

National Aeronautics and
Space Administration

Cooperative Agreement Notice (CAN) FY2017

**2020 Astrophysics Decadal Large Mission Concept
Origins Space Telescope (OST)
System Studies
at
NASA Goddard Space Flight Center**

A Cooperative Agreement Notice for OST Systems Studies

CAN No. NNG17470002C
Released January 26, 2017

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**Cooperative Agreement Notice (CAN)
OST Mission Concept System Studies at NASA GSFC**

i. CAN No. NNG17470002C: Summary of Key Information

Objective: To award cooperative agreements for partnerships with United States commercial business and/or colleges and universities that will meet the goal of developing the Origins Space Telescope (OST) mission concept systems studies to meet specific NASA needs at GSFC, as well as those of the partner. This goal will be accomplished by selecting Offerors who will cooperatively share in the cost of OST concept studies.

Eligibility: Open to United States commercial businesses, colleges, and universities

Submission Summary and Key Dates:

This CAN will follow a single step process for proposal submissions. The Offeror may submit a proposal at any time prior to the proposal due date noted below. NASA will assess each proposal submitted up to the proposal due date.

FY17 CAN Release: January 26, 2017

FY17 CAN Proposal Due: March 1, 2017,
5:00 PM EST

FY17 CAN Proposal Selection and Award Notification: March 15, 2017

FY17 CAN Cooperative Agreement Award and Study Start: April 3, 2017

Note: Submissions that are either incomplete or submitted after the proposal due date will not be accepted for this FY17 CAN.

Submissions: Wanda Moore, NASA GSFC: wanda.b.moore@nasa.gov

FY17 CAN Proposal Evaluation Panel: A committee comprising OST science, technology, and engineering civil servant team members, as well as additional independent civil servant science, technology, and engineering NASA GSFC personnel.

FY17 Selection Official: NASA GSFC's OST Study Manager

Awards:

- GSFC resource contribution awards will be in the range \$10,000 to \$100,000, matched or exceeded by Offeror contributions. Contributions can be cash in-kind (non-cash) resources or a combination of each.
- Partnerships: Businesses may choose to propose individually or partner with other companies or academic institutions. Offerors are encouraged to propose for the joint development of systems engineering studies and trades that meet the OST team and GSFC needs.
- Expected number of awards: Depending on the number of individual and partner proposals received and their cost, up to 5 proposals may be selected for awards.

NASA GSFC anticipates the availability of a total of \$100,000 for this program. However, the Government's obligation to make awards is contingent upon the availability of sufficient appropriated funds from which payment can be made and the receipt of proposals that NASA determines are acceptable for award under this CAN. Final award amounts may be negotiated.

- Study Duration: Up to 18 months
- Awards will be subject to the provisions of the NASA Grant and Cooperative Agreement Handbook, Section D located as follows:
https://prod.nais.nasa.gov/pub/pub_library/grantd.html.
- Potential awardees are hereby notified that the provisions set forth in the NASA Grant and Cooperative Agreement Handbook, Section D at § 1274.9 are to be incorporated into and made a part of all cooperative agreements with commercial firms. When included, the provisions at § 1274.902 through § 1274.909 and the provisions at § 1274.933 through § 1274.942 are to be incorporated in full text substantially as stated in this regulation. When required, the provisions at § 1274.910 through § 1274.932, may be incorporated by reference in an enclosure to each cooperative agreement. For inclusion of provisions in subcontracts, see Exhibit A of this subpart 1274.9, and § 1274.925.
- Additionally, the following requirements apply to all awards:
 - 2 CFR Part 170, Reporting Subaward and Executive Compensation Information;
 - 2 CFR Part 175, Award Term for Trafficking in Persons; and
 - 2 CFR 182, Government-wide requirements for Drug-Free Workplace
- Intellectual Property Resulting from Awards
 - Intellectual property provisions shall be subject to the terms and conditions at 14 CFR 1274.
 - Data Rights: NASA wishes to disseminate data and material produced under this award as broadly as possible with minimal restrictions. While recipients are not restricted in their own use and distribution of data first produced in performance of an award, NASA's goal is to reduce restrictions on dissemination and use of data to the greatest extent possible, consistent with the terms and conditions of the award. Data rights differ based on whether data are first produced under an award or instead are developed at private expense outside the award.
 - Limited Rights Data: The U.S. Government will not normally require delivery of confidential or trade secret-type technical data developed solely at private expense prior to issuance of an award, except as necessary to monitor scientific/technical progress and evaluate the potential of proposed technologies to reach specific scientific/technical and cost metrics.
 - Government rights in Technical Data Produced under Awards: The U.S. Government normally retains unlimited rights to technical data produced under awards, including the right to distribute to the public. However, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.
 - Invention Rights: Recipients that are Small Businesses or nonprofit organizations may elect to retain title to their inventions pursuant to the Bayh-Dole Act (35 U.S.C. § 202). Large business recipients are subject to section 20135 of the National Aeronautics and Space Act (51 U.S.C. § 20135)

