National Aeronautics
and Space Administration

January 19, 2001
AO 01-OSS-01

Announcement of Opportunity

Pluto-Kuiper Belt Mission

Notice of Intent Due: February 21, 2001
Proposals Due: March 21, 2001

Pluto-Kuiper Belt Mission
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1.0 Description of Opportunity

1.1 Introduction and Announcement Objectives

The National Aeronautics and Space Administration (NASA) announces the opportunity to conduct scientific investigations of the Pluto/Charon system and the Kuiper Belt region of the Solar System through development of a complete space flight mission that includes scientific instrumentation, spacecraft, launch, operations, and data archiving and analysis. Proposals in response to this Announcement of Opportunity (AO) must, at minimum, meet all of the Group 1 science objectives described in Section 3.2 of this AO. It is desirable that they also address Group 2 and perhaps Group 3 objectives, also described in Section 3.2.

The Pluto-Kuiper Belt (PKB) mission is intended to accomplish high quality science investigations through utilization of innovative, streamlined, and efficient approaches. It seeks to contain total mission cost and to improve performance through utilization of new technology and through commitment to, and control of, design/development and operations costs and to transfer new technology among aerospace and nonaerospace firms, educational institutions, other nonprofit organizations, and Government entities. It requires proposers to set goals for the participation of Small Disadvantaged Businesses (SDB's), Women-Owned Small Businesses (WOSB's), Historically Black Colleges and Universities (HBCU's), and other Minority Educational Institutions (MEI's) in proposed procurements. Finally, it seeks to enhance public awareness of and appreciation for space exploration, and to incorporate Education and Public Outreach (E/PO) activities as an integral element of the mission.

Proposals submitted in response to this AO must be for the *complete* mission cycle, from project initiation (Phase B) through mission operations (Phase E), which is to include analysis and publication of data in the peer reviewed scientific literature, delivery of the data to the Planetary Data System (PDS), and full implementation of an E/PO program. Proposals must be consistent with the criteria specified in this AO. Further information on PKB mission constraints, guidelines, and requirements is given in Section 3.0 and 4.0.

NASA cannot commit at this time to select any proposal submitted in response to this AO. Selection will depend on availability of funds that will be determined within priorities set for a restructured Outer Planets program. This AO is being issued at this time to ensure that all options for a PKB mission are maintained. Furthermore, NASA may determine, through competitive peer and technical review, that none of the PKB missions proposed in response to this AO are viable.

1.2 Proposal Evaluation and Selection Process

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

- Proposals submitted in response to this AO will be selected principally on the basis of scientific merit, as evaluated by peer review. In accordance with NASA's tight funding constraints for this mission, the proposed cost to NASA Office of Space Science (OSS) will also be an important selection criterion. Additional selection criteria are: the technical merit and feasibility of the scientific investigation; the feasibility of the mission implementation scheme; and the demonstrated commitment to E/PO, to technology infusion/transfer, and to participation of SDB's, WOSB's, HBCU's, and other MEI's. A discussion of and the weighting of each evaluation criteria is given in Section 6.2 of this AO. It is anticipated that one or two mission proposals will be selected as a result of this first-phase evaluation if NASA believes the missions are feasible.

- Each of the selected teams will conduct a two-month concept study. Each concept study for mission investigations will be funded up to $450K (real year dollars). At the end of the concept studies, NASA will conduct detailed reviews to evaluate the implementing details of the selected investigation(s), namely, any modifications of the scientific objectives, the proposed cost to NASA OSS, design details of the experiment hardware, plans for mission implementation, including all technical and management factors, details of the E/PO programs, and plans for incorporation of SDB's and the infusion and transfer out of new technology (as appropriate) for the investigation project. As a result of this second evaluation, one mission investigation may be selected for implementation leading to flight.

1.3 Proposal Opportunity Period and Schedule

NASA is seeking a PKB mission that will arrive at Pluto as soon as possible, but not later than the 2020 timeframe.

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

AO release..January 19, 2001
Preproposal Conference..February 1, 2001
Notice of Intent due..February 21, 2001
Proposal due by 4:30 p.m. EST...March 21, 2001
Nondomestic Letter of Endorsement due...................................April 19, 2001
Selections announced (target)...May 2001
Downselection (target)……………………………………….August 2001

2.0 Program Goals and Objectives

2.1 Pluto-Kuiper Belt Science Goal

Principal Goal: Perform high-quality scientific investigations of the Pluto-Kuiper Belt region of the Solar System that assure the highest science value for cost.

By conducting investigations at the highest value for cost, NASA seeks to provide a mechanism by which the most pressing scientific questions can be addressed.

2.2 Program Objectives

Supporting Objective 1: Pursue innovative ways of doing business.

The short development schedule and low costs associated with a PKB mission demand innovative business and management practices. NASA's approach to the PKB mission encourages teaming arrangements among domestic or foreign industry, university, and/or Government partners. Competitively selected teams will have the responsibility and authority to accomplish the entire mission. This will permit them to use innovative approaches necessary to stay within the strict cost and schedule limits of the program. NASA oversight and reporting requirements (see Sections 3.5 and 6.3.4) will be limited to only those that are essential to assure success in compliance with committed cost, schedule, performance, reliability, and safety requirements.

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

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

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

Contributing to the improvement of science education and the public understanding of science are explicit goals of OSS. OSS is committed to incorporating project elements directed toward informing the public and providing educational opportunities that support local, state, regional, and national educational objectives and reform efforts.

3.0 Program Constraints, Guidelines, and Requirements

3.1 General Program Constraints and Guidelines

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

<u>Every aspect of the investigation must reflect a commitment to mission success while keeping total costs as low as possible</u>. Consequently, the investigation should be designed to emphasize

mission success within the specified cost and schedule constraints by incorporating sufficient cost, schedule, and design margins, reserves, and content resiliency.

Investigation teams must be led by a single Principal Investigator (PI) who may be from any category of domestic and nondomestic organizations, including educational institutions, industry, nonprofit institutions, NASA Centers, Federally Funded Research and Development Centers (FFRDC's), and other Government agencies.

Teaming arrangements among universities, industry, nonprofit institutions, and/or Government agencies (both foreign and domestic) are encouraged. Investigators working outside the U.S. are not eligible for funding from NASA. Teams are encouraged to use industry participation to the fullest extent reasonable. NASA field centers and FFRDC's are welcome as mission team members. However, when a NASA field center or FFRDC participates as a member of a mission team, it should do so because it brings unique skills, facilities, and/or capabilities to the team.

Proposals submitted to this solicitation may propose launch services as offered and described in this AO (see Section 4.1). Likewise, use of Radioisotope Thermoelectric Generators (RTG's) impose a rigorous launch approval process and thus, must be proposed as outlined in Section 4.1 and Appendix G.

3.2 Science Requirements

NASA has conducted prior studies regarding possible missions to the Pluto-Kuiper Belt region of the Solar System. The results of such studies can be found in such documents as the *Pluto-Kuiper Express Mission and Project Description*, and the *State of Knowledge about the Pluto-Charon System Taken from the Science Definition Team Report* listed in Appendix D and contained in the PKB Library. Within these documents are both reference mission descriptions, as well as recommended science goals.

The NASA Science Definition Teams for the referenced Pluto-Kuiper Express mission carefully considered the range of science objectives appropriate for this mission and prioritized them. These objectives have been endorsed by the appropriate Subcommittees of NASA's Space Science Advisory Committee and will now continue to serve as the basis for the evaluation of scientific merit of proposed investigations. Group 1 objectives, as given below, have the highest priority and are considered of equal priority within that group. Other objectives are listed in successive groups, in order of descending priority. Group 2 objectives are considered important but not of the highest priority while Group 3 are considered to be desirable but of still lower priority. NASA is seeking a mission that can best address these objectives within the budget allowed. <u>All proposals must address, at a minimum, all of the Group 1 objectives</u>; this is defined as the <u>Performance Floor</u>.

In addition to prioritized science objectives, the Science Definition Teams also defined measurement objectives that serve as a guide for proposers offering to meet the Group 1 objectives. Other techniques may be proposed. A summary based on each Science Definition

Team's measurement objectives and a general description of the strawman instrument set considered can be found in the appropriate Mission and Project Description document, available through the online PKB Library, accessed through Internet URL http://www.nra-aoinfo.com/space/pluto/library.html.

Pluto-Kuiper Belt Science Objectives

Group 1 Objectives:

- Characterize the global geology and morphology of Pluto and Charon;
- Map surface composition of Pluto and Charon; and
- Characterize the neutral atmosphere of Pluto and its escape rate.

