirements and expectations. The format, content, schedule and delivery of this report will be defined during contract negotiations.

- A final report will be required describing all elements and phases of the flight mission, with an emphasis on flight results and related data. The final report will also address the IR, and will assess the extent to which the Edison Flight Project met those expectations as stated in the IR. The format, content, schedule and delivery of this report will be defined during contract negotiations.

- Cost-reimbursement contracts will include NFS clause 1852.242-73 NASA Contractor Financial Management Reporting, which requires contractor submission of monthly and quarterly financial management reports (NF5333M/NF533Q).

- Offerors proposing a Firm Fixed Price contract shall provide a proposed schedule of payment milestones for the Edison Program mission including descriptive title, objective success criteria, rationale, and planned achievement dates (month and year) segregated by the base period and each option period. Payments shall be no more frequent than monthly. Payment milestones should be

tied to the progress of significant technical events in the participant's program. The final milestone payment for the base period, and each option period, shall be tied to the major technical milestone required for that period, and should be a significant payment amount, not less than 10 percent of the price for that base or option period.

Appendix A: NASA Technology Readiness Levels

TRL	Definition	Hardware Description	Software Description	Exit Criteria
1	Basic principles observed and reported.	Scientific knowledge generated underpinning hardware technology concepts/applications.	Scientific knowledge generated underpinning basic properties of software architecture and mathematical formulation.	Peer reviewed publication of research underlying the proposed concept/application.
2	Technology concept and/or application formulated.	Invention begins, practical application is identified but is speculative, no experimental proof or detailed analysis is available to support the conjecture.	Practical application is identified but is speculative, no experimental proof or detailed analysis is available to support the conjecture. Basic properties of algorithms, representations and concepts defined. Basic principles coded. Experiments performed with synthetic data.	Documented description of the application/concept that addresses feasibility and benefit.
3	Analytical and experimental critical function and/or characteristic proof of concept.	Analytical studies place the technology in an appropriate context and laboratory demonstrations, modeling and simulation validate analytical prediction.	Development of limited functionality to validate critical properties and predictions using non-integrated software components.	Documented analytical/experi-mental results validating predictions of key parameters.
4	Component and/or breadboard validation in laboratory environment.	A low fidelity system/component breadboard is built and operated to demonstrate basic functionality and critical test environments, and associated performance predictions are defined relative to the final operating environment.	Key, functionally critical, software components are integrated, and functionally validated, to establish interoperability and begin architecture development. Relevant Environments defined and performance in this environment predicted.	Documented test performance demonstrating agreement with analytical predictions. Documented definition of relevant environment.
5	Component and/or breadboard validation in relevant environment.	A medium fidelity system/component brassboard is built and operated to demonstrate overall performance in a simulated operational environment with realistic support elements that demonstrates overall performance in critical areas. Performance predictions are made for subsequent development phases.	End-to-end software elements implemented and interfaced with existing systems/simulations conforming to target environment. End-to-end software system, tested in relevant environment, meeting predicted performance. Operational environment performance predicted. Prototype implementations developed.	Documented test performance demonstrating agreement with analytical predictions. Documented definition of scaling requirements.
6	System/sub-system model or prototype demonstration in an relevant environment.	A high fidelity system/component prototype that adequately addresses all critical scaling issues is built and operated in a relevant environment to demonstrate operations under critical environmental conditions.	Prototype implementations of the software demonstrated on full-scale realistic problems. Partially integrate with existing hardware/software systems. Limited documentation available. Engineering feasibility fully demonstrated.	Documented test performance demonstrating agreement with analytical predictions.
7	System prototype demonstration in an operational environment.	A high fidelity engineering unit that adequately addresses all critical scaling issues is built and operated in a relevant environment to demonstrate performance in the actual operational environment and platform (ground, airborne, or space).	Prototype software exists having all key functionality available for demonstration and test. Well integrated with operational hardware/software systems demonstrating operational feasibility. Most software bugs removed. Limited documentation available.	Documented test performance demonstrating agreement with analytical predictions.
8	Actual system completed and "flight qualified" through test and demonstration.	The final product in its final configuration is successfully demonstrated through test and analysis for its intended operational environment and platform (ground, airborne, or space).	All software has been thoroughly debugged and fully integrated with all operational hardware and software systems. All user documentation, training documentation, and maintenance documentation completed. All functionality successfully demonstrated in simulated operational scenarios. Verification and Validation (V&V) completed.	Documented test performance verifying analytical predictions.
9	Actual system flight proven through successful mission operations.	The final product is successfully operated in an actual mission.	All software has been thoroughly debugged and fully integrated with all operational hardware/software systems. All documentation has been completed. Sustaining software engineering support is in place. System has been successfully operated in the operational environment.	Documented mission operational results.