relating to property rights in inventions. Title to inventions made under an award by a large business recipient initially vests with NASA. However, these recipients may request a waiver to obtain title to inventions made under the award. Such a request may be made in advance of the award or within 30 days thereafter. Even if a waiver request is not made, or denied, a large business recipient may request a waiver on individual inventions made during the course of the award.

Point of Contact for Questions: All general questions about this notice and questions regarding technical Study collaboration with potential GSFC civil servant partners shall be submitted, by email only, to the NASA Contracting Officer, Wanda Moore, wanda.b.moore@moore@nasa.gov.

Cooperative Agreement Notice (CAN)

OST Mission Concept System Studies at GSFC

1.0 Description of the Opportunity

1.1 Background

NASA's Goddard Space Flight Center (GSFC) is located in Greenbelt, Maryland and is a science center with world class scientists in astrophysics, Earth science, heliophysics and Solar System science. GSFC has end-to-end capabilities in all aspects of state-of-the-art component, sub-system, and instrument and mission engineering, including design, development, integration and test, launch, on-orbit operations, communications and navigation, and satellite servicing for all sizes of missions from suborbital through space flight missions. In addition, GSFC has vast expertise in providing safety and mission assurance as well as instrument and project management for the wide array of science instruments and missions aforementioned. GSFC offers this proven combination of science, engineering, and project management expertise as the foundation of its continuing success in formulating and implementing suborbital and space flight missions. With GSFC's record of managing all five Hubble Space Telescope (HST) servicing missions, managing the soon-to-be-launched James Webb Space Telescope (JWST), and managing the development of the Wide Field Infrared Survey Telescope (WFIRST), all with multiple national and international partner institutions, GSFC is poised to leverage this knowledge and expertise. These three NASA-developed missions were the highest priority large mission concepts identified by their respective Astrophysics Decadal Committees.

NASA Headquarters (HQ) has chartered and is partially sponsoring the maturation of four (4) large strategic mission concept studies prior to the 2020 Astrophysics Decadal Survey to provide four scientifically compelling mission concepts with existence-proof point-designs that are feasible and executable with respect to technical, cost, and risk considerations. Each of these four mission concepts is community-led by a Science and Technology Definition Team (STDT), whose expert members were appointed by NASA HQ. The four large mission concepts being studied, in alphabetical order, are:

1. Habitable Exoplanet Imager (HabEx)
2. Large Ultraviolet Optical Infrared (LUVOR) Surveyor
3. Lynx, formerly known as the X-Ray Surveyor
4. Origins Space Telescope (OST), formerly known as the Far-Infrared Surveyor

Each mission concept STDT is supported by a NASA Center, which supplies an engineering team tasked to develop a point design that meets the science goals defined by the STDT. NASA HQ assigned the OST mission concept study to GSFC.

In the post-HST, post-JWST era, OST will be poised to deliver transformative science, as HST has done, across all of astrophysics, including Cosmic Origins (COR), Exoplanet Exploration (ExEP), and Physics of the Cosmos (PCOS), as well as Solar System science.

The OST science themes are summarized on the web page <https://asd.gsfc.nasa.gov/firs/science/>, and pages hyperlinked to that one describe science goals and derived measurement requirements for the observatory.

The GSFC OST team is working with the OST STDT to formulate a scientifically compelling, technically feasible, and cost effective OST mission concept. The OST Team intends to provide the Decadal Survey and the astrophysics community with a mission concept that has a range of scalable architecture options associated with different cost/schedule risks and with different levels of science capability. These options may, in turn, have different levels of starting maturity, and therefore, different degrees of feasibility depending on progress in developing the necessary technologies.

OST will be a large aperture (8-m to 15-m), actively-cooled telescope (~4K) covering a wide span of the mid- to far-infrared spectrum. Its spectrographs will enable three-dimensional surveys of the sky, which will discover and characterize the most distant galaxies, exoplanets and the outer reaches of our Solar System. The observatory will be placed at Sun-Earth L2.

With limited study resources, the OST STDT desires and GSFC plans to bring to bear the expertise of industry, academia, government agencies, and national laboratories. GSFC will coordinate and engage study partners via this Cooperative Agreement Notice (CAN). Specifically, this CAN is intended to leverage the expertise and resources resident in industry and academia to perform systems engineering trades and analyses to help inform the STDT's decisions on OST architectures, technologies, and mission implementation.

