



**National Aeronautics
and Space Administration**

**May 19, 2000
AO 00-OSS-02**

Announcement of Opportunity

Discovery Program 2000

Notice of Intent Due:
Proposals Due:

**June 16, 2000
August 18, 2000**

FOREWORD

This document is a Discovery Program Announcement of Opportunity (AO) for two different types of Discovery Program investigations: Discovery Mission investigations and Mission of Opportunity investigations.

Section 1, Description of Opportunity, provides a brief introduction describing the scope of the solicitation, the two types of investigations that may be proposed in response to this AO, a summary of the selection process, and the schedule. Section 2, Discovery Program Goals, Objectives, and Background and Section 3, Discovery Program Constraints, Guidelines, and Requirements, are applicable to both Discovery Mission investigations and Mission of Opportunity investigations. Section 4 describes Discovery Mission investigations and Discovery Mission-specific requirements. Section 5 describes Mission of Opportunity investigations and Mission of Opportunity-specific requirements. Section 6, Proposal Preparation and Submission; Section 7, Proposal Evaluation, Selection, and Implementation; and Section 8, Conclusion, are applicable to both Discovery Mission investigations and Mission of Opportunity investigations.

Proposers interested only in Discovery Mission investigations should read sections 1, 2, 3, 4, 6, 7, and 8 and any Appendices referred to in those sections.

Proposers interested only in Mission of Opportunity investigations should read sections 1, 2, 3, 5, 6, 7, and 8 and any Appendices referred to in those sections.

Proposers should be aware of changes in this AO from the previous Discovery AO. **Electronic submittal of the Education and Public Outreach (E/PO) proposed program is now required.** There is no longer an exclusion of missions that are intended to achieve science goals of missions already in the Strategic Plan for a similar time period. For Mission of Opportunity investigations, the cost cap is increased (Section 5.4) and the definition of Missions of Opportunity has been expanded to include, for example, missions sponsored by NASA organizations outside of OSS (Section 5.1). Proposal of mission extension options is now allowed (see Section 3.2), although there is no obligation for NASA to fund such options and the costs for these options are not counted against the OSS cost cap. There are now additional requirements for Co-Investigators (Section 3.5). Inclusion of a Participating Scientist Program (PSP) and/or a Data Analysis Program (DAP) is now strongly encouraged (Section 3.2) and an OSS historical level of support for such programs is cited as a guideline: the costs for these are not counted against the OSS cost cap. There are additional requirements related to U.S. export laws and regulations (Section 3.7). For proposals involving international participation, a draft outline of technical responsibilities between cooperating parties must be submitted (see Appendix B). Funding for the development of Concept Study Reports has been raised from \$375K to \$450K, but the number of investigations to be selected has been reduced from 4-6 to 3-5. Finally, there are numerous clarifications throughout the AO that should be considered, such as clarification of the evaluation criteria for “data buy” Mission of Opportunity investigations, and additional clarifications for data being requested for Mission Implementation and E/PO evaluation.

Discovery Program Announcement of Opportunity

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1.0 Description of Opportunity

1.1 Introduction and Announcement Objectives

The National Aeronautics and Space Administration (NASA) announces the opportunity to conduct planetary science investigations through Discovery Program space flight missions that meet the goals of planetary system(s) exploration. For the purpose of this Announcement, the terms “planetary science”

- The scientific objectives of the NASA Solar System Exploration theme, and
- The search for extrasolar planetary systems element of the NASA Astronomical Search for Origins theme.

Discovery missions, therefore, are solar system science missions intended for travel to and exploration of solar system bodies and/or for remote examination of the solar system and extrasolar planetary system environments. These themes are amplified in documents cited in Section 2.1. Additional information concerning these themes can be found on the Office of Space Science homepage at the World Wide Web URL address <<http://spacescience.nasa.gov/>>.

The Discovery Program is designed to accomplish frequent, high quality planetary system(s) science investigations utilizing innovative, streamlined, and efficient management approaches. It seeks to contain total mission cost and to improve performance through the use of new technology and through commitment to, and control of, design/development and operations costs and to transfer new technology among space, nonaerospace firms, educational, other nonprofit organizations, and Government entities. It requires proposers to set goals for the participation of small disadvantaged businesses, women-owned small businesses (WOSB's), Historically Black Colleges and Universities (HBCU's), and other Minority Educational Institutions (MEI's) in proposed procurements. Finally, it seeks to enhance public awareness of, and appreciation for space exploration, and to incorporate Educational and Public Outreach (E/PO) activities into planetary system(s) science investigations.

Proposals to the Discovery Program require careful tradeoffs between science and cost to produce investigations with the highest possible science value for the cost. Investigations proposed at or near the cost cap may be selected only if the science is especially compelling. NASA is seeking program balance between lower and higher cost investigations that will allow a mission launch every 12 to 24 months within the Discovery funding profile. Accordingly, the NASA OSS Cost for all phases of the investigation, including mission launch services and the spacecraft, will be a determining factor in selection.

This AO invites proposals for investigations for the ninth Discovery Mission (and possibly the tenth), and for the execution of appropriate scientific investigations through participation in space missions that are sponsored by organizations other than the Office of Space Science, identified in this announcement as Missions of Opportunity.

Discovery Mission investigations are characterized as complete missions launched on Expendable Launch Vehicles or the Space Shuttle (see Section 4.1 for a description of launch options and restrictions). Proposals submitted in response to this AO for Discovery Mission investigations must be for *complete* investigations from project initiation (Phase B) through mission operations (Phase E), which is to include analysis and publication of data in the peer reviewed scientific literature, delivery of the data to the Planetary Data System (PDS), and full implementation of the mission's Education and Public Outreach (E/PO) program. Proposals must be consistent with the criteria specified in this AO. Proposals that describe only portions of investigations (such as the provision of an instrument as part of a nondomestic mission) may, if appropriate, be proposed as Mission of Opportunity investigations. Approximately three to five Discovery Mission investigations will be selected under this AO and will be awarded funding to conduct concept studies. NASA will review the results of the concept studies and intends to select one investigation for flight. However, NASA reserves the right to select and approve additional investigations for flight based on funding availability and overall compelling scientific merit. Investigations not selected for concept study or flight may recompile for a future flight opportunity under a subsequent Discovery Program AO. Further information on Discovery Mission investigations is given in Section 4.0.

Mission of Opportunity investigations are characterized as being part of non-OSS space missions of any size, but having a NASA OSS Cost that is under \$35 million in Fiscal Year 2001 dollars. These investigations are generally conducted on a no-exchange-of-funds basis with the organization sponsoring the mission. NASA intends to solicit proposals for Mission of Opportunity investigations with each future AO issued for the Discovery Program. For each future AO, the cost limit for Mission of Opportunity investigations is expected to be constant, adjusted only for inflation.

Mission of Opportunity investigations may be undertaken through the Discovery Program when the perceived value is high and the proposed cost to NASA OSS is within the above funding limits. NASA, however, is not required to select a Mission of Opportunity investigation under this solicitation. Note that if a Mission of Opportunity investigation is selected, a reduced flight rate of Discovery Mission investigations is expected. The Discovery Program also expects Mission of Opportunity investigations to meet other program objectives for reducing cost, infusing and transferring new technology, and enhancing education and the public understanding of science. Further information on Mission of Opportunity investigations is given in Section 5.0.

1.2 Proposal Evaluation and Selection Process

The selection process for this Discovery AO will be done in two phases.

- Proposals submitted in response to this AO will be selected principally on the basis of scientific merit, as evaluated by peer review. In accordance with NASA's desire to fly missions as frequently as possible, the proposed cost to NASA OSS will also be an important selection criterion. The technical merit and feasibility of the scientific investigation; the feasibility of the mission implementation scheme; and the demonstrated commitment to education and public outreach, to technology infusion/transfer, and to participation of small disadvantaged businesses, women owned small businesses (WOSB's), Historically Black Colleges and Universities (HBCU's), and other Minority Educational Institutions (MEI's) are additional selection criteria. A discussion of and the weighting of each evaluation criteria are given in Section 7.2 of this AO. It is anticipated that three to five Discovery Mission investigation proposals will be selected as a result of this evaluation. One or more Mission of Opportunity investigation proposals may also be selected; however, NASA is not required to make such a selection under this solicitation.
- Each of the selected investigation teams will conduct a four-month concept study. Each concept study for Discovery Mission investigations will be funded up to \$450K (real year dollars). NASA may select a Mission of Opportunity investigation for implementation without a concept study if NASA is satisfied with its readiness for development and implementation as proposed (see Section 5.1). If a concept study is deemed necessary for a Mission of Opportunity investigation, funding will be determined on a case by case basis, but will not exceed \$250K (real year dollars). At the end of the concept studies, NASA will conduct detailed reviews to evaluate the implementing details of the selected investigations, namely, any modifications of the scientific objectives, the proposed cost to NASA OSS, design details of the experiment hardware, plans for mission implementation, including all technical and management factors, details of the education and public outreach programs, and plans for incorporation of small disadvantaged business and the infusion and transfer out of new technology (as appropriate) for the investigation project. As a result of this second evaluation, one or more Discovery Mission investigations and possibly one or more Mission of Opportunity investigations will be selected for implementation leading to flight.

1.3 Proposal Opportunity Period and Schedule

NASA is seeking Discovery Mission investigations with a mission launch date no later than September 30, 2006; investigations with anticipated launch dates later than this should be proposed in response to a subsequent Discovery AO. However, proposed investigations with launch dates later than that date may be considered if there are sufficiently compelling reasons for them to be considered at this time.

NASA is also seeking Mission of Opportunity investigations through this AO where a commitment from NASA is needed by the sponsoring organization before December 31, 2001. The launch dates for these missions may be at any time. Missions of Opportunity requiring later commitment dates should propose in response to a subsequent Discovery Program AO.

The following schedule describes the major milestones for this Discovery Announcement of Opportunity:

AO release	May 19, 2000
Preproposal Conference.....	June 6, 2000
Notice of Intent due	June 16, 2000
Proposal due by 4:30 p.m. EDT	August 18, 2000
Nondomestic Letter of Endorsement due	September 15, 2000
Selections announced (target)	December, 2000
Concept Study due (target)	May, 2001
Downselection of investigations (target).....	August, 2001

2.0 Program Goals and Objectives

2.1 Planetary System(s) Exploration Goals

The scientific goals of planetary system(s) exploration within the Office of Space Science (OSS) are generally contained in *The Space Science Enterprise Strategic Plan: Origins, Evolution, and Destiny of the Cosmos and Life* (November 1997). The goals in this plan are supported by the report of the National Research Council's Committee on Planetary and Lunar Exploration, titled *The Exploration of Near Earth Objects* (1998), and the report of the National Research Council's Committee on Planetary and Lunar Exploration, titled *An Integrated Strategy for the Planetary Sciences: 1995-2010*. The goals related to the search for extrasolar planetary systems in this plan are supported by *Search for Origins Roadmap* (July 1997), and the Association of Universities for Research in Astronomy report *HST and Beyond, Exploration and Search for Origins: A Vision for Ultraviolet - Optical - Infrared Space Astronomy* (May 1996). All of these documents are contained in the Discovery Program Library (see Appendix E). The scientific goals in these referenced documents as they relate to the scientific objectives of the NASA Solar System Exploration theme and the search for extrasolar planetary systems element of the NASA Origins theme (see Section 1.1) form the basis of the science evaluation criterion.

The goals and strategies outlined in the above documents encompass a wide range of scientific questions spanning a variety of scientific disciplines that NASA seeks to address by supporting investigations in three broad categories: (1) laboratory research and theoretical analyses, (2) ground-based astronomical observations, and (3) flight projects. The Discovery Program solicits only those investigations that fall into the third category. Investigations proposed to be accomplished as flight projects in the Discovery Program include, but are not limited to, remote observations from Earth-orbiting spacecraft, flyby and/or rendezvous/orbiter spacecraft, soft landers and/or penetrators, and sample return missions.

2.2 Discovery Program Objectives

Principal Goal: Perform frequent, high-quality scientific investigations that assure the highest science value for cost.

By conducting a series of planetary systems science investigations at the highest value for cost, NASA will provide a mechanism by which the most pressing questions in planetary systems science may be addressed, permitting a steady improvement in our understanding of planetary systems and the processes that affect them. The frequent, steady nature of the investigations will assure a continuing stream of fresh scientific data to the planetary systems science community, thus helping to maintain the excellence of the U.S. planetary systems science program.

Supporting Objective 1: Pursue innovative ways of doing business.

The short development schedule and low costs associated with Discovery demand innovative business and management practices. NASA's approach to Discovery investigations encourages teaming arrangements among industry, university, and/or Government partners. Competitively selected teams will have the responsibility and authority to accomplish the entire mission. This will permit them to utilize innovative approaches necessary to stay within the strict cost and schedule limits of the program. NASA oversight and reporting requirements will be limited to only that which is essential to assure science investigation success in compliance with committed cost, schedule, performance, reliability, and safety requirements.

Supporting Objective 2: Encourage the use of new technologies to achieve program objectives and foster their transfer into the private sector.

The inclusion of new technologies to achieve performance enhancements and to reduce total mission cost is encouraged in Discovery proposals. Proposals that include new technologies should pay especially careful attention to technology development plans and/or risk mitigation approaches. The use of new technologies will enable more aggressive and exciting scientific objectives to be pursued. The teaming of industry, university, and Government is meant to foster an environment conducive to technology development, utilization, and commercialization.

Supporting Objective 3: Enhance general public awareness of, and appreciation for, planetary system(s) exploration and support mathematics, science, and technology educational reform initiatives at the local, state, and national level.

Contributing to the improvement of science education and the public understanding of science are explicit goals of the Discovery Program and of the Office of Space Science as a whole. The Discovery Program is committed to incorporating program elements directed toward informing the public and providing educational opportunities that support local, state, regional, and national educational objectives and reform efforts.

3.0 Discovery Program Constraints, Guidelines, and Requirements

This section describes the constraints, guidelines, and requirements applicable to all Discovery Program selections. Additional options, guidelines, and requirements specific to Discovery Mission investigations are in Section 4. Additional constraints, guidelines, and requirements specific to Mission of Opportunity investigations are in Section 5. Specific directions for proposal preparation are included in Section 6 and in Appendix B. For investigations selected in phase one, specific guidance relative to the concept study preparation is contained in a document in the Discovery Program Library (DPL) entitled *Guidelines for Concept Study Report Preparation* (see Appendix E).

3.1 General Program Constraints and Guidelines

In the Discovery Program, the major responsibility for the selected investigation rests with the investigation team, which will have a large degree of freedom to accomplish its proposed objectives within the stated constraints with only essential NASA oversight. Once an investigation has been selected for flight, failure to maintain reasonable progress on an agreed upon schedule or failure to operate within the constraints outlined in this section may be cause for its termination by NASA.

Every aspect of a Discovery investigation must reflect a commitment to mission success while keeping total costs as low as possible. Consequently, investigations should be designed and scoped to emphasize mission success within cost and schedule constraints by incorporating sufficient cost, schedule, and design margins, reserves, and content resiliency.

Only those investigations whose proposed cost, design/development schedule, and launch vehicle requirements are within the constraints and guidelines identified herein will be considered as candidates for selection. Investigations significantly below the cost and launch vehicle constraints are encouraged to enable more frequent and, therefore, diverse Discovery Program missions.

Discovery investigation teams must be led by a single Principal Investigator (PI) who may be from any category of domestic and nondomestic organizations, including educational institutions, industry, nonprofit institutions, NASA Centers, the Jet Propulsion Laboratory (JPL), and other Government agencies.

Teaming arrangements among universities, industry, nonprofit institutions, and/or Government agencies (both foreign and domestic) are encouraged. Teams are encouraged to utilize industry participation to the fullest extent reasonable. NASA field centers and the Jet Propulsion Laboratory are welcome as Discovery mission team members. However, when a NASA field center or JPL participates as a member of a Discovery mission team, it should do so because it brings unique skills, facilities, and/or capabilities to the team.

3.2 Science Requirements

The Discovery Program is intended to perform focused planetary system(s) science investigations. The relationship between the scientific objectives, the data to be returned, and the instrument payload to be used in obtaining the desired data must be unambiguous and clearly stated. Discovery investigation teams will be responsible for initial analysis of the data, its subsequent delivery to the Planetary Data System (PDS), the publication of scientific findings, implementation of educational programs, and communication of results to the public. (Information on the PDS, its formats, and its requirements is included in the Discovery Program Library (DPL) discussed in Section 6.1.1).

Options for extended missions (“Phase F”) **may** be included in proposals to this AO. Costs for such options **must be included in your estimate of NASA OSS Cost (Section 3.6.1), but will not** count against the **NASA OSS Cost cap (Section 4.5.2 or 5.4.2)**. It must be understood that inclusion of such options does not imply a commitment from NASA to fund them.

