National Aeronautics
and Space Administration

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Announcement of Opportunity

Small Explorer Program
and
Missions of Opportunity

Notice of Intent Due: May 12, 1997
Proposals Due: June 16, 1997

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APPENDICES

1.0 DESCRIPTION OF OPPORTUNITY

1.1 General Provisions

The National Aeronautics and Space Administration (NASA) announces the opportunity to conduct space science investigations through Small Explorer space flight missions and through Missions of Opportunity. For the purposes of this announcement, the term "space science" encompasses the scientific objectives of the following NASA science themes:

Astronomical Search for Origins and Planetary Systems;
The Sun-Earth Connection; and
Structure and Evolution of the Universe.

Additional information concerning these themes is provided in Section 2.1.

This Announcement of Opportunity (AO) invites proposals for the sixth and seventh Small Explorer missions and for participation in non-NASA space science missions, identified in this AO as Missions of Opportunity. NASA intends to select two Small Explorer missions--one to launch in 2000 and one to launch in 2001. Additional Small Explorer investigations may be selected depending on funding availability. NASA may also select investigations for Missions of Opportunity, depending on the perceived value of the participation and the availability of funds.

The Small Explorer program is designed to accomplish frequent, high quality space science investigations utilizing innovative, streamlined, and efficient management approaches. It seeks to substantially reduce mission cost through commitment to, and control of, design, development, and operations costs, as well as to improve performance and reduce cost through the use of new technology. Finally, it seeks to enhance public awareness of, and appreciation for, space science and to incorporate educational and public outreach activities as integral parts of space science investigations.

The Small Explorer program demands careful tradeoffs between science and cost in order to produce investigations with the highest possible science value consistent with a high flight rate and limited resources. NASA is seeking to launch a Small Explorer mission every 12 months within the Small Explorer funding profile. Accordingly, the total cost to NASA for all phases of the investigation will be a determining factor in selection.

Participation in space science Missions of Opportunity may be undertaken through the Explorer Program when the perceived value of participation is high and the proposed cost of participation is within the funding limits of the Explorer Program. The Explorer Program also expects Missions of Opportunity to meet other program objectives for reducing cost, injecting new technology, and enhancing education and public outreach.

Proposals submitted in response to this AO must be for complete investigations encompassing all mission phases. For the purposes of this AO, mission phases are defined to be: Phase A - concept study; Phase B - definition and preliminary design; Phase C - detail design; Phase D - development through launch plus 30 days; and Phase E - mission operations and data analysis. Phase E is to include analysis and publication of data in the peer reviewed scientific literature and delivery of the data to the appropriate data archive.

NASA intends to select two primary investigations through this AO that will be awarded contracts to conduct concept studies (Phase A) of Small Explorer missions with options for follow-on phases. NASA may also select investigations that will be awarded contracts to conduct concept studies for Missions of Opportunity. Further details concerning the selection process are given in Section 1.2 and Section 5.

- Small Explorer Missions

This kind of investigation is characterized by offering a complete mission in which 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 must be free flyers that are launched on expendable launch vehicles (ELV's) or as a secondary payload on the Space Shuttle. Except for requirements specifically referring to Missions of Opportunity, all requirements of this AO apply to proposals for Small Explorer Missions. This kind of investigation has two options:

Expendable Launch Vehicle Option

Proposals are for complete missions to conduct an investigation that are launched using expendable launch vehicles either as primary or secondary payloads. The Principal Investigator is responsible for the complete investigation , including the instrument, spacecraft, and ground system. Further information on expendable launch vehicle requirements is given in Section 3.1.1. The NASA-provided Small Expendable Launch Vehicle (SELV) is described in Appendix D.

Shuttle Free-Flyer Option

For this Small Explorer option, the Space Shuttle is the launch vehicle. Shuttle-launched Small Explorer investigation payloads are considered as secondary payloads, that is, they are not the reason for the Shuttle mission and are a lower priority than a primary payload. Shuttle carriers (such as the Spartan 400, Spartan Lite, and carriers from other agencies), into which the science instruments are integrated, may be required. The Principal Investigator is responsible for the complete mission, including making arrangements for carrier use and requesting an appropriate flight assignment.

- Missions of Opportunity

This kind of investigation is characterized by offering to be part of a non-NASA space science mission. Missions of Opportunity may be Space Station attached payloads if also being proposed in response to the current European Space Agency AO. Selection by NASA does not constitute selection of the investigation as part of the mission; that is a decision made by the sponsor of the mission. Instead, selection results in a commitment by NASA to fund the U.S. portion of the investigation as part of the Explorer 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 their contribution to the mission. If a commitment from NASA is not needed by the sponsoring organization before December 31, 1997, then the proposal should be submitted to a subsequent Explorer program AO. See Section 3.8 for more details.

1.2 Proposal Criteria and Selection Process

The prime criterion for evaluation of proposals in either mode submitted in response to this AO will be the excellence of their scientific merit as evaluated by peer review. The technical merit and feasibility of the scientific investigation will be the next most important criterion. The feasibility of the mission implementation approach, including, for Small Explorers, the likelihood of being launched in 2000 and 2001, and the degree to which the education and outreach, technology, and small disadvantaged business plans meet program requirements are the next most important criteria. NASA Mission Cost will also be a consideration in the selection of missions. Further discussion of the evaluation criteria is given in Section 5.2.

- Small Explorer Missions

It is anticipated that two Small Explorer investigation proposals will be selected, with each awarded a contract for a Phase A concept study with options for the subsequent mission phases. In addition, one or more Small Explorer proposals may also be selected as alternates in case any difficulties are encountered with the primary selections during the concept study. Investigations not implemented under this AO may recompete for a future flight opportunity under a subsequent, appropriate Explorer AO.

A two-to-five month Phase A concept study will be conducted by each selected investigation team. See Appendix J for information on the report to be prepared by the investigation team during the concept study. The required duration and cost (up to $250K) of the concept study should be part of the initial proposal. At the end of the concept study, NASA will conduct a detailed review to evaluate the implementing details of the selected investigations, namely, any modifications to the scientific objectives, the proposed cost to NASA, design details of the experiment hardware, plans for mission implementation including technical and management factors, details of the education and public outreach programs, and plans for the infusion of new technology (as appropriate). Assuming a positive outcome, NASA will exercise the contract options and confirm the primary missions for definition, design, and development (Phase B/C/D). If, during the concept study phase, a primary mission is judged not suitable to proceed, then an alternate mission may be selected to replace it.

The concept study 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 is subject to cancellation.

Each mission's definition phase will culminate with an independent technical and programmatic review, at which time the investigation may be confirmed for continuation into subsequent mission phases.

- Missions of Opportunity

NASA may select one or more Mission of Opportunity proposals. If such an investigation is selected, NASA will commit to funding the U.S. participation in the investigation as long as performance, cost, and schedule commitments of all parties are met. As with Small Explorer missions, a selected Mission of Opportunity investigation will be awarded a study contract and will be expected to submit a concept study report for NASA's detailed review. The concept study 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 is subject to cancellation.

Each mission's definition phase will culminate with an independent technical and programmatic review, at which time the investigation may be confirmed for continuation into subsequent mission phases. 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.

Provided that the opportunity is still tenable, investigations not selected under this AO may recompete under a subsequent Mission of Opportunity AO, now planned as a regular part of the Explorer Program.

1.3 Proposal Opportunity Period and Schedule

NASA is seeking Small Explorer investigations with mission launch dates no later than September 30, 2000, and September 30, 2001; investigations with anticipated launch dates later than these should be proposed in response to a subsequent Small Explorer AO. Mission of Opportunity launch dates may be at any time.

The following schedule describes the major milestones for this Small Explorer and Missions of Opportunity AO:

AO release	April 14, 1997
Notice of intent due	May 12, 1997
Proposal submittal due by 4 p.m. EDT	June 16, 1997
Non-U.S. Letter(s) of Endorsement due	July 16, 1997
Selections for Concept Study (target)	September 1997
Contract Award (target)	October 1997

2.0 PROGRAM GOALS, OBJECTIVES, AND BACKGROUND

2.1 Space Science Research Goals

The scientific goals of space science research within the Office of Space Science (OSS) are generally contained in *Space Science for the 21st Century: The Space Science Enterprise Strategic Plan*, (August 1995); see Appendix F. The goals in this plan are supported by the following documentation (see also Appendix F):

National Research Council report, titled *A Science Strategy for Space Physics* (1995);

Report of the "HST and Beyond Committee," titled *HST and Beyond. Exploration and Search for Origins: A Vision for Ultraviolet - Optical - Infrared Space Astronomy* (May 1996);

Report Synopsis of the Gamma Ray Astronomy Program Working Group titled *Recommended Priorities for NASA's Gamma-Ray Astronomy Program 1996-2010 (1997)*; and

The Jet Propulsion Laboratory report, titled *Exploration of Neighboring Planetary Systems (ExNPS)* (October 1995).

The goals and strategies outlined in these 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. This Small Explorer and Missions of Opportunity AO solicits only those investigations that fall into this third category. The scientific goals in these referenced documents as they relate to the NASA science themes listed in Section 1.1 will form the basis of the science evaluation criteria. Further information on the science themes may be obtained through the World Wide Web URL address <http://www.hq.nasa.gov/office/oss/>.

2.2 Programmatic Objectives

The Small Explorer program seeks to conduct scientific investigations of modest programmatic scope. The program intends to provide a continuing opportunity for quickly implemented flights of small-class free-flyers to conduct focused investigations that complement major flight missions, prove new scientific concepts, or make other significant contributions to space science. It is the goal of the program to obtain a flight frequency of one flight per year.

By funding U.S. participation in Missions of Opportunity, NASA seeks to bring the capabilities of the U.S. scientific community to bear on important scientific missions conducted as part of non-NASA space science program. These are typically missions sponsored by non-U.S. governments, although space science missions from other U.S. sponsors will also be considered.

Inclusion of the public and education communities in space science research programs and missions are goals of the Office of Space Science. The Explorer program is committed to identifying appropriate approaches to capture and hold public interest and to provide education program activities that support the Nation’s educational initiatives. Additionally, the proposed inclusion of new technology to achieve performance enhancements and reduce costs, as well as the potential for transfer of those technologies to a broader community, are important aspects of the Explorer program.

2.3 Program Background

The Explorer program provides several classes of flight opportunities for the science themes described in Section 1.1 above. Recent changes to the Explorer program are designed to increase the number of flight opportunities in response to recommendations from the scientific community. These changes include providing new classes of Explorer missions and opening up additional opportunities within each class. Explorer program classes will continue to be characterized by the scope of the mission, based primarily on definition and development cost and secondarily on instrument and spacecraft payload size and mass and launch vehicle capabilities. The current Explorer program classes are:

- **University-class Explorers (UNEX)** are characterized by a definition and development cost not to exceed $6M (in FY 1997 dollars). UNEX missions will be launched by a variety of methods still under consideration. At least one launch per year is anticipated for this program.

- **Small Explorers (SMEX)** are characterized by investigations achievable for no more than $38M (in FY 1997 dollars) in definition and development costs that can generally be launched within the capabilities of small expendable launch vehicles. It is NASA's intent to launch one Small Explorer mission per year.
- **Medium-class Explorers (MIDEX)** are characterized by investigations achievable for definition and development costs of no more than $76M (in FY 1997 dollars) that can generally be launched within the capabilities of the NASA Med-Lite launch vehicle. NASA intends to launch one MIDEX mission per year.
- **Missions of Opportunity** are characterized by being part of a non-NASA space science mission of any size with the NASA contribution that is typically under $20 million (in FY 1997 dollars). These missions are conducted on a no-exchange-of-funds basis with the organization sponsoring the mission. NASA intends to solicit proposals for Missions of Opportunity with each future AO issued for UNEX, SMEX, and MIDEX investigations. With each AO, the cost limit for Missions of Opportunity is expected to be constant. Note that the selection of a Mission of Opportunity is expected to decrease the flight rate of the free-flying Explorers rather than reduce the cost cap for any particular class of missions.

3.0 PROGRAM CONSTRAINTS, GUIDELINES, AND REQUIREMENTS

This section describes the constraints, guidelines, and requirements applicable to all phases of the Small Explorer program including Missions of Opportunity. Specific directions for proposal preparation are included in Section 4 and in Appendix B.

3.1 General Program Constraints and Guidelines

The major responsibility for implementing a 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 below may be cause for its termination by NASA.

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

Only those investigations whose proposed cost, schedule, and launch vehicle requirements do not exceed the constraints and guidelines identified herein will be considered as candidates for selection.

3.1.1 General Program Guidelines for Small Explorer Missions

Small Explorer mission investigation teams must be led by a single Principal Investigator (PI) who may be from any category of U.S. or non-U.S. organization, including educational institutions, industry or nonprofit institutions, or from one of the NASA Centers, the Jet Propulsion Laboratory (JPL), other Federally-funded research and development centers, or other U. S. Government agencies. Teams may be formed from any combination of these institutions.

Contributions of any kind, whether cash or noncash (property and services) to Small Explorer 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. See Section 3.6 for a discussion of cost requirements. The resultant mission must not exceed the scope and cost (Phase A/B/C/D limit of $38 million in FY 1997 dollars) of a Small Explorer mission. A letter of endorsement that contains a statement of financial commitment from each responsible organization offering to make a contribution to the investigation must be submitted with the proposals for all U.S. components. For non-U.S. components of proposals, see Section 3.7.

NASA anticipates that investigators will propose to use the small expendable launch vehicle (SELV) or the Space Shuttle to launch Small Explorer missions. Information on these options is given in Appendix D. However, other launch options are available. NASA seeks to take advantage of all reasonable sources of commercial expendable launch vehicle (ELV) services while assuring that NASA-funded payloads are not exposed to excessive risk. Accordingly, U.S. launch vehicles that may be proposed to launch Small Explorer missions pursuant to this AO must be acquired and managed consistent with NASA Launch Services Qualification Requirements. The demonstrated reliability of the proposed launch vehicle and the resultant probability of mission success will be evaluated. The following types of services may be proposed:

> Launch services for launch as a secondary or co-manifest payload aboard a Delta II or Atlas-Centaur (IIA or IIAS) on commercial missions that are subject to Department of Transportation commercial launch licenses may be proposed and directly acquired by a proposer. Other domestic dedicated launch services that are subject to a Department of Transportation commercial launch license may also be proposed only if fully contributed by the mission team.
>
> The use of non-U.S. manufactured launch services may be proposed on a no-exchange-of-funds basis.

3.1.2 General Program Guidelines for Missions of Opportunity

Investigation teams for Missions of Opportunity must be led by a single Principal Investigator (PI) who may be from any category of U.S. or non-U.S. organization, including educational institutions, industry or nonprofit institutions, or from one of the NASA Centers, the Jet Propulsion Laboratory (JPL), other Federally-funded research and development centers, or other U.S. Government agencies.

Missions of Opportunity are conducted on a no-exchange-of-funds basis between NASA and the organization sponsoring the mission. Contributions of any kind to NASA's participation, whether cash or noncash (property and services) by organizations other than the Office of Space Science are welcome for Mission of Opportunity investigations. A letter of endorsement that contains a statement of financial commitment from each responsible organization offering to make a contribution to the investigation must be submitted with the proposals for all U.S. components. For non-U.S. components of proposals, see Section 3.7.

3.2 Science Requirements

The relationship between the proposed scientific objectives, the data to be returned, and the instrument payload to be used in completing the proposed investigation must be unambiguous and clearly stated in the proposal. Small Explorer investigation teams will be responsible for initial analysis of the data, its subsequent delivery to an appropriate data repository, the publication of scientific findings, and communication of results to the public.

In accordance with NASA policy, there shall be no proprietary data rights period for Small Explorer investigations. Small Explorer teams will be responsible for collecting the scientific, engineering, and ancillary information necessary to validate and calibrate the scientific data prior to depositing it in the appropriate data repository. The time required to complete this process should be the minimum necessary to provide appropriate data to the scientific community and the general public. As part of their funded Phase E activities, investigation teams must include an appropriate period for data analysis independent of archiving activities.

Mission of Opportunity 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 the U.S. is involved, if not the entire mission, will be made available to the U.S. scientific community in a timely way.

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

The education, outreach, technology, and small disadvantaged business requirements apply to both Small Explorer and Mission of Opportunity investigations.

3.3.1 Education and Outreach

Education and outreach activities directed toward precollege education and the public understanding of science are a required component of Small Explorer and Mission of Opportunity investigations. Such activities should be developed to be consistent with and support the Office of Space Science Education/Public Outreach Strategy contained in *Partners in Education, A Strategy for Integrating Education and Public Outreach into NASA's Space Science Programs*, dated March 1995, and its accompanying implementation plan, *Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy*, dated October 1996 (see the Explorer Program Library described in Section 4.1.1 and Appendix F). Guidance contained in the Education/Outreach Strategy and Implementation Plan will be used as the basis for evaluating proposed activities in this area. Proposed activities may also include public information programs that will inform the public by mass media or other means, or utilize other innovative ideas for bringing space science to the public. Proposed Small Explorer investigations must include the PI's approach for planning an education/outreach program, arranging for appropriate partners and alliances, implementing the education/outreach program including appropriate evaluation activities, and disseminating education/outreach products and materials. Costs for such activities must be included as part of mission planning, development, and operations costs. The Education/Public Outreach Task Force of the OSS Space Science Advisory Committee has recommended that, as a long term goal, OSS should plan to spend one to two percent of its total budget on education and the public understanding of science. This and further guidance on education and outreach activities are contained in the implementation plan mentioned above.

3.3.2 Advanced Technology

NASA seeks to infuse new technologies that enhance performance and reduce costs 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 *Office of Space Science Integrated Technology Strategy*, which is included in the EPL described in Section 4.1.1. Small Explorer and Mission of Opportunity investigations present an opportunity to develop and test new technologies and applications. Investigations dependent on new technology will not be penalized for risk provided that adequate plans are described to provide reasonable assurance of the success of the investigation.

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 is viewed as an investment in our 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 businesses, small disadvantaged businesses, and women-owned small business concerns. (See Appendix A, Section XIII.)

3.4 Technical Approach Requirements

Proposals must encompass all technical aspects of the investigation from the Phase A concept study through delivery of the data to the appropriate data repository and their analysis (the final part of the operations phase, Phase E). NASA Handbook NHB 7120.5, *Management of Major System Programs and Requirements*, delineates activities, milestones, and products typically associated with each of these phases and may be used as a reference in defining a team's mission approach. This Handbook is included in the EPL (see Appendix F). Mission teams have the freedom to use their own processes, procedures, and methods, and the use of innovative processes is encouraged when cost, schedule, technical improvements, and reliability can be demonstrated.