It is important to recognize that the mission architecture(s) and/or point design(s) developed by the OST STDT and study team and presented to the 2020 Decadal Survey will not be the actual mission architecture(s) that will be built, even if the mission concept is prioritized by the Decadal Survey. Therefore, the products of this CAN do not set the final requirements for an OST mission. Rather, the partners selected from this CAN will help to inform current trades and determine notional paths for a scientifically compelling and executable mission concept that will be independently costed by the Aerospace Corporation or an equivalent entity.

Key to delivering an OST Design Reference Mission that could receive an endorsement in the 2020 Decadal Survey is the depth of understanding that underlies a convincingly executable mission that will achieve compelling science. Schedule and cost risks must be understood and acceptable, and the mission must be affordable in a reasonable development time if it is started in the 2020 decade. It is vital to be able to understand the solution space in sufficient depth that science per dollar can be maximized at an affordable cost. Thus, the OST STDT is interested in innovative engineering, manufacturing, integration and test, and technology solutions that have potential to reduce costs and/or risks.

For more information on the OST mission concept, please visit our public website at: <http://asd.gsfc.nasa.gov/firs/>

1.2 Purpose

The objective of this Cooperative Agreement Notice (CAN) is to partner with U.S. commercial businesses and/or academic institutions to perform system engineering trades, produce whitepapers, engineering reports, error budgets, and other documentation that will help the OST STDT to evaluate technical options and convince the Decadal Survey

that the mission is worthy of prioritization. Listed below are identified areas of interest, with the caveat that this list is not comprehensive:

- (1) Optical Systems
 - a. Radiometric throughput analysis
 - b. End-to-end wavefront error budget development
 - c. Mirror material evaluation, fabrication study and planning: innovative solutions that plausibly lead to cost savings in mirror segment manufacturing, integration, and testing consistent with the OST's cryogenic operating temperature and long-wavelength application
- (2) Observatory Systems, Subsystems and Deployments
 - a. Observatory-level cryo-thermal system architecture for a large cryogenic (~4K) telescope, with implementation approach, including sunshield design and deployment, current state-of-the-art cryocoolers, and approach to minimizing thermal conducting path between warm and cold subsystems
 - b. Active/passive dynamic isolation and pointing control systems
 - c. Backplane, packaging, and deployment design for 5-meter fairing launch vehicles
 - d. Observatory integration and test planning and flow
 - e. Materials trades
- (3) Mid-IR Detectors

The purpose of this opportunity is to build partnerships to conduct system engineering trades and participate in other facets of the study outlined in more detail in Section 2 of this CAN. Selected partners will collaborate with the OST Study Center at NASA GSFC to support the OST STDT in its quest to develop a scientifically compelling, executable mission concept.

1.3 Scope

This CAN is seeking responses from potential partners interested in entering into a cooperative agreement with NASA GSFC for the joint development of systems engineering studies and trades that meet OST team and GSFC needs. These studies are sponsored by NASA and managed by the OST Study Manager at NASA's Goddard Space Flight Center, Greenbelt, MD.

Study Proposals should be submitted in accordance with the instructions in this announcement in Section 3 and should meet the study requirements identified in Section 2. The studies will be selected based on the criteria described in Section 4 of this announcement.

NASA plans to fund studies at approximately \$10,000 to \$100,000 per study with a period of performance of approximately 18 months. There is flexibility in the scope of work and funding levels that is subject to negotiation between NASA GSFC and selected Offerors. Study awards are contingent upon availability of funds. The participating partner will contribute resources whose value matches or exceeds the NASA funding for the study. The studies will be joint development efforts in the areas of (1) Optical Systems and/or (2) Observatory Systems, Subsystems and Deployments and/or (3) Mid-IR Detectors. These will include collaboration with NASA and/or NASA support contractor personnel.

NASA facilities may be available for use in the study development and demonstration, if needed. Any requirement for access to NASA facilities must be negotiated prior to proposal submission and stipulated in the CAN proposal.

Under this notice, NASA will award cooperative agreements in accordance with the applicable sections of the NASA Grant and Cooperative Agreement Handbook, Section D (July 23, 2007) (the Handbook). Under a cooperative agreement, the funding agency will have substantial involvement in, and contribution to, the technical aspects of the effort. Cooperative Agreements differ from grant programs where there is no substantial involvement of the funding agency in monitoring the work or research program. This type of Notice also allows contact with the potential subject matter experts at Goddard Space Flight Center during the CAN open period subject to the limitations set forth in the Handbook. Particular attention is directed to Handbook Section D, and Section 1274.203(f). The Agreements Officers for this notice is Steve Lloyd (steven.r.lloyd@nasa.gov), and his Authorized Representative is Wanda Moore (wanda.b.moore@nasa.gov).