Generic TRL descriptions are found in NPR 7123.1, NASA Systems Engineering Processes and Requirements, Table G-19.

Appendix B: Technology Focus Areas for this Edison Program BAA

The Edison Small Satellite Demonstration Missions Program is seeking to validate through spaceflight one or more small spacecraft subsystem technologies or mission capabilities with game-changing and/or crosscutting potential, specifically maturation from NASA Technology Readiness Levels (TRL) 5 or 6 to TRL 7. (Appendix A provides official definitions for NASA's Technology Readiness Levels). Game-changing technologies are defined as subsystems or mission capabilities that are a major advance over the current state-of-the-art or that represent the creation of a previously non-existent small spacecraft capability. Cross-cutting technologies are defined as subsystems or mission capabilities with applicability to more than one potential small spacecraft user in the space sector, including NASA Mission directorates or other civil, commercial, and/or national security users.

Proposals for flight validation technologies or mission capabilities that represent only incremental improvements in the state-of-the-art capabilities, and that are of interest to relatively few users are not appropriate for this solicitation. Further, technology concepts must show a high potential for infusion to external customers or stakeholders. Technologies or mission capabilities requiring low or mid-TRL advancement (TRL 4 or lower) or very high TRL advancement (TRL 8-9) are also not appropriate for the Edison Program.

NASA anticipates that these small spacecraft missions will be launched as secondary payloads or hosted payloads with other spacecraft missions but may eventually include dedicated launches as primary payloads on very small launch vehicles. Appendix C lists standard orbits, interfaces, and accommodations for Government-furnished secondary launch and hosted payload capabilities. Proposers may also propose their own secondary launch or hosted payload capability.

"Small spacecraft" is defined as ESPA class (180kg) or less. Where proposers target a specific class of small spacecraft, the following wet mass range definitions apply:

Minisatellite, 100 kilograms or higher
Microsatellite, 10-100 kilograms
Nanosatellite, 1-10 kilograms
Picosatellite, 0.01-1 kilograms
Femtosatellite, 0.001-0.01 kilograms

Focus Areas

The following focus areas are sought via this BAA to validate and demonstrate technologies for small spacecraft. A proposer may address any one of these independently, or in combination, as long as the specific criteria for each are still met.

Demonstration of Close Proximity Operations Technologies Utilizing Small Spacecraft Systems

The ability of one or more small spacecraft to rendezvous and dock with other space objects may enable spacecraft to perform inspection and servicing functions for larger spacecraft, either independent of the serviced spacecraft or as hosted platforms. Large and small spacecraft have demonstrated limited proximity operations, but more work is needed to develop highly reliable autonomous formation flight and rendezvous systems, especially for approaching uncooperative objects, and lightweight, universal docking or capture systems that are compatible with small spacecraft form factors.

Further, in order to enable a potentially large number of spacecraft to act as a larger system or virtual spacecraft, or for spacecraft to physically join and depart other spacecraft or targets (proximity operations), specific key technologies are required to be developed and demonstrated in space on small spacecraft platforms. Small spacecraft missions sought in this topic area may include the synthesis of technologies such as high precision attitude determination and control systems (ADCS) including rate sensors, star trackers, attitude management systems, and related algorithms and control software. Supporting technologies include high accuracy ranging and timing systems, and applicable propulsion technologies, which are compatible with small and very small spacecraft that can be safely launched as auxiliary payloads. This topic is open to all small spacecraft types defined earlier in this section.

Demonstration of In-Space Primary Propulsion Technologies for Cubesat Systems

In-space propulsion begins where launch vehicle upper stage propulsion leaves off, providing primary propulsion and orbital maneuvering capabilities. Further small-scale advanced in-space propulsion technologies will enable much more effective exploration of the solar system by allowing mission designers to utilize small spacecraft missions with shorter trip times and lower development, launch and operations costs.

This focus area of the Edison Program solicitation is seeking proposals to demonstrate novel in-space systems providing primary propulsion capabilities for very small spacecraft. Systems utilizing high performance, low-toxicity propellants, electric propulsion, solar sails, tethers, and other advanced systems are of interest.