Any samples of extraterrestrial planetary materials returned by Discovery missions shall be delivered to the NASA astromaterial curatorial facility located at NASA's Johnson Space Center (JSC); contact Dr. Carl B. Agee, Chief Scientist for Astromaterials at (281) 483-4887. Costs for use of this facility should be included in the NASA OSS Cost. Investigation teams will be responsible for all aspects of the delivery of such materials to the astromaterial curatorial facility. This facility will be given the task of providing for the physical security, inventory accountability, environmental preservation, and distribution of the samples in support of scientific research programs organized around each mission. For every Discovery mission investigation in which extraterrestrial planetary materials are returned to Earth, the JSC astromaterial curatorial facility will perform sample processing in support of the mission science team. The science team shall be allocated no more than 25 percent (by mass) of the returned sample unless a larger fraction can be fully justified by the nature of the proposed investigation. The remainder shall be kept in pristine condition for research by the community at large.

There shall be no proprietary data rights period for Discovery investigations. Discovery teams will be responsible for collecting the scientific, engineering, and ancillary information necessary to validate and calibrate the scientific data prior to delivery to the PDS. Data products delivered to the PDS shall be documented, validated, and calibrated in physical units useable by the scientific community at large. The time required to complete this process should be the minimum that is necessary to provide appropriate data to the scientific community and the general public.

Investigation teams **must** also include an adequately funded data analysis period, independent of PDS archiving activities, as a part of their Phase E activities. Data analysis in this sense should be understood to include publication of scientific results of the investigation in refereed journals.

It is OSS policy to emphasize and encourage the addition of Participating Scientist Programs (PSP's) and Data Analysis Programs (DAP's) to broaden the scientific impact of missions (also see Section 7.2.1c). These programs are initiated no earlier than Phase E. Historically, OSS has funded DAP's at an annual level between 1 and 3 percent of the mission's Phase C/D

development costs. Although OSS will independently solicit and administer these programs, the costs of implementing a PSP and/or a DAP **must** be included in **your estimate of the NASA OSS Cost (Section 3.6.1)**. **However**, these costs **will not** count against the NASA OSS Cost cap (**Section 4.5.2 or 5.4.2**). Investigations that include adequately funded PSP's and/or DAP's, where these are appropriate, will receive additional consideration in evaluation.

3.3 Education, Public Outreach, New Technology, and Small Disadvantaged Business Requirements

The education, outreach, new technology, and small disadvantaged business requirements encompass the areas described in the following subsections.

3.3.1 Education and Public Outreach

OSS expects education and public outreach to be a significant part of each OSS flight program and research discipline, and strongly encourages space science researchers to engage actively in education and public outreach as an important component of their NASA-supported professional activities. In order to achieve this goal, OSS has developed a comprehensive approach for making education at all levels (with a particular emphasis on K-14 education) and the enhancement of public understanding of space science integral parts of all of its missions and research programs. The three key documents that establish the basic policies and guide all OSS Education and Public Outreach activities are a strategic plan entitled *Partners in Education: A Strategy for Integrating Education and Public Outreach Into NASA's Space Science Programs* (March 1995), an accompanying implementation plan entitled *Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy* (October 1996), and the *Explanatory Guide to the NASA Office of Space Science Education and Public Outreach Evaluation Criteria* (April 1999). These documents are available through the Discovery Program Library (see Appendix E) or, alternatively, can be accessed by selecting "Education and Public Outreach" from the menu on the OSS homepage at the World Wide Web address <http://spacescience.nasa.gov>, or may be requested from Dr. Jeffrey Rosendhal, Office of Space Science, Code S, NASA Headquarters, Washington, DC 20546-0001.

In accordance with these established OSS policies, Education and Public Outreach (E/PO) will be an integral element of the Discovery Program, and 1-2% of the NASA OSS Cost (excluding launch vehicles) will be allocated to education and outreach.

Instructions for the E/PO component of the proposal are contained in Appendix B and C. While Appendix B provides the general guidelines for proposal preparation, Appendix C contains a detailed discussion of the evaluation criteria to be used in evaluating the E/PO proposals. It also provides information on the assistance available to develop E/PO proposals and to identify and formulate suitable opportunities for partnerships with the E/PO community.

3.3.2 *New Technology*

NASA seeks to infuse new technologies into its programs and to strengthen the mechanisms by which it transfers such technologies to the private sector, including the nonaerospace sector. The means by which NASA's Office of Space Science plans to implement new technology is described in *The Space Science Enterprise Integrated Technology Strategy* (October 1998), which is included in the DPL described in Section 6.1.1. The Discovery Program represents an opportunity for NASA to develop and test new technologies and applications, as well as strengthen existing technology transfer mechanisms and explore and implement new mechanisms and approaches to economic benefit. **This is especially true when such technology enhances the acquisition of an investigation's science or reduces the costs for the mission. It is important, however, that investigations that are dependent on new technology must have either sound development/qualification plans for the new technology or adequate backup plans defined for use in the event that the new technology runs into problems and will not be ready prior to assembly and test of the spacecraft. Investigations that are dependent on new technology will not be penalized for risk provided that adequate plans are described to reduce the risk by providing reasonable back-up approaches, or if none exist, providing for the development/qualification such that the success of the investigation is assured.**

3.3.3 *Small Disadvantaged Business and Minority Institutions*

The PI and team members shall agree to use their best efforts to assist NASA in achieving its goal for the participation of small disadvantaged businesses, women-owned small businesses, Historically Black Colleges and Universities, and other Minority Educational Institutions in NASA procurements. Investment in these organizations reflects NASA's commitment to increase the participation of minority concerns in the aerospace community, and it is to be viewed as an investment in the nation's future. Offerors, other than small business concerns, are also advised that contracts resulting from this AO will be required to contain a subcontracting plan that includes goals for subcontracting with small, small disadvantaged, women-owned, and HUB Zone small business concerns. See Appendix A, Section XIII. Note that fostering participation of minority educational institutions in space science missions and research projects can also be a critical component of the E/PO program.

3.4 **Technical Approach Requirements**

Discovery projects must encompass all technical aspects of the investigation from preliminary analysis and technical definition (Phase B) through delivery of the data to the PDS and their analysis (the final part of the operations phase, Phase E). The document, NPG 7120.5A *NASA Program and Project Management Processes and Requirements*, delineates activities, milestones, and products typically associated with Formulation and Implementation of projects and may be used as a reference in defining a team's mission approach. While NPG 7120.5 does not define subphases, the Office of Space Science has defined Formulation as Phases A and B, and Implementation as Phases C, D, and E. This document is included in the DPL (see Section 6.1.1). Mission teams have the freedom to use their own processes, procedures, and methods, and the use of innovative processes is encouraged when cost, schedule, and technical improvements can be demonstrated.

Each Discovery project shall have a cost-effective mission assurance program. This program should include a quality assurance program that is consistent with the ISO 9000 series, American National Standard, *Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation, and Servicing*, ANSI/ASQC Q9001-1994 (see Appendix E).

Radioisotope sources of electrical power, such as Radioisotope Thermoelectric Generators (RTG's), are not permitted on Discovery missions proposed to this AO. Other, smaller radioactive sources (such as radioactive heating units or instrument calibration sources) are permitted. However, since such usage will require, as a minimum, an environmental assessment (See Environmental Quality Regulations, 40 CFR Parts 1500-1508 in Appendix E, and DPL), proposers should minimize the quantity of radioactive material employed. As a general rule, as the quantity of radioactive material increases, the likelihood increases that an environmental impact statement, with the attendant schedule and cost risks, will be required.

Investigation teams are welcome to use currently available NASA navigation, tracking, control, communications, and other services. Non-NASA capabilities may also be used if they are technically appropriate and cost effective. The costs for such services, whether obtained from NASA or from other sources, must be included in the cost estimate. Cost information for NASA provided services (*NASA's Mission Operations and Communications Services*) is provided in the DPL (See Appendix E).

3.5 Management Requirements

NASA intends to give the Principal Investigator and his/her team the ability to use their own management processes, procedures, and methods to the fullest extent possible. Discovery investigation teams should define the management approach best suited for their particular teaming arrangement. This approach should be commensurate with the investigation's implementation approach, while retaining a simple and effective management structure that assures adequate control of development within the cost and schedule constraints. The investigation team should develop a Work Breakdown Structure (WBS) that best fits its organizational approach and mission design concept.

The PI is expected to be the central person in charge of each Discovery investigation, with full responsibility for its scientific integrity and for the integrity of all other aspects of the mission such as the E/PO program. The PI is responsible for assembling a team to propose and implement a Discovery investigation. The PI is accountable to NASA for the scientific success of the investigation and must be prepared to recommend project termination when, in the judgment of the PI, the successful achievement of established minimum science objectives, as defined in the proposal as the Performance Floor, is not likely within the committed cost and schedule reserves.

In accordance with NASA's transfer of program management responsibility to its Centers, Discovery program management responsibilities have been assigned to the NASA Management Office (NMO) located at the Jet Propulsion Laboratory. The responsibilities of the Discovery Program Manager in the NMO will include mission implementation oversight; coordination of

Government-furnished services, equipment, and facilities; and contract management of selected investigations. In addition, the Discovery Program Manager will conduct independent reviews coincident with the major project reviews, such as preliminary design review or the critical design review.

Each Discovery investigation must have a Project Manager (PM) who will oversee the technical implementation of the project. The role, qualifications, and experience of the PM should be adequate to ensure that the technical and managerial needs of the investigation will be met (see *Discovery Program Plan* in the Discovery Program Library for additional details).

Every Discovery investigation must also define the risk management approach it intends to use to ensure successful achievement of the investigation objectives within established resource and schedule constraints. Included in this discussion of risk management should be risk mitigation plans for new technologies and the need for any long-lead items that need to be placed on a contract before the start of Phase C/D, to ensure timely delivery. In addition, any manufacturing, test, or other facilities needed to ensure successful completion of the proposed investigation should be identified in every Discovery proposal.

3.5.1 Co-Investigator Roles and Requirements

A Co-Investigator is defined to be an investigator who plays a necessary role in the proposed investigation and whose services are either funded by NASA or are contributed. If funded by NASA, costs must be accounted for in the NASA OSS Cost. If contributed, the costs must be accounted for in the Total Mission Cost and an endorsement letter from the proposed Co-Investigator's institution must be provided with the proposal. The role of each Co-Investigator must be described in the proposal. Other nonfunded members of the proposal team may be included in the proposal as collaborators. See Appendix B for additional details.

3.6 Cost Requirements

3.6.1 NASA OSS Cost

A major goal of Discovery investigations is to provide the highest science value for cost. Therefore, NASA OSS Cost will be one factor in the selection of Discovery investigations and in the continuing assessment of ongoing Discovery investigations. All proposals must provide an estimate of NASA OSS Cost.

NASA OSS Cost is defined as the funding that NASA OSS would be expected to provide to complete the investigation, including the cost of the Concept Study and all costs in Phases B through E, including reserves, contributions, and contract fees. Generally, all costs must be included as NASA OSS costs unless specifically excluded. Examples of costs to be included in all proposals are: education and public outreach (E/PO) activities; new technology infusion and transfer; subcontracting costs (including fees); science teams; all personnel required to conduct

the investigation, analyze and publish results, and deliver data in archival format to the PDS; insurance; NASA Deep Space Network (DSN) and other SOMO (Space Operations Management Office) support, if required (see *NASA's Mission Operations and Communications Services* document in the DPL, Appendix E); Navigation and Ancillary Information Facility (NAIF) services; NASA curatorial support (if required; see Section 3.2); and all labor (including contractor and Civil Servant).

Section 4.5.2 of this AO describes additional cost elements, specific to Discovery Mission investigations, that are to be included. Section 4.5.2 also specifies caps on NASA OSS Costs and on major mission element costs for Discovery Mission investigations. An additional requirement on proposals for Discovery Mission investigations is an estimate of Total Mission Cost (TMC), described in Section 4.5.3.

Section 5.4.2 describes additional cost elements specific to Mission of Opportunity investigations and specifies the NASA OSS Cost cap for Mission of Opportunity investigations.

As noted in Section 3.2, costs for a Phase F, a PSP, and/or a DAP, if any of these are proposed, must be included in the estimate of NASA OSS Cost but **will not count against the cost caps.**

The specific cost information required for proposals is described in Appendix B. Since the provision of cost details is not anticipated until the conclusion of the concept study, cost estimates in the proposal may be generated with models or cost estimating relationships from analogous missions. However, **for selected investigations**, the proposed cost to NASA OSS shall not increase by more than 20% from the proposal to the concept study and must not exceed the Discovery Program cost constraints. Since costs and obligational authority may well be different, it is incumbent on proposers to define any obligational requirement that exceeds planned costs.

3.6.2 Full Cost Accounting

Where NASA-provided services are used, NASA Civil Service labor and supporting NASA Center infrastructure must be costed on a full cost accounting basis. If NASA guidance for full cost accounting has not been fully developed by the closing date for proposal submission or for completion of the concept studies, NASA Centers may submit full cost proposals based on the instructions in the NASA Financial Management Manual, Section 9091-5, Cost Principles for Reimbursable Agreements (see Appendix E). If any NASA costs are to be considered as contributed costs, the contributed item(s) must be separately funded by an effort complementary to the proposed investigation, and the funding sources must be identified. Other Federal Government elements of proposals must follow their agency cost accounting standards for full cost. 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.

3.6.3 Contributions

Contributions of any kind, whether cash or noncash (property and services), to Discovery investigations by organizations other than the Office of Space Science are welcome. Values for all contributions of property and services shall be established in accordance with applicable cost principles. Such contributions may be applied to any part or parts of a mission. A letter of endorsement that provides evidence that the institution and/or government officials are aware and supportive of the proposed investigation and will pursue funding for the investigation if selected by NASA must be submitted with the proposals for all U.S. components. For non-U.S. components of proposals, see Section 3.7.

The cost of contributed hardware should 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 cost associated with the reproduction and modification of the item (i.e., any recurring and mission-unique costs) 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 investigation, then it may 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 should be consistent with rates paid for similar work in the offeror's organization. The cost of contributions does not need to include funding spent before the start of the investigation (before completing a contract with NASA). The value of materials and supplies shall be reasonable and shall not exceed the fair market value of the property at the time of the contribution. Contribution funding limitations are defined in section 4.4.

3.7 International Participation

Recognizing the potential scientific, technical, and financial benefits offered to all partners by international cooperation, participation by non-U.S. individuals and organizations as team members in Discovery Program investigations is encouraged. Such participation can add to management complexity and risk, however, and proposers should limit cooperative arrangements to those offering significant benefits while maintaining clear technical and management interfaces. The proposal should discuss risks and benefits of proposed cooperative arrangements as well as management approaches to mitigating these risks.

International participation may include, but is not limited to, the contribution of scientific instruments, the spacecraft (or a portion thereof) and the subsequent sharing of the data from the mission, all at no cost to NASA. Launch vehicles and launch services may also be contributed by international partners but, unlike other contributions, are not subject to the "one-third" limit described in Section 4.4. However, they should be included in all calculations and discussions of the total mission costs. The performance record of proposed launchers will be considered in assessing the likelihood of success for the proposed investigation.

The direct purchase of goods and/or services from non-U.S. sources is permitted with the following restriction: NASA will not purchase non-U.S. launch vehicles for Discovery missions, nor may funds provided to a Discovery mission team be used to purchase a launch vehicle from a non-U.S. source. The provision of launch services as a contribution to a Discovery mission by a non-U.S. partner is acceptable only at no cost to NASA.

Potential Discovery participants are advised that a contract or subcontract using funds derived from NASA by a U.S. team with a non-U.S. participant must meet NASA and Federal regulations. Information regarding regulations governing the procurement of foreign goods or services is provided in Appendix D. These regulations place an additional burden on investigation teams that should be explicitly included in discussions of the investigation's cost, schedule, and risk management.

Non-U.S. proposals must be submitted in English and comply with all other submission requirements stated in the AO. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. and must be received before the established closing date. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must include a cost plan for the U.S. entities, and, at a minimum, the integrated value of the contribution of each foreign entity. In addition, participation by foreign individuals and/or institutions as team members or contributors to Discovery investigations must be endorsed by the institutions and governments involved. The letter of endorsement must provide evidence that the institution and government officials are aware and supportive of the proposed investigation and that sufficient funding to undertake the activity as proposed will be made available if the proposal is selected by NASA. The endorsement must be submitted per the schedule in Section 1.3. In exceptional cases, proposals containing a foreign component can be submitted without endorsement if the endorsement is not possible before the announced closing date. In such cases, the proposal should indicate when a decision on endorsement can be expected. Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor.