1.4 Partnership Principles

In a cooperative agreement between NASA and a partner, substantial resource contribution on the part of the partner is required. The partner is expected to contribute at least 50 percent of the total resources required to accomplish the objectives of the study.

Cooperative Agreements awarded under this Notice will be fixed price agreements and milestone billing will be the method of payment to the partner. Performance based milestones are used as the basis of establishing a set of verifiable milestones for payment purposes and monitoring study progress. The Offeror will establish the milestones necessary to accomplish the system studies and/or trades to be performed. These milestones will be identified in the proposal (Sample Table in Appendix B). Milestone schedules having payments heavily loaded early in the schedule ("front loaded") must include rationale documenting the need for and benefit of such an arrangement.

2.0 Study Requirements

The objectives of the OST system engineering trades are to identify, assess, and perform the appropriate analyses specified in this document to enable the STDT to make informed decisions about the OST mission concept architecture(s) and point design(s).

2.1 Technical Requirements

2.1.1 Optical Systems

Areas of Interest:

2.1.1.1 Radiometric throughput analysis

OST science objectives include Far-IR observations at wavelengths ranging from 6 to 600 micrometers. A full radiometric budget is requested to validate the science product signal to noise ratio, with special attention to straylight analysis. Beam lobe narcissus has potential to impact performance of the heterodyne instrument. Baffle strategies to prevent stray light will be important.

2.1.1.2 End-to-end Wavefront Error Budget Development:

An end-to-end wavefront error budget is requested to validate the optical performance, including impacts from thermal and mechanical systems. Error budgets need to include both static and dynamic effects, ground-to-orbit variations, and pre-to-post wavefront control allocations. The error budget will need to address the needs of a suite of instruments that include imaging, spectroscopy, and high-contrast modes of operation, and may require multiple image quality metrics, including wavefront error, encircled energy, contrast, and others.

2.1.1.3 Mirror Fabrication Study and Planning

A large segmented primary mirror on the order of 8-15 meters will require numerous individual segments to be fabricated to stringent optical quality specifications. The number of segments will vary based on the individual segment size. Mirror fabrication and test plans for multiple mirror technologies (i.e., beryllium, SiC, etc.) are requested to understand schedule, manufacturing, and logistics constraints on what will likely be a critical-path component. Approaches to lead to lower areal cost and higher areal production rate are of greatest interest.

2.1.2 Observatory Systems, Subsystems and Deployments

Areas of Interest:

2.1.2.1 Observatory-level cryo-thermal system architecture

The OST telescope and instruments will all be actively cooled to 4 K. Warmer surfaces will not be permitted in this volume due to stray light concerns. Ideas for how this cooling can be accomplished using high TRL (5-9) technology are solicited. Sizing the cryocoolers, sunshield configuration, ideas on reliability/redundancy, and servicing possibilities are solicited. Studies are also solicited of: the sunshield design, including size, material, and number of layers; innovative ways to limit the conducting paths between warm and cold subsystems; and cost effective schemes to verify the sunshield performance.

2.1.2.2 Active/passive dynamic isolation and pointing control system

OST's wavefront stability requirements will likely need a combined active and passive dynamic isolation system to inhibit disturbances from spacecraft systems reaching the observatory optical system. Studies that investigate and mature such isolation systems are requested. Of particular interest is the ability to transmit data and power between the spacecraft and optical system while maintaining isolation. Evaluation of a gimbal system that provides slew capabilities and its effects on the isolation system is also of interest.

2.1.2.3 Backplane, Packaging, and Deployment Design for a 5-meter Fairing Launch Vehicle:

One of the architectures to be studied by OST will be compatible with an industry-standard 5-meter diameter launch vehicle fairing, presenting a challenging packaging and deployment problem. Studies that investigate deployment schemes, stiff backplane designs, and launch configuration packaging concepts are requested.

2.1.2.4 Observatory Integration and Test Planning and Flow:

The large aperture sizes being considered by OST will pose a challenge to existing integration and test (I&T) facilities. Studies that investigate observatory-level I&T concepts that take advantage of the OST's long wavelengths to reduce I&T cost, including

but not limited to integration, optical testing at 4K, environmental testing, and transportation logistics are requested.

2.1.2.6 Material Trades

Studies that investigate materials most appropriate for 4K environment are requested. Materials of interest are for the mirror, telescope structure, baffle, and instrument support structures.