This focus area is restricted to Cubesat-class spacecraft. Information on acceptable Cubesat types (1U, 2U, 3U, and 6U) for this BAA can be found in Appendix C.

Demonstration of Novel Communications Systems for Small Spacecraft

As small and very small spacecraft continue to proliferate and find utility in supporting a number of mission architectures, the ability to operate a large number of these spacecraft simultaneously is still quite challenging. In addition, to create a coordinated, synchronized constellation of small spacecraft, novel command and control technologies are required. These technologies include in-space automation, spacecraft-to-spacecraft communication (cross-links), space data networking using individual spacecraft as communication nodes, and the use of other existing communications assets to reduce or eliminate the need for a large, dedicated ground segment footprint, while providing the flexibility and capability to execute robotic exploration and scientific missions using small spacecraft.

Specific technologies sought in this area are small, efficient, high throughput communications systems (radio frequency or optical) compatible with small spacecraft, or related communications architectures that enable robust, reliable command and data retrieval from small spacecraft.

Appendix C: Typical Orbits, Interfaces, and Accommodations for Government-Furnished Secondary Launch and Hosted Payload Capabilities

Orbital Information

Listed below are typical or common orbital parameters that are potentially available for Edison flight demonstration missions on Government launches. These accommodations are expected to be secondary in nature, which means that the Edison Program spacecraft will not dictate final orbit destination, time of launch, or influence the overall mission design to the detriment of the primary spacecraft (Also see Definitions below).

Mission Type	Altitude	Inclination	Comments
DoD (Minotaur I)	350 – 500 km	40- 45°	Launched from Wallops Flight Facility
DoD (Minotaur IV)	685 km	72°	Launched from Kodiak Alaska or Vandenberg AFB
NASA CRS/COTS	300 km	51°	Cargo Resupply – for ISS. Launched from KSC or possibly WFF.
EELV	300 x 23,000 km	<28°	GTO "drop-off" orbit
Sun-Synchronous	500 – 1000 km	98°	Sun-synchronous Earth monitoring orbit ("A-train")

- LEO orbits typically have a 90-minute period.
- Higher inclination orbits are generally in the radiation belts more than lower inclinations.
- Inclinations between 35 and 60° will likely fly through the South Atlantic Anomaly which is a potential radiation hazard for spacecraft.
- Low altitude orbits (<300 km) will expose spacecraft to atomic oxygen, which can be reactive to certain spacecraft materials.
- Atmospheric drag becomes significant below approximately 250 – 300 km.
- The Sun plus Earth's albedo result in a relatively warm orbital environment.

Spacecraft Definitions

For the purposes of this BAA, the following definitions for spacecraft will be used.

Primary payload/satellite	Usually optimized to a specific launch vehicle. Dictates the orbit and drives the mission design. Also drives the launch location, time of year and initial orbital parameters. Primary spacecraft are typically self-contained, i.e., they provide all of the necessary internal power generation and propulsion capability to execute their mission.
Secondary	Does not dictate launch parameters. Typically deployed after

payload/satellite	the primary spacecraft has been successfully deployed. Must conform to the overall development and launch schedule. Must also not expose the overall mission to unacceptable risk.
Piggyback or hosted payload/satellite	Piggyback payloads are typically accommodated within or on another spacecraft (i.e., "hosted). May use host resources (power, communications, thermal management), but may also be entirely self-supporting. Piggybacks may or may not also be deployed from the host spacecraft.
Nanosatellite	Complete spacecraft weighing up to ~10 kg, and generating ~10W of power.
Microsatellite	Complete spacecraft weighing up to 100 kg in mass, with variable power generation and propulsion capabilities.
ESPA-Class	Spacecraft weighing up to 180 kg and conforming to the ESPA standard (see the ESPA User's Guide)
Cubesat (1U, 2U, 3U)	1U, 2U, or 3U secondary spacecraft conforming to the University Cubesat Standard (http://cubesat.calpoly.edu/index.php/documents/developers), and *NASA Launch Services Program, Program Level Poly Picosatellite Orbital Deployer (P-POD) and CubeSat Requirements Document* (LSP-Req- 317.01).
Cubesat (6U)	6U cubesat spacecraft conforming to the NASA/ARC NanoSat Dispenser System, or compatible with Planetary Systems Corp. *Payload Specification for 6U, 12U and 27U*, 2002206, Rev A.