Group 2 Objectives:

- Characterize the time variability of Pluto's surface and atmosphere;
- Image Pluto and Charon in stereo;
- Map the terminators of Pluto and Charon with high resolution;
- Map the surface composition of selected areas of Pluto and Charon with high resolution;
- Characterize Pluto's ionosphere and solar wind interaction;
- Search for neutral species including H, H_2, HCN, and C_xH_y, and other hydrocarbons and nitriles in Pluto's upper atmosphere, and obtain isotopic discrimination where possible;
- Search for an atmosphere around Charon;
- Determine bolometric Bond albedos for Pluto and Charon; and
- Map the surface temperatures of Pluto and Charon.

Group 3 Objectives:

- Characterize the energetic particle environment of Pluto and Charon;
- Refine bulk parameters (radii, masses, densities) and orbits of Pluto and Charon;
- Search for magnetic fields from Pluto and Charon; and
- Search for additional satellites and rings.

In addition, there is much interest in Kuiper Belt Objects (KBO's) because they represent essentially unaltered samples of the primordial material of the protoplanetary disk from which the Solar System formed. A few of these objects have Neptune crossing orbits, but most lie in orbits beyond the closest approach of Pluto. It is widely believed that there is a vast reservoir of KBO's that have never coalesced into planets and that the region where they reside extends far beyond 35 AU. Understanding the Kuiper Belt is a key to understanding where we came from, how life arose on Earth, and how it may have arisen elsewhere.

NASA desires, if at all possible, that the PKB mission be a true PKB mission and not just a flyby of the Pluto-Charon system. It is, therefore, highly desirable to have a reasonable plan for visiting one or more KBO's. This goal does not lend itself to a detailed plan at present because the number of known KBO's is still rather small, and they are very distant and scattered over a vast region. However new KBO's are being discovered at an ever increasing rate and this can be expected to continue during the cruise phase of the mission. The spacecraft should carry the maximum possible margin in fuel so as to allow access to the greatest possible number of KBO targets of opportunity.

Given the present limited knowledge of the Kuiper Belt, offerors are encouraged to propose their best effort plan for visiting one or more KBOs as an extended mission, Phase F option. The budget for this phase will not be counted against the cost cap. The evaluation of the extended mission phase will be of secondary importance after the group 1, 2, and 3 science objectives. Options for Phase F may be proposed with the understanding that NASA has no commitment to fund these options.

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

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

It is OSS policy to emphasize and encourage the addition of Participating Scientist Programs (PSP's) and Data Analysis Programs (DAP's) to broaden the scientific impact of missions (also see Section 6.2.1c). These programs are initiated no earlier than Phase E. Historically, OSS has funded DAP's at an annual level between 1 and 3 percent of the mission's Phase C/D development costs. Although OSS will independently solicit and administer these programs, the costs of implementing a PSP and/or a DAP must be included in the proposed Total Mission Cost (Section 3.6.1). However, these costs **will not** count against the NASA OSS Cost cap (Section 4.5.2).

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

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

3.3.1 Education and Public Outreach (E/PO)

OSS expects E/PO to be a significant part of each OSS flight program and research discipline, and strongly encourages space science researchers to engage actively in E/PO as an important component of their NASA-supported professional activities. In order to achieve this goal, OSS has developed a comprehensive approach for making education at all levels (with a particular emphasis on K-14 education) and the enhancement of public understanding of space science integral parts of all of its missions and research programs.

The basic objectives of this program are to:

- Share the excitement of space science discoveries with the public
- Enhance the quality of science, mathematics, and technology education, particularly at the precollege level
- Help create our 21st century scientific and technical workforce.

The three key documents that establish the basic policies and guide all OSS E/PO activities are a strategic plan entitled *Partners in Education: A Strategy for Integrating Education and Public Outreach Into NASA's Space Science Programs* (March 1995), an accompanying implementation plan entitled *Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy* (October 1996), and the *Explanatory Guide to the NASA Office of Space Science Education and Public Outreach Evaluation Criteria* (April 1999). These documents are available through the PKB Library (see Appendix D), or alternatively can be accessed by selecting "Education and Public Outreach" from the menu on the OSS homepage at the Internet URL address http://spacescience.nasa.gov, or may be requested from Dr. Jeffrey Rosendhal, Office of Space Science, Code S, NASA Headquarters, Washington, DC 20546-0001. Additional information on the ongoing OSS E/PO program can be obtained from the FY 2000 OSS E/PO Annual Report which is also accessible from the OSS homepage address given above.

In accordance with these established OSS policies, E/PO will be an integral element of the PKB mission, and 1-2% of the NASA OSS Cost (excluding launch vehicles) will be allocated to education and outreach. Because of the financial scope of this effort, it is expected that a multi-faceted E/PO program of national scope will be carried out in conjunction with the PKB mission.

3.3.2 Technology Infusion/Technology Transfer

NASA seeks to infuse new technologies into its programs and to strengthen the mechanisms by which it transfers such technologies to the U.S. private sector, including the nonaerospace sector. The means by which NASA OSS plans to implement new technology is described in *The Space Science Enterprise Integrated Technology Strategy* (October 1998), which is included in the PKB Library described in Section 5.1.1. The PKB mission represents an opportunity for NASA to develop and test new technologies and applications, as well as strengthen existing technology transfer mechanisms and explore and implement new mechanisms and approaches to economic benefit. This is especially true when such technology enhances the acquisition of science results or reduces the costs for the mission. It is important, however, that investigations that are dependent on new technology must have either sound development/qualification plans for the new technology or adequate backup plans defined for use in the event that the new technology runs into problems and will not be ready prior to assembly and test of the spacecraft. Investigations that are dependent on new technology will not be penalized for risk provided that adequate plans are described to reduce the risk by providing reasonable back-up approaches, or if none exist, providing for the development/qualification such that the success of the investigation is assured.

3.3.3 Small Disadvantaged Business and Minority Institutions

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

3.4 Technical Approach Requirements

PKB mission projects must encompass all technical aspects of the investigation from preliminary analysis (Phase A) through delivery of the data to the PDS and their analysis (the final part of the operations phase, Phase E). The document, NPG 7120.5A *NASA Program and Project Management Processes and Requirements,* delineates activities, milestones, and products typically associated with Formulation and Implementation of projects and may be used as a reference in defining a team's mission approach. While NPG 7120.5A does not define subphases, OSS has defined Formulation as Phases A and B, and Implementation as Phases C, D, and E. This document is included in the PKB Library (see Section 5.1.1). Mission teams have the freedom to use their own processes, procedures, and methods, and the use of innovative processes is encouraged when cost, schedule, and technical improvements can be demonstrated.

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

Radioisotope sources of electrical power, such as RTG's are permitted. These devices, however, will be provided by NASA as Government Furnished Equipment (GFE) and are discussed in Section 4.1 and Appendix G. Other smaller radioactive sources (such as radioactive heating units or instrument calibration sources) are also permitted. Such usage will require additional environmental documentation (see Environmental Quality Regulations, 40 CFR Parts 1500-1508, and PKB Library). A timely Environmental Impact Statement (EIS) and a Nuclear Safety Launch Approval request will be required. Sufficient resources shall be budgeted to provide the project's EIS supporting documentation and NASA's preparation of the EIS. Resources shall also be budgeted to support NASA's Nuclear Safety Launch Approval request.

Investigation teams are welcome to use currently available NASA navigation, tracking, control, communications, and other services. Non-NASA capabilities may also be used if they are technically appropriate and cost effective. The costs for such services, whether obtained from

NASA or from other sources, must be included in the cost estimate. Cost information for NASA-provided services (*NASA's Mission Operations and Communications Services*) is provided in the PKB Library (See Appendix D).

3.5 Management Requirements

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

The PI is expected to be the central person in charge of the PKB investigation, with full responsibility for its scientific integrity and for the integrity of all other aspects of the mission. The PI is responsible for assembling a team to propose and implement a PKB mission. The PI is accountable to NASA for the scientific success of the mission and must be prepared to recommend project termination when, in the judgment of the PI, the successful achievement of (at a minimum) all of the Group 1 science objectives is not likely within the committed cost and schedule reserves.

PKB mission Program management responsibilities have been assigned to the OSS Director of Outer Planets Programs, Dr. Colleen Hartman, at NASA Headquarters. The responsibilities of that Directorate include mission implementation oversight; coordination of Government-furnished services, equipment, and facilities; and overall schedule and funding resources. In addition, the Outer Planets Program Director or her representative will conduct independent reviews coincident with the major project reviews, such as Preliminary Design Review or the Critical Design Review.

3.5.1 Co-Investigator Roles and Requirements

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

3.6 Cost Requirements

3.6.1 NASA Office of Space Science Cost

A major goal of the PKB mission is to provide the highest science value for cost. Therefore, NASA OSS Cost will be a selection factor. All proposals must provide an estimate of NASA OSS Cost.

NASA OSS Cost is defined as the funding that NASA OSS would be expected to provide to complete the investigation, including the cost of the Concept Study and all costs in Phases B through E, including reserves, contributions, and contract fees. Generally, all costs must be included as NASA OSS costs unless specifically excluded. It should be noted that launch services and RTG's required for this mission should be proposed as described in Section 4.1 and Appendix G of this AO whether provided by NASA or by some other source. Although they will not be included in the proposal, NASA costs associated with launch of the space shuttle will be considered in the overall mission evaluation. However, if an upper stage or other shuttle unique services are required, details of those costs must be submitted in the proposal.