2.1.3 Detectors

Areas of Interest

2.1.3.1 Mid-IR Detectors

The mid-infrared camera will require large (1 million +) format Blocked Impurity Band BIB detectors, operating between 6 (we are currently still entertaining the idea of going down to 2 microns, so this option should also be investigated) and ideally 40 micron wavelengths. The detector arrays would therefore cover a wider bandwidth than the MIRI detectors.

2.2 Reporting Requirements

All proposals shall contain provisions for reporting the progress and results of the OST Systems Studies to the OST Study Manager or designated representative and to the Technical Monitor. The actual points of contact will be specified in the final negotiated agreement. The content and frequency of the reports shall be identified in the proposal. Progress reports can be made in conjunction with milestone completions since these serve as the basis for payments toward the total value of the award. Reporting requirements can be found in the Manual, Exhibit E, Required Publications and Reports.

NASA requires that the first milestone be a study “kick-off” meeting between the partner and NASA which can be a virtual (teleconference and WebEx or Adobe Connect session). In addition, the reporting clauses in a Cooperative Agreement require that any reportable innovation or technology developed during the partnership shall be reported. The Final milestone payment will not be made until all reporting requirements for the study have been fulfilled.

3.0 Proposal Preparation and Submission Instructions

The Offeror shall prepare the Study Proposal in accordance with the instructions in this section. Cost and budget information shall be submitted in accordance with the instructions in Appendix A. All Study Proposals in response to this CAN shall be submitted electronically directly to the Contracting Officer via email to wanda.b.moore@nasa.gov, referencing the CAN number in the subject line. Proposals shall bear the signature of an authorized institutional official (e.g., scanned copy of signed proposal cover page, or electronically signed pdf document). Only electronic submissions will be accepted; paper submissions will not be reviewed.

3.1 Proposal Content and Format

All proposals shall follow the outline below, within the page limitations provided. Pages that exceed the page count limits for any section will be removed and not evaluated. Proposals shall be single-spaced, 12-point font, with 1” margins on all sides, and submitted as a searchable PDF file. Pages larger than 8 ½” x 11” will count as 2 pages. Charts, tables and

graphs may utilize 8-point or larger font size. Spacing and graphics will count toward the page limitations. All pages except the Title Page shall be numbered, and sections shall be clearly separated.

<i>Proposal Sections</i>	<i>Max Page Count</i>
Title Page	1
Executive Summary	1
Study Description	9
Planned Work and Relevance to OST	
Technical Approach, and Merits of the Approach	
Anticipated Challenges and Mitigation Approach	
Schedule with Milestones	
Deliverables	
Key Personnel	
Interface with NASA Personnel and Facilities	
Organizational Chart	
Benefits, Significance, and Impact of Study & Anticipated Outcome	1
Cost Plan: Resources Required (\$ and time)	
Budget Summary, Co-Funding Plan & Milestone Costing	1
(If multiple institutions are joining in a partnership, include budgets from the individual institutions in an appendix titled "Institutional Budgets." This appendix has no page limit. The 1-page Budget Summary must be traceable to the institutional budgets.)	
Collaboration Statement and Miscellaneous Required Information	1
Maximum Total Page Count	14

DETAILS OF OFFEROR PROPOSAL CONTENT

3.1.1 Title Page

The Title Page shall provide a study title that provides the initial indication of the systems study(ies) to be performed to meet a specific OST Systems Studies need. The proposal shall include a reference header with: This Proposal is in response to CAN No. NNG17470002C.

3.1.2 Executive Summary

The Executive Summary shall provide a *study description*, briefly identify *lead individual and key personnel, relevant NASA personnel and/or facilities, and overview of cost estimate*.

3.1.3 Study Description

The Study Description shall be an overview of the proposed study and the technical approach. It shall provide a brief description of the systems study(ies) to be performed with the goals and objectives. It shall specify how this study will address a specific OST/GSFC need. This need can be one or more of the study topics listed in section 1.2, or a topic recommended by the Offeror and justified in terms of its relevance to OST.

3.1.3.1 Planned Work and Relevance to OST

Summarize the objective(s) of the study, and explain its relevance to OST.

3.1.3.2 Technical Approach, and Merits of the Approach

The proposal shall present a clear and succinct statement of the specific study proposed and the technical merits of the approach for the proposed study and/or solution to the NASA OST challenge. A Study work plan shall be included that indicates what development effort will be performed, where it will be performed, and how it will be performed. The methods planned to achieve each milestone or task shall be discussed in appropriate detail. The task descriptions shall be linked to the proposed study milestones.