Proposers should be aware that investigations that include international participation, either through involvement of non-U.S. nationals and/or involvement of non-U.S. entities must include in their proposal in an appendix a draft plan discussing compliance with U.S. export laws and regulations; e.g., 22 CFR 120-130, *et seq.* and 15 CFR 730-774, *et seq.*, as applicable to the scenario surrounding the particular international participation (see Appendix B.I.4). Proposers must also comply with NASA FAR Supplement clause 1852.225-70 entitled "Export Licenses." The discussion must describe in detail the proposed international participation and is to include, but not be limited to, whether or not the international participation may require the prospective proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, the proposal must discuss whether the license has been applied for or, if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available through Internet URL's (<http://www.pmdtc.org> and <http://www.bxa.doc.gov>). Prospective proposers are advised that under U.S. law and regulation, spacecraft and their specifically

designed, modified, or configured systems, components, parts, etc., such as the instrumentation being sought under this AO, are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations, 22 CFR 120-130, *et seq.*

Should a non-U.S. proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the foreign sponsor will each bear the cost of discharging their respective responsibilities. Depending on the nature and extent of the proposed cooperation, these arrangements may entail an exchange of letters between NASA and the foreign sponsor or a formal Agency-to-Agency Memorandum of Understanding (MOU).

In the event that a non-U.S. proposal is selected, NASA will contract with a U.S. lead entity for performance of the U.S.-funded elements of the investigation.

4.0 Discovery Mission Investigations Options, Guidelines, and Requirements

Discovery mission proposals must be for complete, free-flying missions. The Principal Investigator (PI) is responsible to NASA not only for the scientific integrity of the investigation, but also for the management of the complete mission, including provision of the spacecraft, instrument, and ground system. Such missions may be launched on expendable launch vehicles or the Space Shuttle as free-flying spacecraft.

4.1 Discovery Mission Options

Expendable Launch Vehicle Option

Proposals are for complete missions that are launched using expendable launch vehicles (ELV's) either as primary, secondary, or co-manifested payloads. ELV's may either be provided by NASA with NASA funding or by the proposer as a contribution. Launch services will be provided by NASA only for a medium class (Delta II 7925H) or smaller expendable launch vehicle (see Discovery Launch Services Information Summary document in the Discovery Program Library, Appendix E). Larger launch vehicles can be proposed if they are contributed at no cost to NASA as part of a teaming proposal. The launch service costs of the Delta II 7925H or smaller expendable launch vehicle will be funded by NASA and its cost is to be included in the NASA OSS cost. However, it is not to be considered within the \$190 million design/development cap (see Section 4.5).

Further discussions of the ELV launch option are in Section 4.5 with detailed information contained in the *Discovery Launch Services Information Summary* document listed in Appendix E and contained in the Discovery Program Library.

NASA seeks to take advantage of all reasonable sources of commercial ELV services while assuring that NASA-funded payloads are not exposed to excessive risk. The demonstrated reliability of the proposed launch vehicle and the resultant probability of mission success will be evaluated by NASA and factored into the feasibility of mission implementation evaluation

criteria (see Section 7.2). If the opportunity is as a secondary payload on an ELV, the proposer must identify the secondary opportunity and provide evidence that the launch service provider agrees to manifest the investigation as part of the proposal. If the investigation is selected, NASA expects to contract with the U.S. launch service provider to acquire the launch service for the investigation.

It is the responsibility of the proposer to find an organization that will contribute a launch if a contributed launch is part of the proposal. The demonstrated reliability and the resultant probability of mission success will be evaluated as described above for both contributed launch services and NASA funded launch services. The use of non-U.S. provided launch services may be proposed only on a no-exchange-of-funds basis.

Space Shuttle Free Flyer Option

Use of the Space Shuttle may be proposed only if use of its unique capabilities will result in enhanced science return or are necessary for mission success. The request for a Shuttle launch must demonstrate compliance with Space Shuttle Use Policy set forth at 42 U.S.C. 2465a (see appropriate excerpts in *Discovery Space Shuttle Launch Opportunities* document in the Discovery Program Library/Appendix E). The Principal Investigator is responsible for working with the point(s) of contact identified in the *Discovery Space Shuttle Launch Opportunities* document to determine if the investigation is considered a primary or secondary payload and to identify an appropriate flight assignment. Free flying missions on the Shuttle selected for concept study should prepare a NASA Form 1628, *Request for Flight Assignment*, and submit it with the Phase A Study Report.

4.2 Baseline Mission and Performance Floor

Every Discovery mission investigation must have both a "Baseline" mission and a "Performance Floor." The Baseline mission refers to that mission which, if fully implemented, will accomplish the entire set of scientific objectives proposed for the investigation. Any alteration that results in a reduction of the mission's ability to accomplish the Baseline set of scientific objectives as identified in the proposal will be considered a descoping of the investigation. The resulting set of achievable scientific objectives must be reviewed to ensure that the investigation remains at or above the Performance Floor. The Performance Floor is the minimum science return below which the investigation will not be considered justified for the proposed cost. The Performance Floor must be identified and documented for each proposed Discovery investigation along with plans for the prioritized descoping of mission capability from the Baseline to the Performance Floor in the event of cost or schedule growth. The differences between the Baseline Mission and the Performance Floor will be assessed to determine the mission's resiliency in the event that development problems lead to reductions in scope. In addition, the mission team will negotiate a set of performance metrics during the definition phase for program evaluation, including cost, schedule, and others as appropriate. Failure to maintain a level of science return at or above the Performance Floor as determined by NASA will be cause for termination of the investigation.

4.3 International Participation

Any proposed international participation should be described at the same level of detail as that of U.S. partners, to the maximum extent practicable. NASA will seek to validate contribution, cost, schedule, and management data during evaluation of the proposal and in subsequent reviews. Failure to document contribution, cost and schedule data, management approaches and techniques, or failure to document the commitment of all team partners to those costs and schedules, may therefore cause a proposal to be found unacceptable.

4.4 Contributions

Contributions of any kind, whether cash or noncash (property and services) to Discovery Mission investigations by organizations other than the NASA Office of Space Science are welcome, but the sum of contributions to a given mission should not exceed approximately one-third (1/3) of the proposed cost to the Office of Space Science for the Phase C/D development (See Section 4.5.2 below). Values for all contributions of property and services shall be established in accordance with applicable cost principles. Such contributions may be applied to any part or parts of a mission, and will not be charged against the NASA OSS design/development cost-cap of \$190 million (see Section 4.5.3), but must be included in the calculation and discussion of the Total Mission Costs. A Letter of Endorsement that contains a statement of financial commitment from each responsible organization contributing to the investigation must be submitted with the proposals for all domestic components. For non-U.S. components of proposals, see Section 3.7. This Letter of Endorsement is required to assure NASA that all contributions can and will be provided as proposed.

4.5 Schedule and Cost Requirements

4.5.1 Schedule

The Discovery Program is part of an effort to develop a program of frequent, successful, small planetary system(s) investigations. The schedule for investigations selected through this AO is expected to be such that launch can take place by September 30, 2006. The proposer must specify the launch date and indicate launch date flexibility (if any) in the proposal.

The Discovery Program is intended to provide a mechanism to accomplish important scientific investigations within a short time, so the schedule for all Discovery missions must be such that the launch takes place within 35 months from the start of the design/development phase (Phase C/D). Note that Phase A has been defined by the Office of Space Science as the Concept Study and Phase B is a single phase ending approximately one month after preliminary design review. The design/development phase is defined as ending 30 days after launch, so the maximum permissible length of any Discovery mission Phase C/D is 36 months. No constraint is placed on the length of Phase B or Phase E. Procurement of long-lead materials is permitted during the

Phase B timeframe, but should be shown as a Phase C/D task and, therefore, as a Phase C/D cost. The Phase C/D long-lead procurement overlap with Phase B will not be considered when determining the length of Phase C/D. Options for extended missions (“Phase F”) may be proposed, if appropriate, with the understanding that NASA has no commitment to fund these (see Section 3.2).

4.5.2 NASA OSS Cost Requirements and Cost Caps

The Discovery program is also part of an effort to develop space science investigations of modest scope. To this end, NASA OSS will cap its funding for Discovery Mission investigations, including all mission phases and the launch vehicle, at \$299M (FY 2001 dollars). **As noted in Sections 3.2 and 3.6, funding for a Phase F, a PSP, and/or a DAP, if any of these are proposed, will not count against this cap.** Further, NASA OSS will cap funding for Discovery mission development - costs incurred from the start of Phase C/D to launch plus 30 days - to \$190M (FY 2001 dollars). The NASA OSS funding profile available for missions selected under this AO is given in Appendix G.

Although NASA plans to fund directly the costs for U.S. launch services, these costs are nonetheless to be included in the proposal. Launch services may also be proposed at no cost to NASA as part of a teaming proposal. These launch services are to be consistent with NASA Policy Directive (NPD) 8610.7, NASA Launch Services Risk Mitigation Policy. Also for the purpose of this AO, NASA OSS costs includes funding to be used for SOMO services such as DSN tracking and communication lines.

For NASA provided ELV’s, the ELV launch services cost to be used to calculate the NASA OSS Cost for an investigation using an ELV is provided in the *Discovery Launch Services Information Summary* document available in the Discovery Program Library.

If launch services using the Space Shuttle are proposed, the launch services costs should include mission unique and upper stage(s) costs, if any, and integration costs. The cost of completing development of a carrier, if such a carrier will be used for the first time, should be included under spacecraft cost. Conditions and cost for use of this option are discussed in the *Discovery Space Shuttle Launch Opportunities* document available in the DPL (see Appendix E). Note that if the Shuttle is proposed as the launch vehicle, a Shuttle transportation cost which is based upon payload weight/volume must be obtained from the Shuttle Office at NASA Headquarters and included in launch services costs (see *Discovery Space Shuttle Shuttle Launch Opportunities* document). This cost will be used for evaluation cost comparison purposes only.

The specific cost information required for Discovery mission proposals is contained in Appendix B.

4.5.3. *Total Mission Cost*

The Total Mission Cost is defined as all costs that are necessary to complete an investigation beginning with selection through Phase E, including NASA OSS costs, other NASA costs, non-NASA civil servant costs, and contributions from U.S. and non-U.S. entities. In general, proposers should assume all costs must be included unless specifically excluded.

Contributions, that is, goods and/or services offered on a no-exchange-of-funds basis, may be to any mission element, but the total contribution is not to exceed one-third of the proposed Phase C/D NASA OSS cost.

Proposers must estimate the Total Mission Cost in the proposal as described in Appendix B, Table B1. The Total Mission Cost, including contributions, may exceed the NASA OSS Cost cap (\$299M).

4.6 Selection and Cost Limits

For those Discovery Mission investigations selected for a four month concept study through this AO, each will be awarded funding for the study. At the conclusion of the concept study, it is planned that one or more investigations will be selected to proceed into subsequent mission phases. NASA will not continue funding for those investigations not selected to proceed.

A concept study will be conducted by each selected investigation team. The cost (up to \$450K in real year dollars) of the concept study should be part of the initial proposal. See the *Guidelines for Concept Study Preparation* available in the Discovery Program Library for information on the concept study to be conducted by the investigation team.

During the concept study, the NASA OSS cost shall not increase by more than 20% from that offered in the original proposal and, in any event, must not exceed the NASA OSS cost cap of \$299 million (Fiscal Year 2001 dollars). Thereafter, cost shall not increase from that offered in the proposal resulting from the Concept Study. Each mission's concept study must conclude with a commitment by the PI for the cost, schedule, and scientific performance of the investigation. If, at any time, the cost, schedule, or scientific performance commitments appear to be in jeopardy, the investigation will be subject to cancellation. The Discovery Program does not maintain a reserve pool from which investigations exceeding their cost commitments may draw.

5.0 Mission of Opportunity Investigations Background, Constraints, Guidelines, and Requirements

5.1 Missions of Opportunity Background and Constraints

By funding U.S. participation in Missions of Opportunity, NASA seeks to allow the U.S. scientific community to take advantage of missions planned and primarily funded as part of non-OSS space programs. Typically such missions are sponsored by non-U.S. governments, although missions from other U.S. agencies, NASA organizations other than OSS, or private sector organizations are equally qualified. Mission of Opportunity investigations on a military satellite are allowed so long as the satellite is not planned for weapons testing.

For Missions of Opportunity, the proposer offers to participate in a non-OSS mission that is planned or that has been approved by its sponsoring organization. Such participation could take many forms, such as providing a complete science instrument, hardware components of a science instrument, expertise in critical areas of the mission, or purchase of data from the mission. While the U.S. investigator is not required to document the entire mission of the sponsor in the proposal, the investigator must fully document their investigation.

NASA, meanwhile, will evaluate the proposed investigation, not the sponsor's entire mission. Evaluation of Mission of Opportunity investigations will be conducted utilizing the evaluation criteria as discussed in Section 7.2 of this AO.

Note that selection by NASA through this AO does not constitute selection of the investigation as part of the mission, which necessarily is a decision made by the sponsor of the mission. Instead, selection is a commitment by NASA to fund the U.S. portion of the investigation as part of the Discovery Program, although funding beyond basic studies does not begin until detailed design of the mission itself is underway. If an investigation is selected both by NASA and by the mission sponsor, the PI is responsible to NASA for the scientific integrity and the management of the PI's contribution to the mission.

Selection of an investigation may result in a contract, a grant, or a cooperative agreement, depending on the nature of the proposal and the institutions involved. Further information on grants and cooperative agreements is contained in NASA Handbook NPG 5800.1D, entitled, *Grant and Cooperative Agreement Handbook*, dated July 1996, available from the Discovery Program Library (see Appendix E).

Ordinarily, a selected Mission of Opportunity investigation will be expected to submit a concept study report to NASA for detailed review. This report will conclude with a commitment by the PI for the cost, schedule, and scientific performance of the investigation. If, at any time, this commitment appears to be in jeopardy, the investigation will be subject to cancellation regardless of the impact of this cancellation on its "parent" mission. Like other missions proposed to this AO, the NASA funding is subject to cancellation if there is a cost overrun charged to NASA for any reason, including a launch delay caused by the non-OSS partner. The Discovery Program does not maintain a reserve pool from which investigations exceeding their cost commitments may draw.

As noted in Section 1.2, NASA may select a Mission of Opportunity investigation for immediate implementation if NASA is satisfied with its readiness for development and implementation as proposed. For such selection, a Mission of Opportunity proposal must (1) conform to the Discovery AO guidelines for a Mission of Opportunity, and (2) contain a commitment by the PI for the cost, schedule, scientific, and technical performance of the investigation with detail equivalent to that expected at the end of a concept study. The commitment must also be complete for the programmatic considerations included in Section 3.3 (e.g., Education and Public Outreach). Investigations selected in this manner will be subject to the same conditions for cancellation as described in the preceding paragraph.

A technical and programmatic review will be held prior to the start of phase C/D. Assuming a positive outcome, NASA will confirm the investigation to proceed to development. As a condition for confirmation, the organization sponsoring the full mission must make a commitment to enter into an appropriate agreement with NASA that shall include provisions for sharing of flight data.

5.2 General Guidelines for Missions of Opportunity

Missions of Opportunity are always conducted on a no-exchange-of-funds basis with a non-U.S. mission sponsor. For Mission of Opportunity investigations on domestic commercial missions, the PI may receive funding which includes integration/launch services, and will be responsible for payment of these costs.

5.3 Science Requirements

Mission of Opportunity (MOO) investigation teams will have data analysis responsibilities defined by the policies of the mission sponsor; nevertheless, NASA expects that the mission sponsor will enter into an agreement with NASA to assure that data returned from at least those aspects of the mission in which NASA support is involved, if not the entire mission, will be made available to the U.S. scientific community in a timely way.

5.4 Schedule and Cost Requirements

5.4.1 Schedule

It is incumbent on the proposing investigator to provide evidence in his/her proposal that the sponsoring organization intends to fund the mission and that the endorsement of NASA for U.S. participation is required by the sponsoring organization prior to December 31, 2001. The launch date is not constrained. If a commitment from NASA is not needed by the sponsoring organization before December 31, 2001, then the proposal should be submitted to a subsequent Discovery Program AO.

5.4.2 NASA OSS Cost Requirements and Cost Caps

The NASA OSS Cost of a Mission of Opportunity investigation may not exceed \$35 million in fiscal year 2001 dollars (this includes all phases of the investigation). Specific cost information required for proposals is contained in Appendix B. NASA's funding for a selected investigation's concept study (if required; see Section 5.1) will be limited to \$250K (in real year dollars). Cost of the concept study should be budgeted as a part of the initial proposal.

The PI assumes all risk for delays in the mission and should propose appropriate reserves. Following the completion of concept studies, but prior to final selection by the mission's sponsoring organization, NASA funding for additional work will be limited to \$100K (in real year dollars). NASA funding for all studies prior to the initiation of mission detailed design (Phase C) will be limited to 25% of the total NASA commitment for funding of the investigation.