Section 4.5.2 of this AO describes additional cost elements, specific to PKB mission investigations, that are to be included. This section also specifies the cost cap on NASA OSS Cost for PKB mission investigations. An additional requirement on proposals for this AO is an estimate of Total Mission Cost described in Section 4.5.3.

The specific cost information required for proposals is described in detail in Appendix B The proposed cost to NASA OSS shall not increase by more than 20% from the proposal to the concept study and must not exceed the specified cost constraints. Since costs and obligational authority may well be different, it is incumbent on proposers to define any obligational requirement that exceeds planned costs.

3.6.2 Full Cost Accounting

Where NASA-provided services are used, NASA Civil Service labor and supporting NASA Center infrastructure must be costed on a full cost accounting basis. If NASA guidance for full cost accounting has not been fully developed by the closing date for proposal submission or for completion of the concept studies, NASA Centers may submit full cost proposals based on the instructions in the NASA Financial Management Manual, Section 9091-5, Cost Principles for Reimbursable Agreements (see Appendix D).

3.6.3 Contribution Costs

With the exception of RTG's, contributions of any kind, whether cash or noncash (property and services), to PKB mission by space organizations other than the OSS are welcome. Values for all contributions of property and services shall be established in accordance with applicable cost principles. Such contributions may be applied to any part or parts of a mission. A letter of endorsement that provides evidence that the responsible institution and/or Government officials are aware and supportive of the proposed investigation, and will pursue funding for the investigation if selected by NASA, must be submitted with the proposals for all U.S. components. For non-U.S. components of proposals, see Appendix C. The cost of contributed hardware should be estimated as either: (1) the cost associated with the development and production of the item if this is the first time the item has been developed and if the mission represents the primary application for which the item was developed; or (2) the cost associated with the reproduction and modification of the item (i.e., any recurring and mission-unique costs) if this is not a first-time development. If an item is being developed primarily for an application other than the one in which it will be used in the proposed investigation, then it may be considered as falling into the second category (with the estimated cost calculated as that associated with the reproduction and modification alone).

The cost of contributed labor and services should be consistent with rates paid for similar work in the offeror's organization. The cost of contributions does not need to include funding spent before the start of the investigation (before completing a contract with NASA). The value of materials and supplies shall be reasonable and shall not exceed the fair market value of the property at the time of the contribution. Contribution funding limitations are defined in section 4.4.

If any NASA costs are to be considered as contributed costs, the contributed item(s) must be separately funded by an effort complementary to the proposed investigation, and the funding sources must be identified. Other Federal Government elements of proposals must follow their agency cost accounting standards for full cost. If no standards are in effect, the proposers must then follow the Managerial Cost Accounting Standards for the Federal Government as recommended by the Federal Accounting Standards Advisory Board.

3.7 International Participation Requirements

Guidelines for international participation are given in Appendix C.

4.0 Additional Constraints, Guidelines, and Requirements

The 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 launch vehicle, spacecraft, instrument, and ground system. Proposers may propose their own power design and source if such units can be demonstrated to be feasible. Otherwise, NASA will provide the RTG power source(s) as GFE via the Department of Energy. Costs for these units must be included in the NASA OSS cost estimate. The technical and cost parameters of such available units are described in Appendix G of this AO and included in the PKB Library. In any event, proposals must include sufficient resources (schedule and cost) to secure these units, support the development, submittal, and approval of the necessary Environmental Impact Assessment process, and the Nuclear Safety Launch Approval process (also see the *Pluto-Kuiper Belt Launch Services Information* document listed in Appendix D and contained in the Library).

4.1 Mission Constraints, Guidelines, and Requirements

Launch cost for missions proposed in response to this solicitation must be included in the cost for the mission, regardless of whether the ELV is provided by NASA or another source. Foreign ELV's must be free of cost to the U.S. Government, and foreign ELV's must be certified by an institution that is capable of making a binding commitment. Launch costs must also include the provision of sufficient launch vehicle data to support mission risk and safety assessments. NPD 8610.7, Launch Services Risk Mitigation Policy and NPD 8610.12D, Office of Space Flight Space Shuttle Services for NASA and NASA-sponsored Payloads (contained in the PKB Library), must be applied to all launch vehicles. Further discussions of launch costs are in Section 4.5.2 and in the contents of Appendix D and contained in the PKB Library.

Because NASA seeks the earliest possible science return from Pluto, additional consideration will be given to proposals that are scientifically valuable, technically feasible, within cost constraints (Section 3.6), and that arrive at Pluto earlier than 2020. NASA has investigated such missions in other studies and the results of these studies can be found in the such documents as the *Pluto-Kuiper Express Mission and Project Description* document which is listed in Appendix D and contained in the PKB Library.

If proposed missions require a nuclear power source, such a source must be obtained via NASA. Appendix G describes the capabilities and costs of such devices for proposal purposes.

4.2 Baseline Mission and Performance Floor

The Baseline mission refers to that mission which, if fully implemented, will accomplish the entire set of scientific objectives proposed for the investigation. Any alteration that results in a reduction of the mission's ability to accomplish the Baseline set of scientific objectives as identified in the proposal will be considered a descoping of the investigation. The descoped set of scientific objectives must be reviewed to ensure that the investigation remains at or above the Performance Floor. The Performance Floor is defined in this AO as achievement of only the full complement of Group 1 Science Objectives specified in Section 3.2. In addition, the investigation team will negotiate a set of performance metrics during the definition phase for program evaluation, including cost, schedule, and others as appropriate. Failure to maintain a level of science return at or above the Performance Floor will be cause for termination of the investigation.

4.3 International Participation Guidelines

Any proposed international participation should be described at the same level of detail as that of U.S. partners, to the maximum extent practicable. NASA will seek to validate contribution, cost, schedule, and management data during evaluation of the proposal and in subsequent reviews.

4.4 Contribution Limits

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

4.5 Schedule and Cost Requirements

4.5.1 Schedule

The launch date and launch date flexibility (if any) must be specified. Note that Phase A has been defined by the OSS as the Concept Study and Phase B is a single phase ending approximately one month after Preliminary Design Review. The design/development Phase C/D is defined as ending 30 days after launch. While no specific constraint is placed on the length of Phase B, Phase C/D, or Phase E, the mission must arrive at Pluto-Charon in the 2020 timeframe or earlier. It is obvious from these constraints that procurement of long-lead materials will be necessary and permitted during the Phase B timeframe, however, significant commitment or expenditure of development funds will not be permitted until the completion of the Program milestone called Confirmation Review (CR) (see Section 6.3.4). Options for an extended mission (Phase F) may be proposed, if appropriate, with the understanding that NASA has no commitment to fund these options (see Section 3.2).

4.5.2 NASA Office of Space Science Cost Requirements and Cost Cap

The PKB mission is funds limited. To this end, NASA OSS will cap its funding for PKB mission investigations, including all prime mission phases and launch services, at $500 Million (FY 2001 dollars). Funding for an extended mission Phase F, a PSP, and/or a DAP, will not count against this cap. The NASA OSS funding profile available for missions selected under this AO is described in Appendix F and contained in the PKB Library.

Although NASA plans to fund directly the costs for U.S. launch services, including the space shuttle, these costs are to be included as shown in Tables B1 and B2 in Appendix B. The launch services costs to be used to calculate the NASA OSS Cost for an investigation using a domestic ELV or space shuttle is provided in the *Pluto-Kuiper Belt Launch Services Information Summary* document available in the PKB Library. As discussed in Section 4.1, foreign launch services may be contributed to NASA for this solicitation. Also for the purpose of this AO, NASA OSS cost must include funding to be used for SOMO services such as DSN tracking and communication lines.

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

4.5.3. Total Mission Cost

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

Contributions, i.e, goods and/or services offered on a no-exchange-of-funds basis, may be to any mission element, but the total contribution is not to exceed approximately one-third of the proposed NASA OSS cost. Launch vehicle and launch services costs provided by a foreign Government will be included in the total contributions.

4.6 Selection and Cost Constraints

Each investigation selected for a concept study through this AO will be awarded funding for the concept study. At the conclusion of the concept study it is planned that one of these investigations, if NASA deems the investigation feasible, will be selected to proceed into subsequent mission phases. NASA will not continue funding those missions not selected to proceed.

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

During the concept study, the NASA OSS cost shall not increase by more than 20% from that offered in the original proposal and, in any event, must not exceed the NASA OSS cost cap of $500 Million (Fiscal Year 2001 dollars). Thereafter, cost shall not increase from that offered in the proposal resulting from the Concept Study. Each mission's concept study must conclude with a commitment by the PI for the cost, schedule, and scientific performance of the investigation. If, at any time, the cost, schedule, or scientific performance commitments appear to be in jeopardy, the investigation will be subject to cancellation.