3.1.3.3 Anticipated Challenges and Mitigation Approach

The proposal shall give the Offeror's view of the risks involved in the proposed study, and the planned approach to mitigate each identified risk.

If appropriate, the proposal shall state the current TRL(s) of the innovative approach at the component, sub-system, and system level. Describe the challenges of the approach or the proposed study. How hard is this problem?

3.1.3.4 Schedule with Milestones

The schedule section will define the study development schedule with key milestones clearly identified on the schedule. Definitions of the key milestones shall be included with task descriptions and assignments, resource allocations, and planned accomplishments in the proposal. The due dates for any identified deliverables, by either party of the agreement, will be shown on the schedule.

As described in Section 2.2, NASA requires that the first milestone be a study "kick-off" meeting (virtual okay) between the partner and NASA. NASA also requires that the last milestone be a study closeout briefing between NASA and all parties involved, and submission of final reports.

The study shall include at least one milestone per 6-month period.

Appendix F shows the current top-level OST Decadal Mission Study schedule.

3.1.3.5 Deliverables

Expected accomplishments and deliverables for the study shall be clearly stated. At a minimum, each milestone will be accompanied by a written report. These reports are not intended to be merely progress reports, but rather technical memoranda, white papers, and other products that the Offeror deems to be valuable to the OST mission concept study and the OST STD'T's presentation to the Decadal Survey. Describe the planned deliverables in this section.

3.1.3.6 Key Personnel

The proposal shall identify the lead individual and key personnel that will work on the study. Key personnel are the principal investigator and other individuals whose expertise and functions are essential to the success of the study. The proposal shall describe each person's role in the Study, and include a brief description of their qualifications.

3.1.3.7 Interface with NASA Personnel and Facilities

Any in-kind NASA contributions, such as NASA-provided technical expertise and/or

government furnished equipment or facilities, in the effort shall be clearly described. The proposal shall identify any specific NASA personnel expertise and/or facilities needed by the Offeror for the study performed. It shall indicate whether these NASA personnel and/or facilities are required for completion of the study.

3.1.3.8 Organizational Chart

The chart shall identify all institutional partners and indicate lines of authority and key functional areas.

3.1.4 Benefits, Significance, and Impact of Study and Anticipated Outcome

The proposal shall explain the benefits, significance, and impact of the proposed study, as perceived by the Offeror, and summarize the anticipated outcome of the study. Include a description of planned advances relative to the current state-of-the-art. The proposal shall justify the significance and/or impact the proposed study in terms relevant to the OST mission concept study.

3.1.5 Cost Plan: Resources Required (\$ and time)

This section shall contain the following two subsections described below.

A) Budget Summary and Co-Funding Plan

The Cost Plan shall contain a budget and co-funding plan that contains clear identification of resource requirements and contributions as well as the value of the in-kind resources dedicated to accomplishing the study. Under the terms of a Cooperative Agreement, the partner is required to contribute at least 50% of the total resources required to accomplish the Cooperative Agreement. The Cost Plan shall be submitted as a budget summary using the format shown in Appendix A.

The total budget shall be sufficient and reasonable to accomplish the study. It shall identify the costs for the milestones and final deliverables. It shall also contain a clear co-funding plan for the use of NASA resources.

The Cost Plan shall be prepared in accordance with the following guidelines and completed for each agreement year if applicable. The Plan shall include the resources requested from NASA and the resources provided by the Offeror. The total costs for the Study and the shared funding requirements of the Cost Plan shall be reflected in a Table similar to that shown in Appendix A. The cost categories in the table shall be based on the descriptions in the following sections and will be shown in detail in the Budget Summary per Appendix A

Direct Labor:

Salaries and Wages: The name of the principal investigator and other senior associates shall be listed along with the estimated number of person months for which NASA funding is requested or cost sharing will be provided. For other professionals and associates, each position shall be listed, with the number of full time equivalent (FTE) person months and rate of pay (hourly, monthly, or annual). For clerical, secretarial, supporting staff, etc., only the total numbers of persons and total amount of salaries per year in each category are required. Salaries requested shall be consistent with the company's/institution's approved practices.

Fringe Benefits: Contributions to employee (social security, retirement, etc.) may be treated

as direct labor costs if that is the company's/institution's accepted accounting practice.

Other Direct Costs:

Subcontractors and Consultants: Describe the work to be subcontracted, estimated amount, Offeror (if known), and the reason for subcontracting. Identify consultants to be used, why they are necessary, the time they will spend on the study, and rates of pay.