Selected investigations shall have a product 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 H).

Investigation teams may use non-NASA or NASA navigation, tracking, control, communications, and other services. For Small Explorer proposals, however, costs for such services, whether obtained from NASA or from other sources, *must* be included in the cost estimate. For Mission of Opportunity proposals, only the costs for NASA-provided services must be included. Information on space communications capabilities and costing is given in Appendix C.

3. 5 Management Requirements

NASA intends to allow the Principal Investigator and his/her team to use their own management processes, procedures, and methods to the fullest extent possible. 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 necessary to assure the 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 singularly expected to be in charge of each investigation, with full responsibility for its scientific integrity. The PI is responsible for assembling a team to propose and implement the investigation. In forming teams, proposers may obtain services from any qualified institution. (Note that information on services available through the NASA Goddard Space Flight Center (GSFC) is given in Appendix I.)

Likewise, the PI is accountable to NASA for the scientific success of the investigation. Therefore, the PI must be prepared to recommend mission termination if in his/her judgment the successful achievement of established science objectives, as defined in the proposal, is no longer likely within the committed cost and schedule reserves.

In accordance with NASA's transfer of program management responsibility to its Centers, Explorer program management responsibility has been assigned to GSFC. In this role, GSFC is responsible for NASA's fiduciary responsibility to ensure that Explorer missions are achieved in compliance with committed cost, schedule, performance, reliability, and safety requirements. The level of GSFC's involvement in this role may vary from mission to mission depending on the implementing organization and other programmatic considerations. It is expected that the Explorer Program Office will work with the Principal Investigator and implementing organization to define roles and responsibilities to fulfill this responsibility in the most effective manner.

Each selected investigation must have a Project Manager (PM) who reports to the PI and who will oversee the technical implementation of the investigation. 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.

Each investigation must define the risk management approach it intends to use to ensure successful achievement of the mission 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 the development phase, to ensure timely delivery. In addition, any manufacturing, test, or other facilities needed to ensure successful completion of the proposed investigation should be identified.

3.6 Cost and Schedule Requirements

3.6.1 Cost and Schedule Requirements for Small Explorer Missions

The Small Explorer program is part of an effort to develop frequent, small space science investigations. To this end, NASA will limit its funding of Small Explorer missions as outlined in the table below. Further, the schedule for missions selected through this AO is expected to be such that launch of the first mission can take place by September 30, 2000, and that of the second mission by September 30, 2001. The proposer should specify the launch date in the proposal. Phase A (concept study) is of two-to-five months duration. Phase B/C/D is defined as ending 30 days after launch. Procurement of long lead materials is permitted during the Phase B/C time frame and should be defined during the concept study. No time constraint is placed on Phase E.

3.6.1a NASA Mission Cost

The NASA Mission Cost is the funding that NASA would be expected to provide to the investigation team over the course of the investigation, beginning with Phase A and ending with the conclusion of Phase E. This total funding is limited as is the funding for major mission elements, as shown in the following table. The NASA Mission Cost is a consideration in the selection of investigations and in the continuing assessment of ongoing missions.

LIMITATIONS ON NASA MISSION COSTS			
Item	Mission Element	Limitations in FY 1997 Dollars	Comments
1	Launch services including launch vehicle	$19 million	May be increased if Item 2 is decreased accordingly.
2	Phase A/B/C/D	$38 million	Must not be exceeded.
3	Development of the Ground Data System	$3 million	Must not be exceeded.
4	Phase E -- Mission Operations and Data Analysis	$9 million	Must not be exceeded.
5	Total	$69 million	Must not be exceeded.

Although the launch costs of the SELV and the Space Shuttle will be funded directly by NASA, these costs are none-the-less to be included in the proposal. Costing and other information on the SELV and the Space Shuttle Free Flyer option are given in Appendix D. However, other launch options may be provided by NASA for launch on U.S. expendable launch vehicles other than the small-class SELV. (See Section 3.1.1 for discussion of other possible launch options and restrictions.) If the cost to NASA exceeds the proposed launch service cap identified in the preceding table, then the proposed Phase A/B/C/D cost cap must be reduced accordingly. Launch services may also be proposed at no cost to NASA as part of a teaming proposal. For proposal purposes, the launch vehicle cost to be used to calculate the NASA Mission Cost for the free-flyer released from the Space Shuttle is the same as the cost of the small-class fairing option of the SELV as given in Table D-2 of Appendix D.

Proposers must estimate the NASA Mission Cost in the proposal and, if selected through this AO, in much more detail in the concept study report. The specific cost information required for proposals is contained in Appendix B.

Since cost details are 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, during any phase of the investigation, the estimated cost to NASA shall not increase by more than 20% from that offered in the original proposal and must not exceed the NASA cost constraints.

Once established at the end of the concept study, the estimated cost baseline must assure adequate funding to meet cost-to-complete requirements. The Small Explorer program does not maintain a reserve pool from which investigations exceeding their cost commitments may draw.

3.6.1b U.S. Government Mission Cost

A proposal to this AO may include partnership with a U.S. agency other than NASA. If so, the U.S. Government Mission Cost is that which the U.S. Government, including NASA, would incur over the course of the investigation, beginning with Phase A through the conclusion of Phase E. This funding is limited to $69 million in FY 1997 dollars.

3.6.1c Total Mission Cost

The Total Mission Cost is defined as all costs that are necessary to complete an investigation beginning with Phase A through Phase E, including reserves, contributions from U.S. and non-U.S. entities, and contract fees. In general, proposers should assume all costs must be included unless specifically excluded. Examples of costs to be included are: launch vehicles and any upper stages, launch services, education and outreach activities, new technology, subcontracting costs (including fees), science teams, all personnel required to conduct the investigation, analyze and publish results, and deliver data in archival format, insurance, ground data system (see Appendix C), and all labor (including contractor and Civil Servant labor). Proposers must estimate the Total Mission Cost in the proposal and, if selected through this AO, in much more detail in the concept study report. The Total Mission Cost including contributions may exceed the NASA Mission Cost; however, Phase A/B/C/D funding including contributions is limited to $38 million in FY 1997 dollars. See the table below.

LIMITATIONS ON TOTAL MISSION COSTS

Item	Mission Element	Limitations in FY 1997 Dollars	Comments
1	Launch services including launch vehicle	Not limited	
2	Phase A/B/C/D	$38 million	Must not be exceeded.
3	Development of the Ground Data System	Not limited	
4	Phase E -- Mission Operations and Data Analysis	Not limited	
5	Total	Not limited	

3.6.1d Full Cost Accounting

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 definition 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,” or based on their own Center-approved full cost accounting models. 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.

3.6.1e Contributed Costs

The cost of contributed hardware or software 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. If any NASA resources are to be contributed through partnership in a proposal, the contributed items or services must be separately funded and the funding sources must be identified.

3.6.2 Cost and Schedule Requirements for Missions of Opportunity

Although the level of funding available for each proposal will be decided on a case-by-case basis, proposers should be aware than any Mission of Opportunity investigation costing the Explorer Program more than $20M will be difficult to support. NASA's funding for a selected investigation's concept study will be limited to $250K. Follow-on work prior to selection by the mission's sponsoring organization will be limited to $100K and the limit for all studies prior to the initiation of mission detailed design (Phase C) is 25% of the total NASA commitment for funding of the investigation. The PI assumes all risk for delays in the mission and should propose appropriate reserves.

Launch date will not be the key milestone that determines whether a Mission of Opportunity investigation will be considered as a result of this AO. Instead, the date required for a commitment from NASA to the investigation will be the key milestone. If a commitment from NASA is not needed by the sponsoring organization before December 31, 1997, then the proposal should be submitted to a subsequent Explorer program AO.

Full-cost accounting requirements as given in Section 3.6.1d apply to Missions of Opportunity.

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 Small Explorer and Mission of Opportunity investigations is welcomed. 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 on a no-exchange-of-funds basis. Carriers, launch vehicles and launch services, and space operations may also be contributed by international partners and must be included in all calculations and discussions of the Total Mission Costs. There is no limit on the percentage of non-U.S. contribution to a Small Explorer mission.

The direct purchase of goods and/or services from non-U.S. sources is permitted except for following restriction: NASA will not purchase non-U.S. launch vehicles for Small Explorer missions or Missions of Opportunity, nor may funds provided to a 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 Small Explorer mission by a non-U.S. partner is acceptable only on a no-exchange-of-funds basis (i.e., at no cost to NASA). Only those non-U.S. launch vehicles with demonstrated reliabilities may be proposed for Small Explorer missions.

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

Any proposed international participation must be described at the same level of detail as that of U.S. partners. This includes the provision of cost, schedule, and management data in the proposal and in subsequent reviews. Failure to document cost and schedule data, management approaches and techniques, or failure to document the commitment of all team partners to those costs and schedules may cause a proposal to be found unacceptable.

Participation by non-U.S. individuals and/or institutions as team members or contributors to Small Explorer or Mission of Opportunity investigations must be endorsed by the institutions and/or governments involved. Government endorsement is required if the contribution is critical. For noncritical contributions, institutional endorsement is sufficient. The letter of endorsement will provide evidence that the non-U.S. institution and/or government officials are aware and supportive of the proposed investigation and will pursue funding for the investigation if selected by NASA. Such endorsements must be submitted per the schedule in Section 1.3.

3.8 Missions of Opportunity

For Missions of Opportunity, the proposer offers to participate in a non-NASA 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, providing hardware components of a science instrument, or providing expertise in critical areas of the mission. However, the U.S. investigator must fully document the complete investigation in their proposal. It is incumbent on the proposing investigator to provide evidence 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, 1997. The Principal Investigator is accountable to NASA for the scientific integrity and the management of his or her contribution to the mission.

Proposers for non-NASA, non-U.S. missions should recognize that all such proposals must be consistent, and in compliance with, all U.S. Government laws, regulations, and policies governing the export of hardware and/or technical data. Further, any such successful proposal will require the appropriate agreement(s) and export license(s). Therefore, all proposers for non-NASA, non-U.S. missions should contact the Office of External Relations, International Science and Aeronautics Division, at NASA Headquarters at the address in Section 4.1 during the preparation of the concept study to obtain information about U.S. Government laws or policies (e.g., export control), as well as NASA policy and procedures regulating international cooperation that may be relevant to the proposal.

Proposals for Mission of Opportunity investigations will be evaluated using the same criteria as the Small Explorer missions except that the Total Mission Cost is not constrained and the launch date is not constrained.

Like other missions proposed to this AO, the NASA contribution is subject to cancellation if there is a cost overrun charged to NASA for any reason, including a launch delay caused by the non-NASA partner.

4.0 PROPOSAL PREPARATION AND SUBMISSION

4.1 Preproposal Activities

4.1.1 Explorer Program Library

The Explorer Program Library (EPL) is intended to provide additional background information on the Small Explorer program including science goals, technology and education/outreach strategies, and background information on management aspects of flight programs. Additional information on the EPL is contained in Appendix F.

4.1.2 Technical and Scientific Inquiries

Inquiries of a technical nature should be directed to Dr. David Gilman, the Explorer Program Executive, at the address below. Inquiries of a scientific nature should be directed to Dr. Hashima Hasan, the Small Explorer Program Scientist, at her address below. Inquiries are preferred in writing and may be sent by FAX or e-mail.

Dr. David Gilman
Mission and Payload Development Division
Code SD
National Aeronautics and Space Administration
Washington, DC 20546-0001
Fax Number: 202-358-3987
E-mail: david.gilman@hq.nasa.gov
Phone: 202-358-0349

Dr. Hashima Hasan
Research Program Management Division
Code SR
National Aeronautics and Space Administration
Washington, DC 20546-0001
Fax Number: 202-358-3097
E-mail: hashima.hasan@hq.nasa.gov
Phone: 202-358-0377

4.1.3 Preproposal Questions and Answers

In lieu of a preproposal conference, questions about this AO may be sent to either Dr. Gilman or Dr. Hasan at the address above. Answers will be provided within five working days. Answers to all questions (with anonymity preserved) will also be posted following the Small Explorer AO and may be accessed through "Research Opportunities" from the menu at the World Wide Web URL address <http://www.hq.nasa.gov/office/oss/>.

Questions and answers will be posted at the end of each week during the proposal preparation period. Prospective proposers are advised to check this site for new postings.

4.1.4 Notice of Intent to Propose

To assist NASA's planning of the proposal evaluation process, a Notice of Intent must be submitted by all prospective proposers in accordance with the schedule in Paragraph 1.3. This Notice must be typewritten in English and may be submitted in one of the following three ways:

By mail to:

Small Explorer 1997 Support Office
Jorge Scientific Corporation
400 Virginia Avenue SW, Suite 700
Washington, DC 20024

or by FAX to:

Small Explorer 1997 Support Office
202-554-2970

or by e-mail to:

<deb.tripp@hq.nasa.gov>, with Subject designated as <SMEX NOI - (PI Name)>

To the extent the following information is known by the due date, the Notice of Intent should include:

(a) Names, addresses, telephone numbers, e-mail addresses, and fax numbers of the (1) Principal Investigator; (2) any Co-Investigators; and (3) the lead representative from each organization (industrial, academic, educational, not-for-profit, and/or Federal) expected to be included in the proposal team;

(b) Title of the proposed investigation, a brief statement of the scientific objectives, and the primary NASA science theme (see Section 1.1) that the investigation supports;

(c) Mission mode (Small Explorer or Mission of Opportunity) and launch vehicle;

(d) Identification of any new technologies that may be employed as part of the mission; and

(e) A brief statement describing the education/public outreach objectives in the proposed investigation.

Material in a Notice of Intent is for NASA planning purposes only, is confidential, and is not binding on the submitter.

Principal Investigators whose investigation teams include non-U.S. institutions must also send a copy of their Notice of Intent to:

Ms. Bettye Jones
International Science and Aeronautics Division
Code IS
Ref: Small Explorer 1997
National Aeronautics and Space Administration
Washington, DC 20546-0001
USA
Phone: 202-358-1664
FAX: 202-358-3029

In cases where investigators or team members from non-U.S. institutions are to participate, their names, addresses, and affiliations must be included in the Notice of Intent, even if the details of their participation cannot be formalized by the deadline for receipt of the Notice of Intent.

4.2 Format and Content of Proposals

General NASA guidance for proposals in general is given in Appendix A, which is considered binding unless specifically amended in this Section of 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, or in extreme cases, could lead to rejection of the proposal without review. General information and further proposal preparation information are provided as Appendices to this AO.

4.3 Submission Information

4.3.1 *Certification*

The original copy of all proposals shall include a letter of endorsement signed by an institutional official from each partner and each organization expecting to provide contributions of hardware, software, facilities, services, etc. This official must certify institutional support and sponsorship of the investigation, as well as concurrence in the management and financial parts of the proposal. Non-U.S. organizations must submit such endorsements to Ms. Bettye Jones with a copy to the Small Explorer 1997 Support Office at the addresses given in Section 4.1 by the due date given in the schedule in Section 1.3.

Additional certifications identified in Appendix G are required and must be included with the original, signed proposal.

4.3.2 *Quantity*

Proposers must provide 30 copies of their proposal, plus the original signed proposal, on or before the proposal deadline given in Section 1.3.

4.3.3 *Submittal Address*

All proposals must be received at the following address by the schedule in Section 1.3:

Small Explorer 1997 Support Office
Jorge Scientific Corporation
400 Virginia Avenue SW, Suite 700
Washington, DC 20024

Point of contact for commercial delivery: Ms. Debra Tripp; phone: 202-554-2775

Additionally, one copy (over and above the 30 copies) must be sent to the Small Explorer Program Scientist, Dr. Hashima Hasan, at the address given in Section 4.1.2. Furthermore, one copy of any proposal that includes any non-U.S. participants and/or institutional and governmental commitments must be sent to Ms. Bettye Jones at the address listed in Section 4.1.4.

4.3.4 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 (Appendix A, Section VII).

4.3.5 Notification of Receipt

NASA will notify the proposers in writing that their proposals have been received. Proposers not receiving this confirmation within two weeks after submittal of their proposals should contact Dr. David Gilman at the address given in Section 4.1.2.

5.0 PROPOSAL EVALUATION, SELECTION, AND IMPLEMENTATION

5.1 Evaluation, Selection, and Debriefing Processes

All proposals submitted in response to this AO will be subjected to a preliminary screening to determine their compliance to the constraints, requirements, and guidelines of the AO. Proposals not in compliance will be returned to the proposer without review. Proposals in compliance with this AO will then be assessed against the criteria given in Section 5.2 by panels of individuals who are peers of the proposers in the relevant technical, scientific, and other areas. Panels will be instructed to evaluate all proposals independently and not to compare larger missions with smaller ones. These panels may be augmented through the solicitation of mail-in reviews as well, which the panels have the right to accept, modify, or reject. (Note: Owing to this policy of the primacy of the review panels, mail-in reviews as may be solicited are not subject to disclosure or discussion during any subsequent debriefing requested by the proposer; see further below in this Section).

> Proposers should be aware that during the evaluation and selection process, NASA may request clarification of a specific point or points in a proposal. Such a request and the proposer's response shall be in writing.

Once the panel evaluations are complete, a Panel Executive Committee, composed wholly of Civil Servants, will convene to consider the peer review results. This Executive Committee will then finalize the evaluations of each criteria for each proposal. Based on these results the Executive Committee will then serve as an *Ad Hoc* Subcommittee of the Space Science Steering Committee (SSSC; see further below in this Section) to categorize the proposals in accordance with procedures required by Appendix I of Federal Acquisition Regulations (FAR) Supplement 1870.102. These Categories are defined as follows:

> Category I. Well conceived and scientifically and technically sound investigation 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.

(Note: NASA anticipates selecting and funding only Category I investigations.)

The results of the proposal evaluations and categorizations will then be presented by the Headquarters Small Explorer Program Scientist to the SSSC, which is composed wholly of

NASA Civil Servants and appointed by the Associate Administrator for Space Science. The SSSC will conduct an independent review of the evaluation and categorization processes regarding both their compliance to established policies and practices as well as their completeness, self-consistency, and adequacy of all materials related thereto. After this review, the final evaluation and categorization results will be forwarded by the SSSC to the Associate Administrator who will make the final selections.

With regard to final selections, 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 with time. Therefore, it is incumbent upon the Associate Administrator of the Office of Space Science to use all relevant science planning, policy, and cost considerations when making selection(s) among top ranked proposals submitted in response to this AO. In addition, proposers to this AO are advised that it is an objective, but not a requirement, that the final selections reflect a balance among the applicable scientific themes listed in Section 1.1 of 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 two investigations each at the cost ceiling for Small Explorer investigations, or a larger number of significantly lower cost investigations, or a combination of investigations of various costs. Finally, should the Explorer program budget allow, a Category I investigation offered at an exceptionally low cost to NASA may also be considered for tentative selection with the intent of possible implementation after the confirmation of the primary missions resulting from this AO.