5.0 Proposal Preparation and Submission

5.1 Preproposal Activities

5.1.1 Pluto-Kuiper Belt Library

The PKB Library is intended to provide additional background, technical, and management information, and requirements. Information is included on the Deep Space Systems Program, science goals, launch services, DSN capabilities, NASA's technology transfer infrastructure, the OSS's Integrated Technology Strategy, the OSS's E/PO Strategy and Implementation Approach, the PDS, and existing NASA test and mission operations facilities. Proposal information requested or suggested in these reference documents provide examples of data that assist evaluators in better evaluating proposals. In case of conflict between the AO and these documents, however, the AO takes precedence. The contents of the PKB Library are listed in Appendix D. This library is accessible at the Internet URL (http://www.nra-aoinfo.com/space/pluto/library.html). All documents are downloadable, however, if necessary, hard copies of selected documents may be obtained by written request to Dr. Denis Bogan at the address in the section below.

5.1.2 Technical and Scientific Inquiries

Inquiries should be directed to Dr. Denis Bogan at the following address:

Dr. Denis Bogan
Ref. Pluto-Kuiper Belt 2001
Research Program Management Division
Code SR
Office of Space Science
National Aeronautics and Space
Administration
Washington, DC 20546-0001

Fax Number: (202) 358-3097
E-mail: denis.bogan@hq.nasa.gov

5.1.3 Preproposal Conference

A preproposal conference will be held on February 1, 2001 from 10:00 a.m. to 6:00 p.m. EST at:

NASA Headquarters, Conference Room MIC 5A
Two Independence Square
300 E. Street SW
Washington, DC 20546

Contact: Ms. Heather Lancaster for registration
NASA Peer Review Services
Phone: (202) 479-9030 ext. 230
E-mail: hlancast@mail.hq.nasa.gov

All interested parties may attend, but only at their own expense (NASA funds cannot be used) and they must make their own travel arrangements. The purpose of this conference will be to address questions about the proposal process for this AO. The preproposal conference will address all those questions received by NASA up to five days in advance of the conference. Questions should be addressed via E-mail to Dr. Denis Bogan at the address given in Section 5.1.2. Additional questions submitted after this date, including those provided in writing at the conference, may be addressed at the conference only as time permits. Anonymity of the authors of questions will be honored. A PKB AO Preproposal Conference Transcript, including answers to all questions addressed at the conference will be prepared and mailed approximately two weeks after the conference to attendees, to those submitting notices of intent (see Section 5.1.4), and to anyone who submits a request for this document to Dr. Denis Bogan via fax or electronic mail.

5.1.4 Notice of Intent to Propose

To assist NASA's planning of the proposal evaluation process, a Notice of Intent (NOI) to Propose should be submitted by all prospective proposers in accordance with the schedule in Paragraph 1.3. Those submitting an NOI will directly receive program updates as may occur up to the time of proposal due date. This Notice is to be submitted electronically by entering the requested information on the site at the Internet URL address http://props.oss.hq.nasa.gov. Proposers without access to the Web or who experience difficulty in using this site should contact Ms. Debra Tripp by E-mail at dtripp@mail.hq.nasa.gov for assistance.

To the extent the following information is known by the due date, the website for NOI's will request the following information:

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

Material in an NOI is for NASA planning purposes only and is confidential.

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

> "I hereby <u>do / do not</u> authorize NASA to post my name and institutional address (but not the name of my intended proposal) as an addendum to this AO on the Internet starting approximately one week after the NOI due date. If I do authorize such a posting, I

understand that such information will be in the public domain, and I will not hold NASA responsible for any use made by others for revealing this information."

5.2 Format and Content of Proposals

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

5.3 Submission Information

5.3.1 Certification

All proposals must have a Cover Page and Proposal Summary that is to be submitted electronically through the Web site given in Appendix B. Once the form is submitted, it must be printed and signed by the PI. The Cover Page must also be signed by an official of the PI's institution authorized to certify institutional support and sponsorship of the investigation and the management and the financial parts of the proposal.

The proposal shall include a letter of endorsement signed by an institutional official from each identified partner organization expecting to provide critical, no-exchange-of-funds contributions of hardware, software, facilities, services (including Co-I services), etc., that provides evidence that the institution and/or Government officials are aware and supportive of the investigation and will pursue funding if selected by NASA. Paper copies of proposals and the original, signed version must be received by the due dates specified in Section 1.3 of this AO.

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

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

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

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

Unlike previous OSS solicitations, the authorizing institutional signature on the printout of the electronically submitted cover now also certifies that the proposing institution has read and is in compliance with the three required certifications printed in full in Appendix E. Therefore, it is not necessary to separately submit these certifications with the proposal.

5.3.2 Quantity

All proposers must provide 45 copies of their proposal, including the original signed proposal, on or before the proposal deadline.

5.3.3 Submittal Address

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

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

5.3.4 Deadline

All proposals must be received at the address above by the closing date specified in Section 1.3. All proposals received after the closing date will be treated in accordance with NASA's provisions for late proposals (see LATE PROPOSALS section of Appendix A).

5.3.5 Notification of Receipt

NASA will notify the proposers that their proposals have been received. Proposers not receiving this confirmation within two weeks after submittal of their proposals should contact Dr. Denis Bogan at the address given in Section 5.1.2.

6.0 Proposal Evaluation, Selection, and Implementation

6.1 Evaluation and Selection Process

All proposals will be subjected to a preliminary screening to determine their responsiveness to this AO. Proposals that are not in compliance with the constraints, requirements, and guidelines of this AO will be considered unacceptable and returned to the proposer. The remaining proposals will then be assessed by an evaluation team composed of panels of individuals who are peers of the proposers in scientific, technical, and other areas. The evaluations will be done in accordance with the criteria specified in Section 6.2.

After these evaluations, the panels will meet to consider the total qualitative and/or quantitative aspects of the evaluations to integrate the separate panel results, as necessary, to assure consistency and fairness in evaluations. Once these evaluations have been completed and integrated, an *ad hoc* Subcommittee of the Space Science Steering Committee (SSSC) composed entirely of Civil Servants who have served on the panels will convene to consider the peer review results. Note that the evaluation results for the E/PO, technology, and SDB **will not** be included in this committee's review, but will be reviewed by the Program Scientist and the Program Director prior to forwarding recommendation(s) to the Associate Administrator for Space Science. This subcommittee will review all results, and based on this information, it will then categorize proposals in accordance with the category definitions in NASA FAR Supplement 1872.403, as follows:

> Category I. Well conceived and scientifically and technically sound investigations pertinent to the goals of the program and the AO's objectives, and offered by a competent investigator from an institution capable of supplying the necessary support to ensure that any essential flight hardware or other support can be delivered on time, and that data can be properly reduced, analyzed, interpreted, and published in a reasonable time. Investigations in Category I are recommended for acceptance and normally will be displaced only by other Category I investigations.
> Category II. Well conceived and scientifically or technically sound investigations which are recommended for acceptance, but at a lower priority than Category I.
> Category III. Scientifically or technically sound investigations which require further development.
> Category IV. Proposed investigations which are recommended for rejection for the particular opportunity under consideration, whatever the reason.

The results of the evaluations and categorizations will be presented to an *ad hoc* Subcommittee of the SSSC, composed of Civil Service personnel appointed by the Associate Administrator for Space Science for an independent review of the evaluation and categorization processes. After this review, the final evaluation results, including the evaluation results for the E/PO, technology, and SDB will be forwarded to the Associate Administrator who will make the selection(s). Those proposers not selected will be notified by letter and will be offered a debriefing. Proposers selected will be notified by telephone and by letter providing instructions concerning the steps necessary to obtain funding and conduct their concept studies.

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

6.2 Evaluation Criteria

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

6.2.1 Evaluation Criteria for Proposals

The evaluation criteria with their approximate percentage weights given in parentheses are shown below:

- The scientific merit of the investigation (30)
- The NASA OSS cost (20)
- The technical merit and feasibility of the science investigation (20),
- The feasibility of the implementation scheme (20),
- Quality of plans for E/PO, new technology, and SDB's (10)

6.2.1a Scientific Merit of the Investigation

Scientific merit will be evaluated principally on the degree to which the proposed investigation achieves the Group 1 science objectives specified by the Science Definition Team (i.e., the Performance Floor). Additional consideration will be given to investigations that address Group 2 objectives and, at lower priority, Group 3 objectives. Additional consideration will also be given to missions arriving early at Pluto-Charon versus those arriving later. This evaluation will result in descriptive text, as well as a numerical and adjectival score of the scientific merit of the investigation.