Appendix D NSPIRES Instructions for Submission of Proposals

Executive Summaries and Proposals must be submitted electronically via NASA's proposal database system, the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES). In order to submit a proposal via NSPIRES, this Broad Agency announcement (BAA) requires that the proposer register key data concerning the intended submission with NSPIRES at http://nspires.nasaprs.com. Potential applicants are urged to access this site well in advance of the proposal response date to familiarize themselves with its structure and enter the requested identifier information.

Every individual named on the proposal's electronic cover page form (see below) as a proposing team member in any role, including co-investigators and collaborators and Authorized Organizational Representatives (AORs), must be individually registered in NSPIRES and must perform this registration themselves; no one may register a second party, even the proposal principal investigator (PI). Note, NSPIRES requires a PI; the proposal lead for this BAA should serve as the PI for NSPIRES. Every named individual must be identified with the organization through which they are participating in the proposal, regardless of their place of permanent employment or preferred mailing address. This data site is secure and all information entered is strictly for NASA's use, only.

Every individual identified on the NSPIRES proposal cover page as a team member must indicate their commitment to the proposed investigation through NSPIRES prior to proposal cover page submission. Team members must additionally confirm the organization through which they are participating on this proposal. A team member will receive an email from NSPIRES indicating that he/she has been added to the proposal and should log in to NSPIRES.

Once logged in, the team member should follow the link in the "Reminders and Notifications' section of his NSPIRES homepage, titled "Need <role> confirmation for proposal <title> for Solicitation <<solicitation number>>."On the "Team Member Participation Confirmation" page, the proposal team member should read language about the Organizational Relationship, then click the "Continue button".

If the contact information then displayed on the "Team Member Profile" screen is out of date, the proposal team member should update this information later using the "Account Mgmt" link in the NSPIRES navigation bar across the top. Prior to making that update, however, the team member should follow the on-screen prompts to identify the organization through which he/she is participating on this proposal. Click the "Link Relationship" button to the right side of the "Organizational Relationship" banner. Select the organization from the "Link Proposal to an Association" part of the page. If the correct organization is not displayed here, try using the "Add Association area (i.e., the organization is not registered), type ion the formal name in the space provided (or select "Self" if appropriate). Once the organization is selected and the "Save" button is clicked, there a confirmation pager that allows the team

member to edit that relationship if it was chosen incorrectly. Click “Continue”.

Note that the organization through which the proposal team member is participating in the proposal might not be the proposal team member’s primary employer or primary mailing address. If the address information is accurate (or once it has been edited to be accurate), the proposal team member may log out of NSPIRES.

NSPIRES will send an email to both the team member and the PI (proposal lead) confirming that the commitment was made and the organization was identified. The PI (proposal lead) may additionally monitor the status of proposal team member commitments by examining the “Relationship Confirmed” column on the Team Member page of the NSPIRES proposal cover page record. Note that the proposal cover page cannot be submitted until all identified team members have confirmed their participating organizations.

All Executive Summaries and proposals submitted via NSPIRES in response to this BAA must include a required electronic Cover Page form that is accessed at http://nspires.nasaprs.com/. This form is comprised of several distinct sections: a Cover Page that contains the identifier information for the proposing institution and personnel; a Proposal Summary that provides an overview of the proposed investigation that is suitable for release through a publicly accessible archive should the proposal be selected; Business Data that provides the proposed start and end dates, as well as other proposal characteristics; Proposal Team information that provides the co-investigators and other participants in the proposal. This Cover Page form is available for access and submission at the solicitation release date. No other forms are required for proposal submission via NSPIRES. See the NASA Guidebook for Proposers, Sections 2 and 3, for further details.

NSPIRES generates error and warning messages as part of the element check concerning possibly missing data. An error (designated by a red X) will preclude proposal submission to NASA by the authorized organization representative. A warning (indicated by an ! on a yellow field) is an indication that data may be missing; a warning can be ignored after verifying that the material is included in the single attachment containing the complete proposal. Any actions taken because of warnings are at the PI's (proposal lead’s) discretion.

It is unnecessary to download the Proposal Cover Page and incorporate it into the Proposal Document. NSPIRES will automatically route the two parts of the proposal (Cover Page form, proposal document) to the appropriate peer reviewers.

Proposers are encouraged to begin their submission process early. Tutorials and other NSPIRES help topics may be accessed through the NSPIRES online help site at http://nspires.nasaprs.com/external/help.do. For any questions that cannot be resolved with the available online help menus, requests for assistance may be directed by email to nspires-help@nasaprs.com or by telephone to (202) 479-9376, Monday through Friday, 8:00 a.m. - 6:00 p.m. Eastern Time.