Note that funding for Mission of Opportunity investigations must include provisions for the planning and implementation of an appropriate E/PO program in accordance with OSS policies and guidelines.

During the concept study, the NASA OSS cost shall not increase by more than 20% from that offered in the original proposal and must not exceed the NASA OSS cost caps. Thereafter, cost shall not increase from that offered in the proposal resulting from the concept study.

6.0 Proposal Preparation and Submission

6.1 Preproposal Activities

6.1.1 Discovery Program Library

The Discovery Program Library (DPL) is intended to provide additional background, technical, and management information, and requirements. Information is included on the Discovery Program, science goals, launch vehicles, Deep Space Network capabilities, NASA's technology transfer infrastructure, the Office of Space Science's Integrated Technology Strategy, the Office of Space Science's Education and Public Outreach Strategy and Implementation Approach, the PDS, and existing NASA test and mission operations facilities. Proposal information requested or suggested in these reference documents provide examples of data that assist evaluators in better evaluating proposals. In any case of conflict between the AO and these documents, however, the AO takes precedence. The contents of the DPL are listed in Appendix E. This library is accessible on the World Wide Web at the URL (<http://discovery.larc.nasa.gov/discovery/dpl.html>). All documents are downloadable, however, if necessary, hard copies of selected documents may be obtained by written request to Dr. Jay Bergstralh at the address in the section below.

6.1.2 Technical and Scientific Inquiries

Inquiries should be directed to Dr. Jay Bergstralh at the following address:

Dr. Jay Bergstralh
Ref. Discovery 2000
Research Program Management Division
Office of Space Science
Code SR
National Aeronautics and Space
Administration
Washington, DC 20546-0001

Fax Number: (202) 358-3097
E-mail: jay.bergstralh@hq.nasa.gov
(note: subject field should read "DISCAO")

6.1.3 Preproposal Conference

A preproposal conference will be held on the date shown in Section 1.3 at:

Holiday Inn – Capitol
550 C Street, S.W.
Washington, DC 20024
(202) 479-4000

All interested parties may attend, but only at their own expense (NASA funds cannot be used) and they must make their own travel arrangements. The purpose of this conference will be to address questions about the proposal process for this AO. The preproposal conference will address all those questions received by NASA up to five days in advance of the conference. Questions should be addressed to Dr. Jay Bergstralh at the address given in Section 6.1.2. Additional questions submitted after this date, including those provided in writing at the conference, may be addressed at the conference only as time permits. Anonymity of the authors of questions will be honored. A Discovery AO Preproposal Conference Transcript, including answers to all questions addressed at the conference and minutes of the conference, will be prepared and mailed approximately two (2) weeks after the conference to attendees, to those submitting notices of intent (see Section 6.1.4), and to anyone who submits a request for this document to Dr. Jay Bergstralh via fax or electronic mail.

6.1.4 Notice of Intent to Propose

To assist NASA's planning of the proposal evaluation process, a Notice of Intent to Propose should be submitted by all prospective proposers in accordance with the schedule in Paragraph 1.3. Those submitting a Notice of Intent will directly receive program updates as may occur up to the time of proposal due date. This Notice is to be submitted electronically by entering the

requested information on the site at the World Wide Web address <<http://props.oss.hq.nasa.gov>>. Proposers without access to the Web or who experience difficulty in using this site should contact Ms. Deborah Tripp by E-mail at dtripp@mail.hq.nasa.gov or by phone at (202) 554-2775 for assistance.

To the extent the following information is known by the due date, the website for Notice of Intent will request the following information:

- (a) Name, address, telephone number, fax number, E-mail address, and institutional affiliation of the Principal Investigator (PI).
- (b) Full names and institutional affiliations of each of the Co-Investigators (Co-I's). If any Co-Investigators or other team members are from nondomestic institutions, the mechanism by which these people will be funded should be identified in the comments box on the form.
- (c) Mission mode (Discovery Mission or Mission of Opportunity) and anticipated Launch Vehicle.
- (d) A brief statement (150 words or less) for each of the following:
 - (1) The scientific objectives of the proposed mission.
 - (2) Identification of new technologies that may be employed as part of the mission.
 - (3) The Education/Public Outreach objectives in the proposed investigation.
- (e) The name of the Lead Representative from each organization (industrial, academic, nonprofit, and/or Federal) included in the proposing team.

Material in a Notice of Intent is for NASA planning purposes only and is confidential.

SPECIAL NOTICE: As a result of recent AO's for complete mission investigations, such as this one, commercial aerospace and technology organizations have requested access to the names and addresses of those who submit NOI's in order to facilitate informing potential proposers of their services and/or products. As an experiment and at the option of the submitters of a NOI, NASA OSS is willing to offer this information with the understanding that the Agency takes no responsibility for the use of such information. Therefore, all those submitting an NOI in response to this AO should declare their preference with a statement such as the following:

"I hereby do / do not authorize NASA to post my name and institutional address (but not the name of my intended proposal) as an addendum to this AO on the World Wide Web starting approximately one week after the NOI due date. If I do authorize such a posting, I understand that such information will be in the public domain, and I will not hold NASA responsible for any use made by others for revealing this information."

6.2 Format and Content of Proposals

General NASA guidance for proposals to this AO is given in Appendix A, which is considered binding unless specifically amended in this AO. A uniform proposal format is required from all proposers to aid in proposal evaluation. The required proposal format and contents are summarized in Appendix B. Failure to follow this outline may result in reduced ratings during the evaluation process and could lead to rejection of the proposal without review. General information and further proposal preparation information are provided as Appendices to this AO.

6.3 Submission Information

6.3.1 Certification and Commitment Signatures

All proposals must have a Cover Page and Proposal Summary that is to be submitted electronically through the Web site given in Appendix B. Once the form is submitted, it must be printed and used to obtain the required Principal Investigator and institutional signatures. The Cover Page must be signed by an official of the PI's institution authorized to certify institutional support and sponsorship of the investigation, and the management and the financial parts of the proposal. The proposal shall include a letter of endorsement signed by an institutional official from each known partner and each organization expecting to provide critical, no-exchange-of-funds contributions of hardware, software, facilities, services (including Co-Investigator services), etc., that provides evidence that the institution and/or Government officials are aware and supportive of the investigation and will pursue funding if selected by NASA. Paper copies of proposals and the original, signed version must be received by the due dates specified in Section 1.3 of this AO.

Signatures of commitment are required for all science team members identified in the science section (including the PI and Co-I's) and for all named key project personnel named elsewhere in the proposal including key individuals associated with the E/PO activities. These signatures are to be included at the bottom of the resume required for each of these individuals and/or may be included on commitment letters from their institutions (see Appendix B, Section I.2 and I.3). The original documents with signatures are to be included in the original copy of all proposals.

Non-U.S. organizations must additionally submit such endorsements to:

NASA Peer Review Services
GST Corporation
500 E Street, SW, Suite 200
Washington, DC 20024-2760
Tel: (202) 479-9030

by the due date given in the schedule in Section 1.3.

Unlike previous Discovery program solicitations, the authorizing institutional signature on the printout of the electronically submitted cover now also certifies that the proposing institution has read and is in

compliance with the three required certifications printed in full in Appendix F. Therefore, it is not necessary to separately submit these certifications with the proposal.

6.3.2 Quantity

All proposers must provide 35 copies of their proposal, including the original signed proposal, on or before the proposal deadline.

6.3.3 Submittal Address

All proposals must be received at the following address by the proposal due date given in Section 1.3

NASA Peer Review Services
GST Corporation
500 E Street, SW, Suite 200
Washington, DC 20024-2760
Tel: (202) 479-9030

6.3.4 Deadline

All proposals must be received at the address above by the closing date specified in Section 1.3. All proposals received after the closing date will be treated in accordance with NASA's provisions for late proposals (see FAR Supplement 1815.412, Paragraphs a and b in Appendix E/DPL).

6.3.5 Notification of Receipt

NASA will notify the proposers that their proposals have been received. Proposers not receiving this confirmation within two weeks after submittal of their proposals should contact Dr. Jay Bergstrahl at the address given in Section 6.1.2.

7.0 Proposal Evaluation, Selection, and Implementation

7.1 Evaluation and Selection Process

All proposals will be subjected to a preliminary screening to determine their responsiveness to this AO. Proposals that are not in compliance with the constraints, requirements, and guidelines of this AO will be considered unacceptable and returned to the proposer. The remaining proposals will then be assessed by an evaluation team composed of panels of individuals who are peers of the proposers in scientific, technical, and other areas. The evaluations will be done in accordance with the criteria specified in Section 7.2. If during the deliberations, the evaluators need clarification on a proposal, a designated member of the evaluation team may contact the proposer to ask for clarification. At the preproposal conference, proposers will be notified of the estimated time period when questions may be asked.

After these evaluations, the panels will meet to consider the total qualitative and/or quantitative aspects of the evaluations to integrate the separate panel results, as necessary, to assure consistency and fairness in evaluations. Once these evaluations have been completed and integrated, an *ad hoc* Subcommittee of the Space Science Steering Committee (SScSC; see further below), composed entirely of Civil Servants who have served on the panels, will convene to consider the peer review results. Note that the evaluation results for the E/PO, technology, and small disadvantaged business **will not** be included in this committee's review. This Committee will review all results and, based on this information, it will then categorize proposals in accordance with the category definitions in NASA FAR Supplement 1872.403, as follows:

Category I. Well conceived and scientifically and technically sound investigations pertinent to the goals of the program and the AO's objectives and offered by a competent investigator from an institution capable of supplying the necessary support to ensure that any essential flight hardware or other support can be delivered on time and that data can be properly reduced, analyzed, interpreted, and published in a reasonable time. Investigations in Category I are recommended for acceptance and normally will be displaced only by other Category I investigations.

Category II. Well conceived and scientifically or technically sound investigations which are recommended for acceptance, but at a lower priority than Category I.

Category III. Scientifically or technically sound investigations which require further development.

Category IV. Proposed investigations which are recommended for rejection for the particular opportunity under consideration, whatever the reason.

The results of the evaluations and categorizations will be presented to the Space Science Steering Committee (SSSC), composed of Civil Service personnel appointed by the Associate Administrator for Space Science (OSS), for an independent review of the evaluation and categorization processes. After this review, the final evaluation results will be forwarded to the Associate Administrator, who will make the selection(s). Those proposers not selected will be notified by letter and will be offered a debriefing. Proposers selected will be notified by telephone and by letter, which will provide instructions concerning the steps necessary to obtain funding and conduct their concept studies.

The Associate Administrator for Space Science may use a wide range of planning and policy considerations when selecting among top proposals. Proposers should recognize that the Office of Space Science program planning is an evolving activity, dependent upon Administration policies and budgets, as well as planetary exploration objectives and priorities that can change quickly with time. The Office of Space Science develops and evaluates the program strategy in consultation with the scientific community directly and via advisory groups such as NASA's Solar System Exploration Subcommittee (SSES), Astronomical Search for Origins Subcommittee (ASOS) and the National Academy of Sciences Committee on Planetary and Lunar Exploration (COMPLEX).

7.2 Evaluation Criteria

Successful implementation of the Discovery Program requires, in addition to scientific merit, that the investigations be achievable within established boundary conditions of cost and schedule, and that the investigations contribute to the broader NASA space science goals. The evaluation approach is designed to determine the mission with the best combination of quality of science, likelihood that the proposed science investigation can be achieved, low cost, and contribution to broader NASA and space science goals. To accomplish these objectives, the guidelines in Appendix B request specific information that will be used to establish the scientific merit of the investigation, the feasibility of the science investigation, the feasibility of implementing the mission, the cost for each proposal, and the value of the contribution to broader NASA goals.

7.2.1 Evaluation Criteria for Proposals

The evaluation criteria with their approximate percentage weights given in parentheses are shown below. The first parenthesis is for Discovery mission investigations and Mission of Opportunity investigations with hardware; the second is for Mission of Opportunity data buys:

- The scientific merit of the investigation (30) (40),
- The NASA OSS cost (20)(25),
- The technical merit and feasibility of the science investigation (20)(25),
- The feasibility of the implementation scheme (20)(0),
- Quality of plans for education and public outreach, new technology, and small disadvantaged businesses (10)(10)

7.2.1a Scientific Merit of the Investigation

The science information requested in the proposal will be used to evaluate each investigation for its scientific merit. To evaluate the intrinsic scientific merit, the investigation goals and objectives will be compared with the planetary system(s) science community's latest recommendations to determine the impact of the mission on science as a whole and, in particular, on the U.S. planetary system(s) science program (see goals in Section 2.1). This evaluation will include how well the mission fills important knowledge gaps or provides for fundamental progress in a subdiscipline, whether or not it provides ancillary benefits to science, and/or how well the mission may support or overlap ongoing missions. For Discovery Mission investigations, the scientific value of the Performance Floor (see Section 4.2) will also be assessed as part of the determination of the overall scientific merit of the investigation. This evaluation will result in descriptive text as well as a numerical and adjectival score of the scientific merit of the investigation.

7.2.1b NASA OSS Cost

Although it is weighted less than the scientific merit, the proposed cost to NASA OSS will be a significant consideration in the evaluation of the proposals. As noted below, an assessment of the feasibility of completing the investigation within the estimated cost (i.e.; realism of cost) will be part of the evaluation of feasibility of mission implementation.

7.2.1c Technical Merit and Feasibility of the Science Implementation

Each investigation will be evaluated for its technical merit, feasibility, resiliency, and the probability of success. Technical merit and feasibility will be evaluated by assessing the degree to which the investigation will address the proposed scientific goals and objectives and the degree to which the instrument set can provide the necessary data. Considerations in the evaluation of the data analysis and archiving plan include an assessment of planning and budget adequacy and evidence of plans for well-documented, high level products and software usable to the entire science community; and consideration of adequate resources for physical interpretation of data and reporting scientific results in refereed journals. Consideration of whether the data gathered will be sufficient to complete the scientific investigation will be a factor in this assessment. Other major elements include the proposed plan for the timely release of the data to the public domain **and** inclusion of **an extended mission (Phase F)**, a Participating Scientist Program (PSP) and/or a Data Analysis Program (DAP) as appropriate for enlarging science impact. Note that PSP's and DAP's may be initiated no earlier than Phase E, and that NASA will solicit and select all participants in such programs through competitive peer review. Although the costs for a **Phase F, a PSP and/or a DAP** must be included in the proposal, they will not be counted against the NASA OSS Cost cap. For Discovery Mission investigations, resiliency will be evaluated by assessing the approach to descoping the Baseline Mission to the Performance Floor in the event that development problems force reductions in scope. The probability of success will be evaluated by assessing the experience, expertise, and organizational structure of the science team and the mission design vs the instrument set. The role of each Co-Investigator will be evaluated for necessary contributions to the proposed investigation. This evaluation will result in a numerical and adjectival score of the technical merit and feasibility of the scientific investigation.

Mission of Opportunity investigations that do not include hardware (*e.g.*, data buys) will be evaluated against all the factors above except that the commercial instrument(s) design will not be evaluated for its ability to provide the necessary data. It is assumed that NASA will not pay for these data unless the data, as delivered, are suitable for successful completion of the proposed investigation. In addition, data buy Mission of Opportunity investigations need not specify a performance floor, nor provide for a PSP and/or DAP.

7.2.1d Feasibility of the Mission Implementation Scheme

For all investigations submitted through this solicitation, the technical and management approaches will be evaluated to assess the likelihood that the investigation can be implemented as proposed. This will include an assessment of the risk of completing the investigation within the proposed cost. The evaluation will consider implementation factors such as the proposed launch vehicle including reliability, mission design, spacecraft design, and design margins, and the proposers' understanding of the processes, products, and activities required to accomplish development and integration of all elements (flight systems, ground and data systems, *etc.*). It will also consider the adequacy of the proposed approach, the organizational structure, the roles and experience of the known partners, the management approach, the commitments of partners and contributors, and the team's understanding of the scope of work (covering all elements of the mission, including contributions). The relationship of the work to the project schedule, the project element interdependencies, and associated schedule margins will also be evaluated. Investigations proposing new technology will be penalized for risk if adequate backup plans to ensure success of the mission are not described. The proposal must discuss the methods and rationale (cost models, cost estimating relationships of analogous missions, *etc.*) used to develop the estimated cost and must include a discussion of cost risks. Innovative cost effective features, processes, or approaches will be rewarded if proven sound.

It is recognized that teaming arrangements for implementing the mission may not be complete before the proposal closing date. Therefore, proposers will not be penalized if the proposal indicates only candidate (but credible) implementation approaches for the spacecraft, launch vehicle, communications, and ground systems that will allow successful implementation of the mission.