Selected proposers will be notified immediately by phone and by letter and provided with instructions for initiating their concept studies. Proposers not selected will be notified immediately by letter and will be offered a debriefing. Such debriefings may be in person at NASA Headquarters or, if the investigation team prefers, may be conducted by telephone. In the latter case, NASA funds may not be used to defray travel costs by the proposer for a debriefing. In either case, along with the proposing Principal Investigator, a senior representative from key institution(s) of a proposal may also participate in such debriefings.

5.2 Evaluation Criteria

The evaluation criteria below, which will be used as described in Section 5.1 by the peer evaluation Panels and then by selection officials, are designed to determine those proposed investigations with the best overall combination of relevant characteristics. For Missions of Opportunity, the proposed investigation encompasses only the contribution to the mission, not the entire mission. The evaluation factors (which are defined more fully in subsections below) are as follows:

- The scientific merit of the proposed investigation;
- The technical merit and feasibility of the proposed investigation;
- The feasibility of the proposed approach for mission implementation, including the realism of the proposed cost;
- The plan for education, outreach, technology, and small disadvantaged business activities; and
- The proposed NASA Mission Cost.

The proposal categorizations, discussed in Section 5.1 above, will be based on the first four criteria, which are listed in descending order of priority with the first two together having a combined weight of approximately twice that of the second two together. The last criterion will be used in the selection process.

5.2.1 Scientific Merit of the Proposed Investigation

To evaluate the intrinsic scientific merit, the goals and objectives of the proposed investigation will be assessed to determine the impact of the investigation on science as a whole and, in particular, on the U.S. space science program (see goals in Section 2.1). This evaluation will include how well the investigation fills important gaps at the frontiers of knowledge and thereby provides for fundamental progress in a space science theme, whether or not it provides ancillary benefits to the U.S. space science program (e.g., major progress or development in the development of a new technology), and how well the proposed investigation may synergistically support other ongoing space science missions sponsored by NASA or a non-U.S. space agency. Another major element in this assessment will be whether the data that are to be gathered will be sufficient to complete the proposed investigation.

5.2.2 Technical Merit and Feasibility of the Proposed Investigation

Each proposed investigation will be evaluated for its technical merit, feasibility, and the probability of success. Technical merit and feasibility will be evaluated by assessing the degree to which the proposed instrument(s) can be built using the proposed technologies and the degree to which the proposed instrument(s) can provide the necessary data, as well as the degree to which the mission will support the accomplishment of acquisition of the required data. Other major elements include the proposed data analysis and archiving plan, and the proposed plan for the timely release of the data to the public domain.

Should a new technology that represents an untested advance in the state of the art be proposed for use, an independent assessment will be made of the likelihood of its success. Finally, the probability of success will be evaluated by assessing the experience, expertise, and organizational structure of the science team and the technical risk associated with overall mission design and/or instrument set.

5.2.3 Feasibility of the Proposed Approach for Mission Implementation

The technical and management approaches will be evaluated to assess the likelihood that the investigation can be implemented as proposed. For Small Explorer investigations, this will include an assessment of the likelihood of launching in 2000 and 2001. Since it is recognized that teaming arrangements for implementing the mission may not be complete before the proposal closing date, 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 should reasonably allow successful implementation of the mission.

5.2.4 Education, Outreach, Technology, and Small Disadvantaged Business Activities

The tentative plans for education, outreach, technology, and small disadvantaged business activities described in the proposal will be rated by evaluating their likely credibility and the degree to which they propose to meet the program requirements in each of these areas as described in Section 3.3.

5.2.5 The Proposed NASA Mission Cost

The total proposed NASA Mission Cost will be a factor in the final selections. In addition, consideration will be given to NASA's confidence that the mission can be accomplished within those proposed costs.

5.3 Implementation Activities

5.3.1 Notification of Selection

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 any issues noted during the evaluation that may require resolution and any special instructions for the concept study. Proposers of investigations that were not selected will be notified in writing and offered an oral or in person debriefing. The proposer has the option of including a representative from each principal partner in this debriefing.

5.3.2 Contract Administration and Funding

Different mission management approaches and organizational arrangements of the selected proposals may require different contract administration and funding arrangements. Each PI, in his or her proposal, is expected to recommend, as part of the teaming arrangement, the organizations and contract mechanisms NASA should use in awarding work to the team. Where appropriate, cost type contracts with incentives should be considered, particularly where performance incentives are measured based on delivery of calibrated/validated science data products.

It is anticipated that contracts will be awarded for concept studies for at least three (two primary and one alternate) Small Explorer and any Mission of Opportunity investigations selected as a result of this AO, with options for the follow-on mission phases (Phases B/C/D and E). NASA will provide up to $250K to each selected investigation to perform the study, to be initiated as soon as possible after notification of selection. 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 proceeding to the definition, design, and development phase. As a result of evaluation of the concept studies, NASA expects to proceed with the primary investigations to Phase B/C/D by exercising a contract option. In no case, however, is NASA required to exercise any option. An alternate Small Explorer mission may be continued if NASA determines, after reviewing the concept study results, that a primary investigation is no longer feasible.

5.3.3 Confirmation of Investigations

If the Phase B/C/D contract option is exercised, an independent review of the investigation's readiness to proceed will be conducted before being authorized to spend more than 25 percent of the total NASA commitment for Phases A/B/C/D. Results of this Confirmation Review and a decision to proceed (or not) will be rendered within 30 days of the review. This decision will be based upon review of the Phase B results, and evidence of satisfactory technical, cost and schedule performance. In addition, for any Mission of Opportunity, a commitment from the organization sponsoring the full mission to enter into an appropriate agreement with NASA is required.

6.0 CONCLUSION

The Explorer program continues to represent a challenging new way for NASA to accomplish important scientific exploration. It provides an opportunity for frequent flights to execute important space science investigations, as well as to 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 Small Explorer and Mission of Opportunity investigations to be carried out as a result of this Announcement.

Alan N. Bunner
Science Program Director
Structure and Evolution of the Universe
Office of Space Science

Jurgen H. Rahe
Science Program Director
Solar System Exploration
Office of Space Science

Edward J. Weiler
Science Program Director
Astronomical Search for Origins
and Planetary Systems
Office of Space Science

George L. Withbroe
Science Program Director
The Sun-Earth Connection
Office of Space Science

Wesley T. Huntress, Jr.
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.

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.

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 and 3.8 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 will be required for all subsequent contract options. 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 will 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 18-15.412.)

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 - LIMITED EXCLUSIVE RIGHTS (January 1992)

Any contract resulting from this solicitation will contain the following "Rights in Data" clause:

(A) Definition

"Computer software," as used in this clause, means computer programs, computer data bases, and documentation thereof.

"Data," as used in this clause, means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

"Form, fit, and function data," as used in this clause, means data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, as well as data identifying source, size, configuration, mating, and attachment characteristics, functional characteristics, and performance requirements; except that for computer software means data identifying source, functional characteristics, and performance requirements but specifically excludes the source code, algorithm, process, formulae, and flow charts of the software.

"Limited exclusive rights," as used in this clause, means the rights of the Government and others acting on its behalf to use, duplicate, and disclose for Government purposes, the rights of the Contractor to use, duplicate, and disclose for its purposes within the United States, and the rights of other entities designated or approved by the Government to use and duplicate (but not to further disclose) for their purposes within the United States, provided that in all instances the data are made subject to disclosure restrictions that protect and preserve its limited exclusive rights.

"Limited exclusive rights data," as used in this clause, means technical data (including system studies and computer source programs and code) first produced in the performance of this contract that have been specifically identified in this contract (either at the time of contract or subsequently by amendment) as subject to limited exclusive rights, provided such data are not generally known, or such data have not, without obligation as to its confidentiality, been made available to others by the Contractor or are not already available to the Government. The limited exclusive rights of the Government, the Contractor, and other entities regarding the disclosure and use of such data are as set forth in subparagraph (g)(4) of this clause.

"Limited rights," as used in this clause, means the rights of the Government in limited rights data as set forth in the Limited Rights Notice of subparagraph (g)(2) if included in this clause.

"Limited rights data," as used in this clause, means data (other than computer software) developed at private expense that embody trade secrets or are commercial or financial and confidential or privileged.

"Restricted computer software," as used in this clause, means computer software developed at private expense and that is a trade secret; is commercial or financial and is confidential or privileged; or is published copyrighted computer software; including minor modifications of such computer software.

"Restricted rights," as used in this clause, means the rights of the Government in restricted computer software, as set forth in a Restricted Rights Notice of subparagraph (g)(3) if included in this clause, or as otherwise may be provided in a collateral agreement incorporated in and made part of this contract, including minor modifications of such computer software.

"Technical data," as used in this clause, means data (other than computer software) which are of a scientific or technical nature.

"Unlimited rights," as used in this clause, means the right of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

(B) Allocation of rights.

(1) Except as provided in paragraph (c) of this clause regarding copyright, the Government shall have unlimited rights in -

(i) Data first produced in the performance of this contract unless provided otherwise for limited exclusive rights data in accordance with subparagraph (g)(4) of this clause;

(ii) Form, fit, and function data delivered under this contract;

(iii) Data delivered under this contract (except for restricted computer software) that constitute manuals or instructional and training materials for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under this contract; and

(iv) All other data delivered under this contract unless provided otherwise for limited rights data, restricted computer software, or limited exclusive rights data in accordance with paragraph (g) of this clause.

(2) The Contractor shall have the right to -

(i) Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, unless provided otherwise in paragraph (d) of this clause or in subparagraph (g)(4) of this clause;

(ii) Protect from unauthorized disclosure and use those data which are limited rights data, restricted computer software, or limited exclusive rights data, to the extent provided in paragraph (g) of this clause;

(iii) Substantiate use of, add or correct limited rights, restricted rights, limited exclusive rights, or copyright notices and to take other appropriate action, in accordance with paragraphs (e) and (f) of this clause; and

(iv) Establish claim to copyright subsisting in data first produced in the performance of this contract to the extent provided in subparagraph (c)(1) of this clause.

(C) Copyright.

(1) Data first produced in the performance of this contract.

Unless provided otherwise in paragraph (d) of this clause, the Contractor may establish, without prior approval of the Contracting Officer, claim to copyright subsisting in scientific and technical articles based on or containing data first produced in the performance of this contract and published in academic, technical or professional journals, symposia proceedings, or similar works. The prior, express written permission of the Contracting Officer is required to establish claim to copyright subsisting in all other data first produced in the performance of this contract. When claim to copyright is made, the Contractor shall affix the applicable copyright notices of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including contract number) to the data when such data are delivered to the Government, as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. For data other than computer software, the Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government. For computer software, the Contractor grants to the

Government and others acting in its behalf, a paid-up nonexclusive, irrevocable worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly by or on behalf of the Government.

(2) Data not first produced in the performance of this contract.

The Contractor shall not, without prior written permission of the Contracting Officer, incorporate in data delivered under this contract any data not first produced in the performance of this contract and which contains the copyright notice of 17 U.S.C. 401 or 402, unless the Contractor identifies such data and grants to the Government, or acquires on its behalf, a license of the same scope as set forth in subparagraph (c)(1) of this clause; provided, however, that if such data are computer software the Government shall acquire a copyright license as set forth in subparagraph (g)(3) of this clause if included in this contract or as otherwise may be provided in a collateral agreement incorporated in or made part of this contract.

(3) Removal of copyright notices.

The Government agrees not to remove any copyright notices placed on data pursuant to this paragraph (c), and to include such notices on all reproductions of the data.

(D) Release, publication, and use of data.

(1) The Contractor shall have the right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, except to the extent such data may be subject to the Federal export control or national security laws or regulations, or unless otherwise provided in this paragraph, in paragraph (g) of this clause or as expressly set forth in this contract.

(2) The Contractor agrees that, to the extent it receives or is given access to data necessary for the performance of this contract which contain restrictive markings, the Contractor shall treat the data in accordance with such markings unless otherwise specifically authorized in writing by the Contracting Officer.

(3) The Contractor agrees not to establish claim to copyright or publish or release to others any computer software first produced in the performance of this contract other than pursuant to subparagraph (g)(4) of this clause without the Contracting Officer's prior written permission.

(E) Unauthorized marking of data.

(1) Notwithstanding any other provisions of this contract concerning inspection or acceptance, if any data delivered under this contract are marked with the notices specified in subparagraph (g)(2), (g)(3), or (g)(4) of this clause and use of such is not authorized in this clause, or if such data bears any other restrictive or limiting markings not authorized by this contract, the Contracting Officer may, at any time, either return the data to the Contractor, or cancel or ignore the markings. However, the following procedures shall apply prior to canceling or ignoring the markings.

(i) The Contracting Officer shall make written inquiry to the Contractor affording the Contractor 30 days from receipt of the inquiry to provide written justification to substantiate the propriety of the markings;

(ii) If the Contractor fails to respond or fails to provide written justification to substantiate the propriety of the markings within the 30-day period (or a longer time not exceeding 90 days approved in writing by the Contracting Officer for good cause shown), the Government shall have the right to cancel or ignore the markings at any time after said period and the data will no longer be made subject to any disclosure prohibitions.

(iii) If the Contractor provides written justification to substantiate the propriety of the markings within the period set in subdivision (e)(1)(i) of this clause, the Contracting Officer shall consider such written justification and determine whether or not the markings are to be canceled or ignored. If the Contracting Officer determines that the markings are authorized, the Contractor shall be so notified in writing. If the Contracting Officer determines, with the concurrence of the head of the contracting activity, that the markings are not authorized, the Contracting Officer shall furnish the Contractor a written determination, which determination shall become the final agency decision regarding the appropriateness of the markings unless the Contractor files suit in a court of competent jurisdiction within 90 days of receipt of the Contracting Officer's decision. The Government shall continue to abide by the markings under this subdivision (e)(1)(iii) until final resolution of the matter either by the Contracting Officer's determination becoming final (in which instance the Government shall thereafter have the right to cancel or ignore the markings at any time and the data will no longer be made subject to any disclosure prohibitions), or by final disposition of the matter by court decision if suit is filed.

(2) The time limits in the procedures set forth in subparagraph (e)(1) of this clause may be modified in accordance with agency regulations implementing the Freedom of Information Act (5 U.S.C. 552) if necessary to respond to a request thereunder.

(3) This paragraph (e) does not apply if the contract is for a major system or for support of a major system by a civilian agency other than NASA and the U.S. Coast Guard agency subject to the provisions of Title III of the Federal Property and Administrative Services Act of 1949.

(4) Except to the extent the Government's action occurs as the result of final disposition of the matter by a court of competent jurisdiction, the Contractor is not precluded by this paragraph (e) from bringing a claim under the Contract Disputes Act, including pursuant to the Disputes clause of this contract, as applicable, that may arise as the result of the Government removing or ignoring authorized markings on data delivered under this contract.

(F) Omitted or incorrect markings.

(l) Data delivered to the Government without either the limited rights, restricted rights, or limited exclusive rights notice as authorized by paragraph (g) of this clause, or the copyright notice required by paragraph (c) of this clause, shall be deemed to have been furnished with unlimited rights, and the Government assumes no liability for the disclosure, use, or reproduction of such data. However, to the extent the data has not been disclosed without restriction outside the Government, the Contractor may request, within 6 months (or a longer time approved by the Contracting Officer for good cause shown) after delivery of such data, permission to have notices placed on qualifying data at the Contractor's expense, and the Contracting Officer may agree to do so if the Contractor -

(i) Identifies the data to which the omitted notice is to be applied;

(ii) Demonstrates that the omission of the notice was inadvertent;

(iii) Establishes that the use of the proposed notice is authorized; and

(iv) Acknowledges that the Government has no liability with respect to the disclosure, use, or reproduction of any such data made prior to the addition of the notice or resulting from the omission of the notice.

(2) The Contracting Officer may also (i) permit correction at the Contractor's expense of incorrect notices if the Contractor identifies the data on which correction of the notice is to be made, and demonstrates that the correct notice is authorized, or (ii) correct any incorrect notices.

(G) Protection of limited rights data, restricted computer software, and limited exclusive rights data.

(1) When data other than that listed in subdivisions (b)(1)(i), (ii), and (iii) of this clause are specified to be delivered under this contract and qualify as either limited rights data or restricted computer software, if the Contractor desires to continue protection of such data, the Contractor shall withhold such data and not furnish them to the Government under this contract. As a condition to this withholding, the Contractor shall identify the data being withheld and furnish form, fit, and function data in lieu thereof. Limited rights data that are formatted as a computer data base for delivery to the Government are to be treated as limited rights data and not restricted computer software.

(2) [Reserved]

(3) [Reserved]

(4) (i) Notwithstanding any other provisions of this clause, the contract may specify or NASA may require by written request that any data first produced in the performance of this contract be delivered to NASA or furnished to others in accordance with (iii)(a) below, and if so specified or required, the Contractor shall affix the following "Limited Exclusive Rights Notice" to data that are identified in this contract as limited exclusive rights data prior to delivery to the Government or prior to release to others by the Contractor:

LIMITED EXCLUSIVE RIGHTS NOTICE

These data are subject to limited exclusive rights under Government contract No.....(and subcontract ....., if appropriate). These data may be: used, duplicated, and disclosed by or on behalf of the Government for Government purposes; used, duplicated, and disclosed by or on behalf of the Contractor for its purposes within the United States; and used and duplicated (but not further disclosed) by other recipients that have been designated or approved by NASA as participants in the program of which this contract is a part for their purposes within the United States with the express limitation that any release or disclosure for any of the foregoing purposes are to be made subject to disclosure conditions that protect and preserve its limited exclusive rights. These limited exclusive rights shall be effective until (insert a date certain). No other disclosure and use of these data is authorized without the written permission of (insert name of contractor or subcontractor). This Notice shall be marked on any reproduction of these data, in whole or in part.

(End of Notice)

(ii) The Contractor is to place the Limited Exclusive Rights Notice on limited exclusive rights data as soon as practicable after the data is reduced to some tangible, recorded form as defined by the term "data" in this clause, but in any event no later than the earlier of either the date of delivery to NASA if delivery is requested, or of release of data. The "date certain" to be inserted in the Notice, indicating the period of limited exclusive rights, shall be 5 years from the date the Notice is placed on the data, unless otherwise agreed to and stated with respect to any item, component, process, or computer software specifically identified in this contract.