6.2.1b NASA Office of Space Science Cost

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

Examples of costs to be included in all proposals are: spacecraft and instrument design/develop/operations costs; launch vehicle and integration and services costs; E/PO activities; new technology infusion and transfer; subcontracting costs (including fees); science teams; all personnel required to conduct the investigation, analyze and publish results, and deliver data in archival format to the PDS; insurance; NASA Deep Space Network (DSN) and other Space Operations Management Office (SOMO) support, if required (see *NASA's Mission Operations and Communications Services* document in the PKB Library); Navigation and Ancillary Information Facility (NAIF) services; and all labor (including contractor and Civil Servant).

6.2.1c Technical Merit and Feasibility of the Science Implementation

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

6.2.1d Feasibility of the Mission Implementation Scheme

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

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

Proposals for the PKB mission must identify a Project Manager (PM) who will oversee the technical and managerial implementation of the project. The PM must work closely with the PI in order to ensure that the mission meets its objectives within the resources outlined in the proposal. The role, qualifications, and experience of the PM must be adequate to ensure that the technical and managerial needs of the investigation will be met.

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

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

6.2.1e Quality of Plans for Education and Public Outreach, New Technology, and Small Disadvantaged Businesses

The E/PO plan will be reviewed to determine the extent to which the proposers are committed to carrying out an E/PO program that meets the goals described in Section 3.3.1; have developed a viable approach based on the proposed mission; and have provided the budget, personnel, and management resources necessary to carry out a significant E/PO program. Each proposal will be given an adjectival score based on these criteria.

The new technology plan will be reviewed to determine the extent to which it meets the requirements given in section 3.3.2. Proposers should address how developmental problems with new technology will be addressed in order to ensure mission success. Each proposal will be given an adjectival score based on these criteria.   The more detailed evaluation criteria contained in the *Explanatory Guide* reference in Section 3.3.1 will be used as the basis for this review as well as for the more detailed review of the E/PO portion of the concept study.

The participation of SDB concerns, WOSB concerns, HBCU's, and Other Minority Institutions (OMI's) will be evaluated (see Appendix A, Section XIII). The evaluation will include the extent to which these entities are specifically identified and the complexity of the work they are to perform. Each proposal will be given an adjectival score based on these criteria.

6.3 Implementation Activities

6.3.1 Notification of Selection/Nonselection

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

6.3.2 Contract Administration and Funding

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

It is anticipated that funding will be awarded for concept studies for the investigations selected as a result of this AO. NASA will provide up to $450K, counted against the $500 Million (FY 2001 dollars) cap, to each selected PKB mission investigation to perform a two-month concept study to be initiated as soon as possible after notification. The product of these studies will be reports to be delivered on the date specified in Section 1.3. The contents and format of the concept study reports are specified in a document in the PKB Library entitled *Guidelines and Criteria For Concept Study Report Preparation* (See Appendix D/ PKB Library). 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 investigation(s) before final selection(s) for implementation. As a result of evaluation of the concept studies, NASA expects to downselect to one investigation to proceed to Phase B if a mission is deemed feasible. NASA will not continue funding for investigation(s) that are not selected to proceed.

6.3.3 Downselection of Investigations

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

6.3.4 Confirmation of Investigations for Subsequent Phases

For the Mission Investigation downselected as above, detailed design of the project will continue. At roughly one month after the completion of Phase B (i.e., the Preliminary Design Review), an independent review team, chartered by the Associate Administrator for Space Science, will conduct a Confirmation Assessment, the results of which will be presented to the Associate Administrator in a formal Confirmation Review (CR). The CR constitutes the NPG 7120.5 Approval process. The implementing organization (e.g., Jet Propulsion Laboratory (JPL), Applied Physics Laboratory (APL), Goddard Space Flight Center (GSFC), etc.) may also choose to hold a Confirmation Readiness Review prior to the CR. The PI, the independent review team chair, and a representative of the implementing organization will present results of these reviews to the Associate Administrator for Space Science at the CR. The Associate Administrator will then decide whether or not to confirm the mission for Implementation (Phase C/D). This decision will be based upon the project's readiness to proceed to design and development and programmatic considerations such as cost, schedule, the ability to achieve the scientific objectives delineated in the proposal, and the completeness of the project's level 1 requirements. Missions not confirmed for Implementation may be terminated. No more funds will be expended on nonconfirmed and terminated missions.

6.4 Selection Factors

As described in Section 6.1, the results of the proposal evaluations based on the criteria above and categorizations will be considered in the selection process.

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

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

7.0 Conclusion

The PKB mission represents a challenging new way for NASA to accomplish important scientific exploration of the outermost part of the Solar System. It provides an opportunity to execute science investigations at the forefront of planetary science, as well as generate opportunities to enhance education initiatives and engage the public in the excitement of science discoveries. NASA invites both the U.S. and international science communities to participate in proposals for PKB mission investigations to be carried out as a result of this Announcement.

Jay T. Bergstralh
Acting Science Theme Director
Solar System Exploration

Edward J. Weiler
Associate Administrator
for Space Science

APPENDIX A

GENERAL INSTRUCTIONS AND PROVISIONS

I. INSTRUMENTATION AND/OR GROUND EQUIPMENT

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

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

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

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

III. SELECTION WITHOUT DISCUSSION

The Government reserves the right to reject any or all proposals received in response to this AO when such action shall be considered in the best interest of the Government. Notice is also given of the possibility that any selection may be made without discussion (other than discussions conducted for the purpose of minor clarification). It is therefore emphasized that all proposals should be submitted initially on the most favorable terms that the offerer can submit.

IV. FOREIGN PROPOSALS

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

V. TREATMENT OF PROPOSAL DATA

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

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 (U.S. PROPOSALS ONLY)

Submission of a Standard Form (SF) 1411 Contract Pricing Proposal Cover Sheet for the Concept Study is not required. The SF 1411 is required for all contract options after the concept study. The investigator's institution agrees that the cost proposal submitted in response to the Announcement is for proposal evaluation and selection purposes, and that, following selection and during negotiations leading to a definitive contract, the institution may be required to resubmit cost information in accordance with FAR 15.403-5.

VII. LATE PROPOSALS

Proposals or proposal modifications received after the latest date specified for receipt may be considered if a significant reduction in cost to the Government is probable or if there are significant technical advantages, as compared to proposals previously received.

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 (U.S. PROPOSALS ONLY)

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

XI. PATENT RIGHTS

- 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.

- For any NASA contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at FAR 52.227-11, Patent Rights – Retention by the Contractor (Short Form) (as modified by NFS 18-52.227-11), shall apply.

XII. RIGHTS IN DATA

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

XIII. SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING

- 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 (SDB) concerns, Women-Owned Small Business (WOSB) concerns, Historically Black Colleges and Universities (HBCU's), and other Minority Educational Institutions (MEI's), as these entities are defined in 52.219-8 and in 52.226-2 of the FAR. Offerors will be evaluated on the participation in the performance of the mission of SDB concerns in the authorized Standard Industrial Classification (SIC) Groups as determined by the Department of Commerce (see FAR 19.201 (b)), as well as the participation of WSOB concerns, HBCU's, and Other Minority Institutions (OMI's).

- Offerors are advised that for NASA contracts resulting from this solicitation which offer subcontracting possibilities, exceed $500,000, and are with organizations other than small business concerns, the clause FAR 52.219-9 shall apply. Offerors whose investigations are selected for implementation leading to flight will be required to negotiate subcontracting plans which include subcontracting goals for small, small disadvantaged, women-owned, and Historically Underutilized Business Zone (HUBZone) small business concerns. Note that these specific subcontracting goals need not be submitted with the proposal. Failure to submit and negotiate a subcontracting plan after the Phase II selection shall make the offeror ineligible for award.

APPENDIX B

GUIDELINES FOR PROPOSAL PREPARATION

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

GENERAL GUIDELINES

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

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

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

Proposals shall contain no more than 62 pages, with exclusions to the page count noted below, including no more than five fold-out pages (28 x 43 cm; i.e., 11 x 17 inches). All pages other than fold-out pages shall be 8.5 x 11 inches or A4 European standard.

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

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

Section	Page Limit
Cover Page and Proposal Summary	Printout of electronic submission
Table of Contents	none
Fact Sheets	2
Science Investigation Description	30
Education/Public Outreach (E/PO)	3
New Technology, and Small Disadvantaged Business (SDB) Plans	2
Mission Implementation Management and Schedule Cost and Cost Estimating Methodology	25
Appendices: (No others permitted) Statement(s) of Work (SOW) for each contract Letter(s) of Endorsement Resumes Draft International Participation Plan - Discussion on Compliance with U.S. Export Laws and Regulations Draft Outline of Technical Responsibilities (if international participation) Compliance with Procurement Regulations by NASA Principal Investigator Proposals Acronyms List Reference List (optional)	No page limit, but brevity encouraged

The content of each proposal is described below.