Since Mission of Opportunity investigations fly on non-OSS missions, factors involving spacecraft and launch vehicle capabilities will be considered in the evaluation only as appropriate. Mission of Opportunity investigations that provide no hardware (*e.g.*, data buys) are not evaluated under this criterion.

Based on the items described above, each proposal will be evaluated as either high, medium, or low risk.

7.2.1e Quality of Plans for Education and Public Outreach, New Technology, and Small Disadvantaged Businesses

All proposed investigations must include an Education/Public Outreach component as part of their proposal. The criteria to be used to evaluate the E/PO component are given in Appendix C and a detailed discussion of those criteria is given in the document *Explanatory Guide to the NASA Office of Space Science Education and Public Outreach Evaluation Criteria* (April 1999) which may be found by linking through the Education and Public Outreach Web site at the URL <http://spacescience.nasa.gov>. See Section 3.3.1 and Appendix C for further details on the E/PO requirements. Each proposal will be given an adjectival score based on these criteria.

The new technology plan will be reviewed to determine the extent to which it meets the requirements given in section 3.3.2. Proposers should address how developmental problems with new technology will be addressed in order to ensure mission success. Each proposal will be given adjectival scores based on these criteria.

The participation of small disadvantaged business concerns, women-owned small business concerns, HBCU's, and OMI's will be evaluated (see Appendix A, Section XIII). The evaluation will include the extent to which these entities are specifically identified and the complexity of the work they are to perform.

7.3 Implementation Activities

7.3.1 Notification of Selection/Nonselection

Following selection, the PI's of the selected investigations will be notified immediately by telephone, followed by formal written notification. The formal notification will include instructions for scheduling a debriefing at which any issues noted during the evaluation that may require resolution and any other special instructions for the concept study, will be communicated. Proposers of investigations that were not selected will be notified in writing and offered oral debriefings for themselves and a representative from each of their main partners (if any).

7.3.2 Contract Administration and Funding

Different mission management approaches and organizational arrangements will require different contract administration and funding arrangements. Each PI, in his or her proposal, must specify the organizations involved in the proposed teaming arrangement. Included in this specification should be any special contracting mechanisms that would be used in awarding work to the team. Cost type contracts with incentives are strongly encouraged, particularly where performance incentives are measured based on delivery of calibrated/validated science data products.

It is anticipated that funding will be awarded for concept studies for the investigations selected as a result of this AO. NASA will provide up to \$450K to each selected Discovery Mission investigation and up to \$250K for each Mission of Opportunity investigation (if applicable; see Section 5.1) to perform a four-month concept study to be initiated as soon as possible after notification. The product of these studies will be reports to be delivered on the date specified in Section 1.3. The contents and format of the concept study reports are specified in a document in the Discovery Program Library entitled *Guidelines For Concept Study Report Preparation* (See Appendix E/DPL). NASA may request presentations and/or site visits to review the concept study results with the investigation teams. The concept studies are intended to provide NASA with more definitive information regarding the cost, risk, and feasibility of the investigations before final selection(s) for implementation. As a result of evaluation of the concept studies, NASA expects to downselect to one or more investigations to proceed to Phase B. NASA will not continue funding for investigations that are not selected to proceed.

7.3.3 Downselection of Investigations

The downselection decision will be made by the Associate Administrator for Space Science based upon review of the concept study results and current programmatic considerations. The criteria for evaluating the concept study are described in a document in the Discovery Program Library entitled *Concept Study Evaluation Criteria*. The scientific, technical, management, cost, and other aspects of the concept study will be assessed by a panel composed of individuals who are experts in each of the areas to be evaluated. The evaluation of the concept study for each investigation will be similar to the proposal evaluation, but will consider the additional detailed information provided. The evaluation will include a reexamination of the scientific merit of the investigation should any modifications be introduced as a result of the concept study, the total cost to NASA, the technical merit and feasibility of the science investigation, and the feasibility of implementing the mission. A complete assessment of the technical approach, the management, the Phase B plans, and the cost risk will be integrated to evaluate the probability that the implementation approach will support the science objectives. In addition, there will be a detailed evaluation of education, outreach, new technology, and small disadvantaged business plans. It is expected that the detailed plans for these activities will be developed as part of the concept study.

7.3.4 Confirmation of Investigations for Subsequent Phases

At the completion of the Phase B study (i.e., after the Preliminary Design Review) for missions selected, an independent review team, chartered by the Associate Administrator for Space Science, will conduct a Confirmation Assessment, the results of which will be presented to the Associate Administrator in a formal Confirmation Review (CR). The CR constitutes the NPG 7120.5 Approval process. The implementing organization (*e.g.*, JPL, APL, GSFC, *etc.*) may also choose to hold a Confirmation Readiness Review prior to the CR. The PI, the independent review team chair, and a representative of the implementing organization will present results of these reviews to the Associate Administrator for Space Science at the CR. The Associate Administrator will then decide whether or not to confirm the mission for Implementation (Phase C/D). This decision will be based upon the project's readiness to proceed to design and development and programmatic considerations such as cost, schedule, the ability to achieve the scientific objectives delineated in the proposal, and the completeness of the project's level-one requirements. Missions not confirmed for Implementation may be sent back for more study or may be terminated. No more funds will be expended on nonconfirmed and terminated missions, however, they may repropose to the next Discovery AO.

7.4 Selection Factors

As described in Section 7.1, the results of the proposal evaluations based on the criteria above and categorizations will be considered in the selection process.

Proposers to this AO should recognize that the program of the Office of Space Science is an evolving activity that critically depends upon Administration policies and budgets, as well as Space Science objectives and priorities, any of which may change quickly. Therefore, it is incumbent upon the Associate Administrator for Space Science to use all relevant science planning, policy, benefit, and cost considerations when making selection(s) among top ranked proposals submitted in response to this AO.

The overriding consideration for the final selection of proposals submitted in response to this AO will be to maximize scientific return within the available budget. Depending on the availability of proposals of appropriate merit, this objective may be achieved by the selection of an investigation at the cost ceiling for Discovery investigations, or a larger number of lower cost investigations, or a combination of investigations, including Missions of Opportunity, of various costs.

8.0 Conclusion

The Discovery Program continues to represent a challenging new way for NASA to accomplish important scientific exploration of planetary systems. It provides an opportunity for frequent flights to execute science investigations at the forefront of planetary system(s) science, as well as generate opportunities to enhance education initiatives and engage the public in the excitement of science discoveries. NASA invites both the U.S. and international science communities to participate in proposals for Discovery mission investigations and Mission of Opportunity investigations to be carried out as a result of this Announcement.

Anne L. Kinney
Science Program Director
Astronomical Search for Origins

Carl B. Pilcher
Science Program Director
Solar System Exploration

Edward J. Weiler
Associate Administrator
for Space Science

APPENDIX A

GENERAL INSTRUCTIONS AND PROVISIONS

I. INSTRUMENTATION AND/OR GROUND EQUIPMENT

By submitting a proposal, the investigator and institution agree that NASA has the option to accept all or part of the offeror's plan to provide the instrumentation or ground support equipment required for the investigation, or NASA may furnish or obtain such instrumentation or equipment from any other source as determined by the selecting official. In addition, NASA reserves the right to require use of Government instrumentation or property that subsequently becomes available, with or without modification, that meets the investigative objectives.

NOTICE TO ALL OFFERORS: In the event that a Principal Investigator employed by NASA is selected under this Announcement of Opportunity (AO), NASA will award prime contracts to non-Government participants, including co-investigators, hardware fabricators, and service providers, who are named members of the proposing team, as long as the selecting official specifically designates the participant(s) in the selection decision. Refer to Section I of Appendix B of this AO for proposal information which the selecting official will review in determining whether to incorporate a non-Government participant in the selection decision. Each NASA contract with hardware fabricators and service providers selected in this manner will be supported by an appropriate justification for other than full and open competition, as necessary.

II. TENTATIVE SELECTIONS, PHASED DEVELOPMENT, PARTIAL SELECTIONS, AND PARTICIPATION WITH OTHERS

By submitting a proposal, the investigator and the organization agree that NASA has the option to make a tentative selection pending a successful feasibility or definition effort. NASA has the option to contract in phases for a proposed experiment, and to discontinue the investigative effort at the completion of any phase. NASA may desire to select only a portion of the proposed investigation and/or that the individual participates with other investigators in a joint investigation. In this case, the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a NASA selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its leader or contact point. NASA reserves the right not to make an award or cancel this AO at any time.

III. SELECTION WITHOUT DISCUSSION

The Government intends to evaluate proposals and award contracts without discussions with offerors. Therefore, each initial offer should contain the offeror's best terms from a cost or price and technical standpoint. However, the Government reserves the right to conduct discussions, if later determined by the Contracting Officer to be necessary.

IV. NONDOMESTIC PROPOSALS

The guidelines for proposals originating outside of the United States are the same as those for proposals originating within the United States, except that the additional conditions described in Sections 3.7 shall also apply.

V. TREATMENT OF PROPOSAL DATA

It is NASA policy to use information contained in proposals and quotations for evaluation purposes only. While this policy does not require that the proposal or quotation bear a restrictive notice, offerors or quoters should, in order to maximize protection of trade secrets or other information that is commercial or financial and confidential or privileged, place the following notice on the title page of the proposal or quotation and specify the information, subject to the notice by inserting appropriate identification, such as page numbers, in the notice. In any event, information (data) contained in proposals and quotations will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

RESTRICTION ON USE AND DISCLOSURE OF PROPOSAL AND QUOTATION INFORMATION (DATA)

The information (data) contained in (insert page numbers or other identification) of this proposal or quotation constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed for other than evaluation purposes; provided, however, that in the event a contract is awarded on the basis of this proposal or quotation, the Government shall have the right to use and disclose this information (data) to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose this information (data), if obtained from another source without restriction.

VI. STATUS OF COST PROPOSALS

Submission of a Standard Form (SF) 1411 Contract Pricing Proposal Cover Sheet for the Concept Study is not required. The SF 1411 is required for all contract options after the concept study. The investigator's institution agrees that the cost proposal submitted in response to the Announcement is for proposal evaluation and selection purposes, and that, following selection and during negotiations leading to a definitive contract, the institution may be required to resubmit or execute all certifications and representations required by law and regulation.

VII. LATE PROPOSALS

The Government reserves the right to consider proposals or modifications thereof received after the date indicated for such purpose, if the selecting official deems it to offer NASA a significant technical advantage or cost reduction. (See NFS 18-15.208.)

VIII. SOURCE OF SPACE INVESTIGATIONS

Investigators are advised that candidate investigations for space missions can come from many sources. These sources include those selected through the AO, those generated by NASA in-house research and development, and those derived from contracts and other agreements between NASA and external entities.

IX. DISCLOSURE OF PROPOSALS OUTSIDE THE GOVERNMENT

NASA may find it necessary to obtain proposal evaluation assistance outside the Government. Where NASA determines it is necessary to disclose a proposal outside the Government for evaluation purposes, arrangements will be made with the evaluator for appropriate handling of the proposal information. Therefore, by submitting a proposal, the investigator and institution agree that NASA may have the proposal evaluated outside the Government. If the investigator or institution desires to preclude NASA from using an outside evaluation, the investigator or institution should so indicate on the cover. However, notice is given that if NASA is precluded from using outside evaluation, it may be unable to consider the proposal.

X. EQUAL OPPORTUNITY

For any NASA contract resulting from this solicitation, the clause at FAR 52.222-26, Equal Opportunity, shall apply.

XI. PATENT RIGHTS

- A. For any NASA contract resulting from this solicitation awarded to other than a small business firm or nonprofit organization, the clause at NFS 18-52.227-70, New Technology, shall apply. Such contractors may, in advance of a contract, request waiver of rights as set forth in the provision at NFS 18-52.227-71, Requests for Waiver of Rights to Inventions.
- B. For any NASA contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form) (as modified by NFS 18-52.227-11), shall apply.

XII. RIGHTS IN DATA

Any contract resulting from this solicitation will contain the Rights in Data - General clause: FAR 52.227-14.

XIII. SMALL AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING

- A. Offerors are advised that, in keeping with Congressionally mandated goals, NASA seeks to place a fair portion of its contract dollars, where feasible, with small disadvantaged business concerns, women-owned small business concerns, Historically Black Colleges and Universities, and other minority educational institutions, as these entities are defined in 52.219-8 and in 52.226-2 of the FAR. Offerors will be evaluated on the participation in the performance of the mission of small disadvantaged business concerns in the authorized Standard Industrial Classification (SIC) Groups as determined by the Department of Commerce (see FAR 19.201 (b)), as well as the participation of women-owned small business concerns, HBCU's and OMI's.
- B. Offerors are advised that for NASA contracts resulting from this solicitation which offer subcontracting possibilities, exceed \$500,000, and are with organizations other than small business concerns, the clause FAR 52.219-9 shall apply. Offerors whose investigations are selected for implementation leading to flight will be required to negotiate subcontracting plans which include subcontracting goals for small, small disadvantaged, women-owned, and HUB Zone small business concerns. Note that these specific subcontracting goals need not be submitted with the proposal. Failure to submit and negotiate a subcontracting plan after the Phase II selection shall make the offeror ineligible for award.

APPENDIX B

GUIDELINES FOR PROPOSAL PREPARATION

The following guidelines apply to the preparation of proposals in response to this Discovery and Missions of Opportunity AO. The material presented is a guide for the prospective proposer and is not intended to be all encompassing. The proposer must, however, provide information relative to those items applicable, as well as other items required by the AO. In the event of an apparent conflict between the guidelines in this Appendix and those contained within the body of the AO, those within the AO shall take precedence.

GENERAL GUIDELINES

All documents must be typewritten in English, use metric and standard astronomical units, and be clearly legible. Submission of proposal material by facsimile (fax), electronic media, videotape, or floppy disk (except as noted in Section H, below), is not acceptable. In evaluating proposals, NASA will only consider printed material in the submitted proposal. No proposal may reference a World Wide Web site for any data or material necessary for completeness of the proposal.

The proposal must consist of only one volume, with readily identified sections corresponding to Sections D through I given below. Note the restrictions on page count for the various sections specified in the table below. If the same information is required in more than one section of the volume (e.g. instrument and spacecraft design specifications) to support the subject discussion, it may be included by reference to another section where it already exists, provided such reference does not unduly impede understanding of the presented material.

In order to allow for recycling of proposals after the review process, all proposals and copies must be submitted on plain white paper only (e.g., no cardboard stock or plastic covers, no colored paper, etc.). Photographs and color figures are permitted if printed on recyclable white paper only. The original signed copy (including cover page, and signed endorsements) should be bound in a manner that makes it easy to disassemble for reproduction. Except for the original, two-sided copies are preferred. Every side upon which printing appears will be counted against the page limits.

Proposals shall contain no more than 53 pages, with exclusions to the page count noted below, including no more than five fold out pages (28 x 43 cm; i.e., 11 x 17 inches). All pages other than fold out pages shall be 8.5 x 11 inches or A4 European standard.

Single- or double-column format is acceptable. In complying with the page limit, no page should contain more than 55 lines of text and the type font should not be smaller than 12-point (i.e., less than or equal to 15 characters per inch). Figure captions should be in 12 point. Smaller font is allowed within figures and in the cost table.

The following table provides guidance on page count within the proposal:

Section	Page Limit
Cover Page and Proposal Summary	Printout of electronic submission
Table of Contents	none
Fact Sheets	2
Science Investigation description	25
Education/Public Outreach	4 See Appendix C for submission details
New Technology, and Small Disadvantaged Business Plans	2
Mission Implementation Management and Schedule Cost and Cost Estimating Methodology	20
Appendices: (No others permitted) Statement(s) of Work (SOW) for each contract Letter(s) of Endorsement Resumes Draft International Participation Plan - Discussion on Compliance with U.S. Export Laws and Regulations Draft Outline of Technical Responsibilities (if international participation) Compliance with Procurement Regulations by NASA PI Proposals Acronyms List Reference List (optional)	No page limit, but small size encouraged

The content of each proposal is described below. Note that the term “spacecraft” as used in this Appendix includes Space Shuttle carriers.

A. COVER PAGE AND PROPOSAL SUMMARY

A Cover Page and Proposal Summary must be a part of the proposal, but will not be counted against the page limit. It must be signed by the Principal Investigator and an official by title of the investigator’s organization who is authorized to commit the organization. This authorizing signature now also certifies that the proposing institution has read and is in compliance with the three required certifications printed in full in Appendix F; therefore, certifications do not need to be submitted separately.