Equipment, Materials, Supplies: Equipment purchases are discouraged, especially computing equipment. Equipment or materials costing \$1,000 or more shall be listed individually by description and estimated cost and adequately justified. Allowable items for direct NASA funding (if requested) will be limited to equipment and apparatus that are not already available for the conduct of the work. General purpose office equipment will not be considered eligible for support.

Other Direct Costs: Travel – The funding from this CAN shall not to be used for travel unless approved by the OST Study Manager. Mode of travel, destination, number of calendar days, per-diem, and relevance to the proposed activities shall be specified. In order to qualify for support, attendance at meetings or conferences shall first be approved by the OST Study Manager and shall directly contribute to specific study objectives. Allowance for air travel will be in accordance to Federal Travel regulations.

Indirect Costs:

Facility & Administrative and Other Applicable Costs: If not taken into account within Direct Labor or Other Direct Costs, the bases and rate for all indirect fees and costs, including overhead and general facility and administrative expenses shall be within generally acceptable levels, conform to typical Federal grant and contract guidelines, and be clearly specified in the proposal. A copy of any current indirect rate agreement in place (e.g. with the Department of Naval Research – DNR, or Health and Human Resources – HHS) shall be submitted with the proposal.

Profit/Fee: Profit/fee is considered an **unallowable** cost, per the Manual, Section 5.9. In addition, profit/fee is inconsistent with the spirit of the OST Systems Studies Cooperative Development Program, which is intended to enable an entity to further a study by using resources that may not otherwise be available to them and to potentially expand an industrial base for NASA. It is not intended to be a profit generating venture.

B) Milestone Costing

A Milestone Costing Schedule is required. The cost milestones are important because the payment of NASA resources will be made only upon completion of the milestones identified in the proposal and amounts established in the cooperative agreement. Payment milestone costs shall be consistent with the Technical Schedule milestones and appropriately structured and mapped to the actual work planned, as “front loading” of proposals will generally not be permitted. Cost milestone schedules having payments heavily loaded early in the schedule (“front loaded”) shall include rationale documenting the need for and benefit of such an arrangement. Costing schedules shall be structured so that the cost identified for the kick-off meeting reflects only those costs required to conduct the meeting. Should other activities be included, they shall be identified and their corresponding costs identified. An example Milestone Costing Schedule is shown in Appendix B.

3.1.6 Additional Information

In addition, the proposal shall include:

- A) A Cooperative Agreement Collaboration Statement. The Cooperative Agreement Collaboration Statement is a mutually agreed-upon list which summarizes the study responsibilities, tasks and contributions of both parties. The Offeror is expected to provide the description of the NASA responsibilities and contributions as well as their own. The Collaboration Statement will be included as a part of the final Cooperative Agreement content. A template/example is provided in Appendix C.
- B) A Taxpayer Identification Number (TIN) shall be included with the address listed on the proposal. If an award is made, advance payments cannot be made without a TIN (31 U.S.C. 7702(c)(1)).
- C) A Dun and Bradstreet, Data Universal Numbering System (DUNS) number shall be included on the Cover Page of all proposal submissions. Before submitting a proposal, all applications shall have an active registration in the System for Award Management (SAM) database and shall obtain a Commercial and Government Entity (CAGE) code. Prior to award, the grant officer shall verify active registration in the SAM database, by using the DUNS number, or if applicable, the DUNS+4 number, via the Internet at <https://www.sam.gov/portal/SAM#1pr>

3.2 Duration of Proposal Validity

In some instances, a proposal submission may meet the selection criteria, but a Proposal award cannot be made by the target CAN proposal selection and award notification period for funding availability reasons. The possibility exists that additional award funding is made available at a date beyond the target dates that will enable an additional award selection(s). The Offeror shall indicate in the Proposal whether a selection date and/or award and Study start date beyond the target periods/dates listed in the CAN is acceptable, and the length of time, greater than the required minimum length of 120 days, the Proposal will be valid.

4.0 Selection and Evaluation Factors

Proposals submitted to this CAN will be reviewed by a proposal evaluation team. An assessment of each proposal will be conducted per the evaluation criteria in Section 4.1 of this CAN. All offerors will be notified with the result of the assessment regarding their proposal by the date given in section i.

4.1 Evaluation of Study Proposals

- 1. Relevance/alignment and potential of the study to meet a specified OST and NASA need or interest delineated in this Cooperative Agreement Notice.
- 2. The technical quality and appropriateness of the proposed study, including the clarity of the technical approach and the expected outcome, the anticipated accomplishments and deliverables, and the level of technical challenges versus projected benefit.
- 3. The appropriateness and suitability of the cost projections and the proposed shared resource contributions from NASA and from the Offeror(s).