A. COVER PAGE AND PROPOSAL SUMMARY

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

The Cover Page and Proposal Summary must be submitted electronically to the Internet URL site located at <http://props.oss.hq.nasa.gov>. The full names of the PI and the authorizing official, their addresses with zip code, telephone and fax numbers, and electronic mail addresses, are required on the specified form, as well as the names, institutions, and E-mail addresses of all participants, the total NASA Office of Space Science (OSS) Cost, and a 200-word Summary. A hard copy version of this Cover must be submitted with the signatures and included with the original hard copy of the proposal for delivery according to the schedule provided in Section 1.3 in this AO. The signature of the authorizing official for the project institution must also be included. Proposers are advised that they must not reformat this Cover after it is printed, as important NASA-required documentation may be lost. Proposers without access to the Web or who experience difficulty in using this site may contact dtripp@mail.hq.nasa.gov for assistance. Please note that submission of the electronic Cover does not satisfy the deadline for proposal submission.

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

B. TABLE OF CONTENTS

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

C. FACT SHEET

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

D. SCIENCE INVESTIGATION

The Science Investigation section should describe the scientific objectives of the proposed investigation. 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 investigation's goals and objectives in meeting the Pluto-Kuiper Belt (PKB) science objectives as described in Section 3.2.

   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. The Baseline Mission should be explicitly identified.

A description of the descope options available, their phasing, and their effect on meeting the scientific objectives of the mission as the mission is descoped from the Baseline to the Performance Floor should be discussed. Proposals should include only one Baseline mission.

2. Science Implementation.

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

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

   b. Mission. The science observing profile should be discussed. This discussion should include all mission-relevant parameters, such as orbit and/or surface location, pointing requirements, operational timelines (including observing periods, data transmission periods, and time-critical events), etc. The manner in which the stated investigation objectives and selected instruments drive the proposed mission design and operations plan should be apparent from this discussion.

   c. Data Analysis and Archiving. The reduction and analysis plan for data should be discussed, including the method and format of the data reduction, data validation, and preliminary analysis. The process by which data will be prepared for archiving should be discussed, including a list of the specific data products and the individual team members responsible for the data products. The plan must include a detailed schedule for the submission of raw and reduced data to the appropriate data archive in the proper formats, media, etc. Delivery of the data to the data archive must take place in the shortest time possible.

   d. Science Team. This section must identify each necessary individual of the investigation science team and their roles and responsibilities. The capabilities and experience of all members of the proposed science team must be described. Resumes or curriculum vitae of team members should be included as attachments to the proposal (see Section I below). The role of each Co-Investigator (Co-I) must be explicitly defined and justified, and the funding source (NASA or contributed) for the PI and each Co-I noted. A letter of endorsement is required from each Co-I institution if the Co-I services are contributed (see Section I.2).

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

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

1. Education and Public Outreach. This section should discuss the proposer's commitment to carrying out an E/PO program that meets the goals described in Section 3.3.1; sketch out an overview of the planned E/PO activities and their relationship to the proposed mission; and describe the proposed budget, personnel, and management provisions that are being made for E/PO. (If the proposed mission is selected for study, detailed plans for implementing the E/PO activities are to be submitted with the Phase A study report.)

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

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

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

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

2. Small Disadvantaged Business. A summary plan is required specifying the proposed investigation's commitment to include the participation of SDB's and minority institutions as described in Section XIII of Appendix A of the AO.

3. New Technology. This section should discuss how new technology relates to the proposed investigation, including: (1) insertion of new technology into the project, (2) transfer of new technology from the project to other projects or programs, and (3) commercialization of new technology. The functions that the new technology performs and how it will be demonstrated for the investigation should be described. Also to be discussed is the development of partnerships among space, nonspace firms, educational, other nonprofit organizations, and Government entities to facilitate technology development, transfer, and commercialization along with how the mission team will implement the transfer and/or commercialization.

F. MISSION IMPLEMENTATION

This section should provide a description of the mission, including mission design, instrument accommodation, spacecraft, launch vehicle requirements, ground systems, communications approach, and mission operations plan. Specific information should be included that describes the unique requirements placed on these mission elements by the science investigation. In some areas (for example, instruments), the data requested may already be presented in another section (e.g., the Science Implementation section). In such cases, proposers may provide a reference to those sections and need not repeat the data in the Mission Implementation section.

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

- Heritage and maturity of mission elements (instruments, spacecraft, ground systems, and mission design, etc.);
- Approach to the use or nonuse of redundancy and other reliability measures;
- Requirements for burn-in of parts and total operating time required without failure prior to flight;
- Assembly, integration, and test flows and integration and test approach;
- Environmental test philosophy (test flow and sequence, test margins, and test durations)
- Product assurance activities;
- Systems engineering and trade studies;
- Potential risks to the proposed investigation and plans for mitigating those risks;

- Technology development plans and back-up plans if existing technologies do not meet development needs (new technology may be penalized for risk if adequate plans are not described to ensure success of the investigation); and
- Fuel management strategy

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

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

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

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

3. Uplink Information.
    - Number of uplinks per day
    - Number of Bytes per uplink
    - Bit error rate

- Approach and schedule for obtaining license(s) for use of proposed frequency bands

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

Definitions:

Contingency (or *reserve*), when added to a resource, results in the maximum expected value for that resource. Percent contingency is the value of the contingency divided by the value of the resource excluding contingency.
Margin is the difference between the maximum possible value of a resource (the physical limit or the agreed-to limit) and the maximum expected value for a resource. Percent margin for a resource is the available margin divided by its maximum expected value.
Example: A payload in the design phase has an estimated mass of 115 kg including a mass reserve of 15 kg. There is no other payload on the Expendable Launch Vehicle (ELV) and the ELV provider plans to allot the full capability of the vehicle, if needed. The ELV capability is 200 kg. The mass reserve is 15/100 = 15%, and the mass margin is 85 kg or 85/115 = 74%. Example: The end-of-mission life capability of a spacecraft power system is 200 Watts. The proposed instrument is expected to use 40 Watts, and a 25% contingency is planned. 75 Watts is allotted by the satellite provider. The reserve is 10 Watts while the margin is 25 watts, or 25/50 = 50%.

5. Attitude and Control Requirements
   - Control method (3-axis, spinner, gravity gradient, etc.). For spin stabilized spacecraft, provide spin rate and axis in terms of spacecraft body coordinate frame.
   - Control reference (solar, inertial, Earth-nadir, Earth-limb, etc.)
   - Attitude requirements as a function of time during all science mission phases
   - Attitude control requirements for bias, drift, stability or jitter, and rate for scanning (each axis)
   - Spacecraft attitude knowledge requirements at the instrument interface for bias, drift, jitter, and rate for scanning (each axis)
   - Agility (maneuvers, scanning, etc.)
   - Deployments (solar panel, antennas, etc.)
   - Articulation (1- or 2 -axis solar arrays, antennas, gimbals, etc.)
   - Onorbit calibration (alignment, line-of-sight, thermal deformation)
   - Attitude knowledge processing (e.g., real-time versus postprocessing, spaceborne versus ground)

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

7. Spacecraft Characteristics
   - Spacecraft Parameters
     - A block diagram of the spacecraft subsystem components
     - Sensor and actuator information (precision/errors, torque, and momentum, storage capabilities, etc.)
   - Propulsion
     - Estimated delta-V budget
     - Propulsion type(s) (monoprop, bi-prop, dual-mode, solar electric, etc.) and associated propellant(s)/oxidizer(s)
     - Propellant mixture ratio (if bi-prop)
     - Specific impulse of each propulsion mode
   - Communications
     - Modes of communications operations
       - For transmit only mode
         - Mode timeline, data rate(s), duration
       - For receive only mode
         - Mode timeline, data rate(s), duration
       - For Rx and Tx mode simultaneously
         - Mode timeline, duration
   - Command and Data Handling
     - Spacecraft housekeeping data demand. If known, provide timelined data demands shall be provided for each subsystem operational mode (i.e. for Guidance, Navigation, and Control (GN&C), Standby, Fine Pointing, Reaction Wheel Momentum Management; Communications, etc.).
     - Data storage unit size (Mbits)
     - Maximum storage record rate
     - Maximum storage playback rate

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

G. MANAGEMENT AND SCHEDULE

This section should summarize the investigator's proposed management approach for the complete investigation including the E/PO. The management organization (including an organization chart) and decision-making process should be described, and the teaming arrangement 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 PI and Project Manager (PM) must be described, but key project personnel (e.g., the PM) need not be identified by name at this time. Risk management and risk mitigation plans must be described, e.g., spacecraft compatibility with multiple launch systems. This discussion should include the top 3-5 risks, descoping strategies, if relevant, and management strategies for control, allocation and release of technical, cost and schedule reserves and margins. When major subcontracts are required, the acquisition strategy, including the incentive strategy, should be described.

A project schedule to meet the proposed launch date and covering all phases of the investigation should be provided. The schedule should include, as a minimum, proposed major project review dates; instrument development; spacecraft development; instrument-to-spacecraft integration and test; launch vehicle integration; mission operations and data analysis; and planning and implementation of the E/PO program. The schedule should also show the proposed project’s critical path from the beginning of Phase B to launch, and should be supported by a brief explanation of the principal factors driving this schedule path. Schedule reserve should be clearly identified.