The Cover Page and Proposal Summary must be submitted electronically to the WWW site located at <http://props.oss.hq.nasa.gov>. The full names of the Principal Investigator and the authorizing official, their addresses with zip code, telephone and fax numbers, and electronic

mail addresses, are required on the specified form, as well as the names, institutions, and E-mail addresses of all participants, the type of investigation

proposed, the total NASA OSS Cost, and a 200-word Summary. A hard copy version of this Cover must be printed in time to acquire signatures and include with the original hard copy of the proposal for delivery according to the schedule provided in Section 1.3 in this AO. Signatures should also include the authorizing official for the project institution. Proposers are advised that they must not reformat this Cover after it is printed, as important NASA-required documentation may be lost. Proposers without access to the Web or who experience difficulty in using this site may contact the dtripp@mail.hq.nasa.gov for assistance. Please note that submission of the electronic Cover does not satisfy the deadline for proposal submission.

It is NASA's intent to enter the Summaries of all selected investigations for its various programs into a publicly accessible database. Therefore, the Summary should not contain any proprietary or confidential information that the submitter wishes to protect from public disclosure.

B. TABLE OF CONTENTS

The proposal should contain a table of contents, which will not be counted against the page limit. This table of contents should parallel the outlines provided below in Sections D through I.

C. FACT SHEET

A Fact Sheet that provides a brief summary of the proposed investigation must be included in the proposal. The information conveyed on the Fact Sheet should include the following: science objectives (including the importance of the science to the NASA science themes), education and outreach and new technology objectives, mission overview (including mission objectives and major mission characteristics), science payload, key spacecraft characteristics, anticipated launch vehicle, mission management (including teaming arrangement as known), schedule, and cost estimate. Other relevant information, including figures or drawings, may be included at the proposer's discretion. The Fact Sheet is restricted to two pages (preferably a double-sided single sheet).

D. SCIENCE INVESTIGATION

The Science Investigation section should describe the scientific objectives of the proposed investigation, including the value of the investigation to the space science themes. The primary science theme to which the investigation applies should be identified. A discussion of the scientific products and how the science products and data obtained will be used to fulfill the scientific objectives should be provided. A discussion of how the science data will be obtained, including a plan for delivery of the products, and the individuals responsible for the data delivery, should also be provided.

1. Scientific Goals and Objectives. This section should consist of a discussion of the goals and objectives of the investigation; their value to the primary and any secondary science themes; and their relationships to past, current, and future investigations and missions. It should describe the history and basis for the proposal and discuss the need for such an investigation. An overview of the mission should be provided.

The measurements to be taken in the course of the mission, the data to be returned, and the approach that will be taken in analyzing the data to achieve the scientific objectives of the investigation should be discussed. This description should identify the investigation to be performed, the quality of the data to be returned (resolution, coverage, pointing accuracy, measurement precision, etc.), and the quantity of data to be returned (bits, images, etc.). The relationship between the data products generated and the scientific objectives should be explicitly described, as should the expected results. It is assumed that the above information will constitute the Baseline Mission.

This section must also identify a minimum acceptable data and scientific return for the mission (the Performance Floor), below which the mission would not be worth pursuing. The value of the Performance Floor should be discussed. A description of the descope options available, their phasing, and their effect on meeting the scientific objectives of the mission, as the mission is descope from the Baseline to the Performance Floor should be discussed. Proposals should include only one Baseline mission and one Performance Floor.

2. Science Implementation.

- a. Instrumentation. This section should describe the instrumentation and the criteria used for its selection. It should identify the individual instruments and instrument systems, including their characteristics and requirements. It should indicate items that are proposed to be developed, as well as any existing instrumentation or design/flight heritage. The quality and quantity of data generated by each instrument, as they relate to the stated science investigation goals and objectives should be discussed. The flow-down from science investigation goals to measurement objectives to instrument performance should be stated clearly and supported by analysis where possible.

A preliminary description of each instrument design with a block diagram showing the instrument systems and their interfaces should be included, along with a presentation of the estimated performance of the instrument. These performance characteristics (which shall be considered as requirements on the flight system) should include mass, power, volume, data rate(s), pointing, and pointing accuracy, as well as resolution, precision/sensitivity, and calibration requirements.

- b. Mission. The science payload observing profile should be discussed. This discussion should include all mission-relevant parameters, such as orbit and/or surface location, pointing requirements, operational time lines (including observing periods, data transmission periods and time-critical events), etc. The manner in which the stated investigation objectives and selected instruments drive the proposed mission design and operations plan should be apparent from this discussion.
- c. Data Analysis and Archiving. The data reduction and analysis plan, after the data have been delivered to the ground, should be discussed, including the method and format of the data reduction, data validation, and preliminary analysis. The process by which data will be prepared for archiving should be discussed, including a list of the specific data products and the individual team members responsible for the data products. The plan must include a detailed schedule for the submission of raw and reduced data to the appropriate data archive in the proper formats, media, etc. Delivery of the data to the data archive must take place in the shortest time possible.
- d. Science Team. This section must identify each necessary individual of the investigation science team and their roles and responsibilities. The capabilities and experience of all members of the proposed science team must be described. Resumes or curriculum vitae of team members should be included as attachments to the proposal (see Section I, below). The role of each Co-Investigator must be explicitly defined and justified, and the funding source (NASA or contributed) for the PI and each Co-Investigator noted. A letter of endorsement is required from each Co-Investigator's institution if the Co-Investigator's services are contributed (see Section I.2).

E. EDUCATION/ PUBLIC OUTREACH, NEW TECHNOLOGY, AND SMALL DISADVANTAGED BUSINESS PLAN

The education, outreach, new technology, and small disadvantaged business sections must provide a summary of the benefits expected to be offered by the mission beyond the scientific benefits.

- 1. Educational and Public Outreach. This section must reflect the proposer's commitment to achieving the goals of the OSS education and public outreach strategy as reflected in the implementation plan for that strategy. Further information on the OSS broad approach to education and outreach can be found in *Implementing the Office of Space Science (OSS) Education and Outreach Strategy* (see section 3.3.1). Letters of support/commitment from partners/subcontractors and resumes from key E/PO personnel should be included as appendices to the proposal. **Also see Appendix C for additional information about the E/PO effort and for electronic submission requirements.**

2. Small Disadvantaged Business. A summary plan is required specifying the proposed investigation's commitment to include the participation of SDB's and minority institutions as described in Section XIII of Appendix A of the AO.
3. New Technology. This section should discuss how new technology relates to the proposed investigation, including: (1) insertion of new technology into the project, (2) transfer of new technology from the project to other projects or programs, and (3) commercialization of new technology. The functions that the new technology performs and how it will be demonstrated for the investigation should be described. Also to be discussed is the development of partnerships among space, nonspace firms, educational, other nonprofit organizations, and Government entities to facilitate technology development, transfer, and commercialization along with how the mission team will implement the transfer and/or commercialization.

F. MISSION IMPLEMENTATION

This section should provide a description of the mission, including mission design, instrument accommodation, spacecraft, launch vehicle required, ground systems, communications approach, and mission operations plan. Specific information should be included that describes the unique requirements placed on these mission elements by the science investigation. If the Space Shuttle is proposed as the launch vehicle, the proposal must state whether the investigation is considered a primary or a secondary payload, specify the target flight assignment, and provide justification for Shuttle use as required by 42 U.S.C. 2465a (see the *Discovery Space Shuttle Launch Opportunities* document in the Discovery Program Library/Appendix E). In some areas (for example, instruments), the data requested may already be needed and presented in another section (e.g.; the Science Implementation section). In such cases, proposers may provide a reference to those sections and need not repeat the data in the Mission Implementation section.

Within this section describe the development approach that will assure mission success. Include the following items to the degree they are known:

- Heritage and maturity of mission elements (instruments, spacecraft, ground systems, and mission design, etc.);
- Approach to the use or nonuse of redundancy and other reliability measures;
- Requirements for burn-in of parts and total operating time required without failure prior to flight;
- Assembly, integration and test flows and integration and test approach;
- Environmental test philosophy (test flow and sequence, test margins and test durations)
- Product assurance activities;
- Systems engineering and trade studies;
- Potential risks to the proposed investigation and plans for mitigating those risks; and
- Technology development plans and back-up plans if existing technologies do not meet development needs (new technology may be penalized for risk if adequate plans are not described to ensure success of the investigation).

- Fuel management strategy

It is recognized that teaming arrangements to implement the investigation may not be complete at the time of the proposal. Proposers will not be penalized for this if it is demonstrated that there are candidate implementation approaches for the spacecraft, launch vehicle, communications, and ground systems that will allow the successful implementation of the investigation within the proposed cost and schedule.

Although the maturity of the proposed design may require the results of a later trades during the Concept Study, in addition to the information above, the specific data identified below should be provided (preferably in tables) **to the extent known and as applicable to the mission configuration proposed.**

1. General information.

- Launch date (including launch date and launch window)
- Launch Energy (C3) for baseline launch window
- Mission duration (cruise, science, total)
- Orbit type (Earth orbit, heliocentric, etc.)
- Orbit parameters for all science mission phases (semimajor axis, eccentricity, inclination, node time of day, argument of perigee, altitude)
- Epoch time in Gregorian date and duration of each science mission phase (e.g. different orbits, flybys) corresponding to information above
- Nonplanetary target (e.g. asteroids, moons, comets) orbital elements and gravitational constants

2. Downlink Information.

- Data rate and volume (kbps, Mbytes/day)
- Bit error rate, onboard storage (Mbytes)
- Power available for communications (watts)
- Number of data dumps per day, spacecraft data destination (e.g., mission operations center)
- Science data destination (e.g., science operations center)
- Maximum time lag between data dump and data arrival at destination if relevant to science needs.
- Also see *NASA's Mission Operations and Communications Services* document in the Discovery Program Library/Appendix E for additional data required for Deep Space Network and commercial downlink options

3. Uplink Information.

- Number of uplinks per day
- Number of Bytes per uplink
- Bit error rate
- Approach and schedule for obtaining license(s) for use of proposed frequency bands

4. Resources and Margins.

- For satellite (instrument package and spacecraft), provide estimates for mass, power, and reserves at the subsystem level (including propellant(s)/oxidizer(s)), and margins at the system level.
- For instrument package requirements on the spacecraft, provide pointing accuracy, knowledge, stability, attitude, and maneuvering requirements necessary for science operations (include design margins, when known).

Definitions:

Contingency (or reserve), when added to a resource, results in the maximum expected value for that resource. Percent contingency is the value of the contingency divided by the value of the resource less the contingency.

Margin is the difference between the maximum possible value of a resource (the physical limit or the agreed-to limit) and the maximum expected value for a resource. Percent margin for a resource is the available margin divided by its maximum expected value.

Example: A payload in the design phase has an estimated mass of 115 kg including a mass reserve of 15 kg. There is no other payload on the ELV and the ELV provider plans to allot the full capability of the vehicle, if needed. The ELV capability is 200 kg. The mass reserve is $15/100 = 15\%$, and the mass margin is 85 kg or $85/115 = 74\%$.

Example: The end-of-mission life capability of a spacecraft power system is 200 Watts. The proposed instrument is expected to use 40 Watts, and a 25% contingency is planned. 75 Watts is allotted by the satellite provider. The reserve is 10 Watts while the margin is 25 watts, or $25/50 = 50\%$.

5. Attitude and Control Requirements

- Control method (3-axis, spinner, gravity gradient, *etc.*). For spin stabilized spacecraft provide spin rate and axis in terms of spacecraft body coordinate frame.
- Control reference (solar, inertial, Earth-nadir, Earth-limb, *etc.*)
- Attitude requirements as a function of time during all science mission phases
- Attitude control requirements for bias, drift, stability or jitter, and rate for scanning (each axis)
- Spacecraft attitude knowledge requirements at the instrument interface for bias, drift, jitter, and rate for scanning (each axis)

- Agility (maneuvers, scanning, *etc.*)
- Deployments (solar panel, antennas, *etc.*)
- Articulation (1- or 2 -axis solar arrays, antennas, gimbals, *etc.*)
- On-orbit calibration (alignment, line-of-sight, thermal deformation)
- Attitude knowledge processing (*e.g.* real-time versus postprocessing, spaceborne versus ground)

6. Instrument Characteristics (for each instrument)

- Instrument mass (include breakouts of electronics and aperture mass if known)
- Instrument viewing direction in body coordinates.
- Define instrument operational modes
- Provide instrument operational mode timeline
- Data demand for each instrument operational mode
- On-board recording required from spacecraft?
- Power demand for each instrument operational mode. This should include peak, average and, stand-by power.
- Supplemental power supplied by primary batteries
- Is instrument active or passive?
- Does instrument have separate thermal control capability?
- Bias, drift, and noise of instrument data used in pointing control and knowledge determination.
- Character of significant instrument-generated jitter and momentum.

7. Spacecraft Characteristics

- Spacecraft Parameters
 - A block diagram of the spacecraft subsystem components.
 - Sensor and actuator information (precision/errors, torque, and momentum storage capabilities, *etc.*)
- Propulsion
 - Estimated delta-V budget
 - Propulsion type(s) (monoprop, bi-prop, dual-mode, solar electric, *etc.*) and associated propellant(s)/oxidizer(s)
 - Propellant mixture ratio (if bi-prop)
 - Specific impulse of each propulsion mode
- Communications
 - Modes of communications operations
 - For transmit only mode
 - Mode timeline, data rate(s), duration
 - For receive only mode
 - Mode timeline, data rate(s), duration
 - For Rx and Tx mode simultaneously
 - Mode timeline, duration
- Command and Data Handling
 - Spacecraft housekeeping data demand. If known, timed data demands shall be provided for each subsystem operational mode (*i.e.* for Guidance, Navigation, and

Communication (GN&C), Standby, Fine Pointing, Reaction Wheel Momentum Management... ; for Comm, transmit, receive,...).

- Data storage unit size (Mbits)
- Maximum storage record rate
- Maximum storage playback rate
- Power
 - Definition of each spacecraft subsystem operational mode over all science phases. Provide power demand for each operational mode. Also provide operational schedule (timeline) for each mode.
 - Type of array structure (rigid, flexible, body mounted)
 - Solar array axes of rotation (vector projected in spacecraft coordinates)
 - Array size
 - Solar cell type
 - Solar cell efficiency
 - Expected power generation at Beginning of Life (BOL) and End of Life (EOL)
 - Worst case sun incidence angle to solar panels during science mission
 - Battery type
 - Battery storage capacity
 - Worst case battery Depth of Discharge (DOD)
 - Spacecraft bus voltage

For Missions of Opportunity, provide the information above that is related to the proposed investigation's requirements on and interfaces with the sponsor's instrument/spacecraft.

G. MANAGEMENT AND SCHEDULE

This section should summarize the investigator's proposed management approach for the complete investigation including the E/PO. The management organization (including an organization chart) and decision-making process should be described, and the teaming arrangement (as known) should be discussed. The responsibilities of team members, including contributors, and institutional commitments should be discussed. Unique capabilities that each team member organization brings to the team, as well as previous experience with similar systems and equipment, should be addressed. The specific roles and responsibilities of the Principal Investigator and Project Manager must be described, but key project personnel (e.g., the Project Manager) need not be identified by name at this time. Risk management and risk mitigation plans must be described. This discussion should include the top 3-5 risks, descoping strategies, if relevant, and management strategies for control, allocation and release of technical, cost and schedule reserves and margins. When major subcontracts are required, the acquisition strategy including the incentive strategy should be described.

A project schedule to meet the proposed launch date and covering all phases of the investigation should be provided. The schedule should include, as a minimum, proposed major project review dates; instrument development; spacecraft development; instrument-to-spacecraft integration and test; launch vehicle integration; mission operations and data analysis; and planning and implementation of the E/PO program. Schedule reserve should be clearly identified.

Mission of Opportunity proposals should specifically address how the investigation team will interrelate with the sponsoring organization, organizationally and managerially. Mission of Opportunity proposals should also address:

The status of the commitment from the spacecraft builder/owner or sponsoring organization to fly the proposed instrument or conduct the proposed investigation.

Describe if and how the proposed investigation relates to the spacecraft sponsor's overall mission objectives.

Describe the investigation development plan and how it fits in the development plan for the sponsor's mission.

Describe how the operations plan for the proposed investigation fits within the mission of the sponsoring organization.

H. COST AND COST ESTIMATING METHODOLOGY

This section shall include an estimated cost of the investigation that encompasses all proposed activities, including all applicable mission phases, launch services, development of the ground data system, implementation of E/PO, fee, and contributions. These costs shall be consistent with the program requirements described in Section 3, 4, and 5 of the AO. The amount required in each fiscal year should be identified by providing the data in Tables B1 and B3 for Discovery missions and Tables B2 and B3 for Missions of Opportunity. The top portion of Table B1 requests cost data relative to the NASA OSS Cost while the lower portion requests cost data relative to contributions. Table B2 requests NASA OSS cost data for Missions of Opportunity. Table B3 summarizes the NASA OSS Cost by Phase. The completed tables will not be counted against the page limit. Table B4 gives the NASA inflation index to be used to calculate real year dollars. Note that if the Shuttle is proposed as the launch vehicle, a Shuttle transportation cost which is based upon payload weight/volume must be obtained from the Shuttle Office at NASA Headquarters and included in launch services costs (see *Discovery Shuttle Launch Opportunities* document in the Discovery Program Library). This cost will be used for evaluation cost comparison purposes only.