The full proposals will be evaluated on the following factors. These factors will be weighted as follows:

<u>Factor</u>	<u>Weight (%)</u>
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1. Relevance, Technical Merit and Feasibility	40
2. Benefits, Significance, and Impact of Study and Anticipated Outcome	30
3. Cost Plan	30

The proposals will be evaluated and selected in accordance with available funding levels.

4.1.1 Factor: Relevance, Technical Merit and Feasibility

The proposed study will be evaluated on whether it offers a feasible technical approach to an OST problem or need. The evaluation sub-factors for Technical Merit and Feasibility include:

- A) Technical Approach and Merit: The relevance and merit of the proposed study to an OST need compared to state-of-the-art technologies, including risks involved in the proposed innovation or study, will be evaluated.
- B) Technical Feasibility, Current TRL(s), and Degree of Difficulty: The clarity, reasonableness, and feasibility of the work plan, including study tasks, task objectives and methods to achieve them, and the expected Study accomplishments and deliverables will be evaluated. The merit and feasibility of the requested NASA contributions (cash, NASA technical expertise and/or Government Furnished Equipment or Facilities) as identified in the description of the technical effort will be evaluated.
- C) Schedule/Milestones: The clarity, completeness, and reasonableness of the development schedule including key milestones, definitions of the key milestones, task descriptions and assignments, resource allocations, and planned accomplishments and due dates for any identified deliverables by either party of the agreement as described in the Technical Approach will be evaluated.
- D) Personnel and Past Related Experience and Relevance: The directly related education and relevant experience of the Offeror's key personnel identified as the principal investigator and the other individuals whose expertise and functions are essential to the success of the study will be evaluated.

Under Technical Merit and Feasibility, sub-factors A) and B) are equally important and more important than sub-factor C), which is more important than sub-factor D).

4.1.2 Benefits, Significance and Impact of Study, and Anticipated Outcome

The proposed study will be evaluated on the benefits, degree of impact to an OST mission concept if successful, and the anticipated result for an OST problem or need.

4.1.3 Cost Plan

The Cost Plan will be evaluated for completeness, clarity and appropriateness. The evaluation sub-factors for the Cost Plan include:

- A) Budget and Milestone Costing Schedule:
The overall Cost Plan including the Budget Summary and Milestone Costing Schedule (if applicable) will be evaluated to ensure the elements of the proposed study budget

are clearly describe, complete and appropriate to cover the necessary scope, requirements and tasks to accomplish the intent of the cooperative agreement study.

The evaluation will assess the clear identification of the type (cash and/or in-kind labor, equipment uses, facility use, materials, etc.) and value of the resource contribution required for each element and from each party to accomplish the study.

B) Resource Contributions:

The evaluation will assess whether the overall resource contributions of NASA and the Offeror are appropriate per the CAN guidelines of Section 1.3, Scope and Section 1.4, Partnership Principles.

The evaluation will assess whether the total value of the resource contributions (cash and/or in-kind) from OST GSFC and from the Offeror are sufficient to accomplish the cooperative agreement for the scope of work shown in the proposal.

The evaluation will assess whether the amount of OST GSFC and Offeror resource contributions shown for each budget element are appropriate and sufficient for the scope of work shown in the proposal.

The Milestone Costing Schedule of the OST GSFC cash contribution to the Offeror (if applicable) will be evaluated for clarity and appropriateness of costing milestones relative to the technical schedule/milestones.

If a Milestone Costing Schedule is applicable, the evaluation will assess whether the amount of OST GSFC cash contribution to the Offeror for each cost milestone is appropriate.

Under Cost Plan, sub-factor A) and sub-factor B) are of equal importance.

5.0 Personal Identity Verification of Contractor Personnel

Agencies shall follow Federal Information Processing Standards Publication (FIPS PUB) Number 201, "Personal Identity Verification of Federal Employees and Contractors," and the associated Office of Management and Budget (OMB) implementation guidance for personal identity verification for all affected Offeror and subcontractor personnel when cooperative agreement performance requires Offerors to have physical access to a federally-controlled facility or access to a Federal information system.

As a result, the following clause is required to be in all applicable solicitations and cooperative agreements:

Personal Identity Verification (PIV) of Contractor Personnel (JAN 2006)

- (a) The Offeror shall comply with agency personal identity verification procedures identified in the Homeland Security Presidential Directive-12 (HSPD-12), Office of Management and Budget (OMB) guidance M-05-24, and Federal Information Processing Standards Publication (FIPS PUB) Number 201.

- (b) The Offeror shall insert this clause in all subcontractors when the subcontractor is required to have physical access to a federally-controlled facility or access to a Federal information system.
- (c) Please see Appendix D for the procedure and process for PIV.