(iii) The Contractor agrees:

(a) to make limited exclusive rights data available to any other entity designated or approved by NASA as a participant in the program of which this contract is a part, either as specifically designated in this contract or as subsequently approved and directed in writing by NASA;

(b) obtain written affirmation that any entity receiving limited exclusive rights data pursuant to (a) above will abide by the use, duplication, and disclosure prohibitions of the Limited Exclusive Rights Notice; and

(c) not to authorize any disclosure and use of limited exclusive rights data than as set forth in the Limited Exclusive Rights Notice without the concurrence of NASA.

(H) Subcontracting.

(1) The Contractor has the responsibility to obtain from its subcontractors all data and rights therein necessary to fulfill the Contractor's obligations to the Government under this contract. If a subcontractor refuses to accept terms affording the Government such rights, the Contractor shall promptly bring such refusal to the attention of the Contracting Officer and not proceed with subcontract award without further authorization.

(I) Relationship to patents.

(1) Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government.

(2) Nothing in this clause shall restrict the rights of the contractor under the New Technology clause of this contract.

(J) Immigrant Aliens.

(1) For the purpose of this clause, disclosure of "limited exclusive rights data" to Immigrant Aliens in the course of their employment by the Contractor shall not be interpreted as disclosure outside the United States. An immigrant alien is defined as "any person lawfully admitted in the United States under an immigration visa for permanent residence."

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 minority educational institutions, as these entities are defined in 52.219-8 of the FAR and 1852.219-76 of the NASA FAR Supplement. For this Announcement of Opportunity, NASA has established a recommended goal of 8 percent for the participation of these entities at the prime and subcontract level. This goal is stated as a percentage of the total contract value. NASA encourages all offerors to meet or exceed this goal to the maximum extent practicable and to encourage the development of minority businesses and institutions throughout the contract period. Offerors will be evaluated on the proposed goal for participation of the entities listed above in comparison with the 8 percent goal and on the methods for achieving the proposed goal.

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 who are selected under this AO will be required to negotiate subcontracting plans which include subcontracting goals for small, small disadvantaged, and women-owned small business concerns. Note that these specific subcontracting goals differ from the 8 percent goal described in paragraph A above, and need not be submitted with the proposal. Failure to submit and negotiate a subcontracting plan after selection shall make the offeror ineligible for award of a contract.

APPENDIX B

GUIDELINES FOR PROPOSAL PREPARATION

The following guidelines apply to the preparation of proposals in response to this Small Explorer Program 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 should, 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 the International System (SI) of units, and be clearly legible. Submission of proposal material by facsimile (fax), electronic media, videotape, floppy disk, etc., is not acceptable. In evaluating proposals, NASA will only consider printed material. No proposal may reference a World Wide Web site for any data related to the proposal.

The proposal must consist of only one volume, with readily identified sections corresponding to sections D through I given below. Note the guidance on page count for the various sections specified in the table on page B-2.

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, certifications, and non-U.S. 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 33 pages, including no more than three 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. The following table provides guidance on page count within the proposal:

Section	Pages
Science Investigation description	20
Education and Outreach, Technology, and Small Disadvantaged Business Plan	3
Mission Implementation Management, Schedule, and Cost Estimating Methodology	7 3
Appendices: (no others permitted) Resumes Letters of Endorsement Statement(s) of Work (SOW) for each contract option Reference List (optional)	No page limit, but small size encouraged

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 Times (i.e., approximately 15 characters per inch).

The content of each proposal is described below.

A. INVESTIGATION SUMMARY

A summary of the proposed investigation must be included with the proposal. The Investigation Summary does not count against the page limit. The information conveyed on this Investigation Summary should include the following: PI and Co-I's, abstract, the primary and any secondary science themes that the proposal addressees, mission mode (Small Explorer or Mission of Opportunity), and anticipated launch vehicle. The form to be used for this Summary is located at the end of this Appendix.

B. COVER PAGE

A cover page 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. The full names of the Principal Investigator and the authorizing official, their addresses with zip code, telephone and fax numbers, and electronic mail addresses, shall be included.

C. 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.

D. SCIENCE

The science 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.

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.

      A preliminary description of each instrument design with a block diagram showing the instrument systems and their interfaces should be included, along with a description of the estimated performance of the instrument. Performance characteristics should be related to the measurement and investigation objectives as stated in the proposal. Such characteristics include a discussion of the data rates, fields of view, resolution, precision/sensitivity, pointing accuracy, etc.

b. Mission. Mission observing strategy and spacecraft performance required for obtaining the necessary data with the proposed instrumentation must be described. The concept for operating the mission and the requirements for mission operations must be given.

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 the investigation science team and their roles and responsibilities. The capabilities and experience of all members of the proposed science team should be described. Alternately, resumes or curriculum vitae of team members may be included as attachments to the proposal (see Section J, below). The role of each science team member in the investigation should be explicitly defined.

E. EDUCATION, OUTREACH, TECHNOLOGY, AND SMALL DISADVANTAGED BUSINESS PLAN

The education, outreach, technology, and small disadvantaged business section shall provide a summary of the benefits offered by the mission beyond the scientific benefits. This plan should reflect the proposer's commitment to achieving the goals of the OSS education and outreach strategy as reflected in the Implementation Plan for that strategy, participation of small disadvantaged business, and the use of new technology in the implementation of the investigations. 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 contents of the EPL, Appendix F). Appendix A, Section XIII discusses requirements for small disadvantaged businesses. Guidance on the use of new technology in investigations can be found in the *OSS Integrated Technology Strategy* in the EPL.

F. MISSION IMPLEMENTATION

This section should provide a brief overview of the mission, including mission design, instrument accommodation, spacecraft, launch vehicle required, ground systems, and communication approach. Specific information should be included that describes the unique requirements placed on these mission elements by the science investigation. Tables with mass, power, data, and communications resources and margins would be helpful in understanding the degree of maturity of the proposed approach. Potential risk areas to the proposed investigation and plans for mitigating those risks should be discussed. Investigation that depend on new technology will not be penalized for risk if adequate plans are described to ensure success of the investigation.

It is recognized that teaming arrangements to implement the mission 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.

G. MANAGEMENT AND SCHEDULE

This section should briefly summarize the investigator's proposed management approach. The management organization 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 should be discussed. Key project personnel (*e.g.,* the Project Manager) need not be identified by name at this time.

A project schedule to meet the proposed launch date and covering all phases of the investigation should be provided. The schedule should include proposed major project review dates; instrument development; spacecraft development; instrument to spacecraft integration and test; launch vehicle integration; and mission operations and data analysis.

H. COST AND COST ESTIMATING METHODOLOGY

This section shall include a first-order estimated cost of the investigation that encompasses all proposed activities, including Phase A/B/C/D/E, launch services, development of the ground data system, fee, and contributions. These costs shall be consistent with the program requirements described in Section 3 of the AO. The amount to be costed in each fiscal year should be identified by providing the data in Table B1, which will not be counted against the page limit. The top portion of Table B1 requests cost data relative to the NASA Mission Cost. The lower portion addresses contributions. Table B2 gives the NASA inflation index to be used to calculate real year dollars.

The methodology used to estimate the cost, for example, specific cost model, past performance, cost estimating relationships from analogous missions, should be discussed.

I. APPENDICES

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

1. <u>Resumes</u>. Provide resumes or curriculum vitae for all science team members identified in the science section. Resumes or curriculum vitae should be no longer than two pages in length.

2. <u>Letters of Endorsement</u>. Letters of endorsement must be provided from all organizations offering to make a contribution to the investigation. Letters of endorsement should be signed by both the lead representative from each organization represented on the team, and by institutional and Government officials authorized to commit their organizations to participation in the proposed investigation.

3. <u>Statement of Work (SOW):</u> For investigations managed from non-Government institutions, provide a SOW for all potential contracts <u>with NASA</u>. 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 as defined in Appendix J. In addition, the SOW must include general tasks statements for Phases B/C/D, and for Phase E for the investigation. 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 no more than a few pages in length.

4. References List: Proposals may provide, as an appendix, 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.

TABLE B1

TOTAL MISSION COST FUNDING PROFILE TEMPLATE

(FY costs* in Real Year Dollars, Totals in Real Year and FY 1997 Dollars)

Item	FY1	FY2	FY3	FY4	FY5	...	FYn	Total (Real Yr.)	Total (FY 1997)
Phase A	$	$	$	$	$	$	$	$	$
Phase B/C/D	$	$	$	$	$	$	$	$	$
- Instrument A									
- Instrument B									
- Spacecraft									
- MSI&T **									
Ground Data System Dev	$	$	$	$	$	$	$	$	$
Launch services	$	$	$	$	$	$	$	$	$
Phase E	$	$	$	$	$	$	$	$	$
Other (specify)	$	$	$	$	$	$	$	$	$
NASA Mission Cost	$	$	$	$	$	$	$	$	$
Contributions by Organization (Non-U.S. or U.S.) to:									
Phase A/B/C/D	$	$	$	$	$	$	$	$	$
- Organization A									
- Organization B									
Ground Data System Dev	$	$	$	$	$	$	$	$	$
- Organization A									
Launch Services	$	$	$	$	$	$	$	$	$
- Organization A									
Phase E	$	$	$	$	$	$	$	$	$
- Organization A									
Other	$	$	$	$	$	$	$	$	$
Contributed Costs (Total)	$	$	$	$	$	$	$	$	$
						Mission Totals			$

* Costs should include all costs including any fee

** MSI&T - Mission System Integration and Test <u>and</u> preparation for operations

TABLE B2

NASA NEW START INFLATION INDEX

Fiscal Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
Inflation Rate	0.0%	3.7%	3.9%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%
Cumulative Inflation Index	1.0	1.037	1.077	1.118	1.161	1.205	1.251	1.300	1.350

Use an inflation rate of 3.8% for years beyond 2005.

Small Explorer and Missions of Opportunity
Investigation Summary Form

AO 97-OSS-03	Small Explorer Program and Missions of Opportunity

Principal Investigator *Title* *First Name* *Middle Name* *Last Name*		
Department		
Company/Institution		
Street Address	City/Town	
State	Zip/Postal	Country
Telephone	Fax	E-Mail Address

Proposal Title
Science Theme Supported (1 = primary; 2 = secondary) [ ]Structure and Evolution of the Universe [ ]The Sun-Earth Connection [ ]Astronomical Search for Origins and Planetary Systems

Abstract (Limit 150 words)

Small Explorer and Missions of Opportunity
Investigation Summary Form (Page 2)

Principal Investigator
Title *First Name* *Middle Name* *Last Name*
Proposal Title

Mission Mode (Check one)	Cost
[ ]Small Explorer [ ]Mission of Opportunity	NASA Mission Cost $_______ Total Mission Cost $_______

Anticipated Launch Vehicle:

Co-Investigator(s)		
Name	Institution	E-mail

APPENDIX C

GROUND DATA SYSTEMS AND MISSION OPERATIONS AND DATA ANALYSIS (MO&DA)

BACKGROUND

In the past, prelaunch development of the ground data system and postlaunch mission operations for Earth-orbiting missions were funded by the former Office of Space Communications (Code O). As part of NASA's reorganizations, and transition to full-cost accounting, such funds will be transferred to the appropriate enterprise, in this case the Office of Space Science. Therefore, funding for such functions must be included in mission proposals, including responses to this AO, and evaluated and reviewed accordingly.

The following sections describe the elements of the ground data systems and operations and provide guidance on how costs associated with these functions should be allocated against the various Small Explorer cost cap categories. Proposers are free to propose development of their own operations systems and services, propose the use of operations system and services provided by NASA or third parties, or some combination of these options.

1. DEVELOPMENT OF THE GROUND DATA SYSTEM

The development of the ground data system encompasses the items listed below. Note that this does not include the development of systems for science data processing or science operations (e.g., instrument performance evaluation or instrument calibration scheduling). The cost of the ground data system development is considered to be pre-launch costs and NASA Mission Cost shall not exceed the cost limit given in Section 3.6 of the AO for development of the ground data system. These costs are those typically incurred in developing systems, or arranging for the use of existing shared systems, such as ground stations.

- **Space/ground communications.** Includes arrangements for or development of telemetry acquisition and commanding. This may include the development of a new ground station, the arrangement for the use of existing ground stations, the arrangement for the use of the Tracking Data Relay Satellite System, or other methods of communicating between the spacecraft and the ground.

- **Data Transport.** Includes arrangement for or development of the data transport among the ground system components, including electronic communications and physical media shipment.

- **Mission Operations System.** Includes arranging for or developing the system for mission planning, scheduling, commanding, and spacecraft telemetry monitoring.

- **Level Zero Processing.** Includes arranging for or developing the system for the removal of the artifacts of the data downlink and recreation of the data in the form that it was generated. The output of level zero processing is ready for processing into science products.

- **Tracking and Attitude.** Includes arranging for or developing the system for attitude determination, attitude sensor calibration and alignment, attitude maneuver and control, trajectory determination, trajectory design and control, acquisition data, and launch support.

- **Test Systems.** Includes arranging for or developing the system for the exercise of the interfaces and the end-to-end system

- **Management, Systems Engineering, and Testing.** Required to develop the operations ground system, verify its functionality, and test for RF compatibility with the spacecraft. Management functions also include spectrum licensing. NASA will provide assistance in obtaining licenses to missions that use Government frequencies for noncommercial applications.

- **Maintenance.** Any maintenance, licensing, or system administration that is required prior to the MO&DA phase.

2. PREPARATION FOR OPERATIONS

The proposer is responsible for the prelaunch operations preparation for the mission. This includes all efforts to prepare for operations until the start of the MO&DA phase and includes operations from launch through spacecraft and instrument checkout within the first 30 days after launch. It includes maintaining the spacecraft operations data base that defines operations parameters such as telemetry limits and the definition of all procedures for operating the spacecraft for all phases of the mission. Preparation for operations also includes the responsibility to see that the requirements for the Mission Operations and Data Analysis phase are understood and fully costed. The cost of Preparation for Operations must be included in the Phase A/B/C/D cost cap given in Section 3.6 of the AO.

The scope of this effort includes:

- **Defining operations plans and procedures**. Includes pertinent operations agreements with other support elements. Detailed operations requirements should be documented to define the functional mission needs for developers of other components of the system. This effort includes developing the procedures for operating the mission, including contingency procedures.

- **Training**. The effort of the operations team to be trained on the operation of the ground system and the operation of the spacecraft and instruments. This includes participation in tests and simulations.

- **Testing.** Acceptance testing of the operations ground system from the developers/providers (if they are a different group than the operators) and verification that the ground system and operations team are ready for operations.

- **Mission Development Participation.** Any involvement in the development and test of other components of the mission, such as reviews or system evaluation.

- **Reviews.** Preparation and presentation of any reviews held to verify operational status or readiness.

- **Configuration.** Configuration of the operations ground system as required (for example, any augmentations to the telemetry and commands parameter data base or the generation of user specific display formats)

- **Pre-MO&DA Operations.** Operations until the MO&DA phase begins (launch plus 30 days)

3. MISSION OPERATIONS AND DATA ANALYSIS (MO&DA)

The proposer is responsible for the MO&DA phase of the mission, including mission operations and science processing in support of the proposed research objectives. The Mission Operations and Data Analysis phase encompasses the items listed below. This phase (Phase E) is expected to begin 30 days after launch. The NASA Mission Cost for Phase E must not exceed the cost limit given in Section 3.6 of the AO.

- **Mission operations.** This includes the personnel to operate the spacecraft and the ground system for the proposed mission lifetime. It includes mission scheduling, command generation, telemetry monitoring, and level zero processing of the science data. It also includes support of orbit determination, attitude processing, and any needed on-orbit attitude sensor calibration or alignment and provision of any needed calibration constants to the level zero or science data processing functions.

- **Uplink and Downlink Communications.** This includes use of NASA's space network (Tracking and Data Relay Satellite System - TDRSS), low-Earth orbit ground network or space/ground links provided by the proposer or third parties.

- **Ground communications**. This includes the costs of moving data among the ground elements. It may include the shipment of physical media as well as electronic communication

- **Science operations.** This includes the personnel to plan the science operations and to monitor the performance of the science instrument. It also includes any needed on-orbit instrument calibration and alignment, as well as providing any needed calibration constants to the level zero or science data processing functions.

- **Science data processing.** This processes the data from level 0 to higher level data products, stores the products for the life of the mission, and distributes the products to the science team. This includes any effort to prepare the data for permanent archiving after the completion of the mission.

- **Science team activities**, including data validation and analysis.

- **Maintenance and sustaining engineering of the ground data systems**. This includes hardware maintenance, spares, renewal of commercial-off-the-shelf software licenses, and any problem correction or enhancement of the ground system for the proposed life of the mission.

The recently established Space Operations Management Office (SOMO) at the Johnson Space Center, is responsible for the functional management of all of NASA space operations efforts.

NASA is currently in transition to full-cost accounting principles. These principles, and their implementation in direct cost accounting, will evolve during the next two years, and specific price lists are currently not available. To assist the proposers, this section provides information on typical costs. Contact the NASA point of contact given below if you wish to consider using NASA institutional resources and the point of contact will assist the proposer in developing the cost of institutional system usage required for the unique needs of the mission.

Cost of the ground system development, operations preparation, and operations will depend on the unique combination of requirements and systems associated with a particular mission. However, costs for a typical missions in response to this AO would consist of:

Ground data system development. The cost to procure hardware and configure and extend commercial off the shelf software (or adapt existing software from a similar mission) would be approximately $2 million. The allocation of functions between the spacecraft and ground system can have significant impact on the ground system development costs

Operations Preparation. The effort to prepare for operations would typically cost about $700 K for a mission that is similar to a previous mission.

Operations. The mission operations team for a simple mission would cost about $400 K per year. Maintenance and other supporting services would cost about $100 K per year.

Use of a ground station would cost:

Selected NASA Ground Station Services	**Fees in (FY 97) $K, per hour** (*for the purpose of this AO only)*
18m L/S-band in Wallops Virginia	$1.3K
8m TOTS at Wallops and Fairbanks	$0.4K
10m McMurdo	$1.0K
5m S-band at Fairbanks	$0.4K
34 m DSN (Madrid, Canberra, Goldstone)	$1.6K
70 m DSN (Madrid, Canberra, Goldstone)	$3.9K
26m S-Band (Madrid, Canberra, Goldstone)	$2.0K

Note that the 34 m and 70 m DSN stations are projected to be significantly oversubscribed in the time frame for these missions.