Proposers must submit the data in Table B1 or B2, as appropriate, and Table B3 and may also submit this data as well as additional data supporting these estimates, on a floppy disk with their original, signed proposal. The disk may be either IBM-compatible or Macintosh-compatible and the cost data, including the headings for the rows and columns, should be in tab-delimited text files. The proposer may use the application file of their choice (EXCEL, Word, etc.) so long as these are standard applications. The disk should be labeled with the title of the proposal and the PI's name. Please note that evaluators may refer to this supporting data to clarify costs provided in the proposal, however, there is no guarantee that this data will be fully evaluated. Only the data in the proposal can be assumed to be fully evaluated.

The methodology used to estimate the cost, for example, specific cost model, past performance, cost estimating relationships from analogous missions, should be discussed. Budget reserve strategy, including budget reserve levels as a function of mission phase, should be discussed. Please provide assumptions used in developing cost estimates to help facilitate reviewer understanding of proposed cost estimates.

I. APPENDICES

The following additional information is required to be supplied with the proposal as Appendices and, as such, will not be counted within the specified page limit. NO OTHER APPENDICES ARE PERMITTED.

1. Statement of Work (SOW) and Funding Information. For investigations managed from non-Government institutions, provide a SOW. For investigations managed from Government institutions, provide a SOW as if the institution were non-Government. This SOW must include the requirement for a concept study report that is described in the Guidelines for Concept Study Report document available through the Discovery Program Library. The SOW must include general tasks statements for Phases B/C/D and for Phase E for Discovery Mission investigations and Missions of Opportunity investigations. All SOW's should include the following as a minimum: Scope of Work, Deliverables (including science data), and Government Responsibilities (as applicable). SOW's need not be more than a few pages in length. If more than one contractual arrangement between NASA and the proposing team is required, funding information must be provided which identifies how funds are to be allocated among the organizations with a separate Statement of Work for each organization.
2. Letters of Endorsement. Letters of endorsement must be provided from all organizations offering critical facilities (*e.g.*, integration and test, thermal vacuum chambers, L-Tool, etc.), goods, and/or services (including Co-Investigator services), non-U.S. organizations providing hardware or software to the investigation, the Launch Service provider if the launch service is not provided through a NASA contract, and the major participants in the proposal. Letters of endorsement must provide evidence that the institution and/or Government officials are aware and supportive of the proposed investigation and will pursue

funding for the investigation if selected by NASA. They must be signed by institutional and/or Government

officials authorized to commit their organizations to participation in the proposed investigation. Signed letters of support or commitment must also be provided from all key E/PO partners or subcontractors detailing their commitment to, or involvement in the education and public outreach effort.

3. Resumes. Provide resumes or curriculum vitae for all science team members identified in the science section and for all named key project personnel. Each resume should contain the information in the order given as follows:
 - a) the name and organization of the individual,
 - b) a one sentence description of the individual's job or role on the project,
 - c) the resume or vitae clearly showing experience related to the job the individual will perform on the proposed investigation,
 - d) the commitment signature of the individual and the date,
 - e) if any portion of the commitment is a contribution (not reimbursed by the project), the amount (%) of the contribution and the signature of an authorizing official of the individual's organization.

Also provide resumes for all key E/PO lead personnel. Include resume data on experience which relates to the job these personnel will be doing for the proposed investigation.

The complete resume form should be no longer than two pages in length for each participant.

4. Draft International Participation Plan - Discussion on Compliance with U.S. Export Laws and Regulations. Investigations that include international participation, either through involvement of non-U.S. nationals and/or involvement of non-U.S. entities must include a section discussing compliance with U.S. export laws and regulations; e.g., 22 CFR 120-130, *et seq.* and 15 CFR 730-774, *et seq.*, as applicable to the scenario surrounding the particular international participation. The discussion must describe in detail the proposed international participation and is to include, but not be limited to, whether or not the international participation may require the proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available through Internet URL's <http://www.pmdtc.org> and <http://www.bxa.doc.gov>. Proposers are advised that under U.S. law and regulation, spacecraft and their specifically designed, modified or configured systems, components, parts, etc., such as the instrumentation being sought under this AO, are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations, 22 CFR 120-130, *et seq.*

5. Outline of Technical Responsibilities between U.S. and International Partners. These outlines will be used by the Office of External Relations, NASA Headquarters at Selection as the starting point for formalizing the agency to agency agreements that will be required if the investigation is implemented.”
6. Compliance with Procurement Regulations by NASA PI Proposals. Proposals submitted by NASA employees as Principal Investigators should contain the following information concerning the process by which non-Government participants were included in the proposal. The proposal should (i) indicate that the supplies or services of the proposed non-Government participant(s) are available under an existing NASA contract; (ii) make it clear that the capabilities, products, or services of these participant(s) are sufficiently unique to justify a sole source acquisition; or (iii) describe the open process that was used for selecting proposed team members. While a formal solicitation is not required, the process cited in (iii) above should include at least the following competitive aspects: notice of the opportunity to participate to potential sources, submissions from and/or discussions with potential sources, and objective criteria for selecting team members among interested sources. The proposal should address how the selection of the proposed team members followed the objective criteria and is reasonable from both a technical and cost standpoint. The proposal should also include a representation that the Principal Investigator has examined his/her financial interests in or concerning the proposed team members and has determined that no personal conflict of interest exists. The proposal must provide a certification by a NASA official superior to the Principal Investigator verifying the process for selecting contractors as proposed team members, including the absence of conflicts of interest.
7. Acronyms and Abbreviations List.

The following item is optional.

8. References List. Proposals may provide a list of reference documents and materials used in the proposal. The documents and materials themselves cannot be submitted, except as a part of the proposal and included within the prescribed page count, nor should it be necessary to consult these references to adequately review the proposal.

TABLE B1
TOTAL MISSION COST FUNDING PROFILE TEMPLATE
FOR DISCOVERY MISSIONS
(FY costs* in Real Year Dollars, Totals in Real Year and FY2001 Dollars)

Cost Element**	FY1	FY2	FY3	FY4	FY5	...	FYn	Total (Real Yr.)	Total (FY 2001)
NASA OSS Cost:									
Proj Mgt/Sys Engineering									
Instrument A									
Instrument B									
Spacecraft -S/C Bus -S/C Int, Assy, & test -Launch C/O & Orb Ops									
MO***									
DA***									
DSN									
Ground Data System Dev									
Launch services									
E/PO									
Reserves									
Other (specify)									
Total NASA OSS Cost	\$	\$	\$	\$	\$	\$	\$	\$	\$
Contributions:									
Proj Mgt/Sys Eng									
Instrument A									
Instrument B									
Spacecraft									
MO&DA									
DSN									
Ground Data System Dev									
Launch services									
E/PO									
Reserves									
Other (Specify)									
Total Contributions	\$	\$	\$	\$	\$	\$	\$	\$	\$
								Total Mission Cost	\$

- * Costs should include all costs including any fees
- ** Refer to Discovery Program Library for Definition of Cost Elements
- *** Mission Operations and Data Analysis

TABLE B2
NASA OSS COST FUNDING PROFILE TEMPLATE
FOR MISSIONS OF OPPORTUNITY
(FY costs* in Real Year Dollars, Totals in Real Year and FY2001 Dollars)

Cost Elements**	FY1	FY2	FY3	FY4	FY5	...	FYn	Total (Real Yr.)	Total (FY 2001)
Proj Mgt/Sys Eng									
Instrument A									
Instrument B									
Ground Data System Dev									
MO***									
DA***									
DSN									
E/PO									
Reserves									
Other (specify)									
NASA OSS Cost	\$	\$	\$	\$	\$	\$	\$	\$	\$

- * Costs should include all costs including any fee
** Refer to Discovery Program Library for Definition of Cost Elements
*** Mission Operations and Data Analysis

TABLE B3
MISSION PHASE SUMMARY OF NASA OSS COST
(FY costs in Real Year Dollars, Phase Totals in Real Year and FY2001 dollars)

Mission Phase	FY1	FY2	FY3	FY4	FY5	...	FYn	Total (RY\$)	Total (FY01\$)
Concept Study									
Phase B									
Phase C/D									
Phase E									
Launch Vehicle									
FY Totals	\$	\$	\$	\$	\$	\$	\$	\$	\$

TABLE B4

NASA NEW START INFLATION INDEX

Fiscal Year	2001	2002	2003	2004	2005	2006	2007	2008
Inflation Rate	0.0%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%
Cumulative Inflation Index	1.0	1.031	1.062	1.096	1.130	1.165	1.201	1.238

Use an inflation rate of 3.1% for years beyond 2008.

APPENDIX C

EDUCATION/PUBLIC OUTREACH EVALUATION CRITERIA AND PROPOSAL PREPARATION ASSISTANCE

I. EVALUATION CRITERIA

E/PO proposals will be evaluated (see criteria below) by appropriately qualified scientific, education, and outreach personnel, and, as outlined in Sections 7.1 and 7.2 of the Announcement of Opportunity, the results of those evaluations will be explicitly considered by the OSS Selecting Official as an integral part of the overall evaluation and selection process. These criteria will also be used in the evaluation of the Concept Study Reports.

There are seven evaluation criteria against which proposed OSS E/PO activities will be evaluated --four general criteria and three specific criteria.

The general criteria to be applied to the evaluation of all proposals, which reflect requirements necessary for further consideration of a proposal, are:

- The quality, scope, and realism of the proposed E/PO program including the adequacy, appropriateness, and realism of the proposed budget;
- The capability and commitment of the proposer and the proposer's team and the direct involvement of one or more science team members in overseeing and carrying out the proposed E/PO program;
- The establishment or continuation of effective partnerships with institutions and/or personnel in the fields of education and/or public outreach as the basis for and an integral element of the proposed E/PO program;
- The adequacy of plans for evaluating the effectiveness and impact of the proposed education/outreach activity.

To ensure that the goals and objectives of the OSS E/PO strategy are realized in practice, proposals will also be evaluated using the following specific criteria listed below. Based on the funding guidelines given elsewhere in this AO, the E/PO programs submitted in response to this Announcement will involve the expenditure of substantial resources. Therefore, it is expected that proposed E/PO programs will have a breadth and depth commensurate with these resources. Such programs are expected to be multi-faceted in nature, address a number of different aspects of education and outreach contained in the specific criteria, and have state, regional, or national scope. The specific E/PO criteria are:

- For proposals dealing directly with or strongly affecting the formal education system (e.g., through teacher workshops or student programs carried out at informal education institutions such as science museums and planetariums), the degree to which the proposed E/PO effort is aligned with and linked to nationally recognized and endorsed education reform efforts and/or reform efforts at the state or local levels;

- The degree to which the proposed E/PO effort contributes to the training of underserved and/or underutilized groups and their involvement in and broad understanding of science and technology;
- The potential for the proposed E/PO activity to expand its scope by having an impact beyond the direct beneficiaries, reaching large audiences, being suitable for replication or broad dissemination, or drawing on resources beyond those directly requested in the proposal.

Although creativity and innovation are certainly encouraged, note that neither of these sets of criteria focuses on the originality of the proposed effort. Instead, NASA seeks assurance that the proposer is personally committed to the E/PO effort and the mission PI and/or appropriate research team members will actively be involved in carrying out a meaningful, effective, credible, and appropriate E/PO activity; that such an activity has been carefully planned and will be effectively executed; and that the proposed investment of resources will make a significant contribution toward meeting OSS E/PO plans and objectives.

In order to provide further insight to prospective proposers about the meaning of these evaluation criteria (and to ensure that E/PO proposals are reviewed on a consistent basis), OSS has developed an Explanatory Guide to the Office of Space Science Education and Public Outreach Evaluation Criteria. This document is available through the Discovery Program Library (see Appendix E) or may be accessed following the directions in Section 3.3.1 of the Announcement of Opportunity. Navigation through this Explanatory Guide at its Web site is facilitated by internal links. This Guide is not an extension of the E/PO requirements or criteria but is meant to provide an easy-to-follow introduction to the OSS Education and Public Outreach Program using a series of Frequently Asked Questions (FAQs) followed by a detailed discussion of the E/PO review criteria. “Indicators” contained in that discussion are the ones used by reviewers as the basis for their evaluation. Therefore, all proposers are strongly urged to review this Explanatory Guide.

II. ASSISTANCE FOR THE PREPARATION OF E/PO PROPOSALS

NASA OSS has established a nation-wide support infrastructure of space science education/public outreach groups one of whose purposes is to directly aid space science investigators in identifying and developing high quality E/PO opportunities. This infrastructure provides the coordination, background, and linkages for fostering partnerships between the space science and E/PO communities, and the services needed to establish and maintain a vital national, coordinated, long-term OSS E/PO program. Of particular interest are two elements of this system (which are also described in more detail in the OSS education/outreach implementation plan referred to in Section 3.3.1 of this Announcement):

Four OSS science theme-oriented E/PO "Forums" have been established to help orchestrate and organize in a comprehensive way the education/outreach aspects of OSS space science missions and research programs, and provide both the space science and education communities with ready access to relevant E/PO programs and products; and

Five regional E/PO "Broker/Facilitators" to search out and establish high leverage opportunities, arrange alliances between educators and OSS-supported scientists, and help scientists turn results from space science missions and programs into educationally-appropriate activities suitable for regional and/or national dissemination

Prospective proposers are strongly encouraged to make use of these groups to help identify suitable E/PO opportunities and arrange appropriate alliances. Proposers should be careful to note that these Forums and Broker/Facilitators have been established to provide help, but the responsibility for actually developing the E/PO program and writing the proposal is that of the proposer. Points of contact and addresses for all of these E/PO Forums and Broker/Facilitators may be found by opening Education and Public Outreach from the menu of the OSS homepage at <http://www.space-science.nasa.gov>.

III. PREPARATION AND SUBMISSION OF AN E/PO PROPOSAL

In order to be considered for evaluation, E/PO proposals must adhere to the following formats and also must be submitted both electronically and in hard copy as described below.

An E/PO proposal is to consist of a contiguous body, budget, and key personnel workforce information:

- The body of the E/PO proposal is limited to four pages (using the fonts and page layouts specified in the appropriate Guidelines for Proposal Preparation appendix) and must include the following parts: a brief abstract of the proposed activity (not to exceed 800 characters); an expanded description of the E/PO objectives and planned activities; a description of the intended involvement of the Principal Investigator and/or key science team members in the proposed E/PO effort; a description of any educational personnel who are involved in the effort (resumes), including proposed partnership institutions (together with specific indicators of commitment on the part of partners where appropriate); a description of how the effort will be managed; and an explanation of the requested E/PO budget (including expenditures for Co-Is/subcontractors). Note that the mission PI or one of the science team members of the parent research proposal must have the prime responsibility for overseeing the implementation of the proposed E/PO activity. The responsible individual should be clearly identified in the body of the E/PO proposal. Details of organizational and management arrangements described in the "Management and Schedule" section of the proposal may be included by reference and do not have to be repeated in this section of the proposal.
- The period of performance of an E/PO activity is generally expected to coincide with that of the proposed investigation throughout all phases including the data analysis phase. To the extent that the details are available, the E/PO budget must be summarized for its entire intended total period of performance, as well as for each individual year thereof, using the budget summary formats at the end of this Appendix. In addition, this E/PO budget must be integrated into the budget for the entire proposed investigation as

specified elsewhere in this AO. Note that these budget summary sheets are not included in the page limits indicated above and in Appendix B. This information (analogous to the supporting cost data for the scientific and technical aspects of the proposals described in Section H of Appendix B) is intended to help OSS assess the adequacy, appropriateness, and realism of the budget for the proposed E/PO program.

E/PO proposals must be submitted by each of two separate ways:

- An electronic submission of the E/PO Section from the proposal together with the detailed E/PO Budget Summary and Key Personnel sheets (see E/PO Templates 1, 2, 3 below), to the secure Web site <http://www.lpi.usra.edu/panel/>, which provides detailed submission instructions for using a wide variety of formats. Proposers without Web access or who experience difficulty in using this site may request assistance from the Lunar and Planetary Institute by E-mail at panel@lpi.usra.edu or by phone at (281) 486-2137; and
- A hard-copy version in the research proposal to include the E/PO proposal text, letters of support/commitment, and resumes. Note: Detailed budget and workforce information (Templates 1-3) should only be submitted electronically as described above and should not be included in the hard copy of the proposal.