Appendix E Cost/Price Plan Instructions

Additional instructions are provided below related to submittal of the Cost Plan.

General Instructions

A. Cover sheet to include:
(1) BAA number;
(2) Title of proposal;
(3) Lead Organization submitting proposal;
(4) Type of business, selected among the following categories: "LARGE BUSINESS", "SMALL DISADVANTAGED BUSINESS", "SMALL BUSINESS", "HBCU", "MI", "OTHER EDUCATIONAL INSTITUTION", OR "OTHER NONPROFIT";
(5) All other team members (if applicable) and type of business for each;
(6) Proposal title;
(7) Technical point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax, email;
(8) Administrative point of contact to include: salutation, last name, first name, street address, city, state, zip code, telephone, fax and email;
(9) Award instrument requested: cost-plus-fixed-free (CPFF), cost-contract—no fee, fixed price contract or Intra-Agency/Interagency Acquisition;
(10) Place(s) and period(s) of performance;
(11) Name, address, and telephone number of the proposer's cognizant Defense Contract Management Agency (DCMA) administration office (*if known)*;
(12) Name, address, and telephone number of the proposer's cognizant Defense Contract Audit Agency (DCAA) audit office (*if known*);
(13) Statement as to whether the proposing organization is subject to cost accounting standards; whether the proposing organization has submitted a CASB Disclosure Statement, and if it has been determined adequate; whether the proposing organization has been notified that it is or may be in noncompliance with its Disclosure Statement or CAS (other than a noncompliance that the cognizant Federal agency official has determined to have an immaterial cost impact), and, if yes, an explanation; whether any aspect of this proposal is inconsistent with its disclosed practices or applicable CAS, and, if so, an explanation; and whether the proposal is consistent with its established estimating and accounting principles and procedures and FAR Part 31, Cost Principles, and, if not, an explanation;
(14) Date proposal was prepared;
(15) DUNS number;
(16) TIN number;
(17) Cage Code;
(18) Subcontractor Information;
(19) Name, title, and signature of authorized representative; and
(19) Proposal validity period.

B. As part of the specific information required, the offeror must explain the estimating process used in the proposal, including—

(1) The judgmental factors applied and the mathematical or other methods used in the estimate, including those used in projecting from known data; and

(2) The nature and amount of any contingencies included in the proposed price.

C. The offeror must show the relationship between contract line item prices and the total contract price. The offeror must attach cost-element breakdowns for each proposed line item. The offeror must furnish supporting breakdowns for each cost element, consistent with its cost accounting system.

D. If the offeror has an agreement with Government representatives on use of forward pricing rates/factors, identify the agreement, include a copy, and describe its nature.

E. Provide a description of the offeror's accounting system. Award of a cost-reimbursement type contract requires an accounting system capable of accurately collecting, segregating and recording costs by contract. If the offeror's system has previously been reviewed and approved by the Government, provide the name and telephone number of the cognizant Government office, including email and phone number of auditor.

Specific Instructions – Cost Elements

Depending on the offeror's system, the offeror must provide breakdowns for the following basic cost elements, as applicable:

A. *Direct Labor*. Provide a time-phased (*e.g.*, monthly, quarterly, etc.) breakdown of labor hours, rates, and cost by appropriate category, and furnish bases for estimates.

B. *Materials and services (subcontracts)*. Provide a consolidated priced summary of individual material quantities included in the various tasks, orders, or contract line items being proposed and the basis for pricing (vendor quotes, invoice prices, etc.). Include raw materials, parts, components, assemblies, and services to be produced or performed by others. For all items proposed, identify the item and show the source, quantity, and price. Conduct price analyses of all subcontractor proposals. Conduct cost analyses for all subcontracts when certified cost or pricing data are submitted by the subcontractor. Include these analyses as part of the offeror's own certified cost or pricing data submissions for subcontracts expected to exceed the appropriate threshold in FAR 15.403-4. Submit the subcontractor certified cost or pricing data and data other than certified cost or pricing data as part of your own proposal. These requirements also apply to all subcontractors if required to submit certified cost or pricing data.

(1) *Adequate Price Competition.* Provide data showing the degree of competition and the basis for establishing the source and reasonableness of

price for those acquisitions (such as subcontracts, purchase orders, material order, etc.) exceeding, or expected to exceed, the appropriate threshold set forth at FAR 15.403-4 priced on the basis of adequate price competition. For interorganizational transfers priced at other than the cost of comparable competitive commercial work of the division, subsidiary, or affiliate of the contractor, explain the pricing method (see FAR 31.205-26(e)).