Use of the Tracking and Data Relay Satellite System (the Space Network) would cost:

TDRSS Service Description	**Fees in (FY 97) $K, per hour** (*for the purpose of this AO only)*
TDRSS Flexible Support (Flexible Support. implies that the user requests contacts which permit NASA, at its option, to schedule service at any time during the period of a single orbit of the user mission.)	If the requests are not flexible, the cost of the service doubles.
Single Access (S or Ku-band)	$0.6K
Multiple Access (S-band) Forward Service	$0.3K
Multiple Access (S-band) Return Service	$0.06K *(Nominal for SA Users)*

The ground station and TDRSS service costs are for proposal purposes only; they may change in the future as full cost accounting is implemented. These are typical costs to aid in estimating the cost of a proposed mission. These costs are provided for illustrative purposes and do not change the caps defined elsewhere in this AO. Actual costs could be lower if the mission can take advantage of existing systems or higher, if the mission has unique requirements. The proposer must provide an estimate of the cost to support the proposed mission, working within the proposer's team, with NASA, or with a third party supplier of ground systems and operations services.

Proposers who have questions on NASA services or require assistance in defining ground data system and operations approaches should contact:

Stanley Fishkind
Program Integration Office
Code MG
National Aeronautics and Space Administration
Washington DC 20546-0001
Fax number: 202-358-3520
E-mail: stanley.fishkind@hq.nasa.gov
Phone: 202-358-0709

Additional information regarding NASA ground systems and operations is available via Internet at the home pages listed below.

http://joy.gsfc.nasa.gov
http://www.jsc.nasa.gov/somo/svc_cat.html
http://deepspace1.jpl.nasa.gov/advmiss/

APPENDIX D

SMALL EXPLORERS LAUNCH SERVICES INFORMATION SUMMARY

This appendix provides data and guidelines for Small Expandable Launch Vehicles Services, and for Space Shuttle Launched Free Flyers.

SMALL EXPENDABLE LAUNCH SERVICES (SELVS II)

Small Expendable Launch Services (SELVS II) available to Small Explorer missions for the purpose of this AO are provided in this section of the appendix. Emphasis is given to those characteristics that either affect or constrain the payload.

As stated in the AO, the total cost of SMEX missions assumes baseline launch services and performance; also referred to in this appendix as Small Class/Fairing A. Investigations requiring launch vehicle performance and services beyond the baseline may do so, but the additional cost must be deducted from the phase A/B/C/D mission cost. Information on SELVS II may be obtained through the Orbital Launch Services Project Office, Code 470, NASA Goddard Space Flight Center, Greenbelt, MD 20771; contact Mark Roberts (mark.roberts@gsfc.nasa.gov), (301) 286-5532.

Launch Vehicle Description

SELVS II is currently in the procurement cycle. Since the actual launch vehicle(s) and Contractor(s) have not been selected, the launch vehicle will be referred to as "SELVS II" throughout this appendix. The selected Contractor will use the SELVS II to provide launch services for the Small Explorer missions to be selected and confirmed from proposals received in response to this AO. SELVS II will be a multistage solid- or liquid-propellant vehicle.

Payload/Vehicle Integration and Launch

Integration of the payload to the SELVS II vehicle will be accomplished at the yet-to-be-determined launch site. The SELVS II Contractor will manage the mission integration of the payload flight and ground systems with the launch vehicle and its associated GSE.

Payload Mass

The SELVS II RFP specifies minimum performance requirements for a number of missions, as shown in Table D-1. Spacecraft mass capability anticipated as available under the SELVS II Contract is shown for circular orbits of 28.5 degrees inclination in Figure D-1 and for sun-synchronous inclinations in Figure D-2. Low inclination missions (0 to <28.5 deg) will be possible with SELVS II as a nonstandard service costing approximately 20% more than the standard price for the vehicle chosen. To obtain spacecraft mass capabilities for these types of orbits use the "Request for Clarification for a Specific Payload to Orbit" form found on page D-11 of the appendix.

Orbit Injection Accuracy

Orbit injection accuracy varies with the mission orbit. For low Earth circular orbits, the 3σ altitude errors are defined in Table D-1.

Fairing Envelope and Payload Attach Fittings

The payload, consisting of the spacecraft and instruments, must fit within the static envelope of the SELVS II vehicle. The vehicle selected for the SELVS II service may offer several fairings. Figure D-3 shows the minimum payload envelopes specified in the SELVS II RFP. Generally, the larger payload envelopes are required by higher mass payloads. Table D-1 relates fairing envelope requirements to payload mass requirements. Fairing envelope B2 is to be assumed for missions requiring an upper stage, e.g. highly elliptical or escape orbits.

Two standard mechanical interfaces are specified in the SELVS II RFP as 38.810 and 23.250 inch bolt circles at the top of the payload attach/separation system provided by the vehicle. Other attach fittings may be available.

Environments

Environment specifications from the SELVS II RFP are shown in Figure D-4.

Electrical Interface

The vehicle electrical interface will allow payload ground support equipment to supply power, command and control, and payload status monitoring until 6 minutes before launch.

Spin

The SELVS II vehicle will be capable of separating the payload in either a spinning or non spinning mode. The SELVS II RFP specifies that the range of spin rates is to be proposed.

Cost

Baseline vehicle (Small Class/Fairing A) and services cost will be $19 million, and enhanced launch vehicle and services (Large Class/Fairing B1 or B2) will be $28 million. Amortized costs are provided in Table D-2. Any vehicle performance required above the "Baseline Vehicle" line in figures D-1 and D-2 will increase the launch cost for that mission to $28 million (Large Class vehicle cost).

Table D-1
SELVS II RFP Minimum Performance Requirements

	Insertion Apse (km)	Non-Insertion Apse (km)	Inclination (deg)	Argument of Perigee (deg)	Payload Mass (kg)	Payload Envelope
1	600	600	74.4	N/A	660	B1
2	1,334	1,334	66	N/A	500	B1
3	600	600	94	N/A	600	B1
4	705	705	98.2	N/A	180	A
5	500	1,000	90	270	180	A
6	500	500	70	N/A	320	A
7	500	500	28.5	N/A	380	A
8	705	705	98.2	N/A	800	B1
9	500	1,000	90	270	870	B1
10	500	500	28.5	N/A	1,260	B1

Notes:
1. Required minimum payload envelopes are specified in Figure A-3
2. Spacecraft mass does not include vehicle-provided attach hardware (PAF).
3. Altitudes specified are relative to the equatorial radius of the Earth.
4. The launch service shall be capable of targeting a right ascension of the ascending node within ±0.5 degrees
5. The launch service shall be capable of providing any required argument of perigee from 0° to 360°.
6. The required 3 σ accuracy on the above requirements is as follows:
   - Insertion Apse: ±20 km
   - Non-Insertion Apse: ±90 km
   - Inclination: ±0.20°
   - Argument of Perigee: ±5°

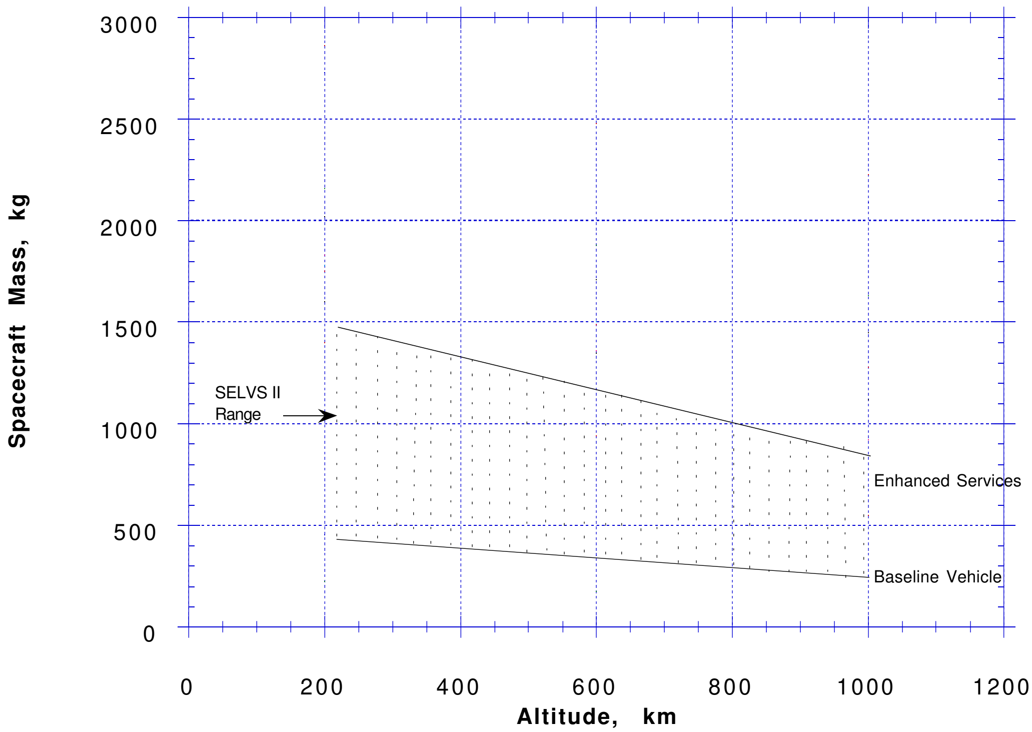


Figure D-1. Anticipated SELVS II Spacecraft Mass Capability for Circular Orbits, Inclination 28.5

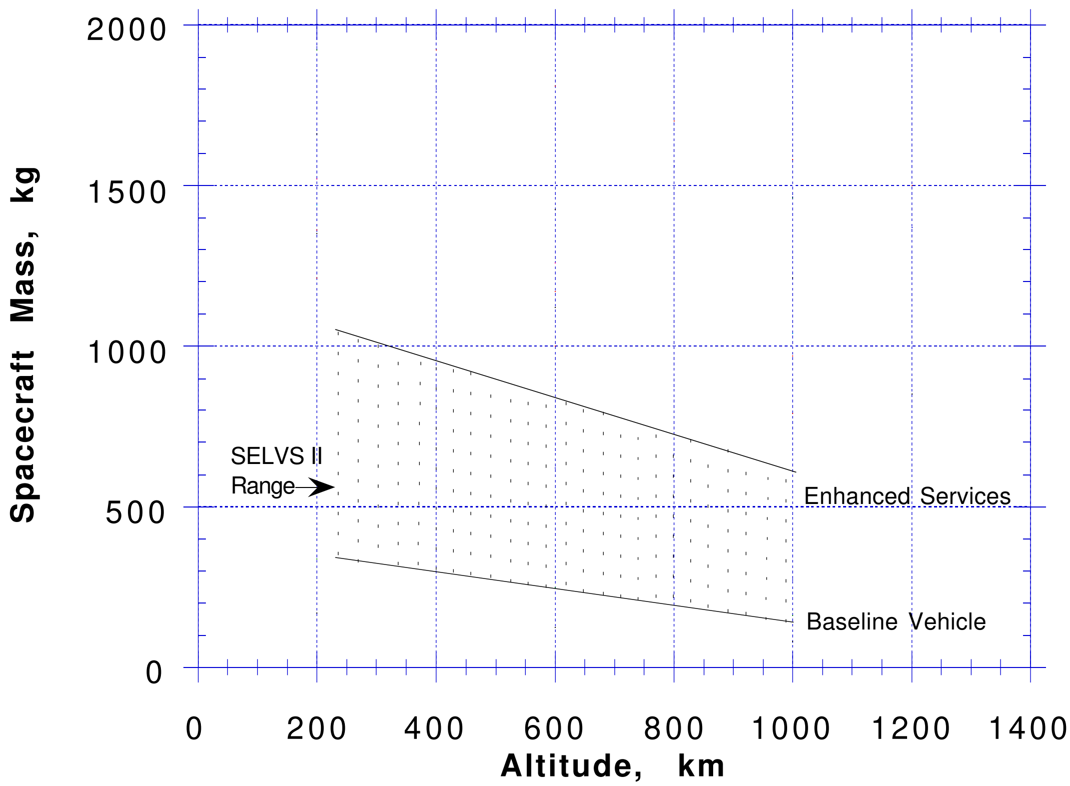
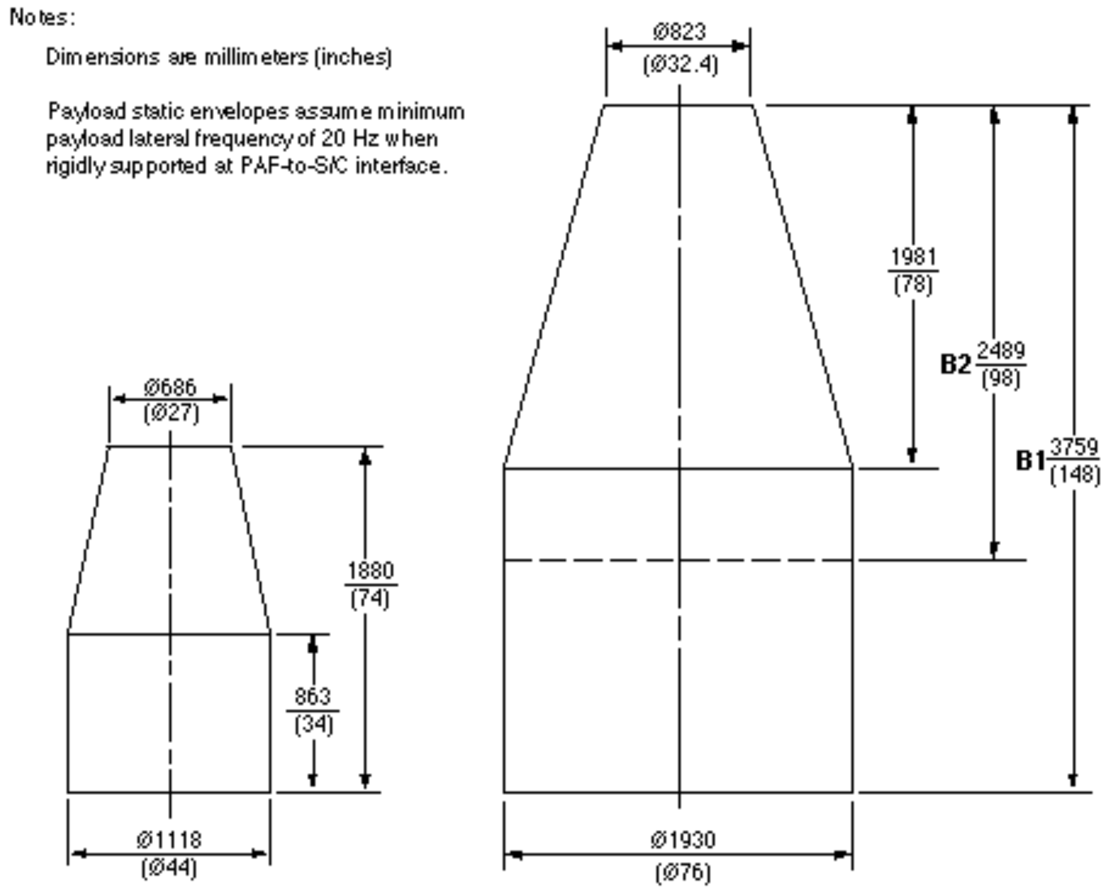
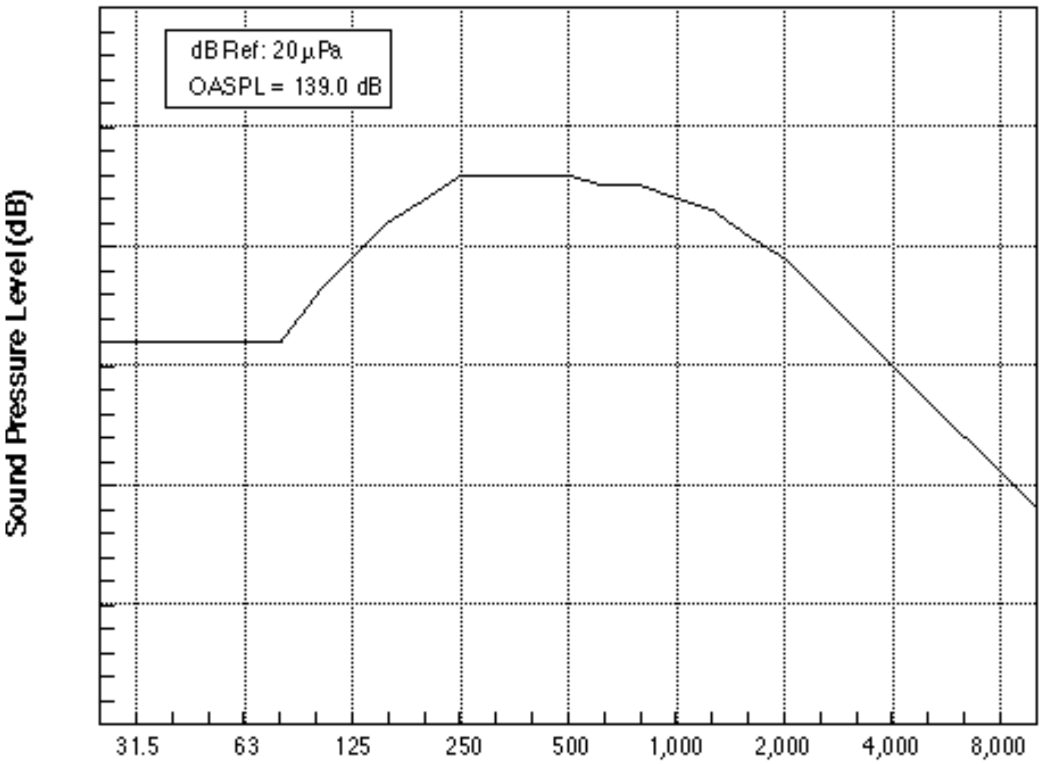


Figure D-2. Anticipated SELVS II Spacecraft Mass Capability for Circular Sun Synchronous Orbits



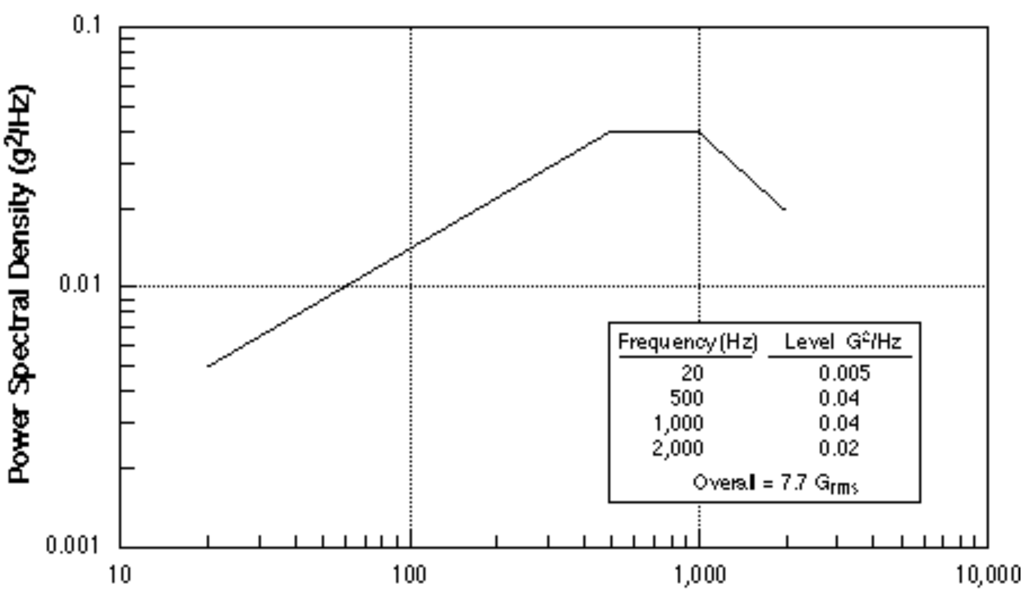
Fairing envelope B2 is to be assumed for missions requiring an upper stage, e.g. highly elliptical orbits**.**