IV. ADDITIONAL INFORMATION

General questions about the OSS E/PO program may be directed to:

Dr. J. David Bohlin
Research Program Management Division
Code SR
Office of Space Science
NASA Headquarters
Washington, DC 20546
E-mail: david.bohlin@hq.nasa.gov
Telephone: 202/358-0880

E/PO Template #1
BUDGET SUMMARY for PROPOSAL

For (check one):

___ Total Period of Performance from (M/D/Y) _____ to _____

___ For Year ___ of ___ from (M/D/Y) _____ to _____

	A	NASA USE ONLY	
		B	C
1. <u>Direct Labor</u> (salaries, wages, and fringe benefits) _____	_____	_____	_____
2. <u>Other Direct Costs:</u>			
a. Subcontractor/Co-I Institution#1 _____	_____	_____	_____
Subcontractor/Co-I Institution #(n) _____	_____	_____	_____
b. Consultants _____	_____	_____	_____
c. Equipment _____	_____	_____	_____
d. Supplies _____	_____	_____	_____
e. Travel _____	_____	_____	_____
f. Other (specify) _____	_____	_____	_____
3. <u>Facilities and Administrative Costs</u> _____	_____	_____	_____
4. <u>Other Applicable Costs:</u> _____	_____	_____	_____
5. <u>SUBTOTAL--Estimated Costs</u> _____	_____	_____	_____
6. <u>Less Proposed Cost Sharing</u> (if any) _____	_____	_____	_____
7. <u>Total Estimated Costs</u> _____	_____	_____	_____

INSTRUCTIONS FOR BUDGET SUMMARY -TEMPLATE#1

- Provide a complete Budget Summary for the total as well as each individual year of the proposed period of performance.
 - Enter the proposed estimated costs in Column A (Columns B & C for NASA use only).
 - Provide, as attachments, detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost as follows.
1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.
 2. Other Direct Costs:
 - a. Subcontracts/Partners/Co-I Institutions: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting. Enter the annual totals on this budget summary page. In addition, for each year of the project, complete a more detailed budget summary form describing the subcontractor's/partner's/Co-I institution's use of NASA funds that the proposer requested through this solicitation (see Template #2 format).
 - b. Consultants: Identify consultants to be used, why they are necessary, the time (number of days) they will spend on the project, and quoted daily rates of pay. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.
 - c. Equipment: List separately. Explain the need for items costing more than \$5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Grant Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
 - d. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
 - e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination, number of trips, and number of travelers where known.
 - f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate.
 3. Facilities and Administrative (F&A) Costs: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.
 4. Other Applicable Costs: Enter total explaining the need for each item.
 5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.
 6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.
 7. Total Estimated Costs: Enter the total after subtracting items 6 from item 5.

E/PO Template #2

BUDGET SUMMARY for SUBCONTRACTOR/Co-I INSTITUTIONS

Name of Subcontractor/Co-I _____

Total Amount Requested:_____

From (M/D/Y) _____ to _____(M/D/Y)

	FY1	FY2	FY(n)	ROW TOTALS
1. <u>Direct Labor</u> (salaries, wages, and fringe benefits)	_____	_____	_____	_____
2. <u>Other Direct Costs</u> :				
a. Subcontracts	_____	_____	_____	_____
b. Consultants	_____	_____	_____	_____
c. Equipment	_____	_____	_____	_____
d. Supplies	_____	_____	_____	_____
e. Travel	_____	_____	_____	_____
f. Other (specify)	_____	_____	_____	_____
3. <u>Facilities and Administrative Costs</u>	_____	_____	_____	_____
4. <u>Other Applicable Costs</u> :	_____	_____	_____	_____
5. <u>SUBTOTAL--Estimated Costs</u>	_____	_____	_____	_____
6. <u>Less Proposed Cost Sharing</u> (if any)	_____	_____	_____	_____
7. TOTAL ESTIMATED COSTS	_____	_____	_____	_____

INSTRUCTIONS FOR BUDGET SUMMARY -TEMPLATE#2

- Provide a complete Budget Summary for the total as well as each individual year of the proposed period of performance by subcontractor, partner, or Co-I institution.
 - Provide, as attachments, detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost as follows.
1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.
 2. Other Direct Costs:
 - a. Subcontracts: For each year of the project, complete a detailed budget describing the work to be subcontracted, recipient (if known), and the reason for subcontracting.
 - b. Consultants: Identify consultants to be used, why they are necessary, the time (number of days) they will spend on the project, and quoted daily rates of pay. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.
 - c. Equipment: List separately. Explain the need for items costing more than \$5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Grant Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
 - d. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
 - e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination, number of trips, and number of travelers where known.
 - f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate.
 3. Facilities and Administrative (F&A) Costs: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.
 4. Other Applicable Costs: Enter total explaining the need for each item.
 5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.
 6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.
 7. Total Estimated Costs: Enter the total after subtracting items 6 from item 5.

E/PO Template #3
Key Personnel
(Percent Time Committed/Direct Costs, Including Benefits, in FY01 \$K)

	FY1	FY2	FY3	FYn	Total
Co-I - Institution #1					
Mission PI (% time)					
Mission PI (direct cost)					
E/PO lead (% time)					
E/PO (direct cost)					
Other Key Personnel					

Template#3 - Instructions:

Workforce staffing plan for key personnel should be phased by fiscal year. In tabular form, the Workforce Table for Key Personnel should give the names and intended work commitment for the mission PI and key E/PO personnel of the proposed project both in time (rounded to the nearest 0.01 of a Work Year typically of 1880 hours) and salary (without addition of overhead or fees - rounded to the nearest \$1K) for each year of the proposed period of performance.

APPENDIX D

REGULATIONS GOVERNING PROCUREMENT OF FOREIGN GOODS OR SERVICES

The following Federal Acquisition Regulation (FAR) clauses cover the purchase of foreign goods and services and may be included in contracts resulting from this Announcement of Opportunity:

- 52.225-3 Buy American Act -- Supplies (January 1994)
- 52.225-7 Balance of Payments Program (April 1984)
- 52.225-9 Buy American Act -- Trade Agreements -- Balance of Payments Program (January 1996)
- 52.225-10 Duty-Free Entry (April 1984)
- 52.225-11 Restrictions on Certain Foreign Purchases (May 1998)
- 52.225-18 European Union Sanction for End Products (January 1996)
- 52.225-19 European Union Sanction for Services (January 1996)
- 52.225-21 Buy American Act -- North American Free Trade Agreement Implementation Act -- Balance of Payments Program (January 1997)

Note that additional Federal Acquisition Regulation (FAR) and NASA FAR Supplement clauses may be applicable to specific procurement actions as required by the cognizant Contracting Officer.

The proposer is directed to the Federal Acquisition Regulations and the NASA FAR Supplements for further information on these regulations. Access information for these documents is given in the Discovery Program Library (see Appendix E).

APPENDIX E

CONTENTS OF THE DISCOVERY PROGRAM LIBRARY

The Discovery Program Library includes documents available electronically via the Internet, as well as paper copy. Proposers are requested to access the document electronically where possible. Only limited paper copies of some documents are available, therefore, requests for copies must be approved by NASA Headquarters. Please note that not all documents are actually located in the Discovery Program Library. For these documents, an internet hyperlink has been provided via the DPL to allow download of the document from their home location.

It is incumbent upon the proposer to ensure that the documents used in proposal preparation are of the date and/or revision listed in the Announcement of Opportunity or this Appendix whenever applicable.

The Discovery Program Library is accessible on the World Wide Web at the URL address:

<http://discovery.larc.nasa.gov/discovery/dpl.html>

Requests for paper copies must be submitted in writing to:

Dr. Jay Bergstralh
Ref. Discovery 2000
Research Program Management Division
Code SR
National Aeronautics and Space
Administration
Washington, DC 20546-0001
Fax Number: (202) 358-3097
E-mail: jay.bergstralh@hq.nasa.gov
Phone: (202) 358-0313

Office of Space Science Strategies and Policies

The Space Science Enterprise Strategic Plan: Origins, Evolution, and Destiny of the Cosmos and Life (November 1997)

This document is a concise statement of the goals and outlook of NASA's Space Science Enterprise. It is a compilation of the major ideas described in more detail in the context of the overall NASA Strategic Plan.

Partners in Education: A Strategy for Integrating Education and Public Outreach into NASA's Space Science Programs (March 1995)

This document describes the overall strategy for integrating education and public outreach into NASA's space science programs.

Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy (October 1996)

This document describes OSS's overall approach to implementing its Education/Public Outreach strategy.

Explanatory Guide to the NASA Office of Space Science Education and Public Outreach Evaluation Criteria (April 1999)

Answers to frequently asked questions, elaboration of each of the OSS E/PO criteria. Document is intended to give a flavor of what exemplary E/PO can be.

The Space Science Enterprise Integrated Technology Strategy (October 1998)

Describes efforts to manage technology infusion into future OSS missions and to promote technology transfer to the private sector.

Space Science Roadmaps

The science themes of the NASA Office of Space Science, through the Space Science Advisory Committee and its subcommittees, have developed Roadmaps. These planning documents prioritize the space science goals for NASA for the years 2000-2020. The following Roadmaps apply to the Discovery Program:

Mission to the Solar System: Exploration and Discovery, A Mission and Technology Roadmap, 2000-2025 (March 1998)

Exploration of the Solar System: Science and Mission Strategy (December 1999)

Search for Origins Roadmap (July 1997)

A paper copy may be obtained by sending an E-mail with name and address to <hthronson@hq.nasa.gov>.

Space Science Supporting Documents

HST and Beyond. Exploration and Search for Origins: A Vision for Ultraviolet - Optical - Infrared Space Astronomy (May 1996)

Report of the HST and Beyond Committee.

NRC Committee on Planetary and Lunar Exploration: An Integrated Strategy for the Planetary Sciences: 1995-2010 (May 15, 1996)

NRC Committee on Planetary and Lunar Exploration: Exploration of Near Earth Objects (1998)

Discovery Guidelines and Requirements Documents

NASA's Mission Operations and Communications Service (March 2000).

Describes the functions and costs of Ground Data Systems and Mission Operations and Data Analysis available via NASA.

Discovery Launch Services Information Summary (March 2000)

Provides information on capabilities and costs of launch services that are available to launch Discovery spacecraft selected pursuant to this AO.

Discovery Space Shuttle Launch Opportunities (March 2000)

Provides information on capabilities and costs of launch services that are available to Discovery spacecraft that utilize this option of this AO.

Navigation and Ancillary Information Facility Services for Discovery Missions

Provides information relative to the NASA Ancillary Information Facility and the SPICE capability for mission design, mission planning, observation planning, and interpretation of scientific observations.

Guidelines for Concept Study Report Preparation (April 2000)

Provides proposers who are selected via the AO guidelines for preparations of the Concept Study Report.

Concept Study Evaluation Criteria (April 2000)

Defines the criteria and weighting by which the Concept Study Report will be evaluated.

Cost Element Definitions (April 2000)

Provides definitions for all major cost elements for proposals and concept study reports.

General Guideline and Requirements Documents

Example Mission Definition and Requirements Agreement

Example of such an agreement.

NPG 7120.5A--NASA Program and Project Management Processes and Requirements (April 1998)

This document provides a reference for typical activities, milestones, and products in the development and execution of NASA missions.

ISO 9000 Series

The following ISO 9000 quality documents describe current national and NASA standards of quality processes and procedures. American National Standard, "Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation, and Servicing," ANSI/ASQC Q9001-1994.

"Quality Management and Quality System Elements - Guidelines," ANSI/ASQC Q9004-1-1994.

"Quality Management and Quality Assurance Standards - Guidelines for Selection and

" Office of Safety and Mission Assurance (Code Q) presentation, April 24, 1995.

Note: The first three ISO 9000-related documents are copyrighted and cannot be reproduced without appropriate compensation. For copies contact:

American Society for Quality Control (ASQC)
P.O. Box 3066
Milwaukee, WI 53201-3066
(800) 248-1946

Planetary Data System Data Preparation Workbook (February 1995).

This document describes the basic formats and requirements used for the archiving of planetary data products by the Planetary Data System (PDS).

Planetary Protection Requirements.

Includes information on Planetary Protection Requirements for NASA spacecraft missions.

NASA Technology Transfer Resources (No date/revision).

The NASA Commercial Technology Network (CTN) serves as an integrated information resource for NASA technology transfer and commercialization.

Discovery Program Background

Discovery Program Commitment Agreement (June 1999).

This document is the highest level definition of the Discovery Program, being the commitment the Associate Administrator for Space Science has with the NASA Administrator. This agreement is updated annually.

Discovery Program Plan (October 1999).

This document provides the objectives and performance goals, the program-level requirements and interfaces, and the management structure and authority for the overall Discovery Program. It is the commitment between the Discovery Program Manager and the Associate Administrator for Space Sciences.

Discovery Management Workshop Reports.

Includes “*Final Report of the Discovery Management Workshop*” and *Recommendations for Discovery Policy and Implementation Guidelines*, two documents generated by the April 1993 Discovery Management Workshop which was convened to address issues in the management of individual Discovery missions and of the Discovery Program as a whole.

Discovery Program Lessons-Learned Workshop.

This report provides a summary of the lessons learned from the first Discovery AO as a result of the Discovery Program Lessons-Learned Workshop.

Minutes of the Third Workshop on Discovery Missions Program: Lessons Learned

(URL: <http://discovery.larc.nasa.gov/discovery/announcements.html>)

Minutes of the Fourth Workshop on Discovery Missions Program: Lessons Learned

(URL: <http://discovery.larc.nasa.gov/discovery/announcements.html>)

Directives and Procurement-related Information

Electronic versions of the latest releases only are available for the following:

NASA Online Directives Information System (NODIS) II.

The NODIS II Directives Library provides online access to the NASA Policy Directives (NPD's - formerly NMI's), NASA Procedures and Guidelines (NPG's - formerly NHB's) and NASA's Policy Charters (NPC's).

Federal Acquisition Regulations (FAR) General Services Administration

(URL: <http://www.arnet.gov/far/>)

NASA FAR Supplement Regulations

(URL: <http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm>)

NASA Financial Management Manual

(URL: <http://www.hq.nasa.gov/fmm/>)

NPG 5800.1D -- Grant and Cooperative Agreement Handbook (July 1996)

(URL: <http://ec.msfc.nasa.gov/hq/grcover.htm>)

Environmental Quality Regulations

(URL: <http://www.access.gpo.gov/nara/cfr/index.html>)

APPENDIX F

Included for reference only. Submission of the signed printout of web page as directed for the Cover Page/Proposal Summary certifies compliance with these certifications.

Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The (*Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant "*) hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1962 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognized and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

Certification Regarding Debarment, Suspension, and Other Responsibility Matters
Primary Covered Transactions

This certification is required by the regulations implementing Executive Order 12549,
Debarment and Suspension, 14 CFR Part 1265.

- A. The applicant certifies that it and its principals:
- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
 - (b) Have not within a three-year period preceding this application been convicted or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph A.(b) of this certification;
 - (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or Local) terminated for cause or default; and
- B. Where the applicant is unable to certify to any of the statements in this certification, he or she shall attach an explanation to this application.
- C. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -- Lowered Tier Covered Transactions (Subgrants or Subcontracts)
- (a) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principles is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department of agency.
 - (b) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Certification Regarding Lobbying

As required by S 1352 Title 31 of the U.S. Code for persons entering into a grant or cooperative agreement over \$100,000, the applicant certifies that:

- (a) No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, in connection with making of any Federal grant, the entering into of any cooperative, and the extension, continuation, renewal, amendment, or modification of any Federal grant or cooperative agreement;
- (b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting an officer or employee of any agency, Member of Congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete Standard Form -- LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (c) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subgrants, contracts under grants and cooperative agreements, and subcontracts), and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by S1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

APPENDIX G

DISCOVERY PROGRAM PLANNING BUDGET PROFILE

The Discovery Program funding profile for future missions is subject to a wide variety of pressures. For planning purposes, the five (5) year forecast of NASA OSS funding for new mission number nine is provided in the table below (in Real Year Million Dollars). These levels represent the projected highest level of available funding for the years FY 2001-2003, but unused portions of funds in each of these years can be used in the following year(s) if necessary. In addition, these levels represent the total available for a new Discovery mission for all costs to NASA OSS, including launch vehicle costs and SOMO services as provided in Discovery Launch Services Information Summary and NASA's Mission Operations and Communications documents located in the Discovery Program Library (see Appendix E).

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Total	\$11	\$31	\$81	\$125	\$106

The NASA forecast for specific budgets beyond FY 2005 are not yet available. The NASA budget for years beyond the FY 2005 should be sufficient to cover any funding requirements necessary for missions proposed to this AO. Consequently, Discovery missions do not need to consider yearly funding limitations for FY 2006 and out.