A level-1 Work Breakdown Structure (WBS) shall be defined as a part of this proposal which clearly links the project organization with the cost information to be provided in Table B1 and provides the proposer with a template for the project schedule information requested above. Inclusion of additional WBS information (Level 2 and 3) is encouraged relative to the flight system development (Phase B/C/D) to demonstrate clear understanding of the proposers implementation plans.

H. COST AND COST ESTIMATING METHODOLOGY

This section shall include an estimated cost of the investigation that encompasses all proposed activities, including all applicable mission phases, launch services, development of the ground data system, implementation of E/PO, fee, and contributions. These costs shall be consistent with the program requirements described in Section 3, 4, and 5 of the AO. The amount required in each fiscal year should be identified by providing the data in Tables B1 and B2 for PKB missions. The top portion of Table B1 requests cost data relative to the NASA OSS Cost while the lower portion requests cost data relative to contributions. Table B2 summarizes the NASA OSS Cost by Phase. The completed tables will not be counted against the page limit. Table B3 gives the NASA inflation index to be used to calculate real year dollars.

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

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

I. APPENDICES

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

1. <u>Statement of Work (SOW) and Funding Information.</u> For investigations managed from non-Government institutions, provide an SOW. For investigations managed from Government institutions, provide an SOW as if the institution were non-Government. This SOW must include the requirement for a concept study report that is described in the *Guidelines and Criteria for Concept Study Report* document available through the PKB Library. The SOW must include general tasks statements

for Phases B/C/D/E and for Phase F (extended mission phase), if offered, for PKB mission investigations. All SOW's should include the following as a minimum: Scope of Work, Deliverables (including science data), and Government Responsibilities (as applicable). SOW's need not be more than a few pages in length. If more than one contractual arrangement between NASA and the proposing team is required, funding information must be provided which identifies how funds are to be allocated among the organizations with a separate SOW for each organization.

2. Letters of Endorsement. Letters of endorsement must be provided from all organizations offering critical facilities (e.g., integration and test, thermal-vacuum chambers, L-Tool, etc.), goods, and/or services (including Co-I services), non-U.S. organizations providing hardware or software to the investigation, the Launch Service provider, if the launch service is not provided through a NASA contract, and the major participants in the proposal. Letters of endorsement must provide evidence that the institution and/or Government officials are aware and supportive of the proposed investigation and will pursue funding for the investigation if selected by NASA. They must be signed by institutional and/or Government Officials authorized to commit their organizations to participation in the proposed investigation. Signed letters of support or commitment must also be provided from all key E/PO partners or subcontractors detailing their commitment to, or involvement, in the E/PO effort.

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

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

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

4. Draft International Participation Plan - Discussion on Compliance with U.S. Export Laws and Regulations. Investigations that include international participation, either through involvement of non-U.S. nationals and/or involvement of non-U.S. entities must include a section discussing compliance with U.S. export laws and regulations; e.g., 22 CFR 120-130, et seq. and 15 CFR 730-774, et seq., as applicable to the scenario surrounding the particular international participation. The discussion must describe in detail the proposed international participation and is to include, but not be

limited to, whether or not the international participation may require the proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or, if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available through Internet URL's http://www.pmdtc.org and http://www.bxa.doc.gov. Proposers are advised that under U.S. law and regulation, spacecraft and their specifically designed, modified, or configured systems, components, parts, etc., such as the instrumentation being sought under this AO, are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations, 22 CFR 120-130, et seq.

5. Outline of Technical Responsibilities between U.S. and International Partners. These outlines will be used by the Office of External Relations, NASA Headquarters, at Selection as the starting point for formalizing the agency-to-agency agreements that will be required if the investigation is implemented.

6. Compliance with Procurement Regulations by NASA PI Proposals. Proposals submitted by NASA employees as PI's should contain the following information concerning the process by which non-Government participants were included in the proposal. The proposal should (i) indicate that the supplies or services of the proposed non-Government participant(s) are available under an existing NASA contract; (ii) make it clear that the capabilities, products, or services of these participant(s) are sufficiently unique to justify a sole source acquisition; or (iii) describe the open process that was used for selecting proposed team members. While a formal solicitation is not required, the process cited in (iii) above should include at least the following competitive aspects: notice of the opportunity to participate to potential sources, submissions from and/or discussions with potential sources, and objective criteria for selecting team members among interested sources. The proposal should address how the selection of the proposed team members followed the objective criteria and is reasonable from both a technical and cost standpoint. The proposal should also include a representation that the PI has examined his/her financial interests in or concerning the proposed team members and has determined that no personal conflict of interest exists. The proposal must provide a certification by a NASA official superior to the PI verifying the process for selecting contractors as proposed team members, including the absence of conflicts of interest.

7. Acronyms and Abbreviations List.

The following item is optional.

8. References List. Proposals may provide a list of reference documents and materials used in the proposal. The documents and materials themselves cannot be submitted,

except as a part of the proposal and included within the prescribed page count, nor should it be necessary to consult these references to adequately review the proposal.

TABLE B1

TOTAL MISSION COST FUNDING PROFILE FOR PLUTO-KUIPER BELT MISSION

FY Costs in Fixed Year FY01 Dollars (to nearest thousand); Totals in both FYO1 and Real Year Dollars

						TOTALS	
Cost Element **	FY1	FY2	FY3	…	FYn	FY01 $	RY $
Concept Study/Phase A							
Reserves							
Total Phase A							
Phase B							
Reserves							
Total Phase B							
Phase C/D (Development)	**Enter each cost element**						
Proj. Mgmt/Miss. Analysis/Sys. Eng.							
Instrument A							
Instrument B							
Instrument …							
Instr. Integration, Assembly and Test							
Subtotal - Instruments							
Spacecraft bus							
Spacecraft Integration, Assembly and Test							
Other Hardware Elements (1)							
Launch Ops (Launch +30 days)							
Subtotal - Spacecraft							
Science Team Support							
Pre-Launch GDS/MOS Development							
Other (2)							
Subtotal Phase C/D before Reserves							
Instrument Reserves							
Spacecraft Reserves							
Other Reserves							
Total Phase C/D							
Phase E (Operations) ***	**Enter each cost element**						
Project Management							
Mission Operations							
Data Analysis							
DSN/Tracking							
Other (2)							
Subtotal Phase E before Reserves							
Reserves							
Total Phase E							
RTG's							
Launch Services							
Total NASA Cost							
Contributions (2)							
Total Contributions							
Total Mission Cost =					→		

(1) Other Hardware Elements: Probes, Etc.

(2) Specify each item on a separate line; include Education & Public Outreach, facilities, etc.

** See ***Program Cost Elements*** document in Pluto-Kuiper Belt Program Library

<u> Exclude costs for planned Extended Mission, Participating Scientist Program, or Data Analysis Program</u>***

TABLE B2
MISSION PHASE SUMMARY OF NASA OSS COST
FY Costs in Real Year Dollars (to nearest thousand)

Cost Element **	FY1	FY2	FY3	…	FYn	TOTALS RY $	TOTALS FY01 $
Concept Study/Phase A							
Phase B							
Phase C/D							
Phase E							
RTG's							
Launch Vehicle/Launch Services							
Total OSS Discovery Mission Cost							
Extended Mission (if required)							
Participating Scientist Program (if required)							
Data Analysis Program (if required)							
Total NASA Cost							
Total Contributions							
					Total Mission Cost = →		

TABLE B3

NASA NEW START INFLATION INDEX

Fiscal Year	2001	2002	2003	2004	2005	2006	2007	2008
Inflation Rate	0.0%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%	2.8%
Cumulative Inflation Index	1.0	1.028	1.057	1.086	1.117	1.148	1.180	1.213

Use an inflation rate of 2.8% for years beyond 2008.

APPENDIX C

GUIDELINES APPLICABLE TO FOREIGN PROPOSALS AND PROPOSALS INCLUDING FOREIGN PARTICIPATION

NASA FAR Supplement
Part 1852.235-72: Instructions for Responding to NASA Research Announcements
(http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm)

Additional Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.

(1) NASA welcomes proposals from outside the U.S. However, foreign entities are generally not eligible for funding from NASA. Therefore, unless otherwise noted, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must be endorsed by the respective Government agency or funding/sponsoring institution in the country from which the foreign entity is proposing. Such endorsement should indicate that the proposal merits careful consideration by NASA, and if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed.

(2) All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the NRA. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established closing date. Those received after the closing date will be treated in accordance paragraph (g) of this provision. Foreign sponsors may, in exceptional situations, forward a proposal without endorsement if the endorsement is not possible before the announced closing date. In such cases, the NASA sponsoring office should be advised when a decision on endorsement can be expected.