Figure D-3. Maximum Fairing Static Envelopes Specified by the SELVS II RFP



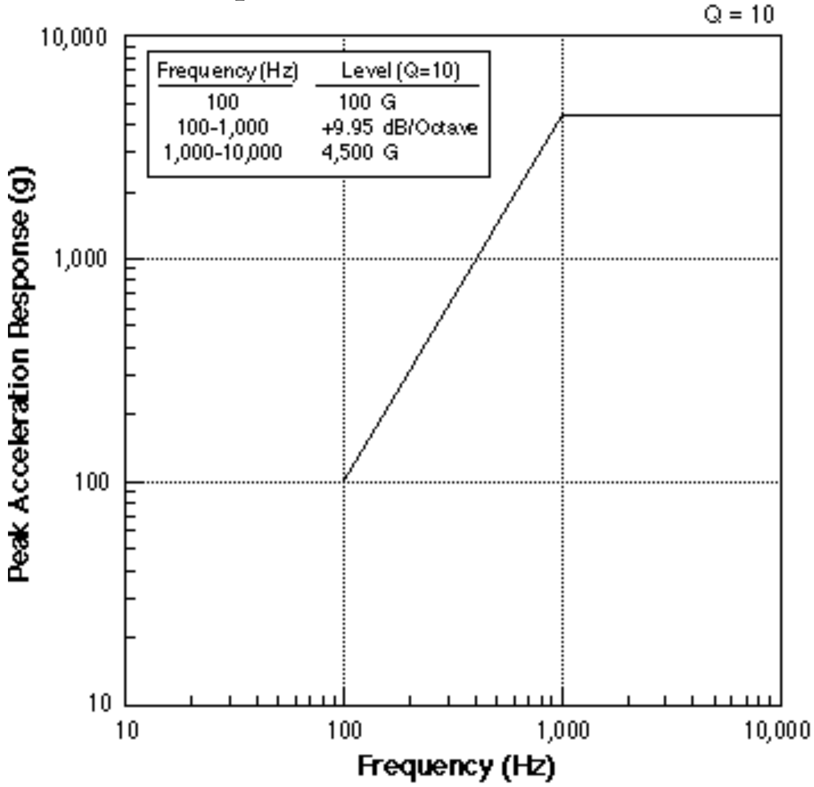
1/3 Octave Center Freq. (Hz)	Maximum Flight Levels (dB)
25	121.0
31.5	121.0
40	121.0
50	121.0
63	121.0
80	121.0
100	123.0
125	124.5
160	126.0
200	127.0
250	128.0
315	128.0
400	128.0
500	128.0
630	127.5
800	127.5
1,000	127.0
1,250	126.5
1,600	125.5
2,000	124.5
2,500	123.0
3,150	121.5
4,000	120.0
5,000	118.5
6,300	117.0
8,000	115.5
10,000	114.0

(a) Spacecraft Acoustic Environment - Maximum Flight Level



(b) Spacecraft Interface Random Vibration Environment

Figure D-4. Maximum Spacecraft Environments for the SELVS II Vehicle



(c) Spacecraft Interface Shock Environment - Maximum Flight Levels

Axis	Maximum Acceleration (g's)
Axial	+11.0 / -4.0
Lateral	± 6.0

Notes: (1) Sign convention: Positive axial acceleration produces compression
(2) Axial and lateral accelerations are simultaneous

(d) Spacecraft Design CG Limit Load Factors

Figure D-4 (continued). Maximum Spacecraft Environments for the SELVS II Vehicle

Table D-2
Launch Service Cost
(Real Year $ in Millions)

Launch in 12/00

Launch Service	FY'98	FY'99	FY'00	FY'01	Total	Total FY'97$
Small Class (Fairing A)	0	12	7	2	21	19
Large Class (Fairing B1 or B2)	5	12	10	4	31	28

Launch in 12/01

Launch Service	FY'99	FY'00	FY'01	FY'02	Total	Total FY'97$
Small Class (Fairing A)	0	13	7	2	22	19
Large Class (Fairing B1 or B2)	5	13	10	4	32	28

Request for Clarification of a Specific Payload to Orbit

Send the following information to determine if the mission orbit is achievable.

Apogee (km)	______________
Perigee (km)	______________
Inclination (deg)	______________
Argument of Perigee (deg)	______________
Total mass to orbit (kg)	______________

Send the completed form to the following:

Mark Roberts
Orbital Launch Services Project Office
Code 470
NASA Goddard Space Flight Center
Greenbelt, MD 20771

Telephone: (301)286-5532.
FAX: (301) 286-1696
E-Mail: mark.roberts@gsfc.nasa.gov

SMALL EXPLORER SPACE SHUTTLE LAUNCHED FREE FLYERS

The Space Shuttle offers unique opportunities to launch payloads that are large, heavy and/or require recovery. It can also carry small payloads on a space-available basis. Since secondary payloads share the mission with other payloads, the resources and capabilities of the Space Shuttle are shared among all payloads on a mission. Free flyers can be either dedicated satellites or carriers to which the instrument mounts, which in turn interface with the Orbiter. The capabilities and resources available to the experimenter are the combination of the satellite/carrier design and the portion of Shuttle resources allocated to that payload.

Proposers using shuttle services should contact the Special Payloads Division, Mail Code 740, NASA Goddard Space Flight Center, Greenbelt, MD 20771; contact Donald E. Carson (301) 286-8813, E-mail address: dcarson@gsfc.nasa.gov for additional information and guidance.

Payload Size

While the capacity of the Space Shuttle is in excess of 32000 pounds, secondary payloads generally do not exceed 8000 pounds. Similarly, the shuttle payload bay volume (15' dia. x 60' long) is shared among the entire payload complement. Instrument size, shape, and mass are driven by the capabilities of the carrier within the constraints of the Shuttle and the other manifested payloads.

Orbits

The Shuttle can carry payloads into orbits with an inclination ranging from 28.5 degrees to 57 degrees. Altitudes at which free flyers can be deployed depend on a variety of factors but can vary from 110 nmi to over 300 nmi. Free flyers can carry orbit adjust systems to modify orbit parameters.

Mission Duration

Shuttle launched free flyer mission duration varies depending on the mission design. Mission designs can include deployment and retrieval on the same Shuttle mission, deployment on one mission and retrieval by a later mission , or deployment and no retrieval.

Spacecraft that are deployed and retrieved on the same mission are generally free flying for two weeks or less. Spacecraft not retrieved on the same mission as deployment can have durations from months to years.

Environment

Launch, orbital, and landing environments are driven by a combination of the Shuttle environment, the presence of other payloads in the bay, and the free flyer design. Specific environments are available from spacecraft and carrier providers.

General design and qualification recommendations for payloads that will fly on the Shuttle can be found in the Goddard Space Flight Center's General Environmental Verification Specification (GEVS), available from the Small Explorers Project Office. In many cases these specifications are conservative and can be relaxed by mission specific analysis.

Payload/Launch Vehicle Integration and Launch

Integration of the payload with the Space Shuttle will be accomplished at the Kennedy Space Center in Florida. The PI's launch site integration and testing team will work with the KSC ground operations team during the integration and of the payload flight and ground systems with the Shuttle and its associated GSE.

Cost

As stated in the AO, for proposal purposes the launch vehicle cost to be used to calculate the NASA Mission Cost for a Shuttle launched free flyer is the same as the cost of the baseline SELV-II services. The cost of integration to the Shuttle, however, must be included in the Phase A/B/C/D cap. Likewise, the development cost of a new carrier or the recurring cost of an existing carrier (if applicable) and/or the cost of a dedicated spacecraft, integration and test to the carrier (if one is used), and any mission uniques, must also be included in the Phase A/B/C/D cost cap. These costs can vary widely depending on mission implementation approach and other requirements. Therefore, proposers should contact the Special Payloads Division, Mail Code 740, NASA Goddard Space Flight Center, Greenbelt, MD 20771; contact Donald E. Carson (301) 286-8813, E-mail address: dcarson@gsfc.nasa.gov for additional information and guidance.

APPENDIX E

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 1994)
52.225-10	Duty-Free Entry (April 1984)
52.225-11	Restrictions on Certain Foreign Purchases (May 1992)
52.225-17	Buy American Act -- Supplies Under European Community Agreement (May 1995)
52.225-18	European Community Sanction for End Products (May 1995)
52.225-19	European Community Sanction for Services (May 1995)
52.225-21	Buy American Act -- North American Free Trade Agreement Implementation Act -- Balance of Payments Program (January 1994)

The proposer is directed to the Federal Acquisition Regulation and the NASA FAR Supplement for further information on these regulations.

APPENDIX F

CONTENTS OF THE EXPLORER PROGRAM LIBRARY

The Explorer Program Library (EPL) 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 documents are available. Please note that not all documents are available via the EPL, but access information is provided.

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

The EPL is accessible on the World Wide Web at the URL address <http://www.ssso.larc.nasa.gov>

Requests for paper copies should be submitted in writing to:

Explorers Program Library
Mail Stop 160
Langley Research Center
National Aeronautics and Space Administration
Hampton, VA 23681-0001
FAX: (757) 864-8894
E-mail: j.a.lintott@larc.nasa.gov

Space Science for the 21st Century: The Space Science Enterprise Strategic Plan (August 1995)

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

Space Science for the 21st Century: Strategic Plan for 1995-2000 (September 1994)

This document details plans for future missions during the period 1995-2000.

A Science Strategy for Space Physics (1995)

National Research Council report. A paper copy may be obtained by sending an E-mail with name and address to <cchamber@nas.edu>.

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"

Exploration of Neighboring Planetary Systems (ExNPS) Study (October 1995)

Jet Propulsion Laboratory report. Mission and technology road map; presentation to the Townes Blue Ribbon Panel

Recommended Priorities for NASA's Gamma-Ray Astronomy Program 1996-2010 (1997***)***

Report synopsis of the Gamma Ray Astronomy Program Working Group

OSS Integrated Technology Strategy (April 1994)

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

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.

NHB 7120.5 -- Management of Major System Programs and Projects (November 1993)

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

Assessment of Recent Changes in the Explorer Program (December 1996)

Report by the Space Studies Board of the National Research Council. A paper copy may be obtained from:

Space Studies Board
2101 Constitution Avenue, NW
National Research Council
Washington, DC 20418

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 Use," ANSI/ASQC Q9000-1-1994

"ISO 9000 and NASA," 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

Example Mission Definition and Requirements Agreement

Example of such an agreement

Sample Terms and Conditions for the Phase A (Concept Study) Contract

MIDEX Lessons-Learned Workshop Report (August 1996)

Proceedings from the Medium-class Explorer (MIDEX) Lessons-Learned Workshop held in June 1996.

Electronic versions only are available for the following:

Federal Acquisition Regulations (FAR) General Services Administration

(URL: http://www.gsa.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/

APPENDIX G

CERTIFICATIONS

CERTIFICATION REGARDING DRUG-FREE WORKPLACE REQUIREMENTS

This certification is required by the regulations implementing the Drug-Free Workplace Act of 1988, 34 CFR Part 85. Subpart F. The regulations, published in the January 31, 1989 Federal Register, require certification by grantees, prior to award, that they will maintain a drug-free workplace. The certification set out below is a material representation of fact upon which reliance will be placed when the agency determines to award the grant. False certification or violation of the certification shall be grounds for suspension of payments, suspension or termination of grants, or government-wide suspension or debarment (see 34 CFR Part 85, Sections 85.615 and 85.620).

I. GRANTEES OTHER THAN INDIVIDUALS

A. The grantee certifies that it will provide a drug-free workplace by:

- (a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;
- (b) Establishing a drug-free awareness program to inform employees about --
  - (1) The dangers of drug abuse in the workplace;
  - (2) The grantees policy of maintaining a drug-free workplace;
  - (3) Any available drug counseling, rehabilitation, and employee assistance programs; and
  - (4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;
- (c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);
- (d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will
  - (1) Abide by the terms of the statement; and
  - (2) Notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five days after such conviction;
- (e) Notifying the agency within ten days after receiving notice under subparagraph (d) (2) from an employee or otherwise receiving actual notice of such conviction;
- (f) Taking one of the following actions, within 30 days of receiving notice under subparagraph (d) (2), with respect to any employee who is so convicted --
  - (1) Taking appropriate personnel action against such an employee, up to and including termination; or
  - (2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or Local health, Law enforcement, or other appropriate agency;
- (g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e), and (f)

B. The grantee shall insert in the space provided below the site(s) for the performance or work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)

____

____

____

Check _____ if there are workplaces on file that are not identified here.

II. GRANTEES WHO ARE INDIVIDUALS

The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance in conducting any activity with the grant.

Organization Name — AO or NRA Number and Title

Printed Name and Title of Authorized Representative

Signature — Date

Printed Principal Investigator Name — Proposal Title

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, 34 CFR Part 85, Section 85.510, Participants' responsibilities. The regulations were published as Part VII of the May 28, 1988 Federal Register (pages 19160–19211). Copies of the regulations may be obtained by contacting the U.S. Department of Education, Grants and Contracts Service, 400 Maryland Avenue, SW (Room 3633 GSA Regional Office Building No. 3), Washington, DC 20202-4725, telephone (202) 732-2505.

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.

Organization Name | AO or NRA Number and Title

Printed Name and Title of Authorized Representative

Signature | Date

Printed Principal Investigator Name | Proposal Title

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.

Organization Name   AO or NRA Number and Title

Printed Name and Title of Authorized Representative

Signature   Date

Printed Principal Investigator Name   Proposal Title

APPENDIX H

FLIGHT ASSURANCE REQUIREMENTS

1.0 GENERAL GUIDELINES

1.1 Overview

Missions selected under this Announcement of Opportunity (AO) will be structured so that the Principal Investigator will be responsible for all aspects of their mission, including Safety, Reliability, and Quality Assurance (SR&QA). Unlike previous Small Explorer AO's, NASA Headquarters has not imposed a payload classification per NMI 8010.1A, thus allowing Principal Investigators to tailor their SR&QA program in accordance with ISO 9001 series standards. This approach maximizes the use of existing and proven processes, procedures, and methodologies

The Product Assurance (PA) requirements for the program recognize a wide variation in complexity, size, and technology for the mission which can affect program risks and costs. In addition, the capabilities of investigators and their partners and subcontractors vary widely. For those organizations with established SR&QA processes and a record of success in space flight, the PA requirements for the Small Explorer program should be considerably reduced from that of the past. For those organizations which do not have established SR&QA processes for space flight hardware, NASA is providing in this appendix a set of guidelines which supplement the more general standards of ISO 9001. It is recommended that the Principal Investigator consider all aspects of the mission when developing a comprehensive PA program. The effort to plan and invest from the beginning in quality design and problem prevention should not be underestimated, as its value in terms of reducing overall cost has been demonstrated.

It is the responsibility of the Principal Investigator to plan and implement a comprehensive SR&QA program for all flight hardware, software, and Ground Support Equipment (GSE). This responsibility extends to all of the Principal Investigator's subcontracts and suppliers. Only limited PA insight is planned by the Small Explorer Project and will be focused primarily on those activities that contribute most to product integrity. Deliverable documentation will be significantly reduced, provided the Principal Investigator maintains an adequate internal record keeping system that provides the necessary traceability for a program of this magnitude. The Small Explorer Project Office will support and participate with the Principal Investigator in assuring that the SR&QA program being implemented is valid, complete, and effective. Likewise, the Small Explorers Project is prepared to assist the Principal Investigator in any aspect of PA and to be the focus for ready and regular access to the Goddard Space Flight Center's flight assurance expertise.

Previous Small Explorer missions have been predominately single string systems, with emphasis on simplicity of design and cost control. Rigorous and disciplined systems engineering, combined with the prevention of problems by using high quality parts and materials and using high standards of workmanship, have allowed a limited reliability and quality assurance program, guarded by the test program, to achieve adequate reliability for a low cost. It is recommended that the Principal Investigator consider similar approaches that envelope all aspects of the mission development. A philosophy based on quick design and development, followed by an extensive test and repair program, has been shown to be the most expensive and unreliable approach.

An agreement between the Principal Investigator and the Small Explorer Project Office on the quality assurance, reviews, safety, design assurance and verification system to be implemented will be required prior to the confirmation of the mission.

2.0 QUALITY ASSURANCE

2.1 Quality System

During Phase B, the Principal Investigator is to define and implement a quality system based on ANSI/ASQC Q9001-1994. The system is to be documented in a quality manual and/or implementation plan. The Small Explorer Project Office will review the quality system and provide the Principal Investigator with an assessment and recommendations.

2.2 Workmanship Standards

Workmanship requirements are a critical part of preventing reliability and quality problems. The Principal Investigator is encouraged to use their own workmanship standards, provided they meet the following minimum NASA guidelines:

- NHB 5300.4 (3A-2): Requirements for Soldered Electrical Connections
- NHB 5300.4 (3G): Requirements for Interconnecting Cables, Harnesses, and Wiring
- NHB 5300.4 (3H): Requirements for Crimping and Wire Wrap
- NHB 5300.4 (3I): Requirements for Printed Wiring Boards
- NHB 5300.4 (3J): Requirements for Conformal Coating and Staking of Printed Wiring Boards and Electronic Assemblies

- NHB 5300.4 (3K): Design Requirements for Rigid Printed Wiring Boards and Assemblies
- NHB 5300.4 (3L): Electrostatic Discharge Requirements

2.3 Product Assurance Audits and Reporting

Assurance Status Reports will be part of the regular, monthly reporting by the Principal Investigator to the Small Explorer Project Office and will summarize the status of all assurance activities and report on any discrepancies (including corrective actions) that could affect the performance of the investigation.