(2) *All Other*. Obtain certified cost or pricing data from prospective sources for those acquisitions (such as subcontracts, purchase orders, material order, etc.) exceeding the threshold set forth in FAR 15.403-4 and not otherwise exempt, in accordance with FAR 15.403-1(b) (*i.e.*, adequate price competition, commercial items, prices set by law or regulation or waiver). Also provide data showing the basis for establishing source and reasonableness of price. In addition, provide a summary of your cost analysis and a copy of certified cost or pricing data submitted by the prospective source in support of each subcontract, or purchase order that is the lower of either $12.5 million or more, or both more than the pertinent certified cost or pricing data threshold and more than 10 percent of the prime contractor's proposed price. Also submit any information reasonably required to explain your estimating process (including the judgmental factors applied and the mathematical or other methods used in the estimate, including those used in projecting from known data, and the nature and amount of any contingencies included in the price). The Contracting Officer may require an offeror to submit cost or pricing data in support of proposals in lower amounts. Subcontractor certified cost or pricing data must be accurate, complete and current as of the date of final price agreement, or an earlier date agreed upon by the parties, given on the prime contractor's Certificate of Current Cost or Pricing Data. The prime contractor is responsible for updating a prospective subcontractor's data. For standard commercial items fabricated by the offeror that are generally stocked in inventory, provide a separate cost breakdown, if priced based on cost. For interorganizational transfers priced at cost, provide a separate breakdown of cost elements. Analyze the certified cost or pricing data and submit the results of your analysis of the prospective source's proposal. When submission of a prospective source's certified cost or pricing data is required as described in this paragraph, it must be included as part of the prime proposer's certified cost or pricing data. The prime must also submit any data other than certified cost or pricing data obtained from a subcontractor, either actually or by specific identification, along with the results of any analysis performed on that data.

C. *Indirect Costs*. Indicate how indirect costs have been computed and applied, including cost breakdowns. Show trends and budgetary data to provide a basis for evaluating the reasonableness of proposed rates. Indicate the rates used and provide an appropriate explanation.

D. *Other Direct Costs*. List all other costs not otherwise included in the categories described above (*e.g.*, special tooling, travel, computer and consultant services, preservation, packaging and packing, spoilage and rework, and Federal excise tax on finished articles) and provide bases for pricing.

E. *Royalties*. If royalties exceed $1,500, you must provide the information required in FAR 15.408 Table 15-2 under II. Cost Elements, E for each royalty or license fee.

F. *Facilities Capital Cost of Money*. When you elect to claim facilities capital cost of money as an allowable cost, you must submit Form CASB-CMF with the proposal and show the calculation of the proposed amount (see FAR 31.205-10).

G. Profit/*Fixed Fee.* Submit the proposed profit/fixed fee rate to be used on the contract. FAR 15.404-4(c)(4)(i)(a) states that the fee for developmental work shall not exceed 15 percent of the contractor's estimated cost, excluding fee. The profit/fixed fee will be established by application of the proposed profit/fixed fee rate to the estimated cost, not the actual cost, of the contract. The proposed profit/fixed fee rate will apply to all changes under the contract.

H. *Non-NASA Contributions*

Contributions of any kind, whether cash or non-cash (property and services), to Edison mission by organizations other than NASA are welcome. Values for all contributions of property and services shall be established in accordance with applicable cost principles. The value of non-U.S. contributions shall be converted to U.S. dollars using the official exchange rate. The official exchange rate can be obtained at http://fms.treas.gov/intn.html. Such contributions may be applied to any part or parts of a mission. The cost of contributed hardware or software shall be estimated as either: (1) the cost associated with the development and production of the item, if this is the first time the item has been developed and if the mission represents the primary application for which the item was developed; or (2) the total of any recurring and mission-unique costs associated with reproduction or modification of the item if this is not a first-time development. If an item is being developed primarily for an application other than the one in which it will be used in the proposed mission, then it shall be considered as falling into the second category (with the estimated cost calculated as that associated with the reproduction and modification alone). The cost of contributed labor and services must be consistent with rates paid for similar work in the offeror's organization. The cost of contributions shall not include funding spent before the start of the mission (prior to award of a contract or other funding mechanism). The value of contributed materials and supplies shall be reasonable and shall not exceed the fair market value of the property at the time of the contribution.