(3) Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the foreign sponsor will each bear the cost of discharging their respective responsibilities.

(4) Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(i) An exchange of letters between NASA and the foreign sponsor; or
(ii) A formal Agency-to-Agency Memorandum of Understanding (MOU).

Export Control Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.

(1) Foreign proposals and proposals including foreign participation must include a section discussing compliance with U.S. export laws and regulations, e.g., 22 CFR Parts 120-130; 15 CFR Parts 730-774; and 10 CFR 110 and 810, as applicable to the circumstances surrounding the particular foreign participation. The discussion must describe in detail the proposed foreign participation and is to include, but not be limited to, whether or not the foreign participation may require the prospective proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available at http://www.pmdtc.org and http://www.bxa.doc.gov. Proposers are advised that under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130.

APPENDIX D

CONTENTS OF THE PLUTO-KUIPER BELT LIBRARY

The Pluto-Kuiper Belt (PKB) Library includes documents that are for reference in preparing a proposal to the PKB Announcement of Opportunity (AO). Note that none of the documents in this library contain requirements that supercede the AO, but provide useful information which augments the AO. All of the documents in this library are available electronically via the Internet. Proposers are requested to access and download the documents electronically where possible. Only limited paper copies of some documents are available; therefore, requests for copies must be approved by NASA Headquarters. Please note that not all documents are actually located in the PKB Library. For these documents, an internet hyperlink has been provided via the PKB Library to allow download of the document from their home location.

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

The PKB Library is accessible at the Internet URL address:

http://www.nra-aoinfo.com/space/pluto/library.html

Requests for paper copies must be submitted in writing to:

Dr. Denis Bogan
Ref. Pluto-Kuiper Belt 2001
Research Program Management Division
Code SR
Office of Space Science
National Aeronautics and Space
Administration
Washington, DC 20546-0001
Fax Number: (202) 358-3097
E-mail: denis.bogan@hq.nasa.gov

Office of Space Science Strategies and Policies

The Space Science Enterprise Strategic Plan: Origins, Evolution, and Destiny of the Cosmos and Life (November 2000)

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

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

This document describes the overall strategy for integrating education and public outreach (E/PO) 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 E/PO strategy.

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

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

OSS Education and Outreach 2000 Annual Report (January 2001)

This document provides summaries of recent OSS E/PO activities and educational products produced.

The Space Science Enterprise Integrated Technology Strategy (October 1998)

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

Space Science Roadmaps

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

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

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

Space Science Supporting Documents

NRC Committee on Planetary and Lunar Exploration: An Integrated Strategy for the Planetary Sciences: 1995-2010 (1994)

NRC Committee on Planetary and Lunar Exploration: Exploring the Trans-Neptunian Solar System (1998)

<u>Pluto-Kuiper Belt Guidelines and Requirements Documents</u>

NASA's Mission Operations and Communications Service (March 2000).
Describes the functions and costs of Ground Data Systems and Mission Operations and Data Analysis available via NASA. Also describes the DSN costing algorithm.

Pluto-Kuiper Belt Launch Services Information Summary (January 2001)
Provides information on capabilities and costs of launch services that are available to launch spacecraft selected pursuant to this AO.

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

Guidelines and Criteria for Concept Study Report Preparation (January 2001)
Provides proposers who are selected via the AO, guidelines for preparations of the Concept Study Report. Also, defines the criteria and weighting by which the Concept Study Report will be evaluated.

Cost Element Definitions (January 2001)
Provides definitions for all major cost elements for proposals and concept study reports.
Pluto-Kuiper Belt Funding Profile
This document contains the best estimate of NASA OSS available funding profile for the PKB mission.

Technical Reference for Radioisotope Thermal Generators (RTG's) for Pluto-Kuiper Belt Mission.

<u>General Guideline and Requirements Documents</u>

NPG 8610.12D--Office of Space Flight Space Shuttle Services for NASA and NASA-sponsored Payloads

NPD 8610.7—Launch Services Risk Mitigation Policy

Example Mission Definition and Requirements Agreement
Example of such an agreement.

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

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

ISO 9000 Series

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

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

"Quality Management and Quality Assurance Standards - Guidelines for Selection and Use," ANSI/ASQC Q9000-1-1994

"ISO 9000 and NASA," Office of Safety and Mission Assurance (Code Q) presentation, April 24, 1995.

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

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

Planetary Data System Data Preparation Workbook (February 1995*).*

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

Planetary Protection Requirements*.*

Includes information on Planetary Protection Requirements for NASA spacecraft missions.

NASA Technology Transfer Resources (No date/revision)***.***

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

<u>Deep Space Systems Program Background</u>

Outer Planets Program Description

This document provides a description of NASA's Outer Planets Program

State of Knowledge of the Pluto-Charon System—Taken from the Pluto Science Definition Team Report

This document provides scientific and technical information regarding Pluto-Charon.

Pluto-Kuiper Belt Express—Mission and Project Description

This document describes the now cancelled PKE NASA mission. The PKE AO was essentially for a competitively selected mission similar to this one, and the document contains useful results of earlier trade studies done by NASA.

Directives and Procurement-related Information

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

NASA Online Directives Information System (NODIS) II.

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

Federal Acquisition Regulations (FAR) General Services Administration
(URL: http://www.arnet.gov/far/)

NASA FAR Supplement Regulations
(URL: http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm)

NASA Financial Management Manual
(URL: http://www.hq.nasa.gov/fmm/)

NPG 5800.1D -- Grant and Cooperative Agreement Handbook (July 1996)
(URL: http://ec.msfc.nasa.gov/hq/grcover.htm)

Environmental Quality Regulations
(URL: http:// www.access.gpo.gov/nara/cfr/index.html)

APPENDIX E

CERTIFICATIONS

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

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

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

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

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

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

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

A. The applicant certifies that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this application been convicted or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a Government entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph A.(b) of this certification;

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or Local) terminated for cause or default; and

B. Where the applicant is unable to certify to any of the statements in this certification, he or she shall attach an explanation to this application.

C. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -- Lowered Tier Covered Transactions (Subgrants or Subcontracts)

(a) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency.

(b) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Certification Regarding Lobbying

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

(a) No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, in connection with making of any Federal grant, the entering into of any cooperative, and the extension, continuation, renewal, amendment, or modification of any Federal grant or cooperative agreement;

(b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting an officer or employee of any agency, Member of Congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete Standard Form -- LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(c) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subgrants, contracts under grants and cooperative agreements, and subcontracts), and that all subrecipients shall certify and disclose accordingly.

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

APPENDIX F

PROGRAM PLANNING BUDGET PROFILE

The Pluto-Kuiper Belt (PKB) funding profile is subject to a wide variety of uncertainties and pressures. NASA budgets are approved on a year-by-year basis. A mission funding profile typically begins with planning studies at a low funding level and then ramps up to peak near or just preceding launch, followed by a ramp down phase. For planning purposes, a profile for a five (5) year mission is provided in the table below (years 6+ rolled into the fifth year).

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Percent of Total	3*	9*	23*	35*	30*

*Note: Current figures are in the PKB Library

APPENDIX G

RADIOISOTOPE THERMOELECTRIC GENERATOR (RTG) CAPABILITIES AND COSTS

Radioisotope Thermoelectric Generators (RTG's) for the Pluto-Kuiper Belt (PKB) mission, if required, must be provided by NASA via the Department of Energy as Government Furnished Equipment (GFE). Since it is unlikely that any new units can be developed and built in the timeline necessary to support this mission, existing hardware will be serviced and used. There are presently two known sets of hardware that can be made available which come from units and partial units of prior missions. These are designated F-5 and E-8 and are similar to each other in size, mass, interfaces, and etc. The beginning of mission (BOM) and end of mission (EOM = launch + 10 years) power for each of these units is slightly different, however, with the E-8 unit power level being approximately 50 watts higher. The specifications for these units are as follows:

F – 5:

Volts: 30
Watts: BOM= 219; EOM = 180
Mass: 56 kg
Volume: cylindrical, end-mounted 114 cm x 42 cm diameter
Cost: $40M* estimated

E-8:

Volts: 30
Watts: BOM = 290; EOM = 230
Mass: 56 kg
Volume: cylindrical, end-mounted 114 cm x 42 cm diameter
Cost: $50M* estimated

*Note: These costs represent the costs to be paid to the Department of Energy to assemble, service, and support the units through launch, including any analysis or data necessary for the launch approval process. If both units are needed for the mission, the total cost is approximately $75 M. All such costs must be included in the Proposed Cost to OSS (see Announcement of Opportunity Section 3.6.1).

More specific RTG technical information is available regarding interface details and other requirements in the PKB Library which can be accessed via the internet at the below Internet URL: http://www.nra-aoinfo.com/space/pluto/library.html

For additional information about the RTG's or their flight implementation, contact Mark Dahl at NASA Headquarters, Code SD: mdahl@hq.nasa.gov; phone: (202) 358-0306.