During all phases of the mission, NASA must be able to assess the reliability of the mission and understand how the Principal Investigator is resolving problems. In order to do this, the Principal Investigator is required to document and report failures to the Small Explorer Project Office beginning with initial power-up of any flight component or assembly (including critical GSE). Reporting is to continue until successful closure by the Principal Investigator's Failure Review Board (FRB).

In order to ensure that the quality system is working the way it is intended to, the Principal Investigator is required to plan and conduct audits of his/her internal PA systems and those of his/her subcontractors and suppliers, examining documentation (processes, procedures, analyses, reports, etc.), operations and products. The Principal Investigator is required to generate and maintain an audit report for each audit. A summary of all audit findings should be included in the monthly report.

The work activities and operations of the Principal Investigator's team, including subcontractors and suppliers, may be evaluated, surveyed, or otherwise inspected by designated representatives from the Small Explorer Project Office, the Government Inspection Agency (GIA), or an independent assurance contractor. The Small Explorer Project Office may delegate appropriate responsibilities and authority in letters of delegation (LOD).

3.0 REVIEWS

The Principal Investigator is encouraged to focus resources from the beginning and throughout the mission development phase on engineering working-level reviews (peer reviews) to identify and resolve concerns prior to formal, system level reviews. The Principal Investigator's quality system is to track and close-out all actions items identified during these peer reviews to ensure that issues are resolved promptly at the lowest levels and before system level reviews. A list of action items/closures for each peer review should be maintained by the Principal Investigator's quality system and made available during system level reviews. Any open action items from any peer reviews should be addressed at the system level reviews.

Upon request, the Small Explorer Project Office will supply technical expertise as required for participation in the areas undergoing detailed engineering reviews.

Unlike the many informal engineering peer reviews that will occur during the project life cycles, there are two semiformal reviews focusing on requirements and the mission concept and five formal, system level reviews that will concentrate on critical systems and end-to-end mission level technical, safety, reliability, flight operations, ground operations, and programmatic issues. If warranted, additional formal reviews may be required for unusually complex areas such as safety and/or flight and ground operations. The following represent the semiformal and formal reviews expected under this program:

- Requirements Review (Semiformal)
- Concept Review (Semiformal)
- Preliminary Design Review (Formal)
- Critical Design Review (Formal)
- Pre-Environmental Review (Formal)
- Pre-Ship Review (Formal)
- Flight Readiness Review (Formal)

Semiformal and formal reviews are to be chaired by the Principal Investigator's organization with copies of the presentation materials provided to the Small Explorer Project Office for information. It is the Principal Investigator's responsibility to address all concerns and action items identified during these reviews.

Independent reviews, including a Confirmation Review as described in the AO, will also be conducted. These reviews will be coordinated with the Principal Investigator so that they coincide with other reviews. It is the Principal Investigator's responsibility to address all concerns and action items identified during these reviews.

4.0 SAFETY

The Principal Investigator is responsible for the overall safety of the mission, from start of development through launch activities. In fulfilling this responsibility, the Principal

Investigator is required to define an overall safety program for documenting hazard analyses, hazard reports, operations hazards analyses, and the safety data package. The Small Explorer Project Office will provide the necessary interfaces with the GSFC testing facility (if applicable), and the launch vehicle and/or range safety points of contact (if applicable).

4.1 General

The Principal Investigator is required to plan and implement a system safety program that accomplishes the following:

- Identifies and controls hazards to personnel, facilities, support equipment, and the flight system during all stages of the mission development. The program is to address hazards in the flight hardware, associated software, ground support equipment, and support facilities.

- Meets the system safety requirements stated in the applicable launch site safety regulation (EWRR 127-1 for the Eastern or Western Range) and the mission System Safety Implementation Plan (SSIP).

- Meets the baseline industrial safety requirements of the institution, as well as any special contractually imposed mission unique obligations.

The Small Explorer Project Office will provide assistance, as necessary to assure that the Safety Plan meets the requirements established above. The Principal Investigator is required to give the Small Explorer Project Office a description of the system down to the subsystem level, and a preliminary assessment of the system's compliance with the requirements of this section.

The Principal Investigator is required to submit, in accordance with a schedule in the contract, all ground operations procedures to be used at GSFC facilities, other integration facilities, or the launch site for review and approval. All hazardous operations, as well as the procedures to control them, are to be identified and highlighted. All launch site procedures are to comply with the applicable launch site safety regulations.

When a specific safety requirement cannot be met, the Principal Investigator is required to provide the Small Explorer Project Office with an associated safety noncompliance request that identifies the hazard and shows the rationale for approval of such a noncompliance, as defined in the applicable launch site safety regulation.

4.2 Safety Data Package

The Principal Investigator is required to submit a safety data package consistent with the design maturity of the mission at each of the independent reviews, up to and including the Pre-Ship Review (PSR) and the Flight Readiness Review (FRR). The contents of each package is to be consistent with the requirements of the applicable launch vehicle and launch site.

4.3 Launch Site Safety Plan

The Principal Investigator is required to submit a Payload Organization launch Site Safety Plan consistent with the launch site requirements for review and approval by the Small Explorer Project Office. The details of the plan and submittal milestones is dependent on the selected launch site safety regulations.

5.0 DESIGN ASSURANCE

5.1 Electrical, Electromechanical, and Electronic (EEE) Parts

The Principal Investigator is required to implement an appropriate EEE parts program consistent with the scope of a Small Explorer mission. Previous Small Explorer missions have utilized parts programs that provided early and frequent interaction between the design team and performance assurance personnel to ensure reliable EEE parts while at the same time maintaining a cost effective parts program. The Small Explorer Project Office recommends that the Principal Investigator consider a similar approach with the parts program.

As a guideline, EEE parts should be selected and processed in accordance with GSFC 311-INST-001, "Instructions for EEE Parts Selection, Screening, and Qualification" for Grade 3 quality parts level, or an internal procedure that meets these standards.

The Principal Investigator is responsible for verifying that any part used in the mission is flight worthy and is not affected by any GIDEP Alert throughout the mission development cycle.

5.2 Materials

The Principal Investigator is required to implement a materials and processes control program beginning with the start of Phase B. The Principal Investigator is required to maintain lists and usage records for inorganic and metallic, polymeric, lubricants, and processes.

5.3 Reliability

Early in the program's preliminary design phase, the Principal Investigator is required to identify specific reliability concerns and the steps being taken to mitigate them. As a minimum, the Principal Investigator is to conduct a Failure Mode and Effect Analysis to a sufficient depth so that mission critical failures are identified and dealt with effectively.

It is strongly recommended that the Principal Investigator accumulate several hundred hours of error-free operation at the observatory prior to the start of environmental testing.

5.4 Contamination

The Principal Investigator is required to plan and implement a contamination control program consistent with the requirements of the mission. The plan should address all aspects of contamination control throughout the mission, including transportation and launch site processing. The contamination control plan should be made available to the Small Explorer Project Office if requested.

5.5 Software

The Principal Investigator is required to employ a structured program for the development of flight and ground software. The program must address appropriate development life cycle phases such as requirements analysis, design, code, and unit test, integration and build test, performance verification, and maintenance. All code produced is to be structured, error-free, properly documented, and maintainable.

6.0 VERIFICATION

The Principal Investigator is required to conduct a verification program to ensure that the spacecraft and instrument(s) meet the specific mission requirements. It is recommended that the Principal Investigator use the Goddard Space Flight Center's General Environmental Verification Specification for STS and ELV Payloads, Subsystems, and Components (GEVS-SE), available from the Small Explorers Project Office, as a tool and a model to prepare the mission verification plan and specification.

The Principal Investigator is required to prepare and submit adequate verification documentation including a verification matrix, environmental test matrix and verification procedures to the Small Explorer project office for review.

APPENDIX I

SERVICES AVAILABLE FROM THE GODDARD SPACE FLIGHT CENTER

In keeping with its mission, the Goddard Space Flight Center will provide access to the Center's institutional capabilities, including facilities, equipment, and expertise in science, engineering, technology, and project management to support and enhance the abilities of the scientific and supporting technical communities to conduct scientific investigations. Upon request, GSFC is prepared to assist Principal Investigators (PI's) selected to proceed into the concept study phase (Phase A) in any or all aspects of mission development, from systems engineering and mission management through on-orbit satellite operation. In this role, Goddard will work with the Principal Investigator to plan and coordinate agreed upon services both within the Center and with external partners to draw on the best capabilities of each to develop the missions at low cost.

GSFC services are available on a full cost basis. Mr. Orlando Figueroa, recently appointed Head of the new GSFC System Technology and Advanced Concepts Directorate, will serve as the single point-of-contact to coordinate any or all aspects of the Center's capabilities requested under this Announcement of Opportunity (AO) including cost estimates during proposal preparation. The possible GSFC services are:

- Mission management, including the planning and execution of all phases of the mission;

- Instrument and spacecraft systems engineering and technologies;

- Mission operations and data systems engineering and technologies. *(Refer to Appendix C for additional information and point of contact);*

- Discipline engineering, including design, analysis, and implementation in areas such as structural/mechanical, thermal, attitude control and determination, command and data handling, communications, and optics;

- Reliability and quality assurance, including parts, materials, analysis, safety, review, and inspection;

- Spacecraft development, including the specification, acquisition or build, and qualification of spacecraft or spacecraft components;

- Test facilities including vibroacoustic, electromagnetic, thermal/vacuum, magnetics, class 10,000 or better integration and test facilities; and

- Launch services, including expendable launch vehicles and the space shuttle.

Access information for Mr. Figueroa is:

Mr. Orlando Figueroa
System Technology and Advanced Concepts Directorate
Goddard Space Flight Center
National Aeronautics and Space Administration
Greenbelt, MD 20771
E-mail: orlando.figueroa@gsfc.nasa.gov

APPENDIX J

GUIDELINES FOR CONCEPT STUDY REPORT PREPARATION

This appendix is intended to provide guidelines to investigations selected under this AO for the preparation of a concept study report. This report is to be prepared by each investigation team during their Phase A concept study. It is due at the completion of the concept study and will be used by NASA to determine if the investigation is ready to proceed into subsequent mission phases. These guidelines may be updated at notification of selection.

The concept study report should contain the following: (i) executive summary; (ii) science investigation description; (iii) education and outreach, technology, and small disadvantaged business plan; (iv) technical approach; (v) management plan; (vi) Phase B/C/D plan; (vii) cost plan; and (viii) appendices. Any changes to the basic data provided in the original proposal should be clearly identified in the concept study report.

The concept study report shall contain no more than 123 pages, including no more than 4 fold out pages (28 x 43 cm; i.e., 11 x 17 inches). The fact sheet, cover page, table of contents, and appendices will not be counted against the page limit. The following page limits apply to individual sections:

Section	Page Limit
Executive Summary	3 pages
Science Investigation description (changes only)	20 pages
Technical Approach Management Plan Education and Outreach, Technology, and Small Disadvantaged Business Plan Phase B/C/D Plan Cost Plan	100 pages
Appendices (no others permitted) Resumes Letters of Endorsement Mission Definition and Requirements Agreement Statement(s) of Work for Each Contract Option Incentive Plan(s) Relevant Experience and Past Performance International Agreement(s) Reference List	No page limit, but small size encouraged

The content of the concept study report is defined below.

A. INVESTIGATION SUMMARY

The same guidelines as for the proposal apply. The form to be used for this summary is located at the end of Appendix B.

B COVER PAGE

The same guidelines as for the proposal apply.

C. TABLE OF CONTENTS

The same guidelines as for the proposal apply.

D. EXECUTIVE SUMMARY

The executive summary should provide an overview of the investigation, including the science objectives and their relationship to the OSS science themes, technical approach, including any new technology planned, management, cost, and education and outreach approaches. This section should not exceed three (3) pages.

E. SCIENCE INVESTIGATION DESCRIPTION

This section should describe any science investigation changes resulting from the Concept Study. Any changes to the investigation from the original proposal should be discussed as should the rationale for such changes.

F. EDUCATION AND OUTREACH, TECHNOLOGY, AND SMALL DISADVANTAGED BUSINESS PLAN

The education and outreach, technology, and small disadvantaged business plan should provide a summary of the benefits offered by the mission beyond the scientific benefits.

1. Educational Program Activities. This section should discuss the degree to which this investigation will generate educational opportunities and contribute to the Nation's educational initiatives. The breadth of involvement of the educational program, including educators, researchers, amateur organizations, and the public at large, should be discussed, as should educational activities to be implemented. Coordination and collaboration with educational institutions should be discussed, along with a discussion of how the investigation team will implement

the educational program. A summary of the proposed budget targeted to educational activities, including any potential leveraging of other resources, and a timeline for the execution of the education program, should be provided.

2. Public Awareness. This section should describe the degree to which the scientific investigation and discoveries will be communicated to the public. The public awareness plan should address how the progress of and results from the mission will be disseminated to the public; the interaction of the various team members; and a schedule of the public awareness activities with mission progression.

3. Small Disadvantaged Business. A summary plan is required specifying the proposed investigation's commitment to meet the SDB participation goal of 8% as described in Section XIII of Appendix A of this AO. In addition, as also specified in Appendix A, subcontracting plans will be required to execute the contract option for investigation implementation.

4. New Technology. This section should discuss how new technology is used in the proposed investigation and its benefits.

G. TECHNICAL APPROACH

The Technical Approach section should detail the method and procedures for investigation definition, design, development, integration, ground operations, and flight operations. A discussion of all new technologies to be used for the investigation, including back-up plans for those technologies, should be provided. This section should also detail the expected products and end items associated with each phase. Mission teams have the freedom to use their own processes, procedures, and methods. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged when cost, schedule, and technical improvements can be demonstrated. The benefits of such processes and products should be discussed. This section must be complete in itself without the need to request additional data.

1. Mission Design. This section should fully describe the operational phase of the mission from launch to end of mission. It should include information on the proposed launch vehicle, orbit, preliminary mission timeline indicating periods of data acquisition, data downlink, etc. The mission design should also describe the communications network to be used and interface requirements, along with potential impacts or conflicts with other users of the selected communications resources.

A "traceability matrix" showing how the proposed mission design complies with the stated objectives, requirements, and constraints of the proposed investigation should be included. The rationale for the selection of launch vehicle should be included. The proposal should identify any innovative features of the mission design that minimize total mission costs.

2. Spacecraft. This section should describe the spacecraft design approach, particularly as it relates to new versus existing hardware and redundant versus single-string hardware. It should fully identify the spacecraft systems and describe their characteristics and requirements. A preliminary description of the flight system design with a block diagram showing the flight element subsystems and their interfaces should be included, along with a description of the flight software and a summary of the estimated performance of the flight system. The flight heritage or rationale used to select the flight system and its subsystems, major assemblies, and interfaces should be described.

   Subsystem characteristics and requirements should be described to the greatest extent possible. Such characteristics include: mass, volume, and power requirements; pointing knowledge and accuracy; new developments needed; space qualification plan; and logistics support. These subsystems may include: structural/mechanical, solar array/power supply (and batteries), electrical, thermal control, propulsion, communications, attitude control, command, data handling, etc. Any design features incorporated to effect cost savings should be identified; however, benefits should be specified and enabling assumptions or risks should be identified. A summary of the resource elements of the flight systems design concept, including key margins, should be provided. The rationale for, and derivation of, margin allocations including mass, power, link, etc., should be provided. Those design margins that are driving costs should be identified.

3. Science Payload. This section should briefly describe the science payload for the investigation. Reference may be made to the proposal. Any changes to the payload or individual instruments or their performance since submission of the proposal should be discussed. Information pertinent to the accommodation of the instrumentation on the spacecraft should also be included. Subsystem characteristics and requirements should be described. Such characteristics include: mass, volume, and power requirements; pointing requirements; new developments needed; and a space qualification plan. Any design features incorporated to effect cost savings should be identified. A summary of the resource elements of the instrument design concept, including key margins, should be provided. The rationale for margin allocation should be provided. Those design margins that are driving costs should be identified.

4. Payload Integration. This section should characterize the interface between the instruments and the flight system. These include, but are not limited to: volumetric envelope, fields of view, weight, power requirements, thermal requirements, command and telemetry requirements, sensitivity to or generation of contamination (e.g., electromagnetic interference, gaseous effluents, etc.), data processing requirements, as well as the planned process for physically and analytically integrating them with the flight system. The testing strategy of the science payload, prior to integration with the spacecraft, should be discussed.

5. Manufacturing, Integration, and Test. This section should describe the manufacturing strategy to produce and test the hardware/software necessary to accomplish the mission. It should include a description of the main processes/procedures planned in the fabrication of flight hardware, software, production personnel resources, incorporation of new technology/materials, and the preliminary test and verification program. Describe the approach for the transition from design to manufacturing and specify data products which will be used to assure producibility and adequate tooling availability.

   The approach, techniques, and facilities planned for integration, test and verification, and launch operations phases, consistent with the proposed schedule and cost, should be described. A preliminary schedule for manufacturing, integration, and test activities should be included. A description of the planned end items, including engineering and qualification hardware, should be included.

6. Mission Operations, Ground, and Data Systems. This section should discuss mission operations and the ground operations support required for the proposed investigation. The planned approach for managing mission operations and all flight operations support, including mission planning should be discussed. Describe any special communications, computer security, tracking, or near real-time ground support requirements, and indicate any special equipment or skills required of ground personnel.

   The approach to the development of the ground data system, including the use, if any, of existing facilities, including Government facilities, should be described. All usage of the Deep Space Network (DSN) and of any existing non-DSN facilities, including Tracking and Data Relay Satellite System (TDRSS), should be explicitly described. Any mission-unique facilities must be adequately described. Include a block diagram of the Ground Data System (GDS) showing the end-to-end concept (acquisition through archiving) for operations and data flow to the subsystem level. Describe all communications, tracking, and ground support requirements. Describe the space/ground link spectrum requirements and the licensing approach. The NASA Frequency Spectrum Management organizations can be used if the mission uses frequencies allocated to the government and the data transmitted is not used directly for commercial purposes. Describe the software design heritage and software development approach and its relationship to the flight system software development.

Specific features incorporated into the flight and ground system design that lead to low-cost operation should be identified. The use of any existing mission operations facilities and processes should be described, as well as any new facilities required to meet mission objectives.

7. Facilities. Provide a description of any new, or modifications to existing, facilities, laboratory equipment, and ground support equipment (GSE) (including those of the team's proposed contractors and those of NASA and other U.S. Government agencies) required to execute the investigation. The outline of new facilities and equipment should also indicate the lead time involved and the planned schedule for construction, modification, and/or acquisition of the facilities.

8. Product Assurance and Safety. This section should describe the process by which the product quality is assured to meet the customer's specifications, including identification of trade studies, the parts selection strategy, and the plans to incorporate new technology. This section should also describe the product assurance plan, including plans for problem/failure reporting, inspections, quality control, parts selection and control, safety assurance, and software validation.

H. MANAGEMENT PLAN

This section sets forth the investigator's approach for managing the work, the recognition of essential management functions, and the overall integration of these functions. This section should specifically discuss the decision-making process to be used by the team, focusing particularly on the roles of the Principal Investigator and Project Manager in that process. The management plan gives insight into the organizations proposed for the work, including the internal operations and lines of authority with delegations, together with internal interfaces and relationships with NASA, major subcontractors, and associated investigators. It also identifies the institutional commitment of all team members, and the institutional roles and responsibilities. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged; however, they should be employed only when cost, schedule, or technical improvements can be demonstrated and specific enabling assumptions are identified.

1. Team Member Responsibilities. This section should describe the roles, responsibilities, time commitment, and experience of all team member organizations and key personnel, with particular emphasis placed on the responsibilities assigned to the Principal Investigator, the Project Manager, and other key personnel. In addition, information should be provided which indicates what percentage of time key personnel will devote to the mission, the duration of service, and how changes in personnel will be accomplished. (Note: The experience of the PI and science team members does not need to be included in this section since it would have been addressed in the proposal.)

   a. Organizational Structure. The management organizational structure of the investigation team must be described in the proposal. The proposal must describe the responsibilities of each team member organization and its contributions to the investigation. Each key position, including its roles and responsibilities, how each key position fits into the organization, and the basic qualifications required for each position, must be described. A discussion of the unique or proprietary capabilities that each member organization brings to the team, along with a description of the availability of personnel at each partner organization to meet staffing needs, should be included. The contractual and financial relationships between team partners should be discussed.

      If experience for a partner is not equivalent to, or better than, the requirements for the proposed mission, explain how confidence can be gained that the mission can be accomplished within cost and schedule constraints.

   b. Experience and Commitment of Key Personnel. Provide a history of experience explaining the relationship of the previous experience to each key individual's role; include the complexity of the work and the results. Include changes in scope during development, if appropriate.

      i. Principal Investigator. The role(s), responsibilities, and time commitment of the Principal Investigator should be discussed. Provide a reference point of contact, including address and phone number.

      ii. Project Manager. The role, responsibilities, time commitment, and experience of the Project Manager should be discussed. Provide a reference point of contact, including address and phone number.

      iii. Other Key Personnel. The roles, responsibilities, time commitments, and experience of other key personnel in the investigation should be described.

2. Management Processes and Plans. This section should describe the management processes and plans necessary for the logical and timely pursuit of the work, accompanied by a description of the work plan. This section should also describe the proposed methods of hardware and software acquisition. The management processes which the investigator team proposes, including the relationship between organizations and key personnel should be discussed, including the following, as applicable: systems engineering and integration; requirements development; configuration management; schedule management; team member coordination and communication; progress reporting, both internal and to NASA; performance measurement; and resource management. This discussion should include all phases of the mission including preliminary analysis, technical definition, the design and development, and operations phases, along with the expected products and results from each phase. Unique tools, processes, or methods which will be used by the investigation team should be clearly identified and their benefits discussed. All project elements should be covered to assure a clear understanding of project-wide implementation.

3. Schedules. The schedule and work flow for the complete mission life-cycle should be clearly defined, and the method and tools to be used for internal review, control, and direction discussed. Schedules for all major activities, interdependencies between major items, deliveries of end items, critical paths, schedule margins, and long-lead procurement needs (defined as hardware procurements required before the start of Phase D) should be clearly identified.

4. Risk Management. This section should describe the approach to, and plans for, risk management to be taken by the team, both in the overall mission design and in the individual systems and subsystems. Particular emphasis should be placed on describing how the various elements of risk, including new technologies used, will be managed to ensure successful accomplishment of the mission within cost and schedule constraints. Investigations dependent on new technology will not be penalized for risk if adequate backup plans are described to ensure success of the investigation.

   A summary of margins and reserves in cost and schedule should be identified by Phase and project element and year and the rationale for them discussed. The specific means by which integrated costs, schedule, and technical performance will be tracked and managed should be defined. Specific reserves and the timing of their application should be described. Management of the reserves and margins, including who in the management organization manages the reserves and when and how the reserves are released, should be discussed. This should include the strategy for maintaining reserves as a function of cost-to-completion.

All funded schedule margins should be identified. The relationship between the use of such reserves, margins, potential descope options, and their effect on cost, schedule, and performance should be fully discussed.

5. Government Furnished Property, Services, Facilities, etc. This section should clearly delineate the Government-furnished property, services, facilities, etc. required to accomplish all phases of the mission.

6. Reporting and Reviews. This section should clearly describe the approach to reporting progress to the Government and the reviews the Government is invited to attend to provide independent oversight. The process, including the individual or organization responsible for reporting integrated cost, schedule, and technical performance should be discussed. A description of the information to be presented should be included.

I. DEFINITION, DESIGN, AND DEVELOPMENT (PHASE B/C/D) PLAN

This section should describe the means by which the definition study and the design and development phases will be performed. This section should identify the key mission tradeoffs and options to be investigated during the Phase B studies and should identify those issues and technologies critical to the mission success. These plans should also define the products of each phase and the schedule for their delivery.

J. COST PLAN

The cost plan should provide information on the anticipated costs for all phases of the mission. A detailed cost proposal is required, including a completed SF 1411, for Phase B/C/D. Cost estimates are required for Phase E, including a description of the estimating technique used to develop the cost estimates. A discussion of the basis of the estimate should be provided with a discussion of heritage and commonality with other programs. All costs, including all contributions made to the investigation, should be included. Proposers should complete a summary of total mission cost phased by fiscal year as shown in Figure J1. In addition, for each phase for the investigation (B/C/D, and E) a Time Phased Cost Breakdown for each Work Breakdown Structure (WBS) element, as shown in Figure J2, should be completed.

It is anticipated that during the period of performance of the proposed mission, NASA will implement full cost accounting for NASA Centers or other Government laboratories. To plan for this, proposers should include any contributions provided by NASA Centers, including Civil Servant services, as well as the cost for the use of Government facilities and equipment. All direct and indirect costs associated with the work performed at NASA Centers should be fully costed and accounted for in the proposal. Teams with NASA partners should work with their respective NASA Centers to develop estimates for these costs.

The inflation index provided in Appendix B should be used to calculate all real-year dollar amounts, unless an industry forward pricing rate is used. If something other than the provided inflation index is used, the rates used should be documented.

All costs shall include all burdens and profit/fee in real-year dollars by fiscal year, assuming the inflation rates used by NASA (provided in Appendix B) or specifically identified industry forward pricing rates.

1. Definition, Design, and Development (Phase B/C/D) Cost Proposal. This section provides a detailed cost proposal for performing Phase B/C/D. The cost proposal should correlate with the plans set forth in the Science, Technical Approach, and Management sections of the proposal

   a. Contract Pricing Proposal Cover Sheet. A completed Contract Pricing Proposal Cover Sheet, SF 1411, must be included with the proposal for Phase B/C/D. The SF 1411 must be signed by the proposer's authorized representative.

   b. Work Breakdown Structure. A Work Breakdown Structure (WBS) should be included for Phase B/C/D. The structure of the WBS should be consistent with the plans set forth in the Technical Approach and Management sections of the proposal and the Statement of Work provided as an Appendix to the proposal. The WBS shall be described to the subsystem level (e.g., Attitude Control System, Propulsion, Structure and Mechanisms) for the spacecraft and to the instrument level for the payload. All other elements of the WBS should be to the major task level (e.g., Project Management, Systems Engineering, Ground Support Equipment).

   c. Workforce Staffing Plan. Provide a workforce staffing plan which is consistent with the Work Breakdown Structure. This workforce staffing plan should include all team member organizations and should cover all management, technical (scientific and engineering), and support staff. The workforce staffing plan should be phased by month. Time commitments for the Principal Investigator, Project Manager, and other key personnel should be clearly shown.

   d. Proposal Pricing Technique. Describe the process and techniques used to develop the Phase B/C/D cost proposal. Provide a description of the cost-estimating model(s) and techniques used in the Phase B/C/D cost estimate.

Discuss the heritage of the models and/or techniques applied to this estimate, including any known differences between missions contained in the model's data base and key attributes of the proposed mission. Include the assumptions used as the basis for the Phase B/C/D cost and identify those which are critical to cost sensitivity in the investigation. Identify any "discounts" assumed in the cost estimates for business practice initiatives or streamlined technical approaches. Describe how these have been incorporated in the cost estimate and will be managed by the investigation team.

e. Phase B/C/D Time-Phased Cost Summary. Provide a summary of the total Phase B/C/D costs consistent with Figure J2. The Phase B/C/D cost summary should be developed consistent with the Work Breakdown Structure and should include all costs to NASA along with all contributed costs. The Phase B/C/D time phased cost summary should be phased by month.

f. Cost Elements Breakdown. To effectively evaluate the Phase B/C/D cost proposals, NASA requires costs and supporting evidence stating the basis for the estimated costs. The proposal will include, but is not limited to:

   i. Direct Labor.
      (1) Explain the basis of labor-hour estimates for each of the labor classifications.
      (2) State the number of productive work-hours per month.
      (3) Provide a schedule of the direct labor rates used in the proposal. Discuss the basis for developing the proposed direct labor rates for the team member organizations involved; the forward-pricing method (including midpoint, escalation factors, anticipated impact of future union contracts, etc.); and elements included in the rates, such as overtime, shift differential, incentives, allowances, etc.
      (4) If available, submit evidence of Government approval of direct labor rates for proposal purposes for each labor classification for the proposed performance period.
      (5) If Civil Servant labor is to be used in support of the Phase B/C/D study, but is not to be charged directly to the investigation, then this labor must be considered as a contribution by a domestic partner, subject to the same restrictions as other contributions by domestic or foreign partners. A discussion of the source of funding for the Civil Servant contributions must be provided.

   ii. Direct Material. Submit a summary of material and parts costs for each element of the WBS.

iii. Subcontracts. Identify fully each effort (task, item, etc. by WBS element) to be subcontracted, and list the selected or potential subcontractors, locations, amount budgeted/proposed, and types of contracts. Explain the adjustments, if any, and the indirect rates (or burdens) applied to the subcontractors' proposed amounts anticipated. Describe fully the cost analysis or price analysis and the negotiations conducted regarding the proposed subcontracts.

iv. Other Direct Costs.

(1) Travel, Relocation, and Related Costs. Provide a summary of the travel and relocation costs including the number of trips, duration, and purpose of the trips.

(2) Computer. Provide a summary of all unique computer-related costs.

(3) Consultants. Indicate the specific task area or problem requiring consultant services. Identify the proposed consultants, and state the quoted daily rate, the estimated number of days, and associated costs (such as travel), if any. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.

(4) Other. Explain and support any other direct costs included in the Phase B/C/D proposal in a manner similar to that described above.

v. Indirect Costs.

(1) List all indirect expense rates for the team member organizations. Indirect expense rates (in the context of this AO) include labor overhead, material overhead, general and administrative (G&A) expenses, and any other cost proposed as an allocation to the proposed direct costs.

(2) If the proposal includes support services for which off-site burden rates are used, provide a schedule of the off-site burden rates. Include a copy of the company policy regarding off-site vs. on-site effort.

(3) If available, submit evidence of Government approval of any/all projected indirect rates for the proposed period of performance. Indicate the status of rate negotiations with the cognizant Government agency, and provide a comparative listing of approved bidding rates and negotiated actual rates for the past five (5) fiscal years.

(4) Discuss the fee arrangements for the major team partners.

2. Mission Operations and Data Analysis (Phase E) Cost Estimate. This section provides a cost estimate for performing the Mission Operations and Data Analysis Phase (Phase E) portion of the mission. The Phase E cost estimates should correlate with the plans set forth in the Science, Technical Approach, and

Management sections of the proposal. In completing this section, the following guidelines will apply:

a. Work Breakdown Structure. A Work Breakdown Structure (WBS) should be included for the Mission Operations and Data Analysis Phase of the mission. The WBS should be consistent with the plans set forth in the Technical Approach and Management sections of the proposal and the Statement of Work that is provided as an Appendix.

b. Cost Estimating Technique. Describe the process and techniques used to develop the Phase E cost estimate. Provide a description of the cost-estimating model(s) and techniques used in your Phase E cost estimate. Discuss the heritage of the models applied to this estimate including any known differences between missions contained in the model's data base and key attributes of the proposed mission. Include the assumptions used as the basis for the Phase E cost and identify those which are critical to cost sensitivity in the investigation. Identify any "discounts" assumed in the cost estimates for business practice initiatives or streamlined technical approaches, and the basis for these discounts. Describe how these have been incorporated in the cost estimate and will be managed by the investigation team.

c. Workforce Staffing Plan. Provide a workforce staffing plan (including civil service) which is consistent with the Work Breakdown Structure. This workforce staffing plan should include all team member organizations and should cover all management, manufacturing, technical (scientific and engineering), and support staff. The workforce staffing plan should be phased by fiscal year. Time commitments for the Principal Investigator, Project Manager, and other key personnel should be clearly shown.

d. Phase E Time-Phased Cost Summary. Provide a summary of the total Phase E costs consistent with Figure J2. The Phase E cost summary should be developed consistent with the Work Breakdown Structure and should include all costs to NASA, along with all contributed costs. The Phase E time phased cost summary should be phased by fiscal year.

3. Total Mission Cost (TMC) Estimate. This section should summarize the estimated costs to be incurred in Phases A through E including launch vehicle, upper stages, and launch services; ground segment costs; and cost of activities associated for social or educational benefits (if not incorporated in any of Phases A through E). The total mission cost estimate should be developed consistent with the Work Breakdown Structure.

This section should include:

Detailed plans for all aspects of the mission not discussed elsewhere in the proposal, including: the launch vehicle, upper stages, and launch services; ground segment; and activities associated with social or educational benefits. Reference may be made to the Technical Approach section of the proposal. In completing this section, the following guidelines will apply:

a. Total Mission Cost. A summary of the Total Mission Cost time-phased by fiscal year must be included in the format shown in Figure J1. This summary should represent the optimum funding profile for the mission. Assets provided as contributions by international or other partners should be included, and clearly identified, as separate line items.

FIGURE J1
TOTAL MISSION COST FUNDING PROFILE TEMPLATE
(FY costs* in Real Year Dollars, Totals in Real Year and FY 1997 Dollars)

Item	FY1	FY2	FY3	FY4	FY5	FYn	...	Total (Real Yr.)	Total (FY 1997)
Phase A	$	$	$	$	$	$	$	$	$
- Organization A									
- Organization B									
- etc.									
Phase B/C/D	$	$	$	$	$	$	$	$	$
- Organization A									
Phase E									
- Organization A									
Launch services	$	$	$	$	$	$	$	$	$
- Organization A									
Ground Data System Dev	$	$	$	$	$	$	$	$	$
- Organization A									
Other (specify)	$	$	$	$	$	$	$	$	$
NASA Mission Cost	$	$	$	$	$	$	$	$	$
Contributions by Organization (Non-U.S. or U.S.) to:									
Phase A	$	$	$	$	$	$	$	$	$
- Organization A									
Phase B/C/D	$	$	$	$	$	$	$	$	$
- Organization A									
Phase E									
- Organization A									
Launch Services	$	$	$	$	$	$	$	$	$
- Organization A									
Ground Data System Dev	$	$	$	$	$	$	$	$	$
- Organization A									
Other	$	$	$	$	$	$	$	$	$
Contributed Costs (Total)	$	$	$	$	$	$	$	$	$
								Mission Totals	$

* Costs should include all costs including fee

FIGURE J2
(Phased costs in Real Year Dollars, Totals in Real Year Dollars)

TIME PHASED COST BREAKDOWN BY WBS AND MAJOR COST CATEGORY

WBS/Cost Category Description	Month 1 or FY1	Month 2 or FY2	• • •	Month n or FYn	Total (RY$)
Total Direct Labor Cost	$	$	$	$	$
WBS 1.0 Management					
WBS 2.0 Spacecraft					
WBS 2.1 Structures & Mechanisms					
WBS 2.2 Propulsion					
etc.					
Total Subcontract Costs	$	$	$	$	$
WBS # and Description					
:					
etc.					
Total Materials & Equipment Cost	$	$	$	$	$
WBS # and Description					
:					
etc.					
Total Reserves	$	$	$	$	$
WBS # and Description					
:					
etc.					
Total Other Costs	$	$	$	$	$
WBS # and Description					
:					
etc.					
Fee					
Other (Specify)					
Total Contract Cost	$	$	$	$	$
Total Other Costs to NASA	$	$	$	$	$
Launch Services					
Ground Segment					
Other (Specify)					
Total Contributions (Non-U.S. or U.S.)	$	$	$	$	$
Organization A:					
WBS # and Description					
etc.					
Organization B:					
WBS # and Description					
etc.					
TOTAL COST FOR PHASE	$	$	$	$	$

K. APPENDICES

The following additional information is required to be supplied with the concept study report. This information can be included as appendices to the report, and as such, will not be counted within the specified page limit.

1. Resumes. Provide resumes for all key personnel identified in the Management section.

2. Letters of Endorsement. Letters of endorsement must be provided from all organizations offering to make a contribution to the investigation. Letters of endorsement should be signed by both the lead representative from each organization represented on the team, and by institutional and Government officials authorized to commit their organizations to participation in the proposed investigation.

3. Mission Definition and Requirements Agreement. A draft Mission Definition and Requirements Agreement should be provided. An example of a Mission Definition and Requirements Agreement is provided in the Explorer Program Library.

4. Statements of Work for each Contract Option. Provide draft Statement(s) of Work for all potential contracts with NASA. These Statement(s) of Work should (as a minimum) be for each contract option (i.e., Phase B/C/D, and Phase E) and clearly define all proposed deliverables (including science data) for each option, potential requirements for Government facilities and/or Government services, and a proposed schedule for the entire mission.

5. Incentive Plan. A draft Incentive Plan should be included with the proposal. This Incentive Plan should outline contractual incentive features for all major team members. Incentive Plans should include both performance and cost incentives, as appropriate.

6. Relevant Experience and Past Performance. Relevant experience and past performance (successes and failures) of the major team partners in meeting cost and schedule constraints in similar projects within the last ten years should be discussed. A description of each project, its relevance to the proposed investigation, cost and schedule performance, and points of contact (including addresses and phone numbers), should be provided.

7. International Agreement(s). Draft International Agreement(s) are required for all non-U.S. partners in the investigation.

8. Reference List. Proposals may provide, as an appendix, 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.