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# **Solar Terrestrial Probes**

## **GUIDELINES AND CRITERIA FOR THE MMS PHASE A CONCEPT STUDY**

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**January 13, 2004**

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## GUIDELINES AND CRITERIA FOR THE PHASE A CONCEPT STUDY

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### INTRODUCTION

It is planned that a subset of proposed investigations from the Magnetospheric Multiscale Mission (MMS) Announcement of Opportunity (AO) will be selected and awarded contracts for Phase A concept studies. The concept study will constitute the investigation's requirements definition phase (Phase A) of the formulation subprocess as outlined in NPG 7120.5A, *NASA Program and Project Management Processes and Requirements*. The purpose of a concept study is to better define the investigation, its implementation requirements (both engineering and management), and its risks, as well as to describe the plans for education and public outreach, small disadvantaged businesses, and new technology. Upon completion of the concept study, proposers will submit a Concept Study Report (CSR) for NASA evaluation. The CSR is to be a self-contained document; that is, selected investigators must not assume that NASA evaluators will have reviewed or even have access to the original proposal.

The CSR is due by 4:30 pm EDT April 26, 2004, at

MMS Concept Study Support Office  
NASA Peer Review Services  
500 E Street, SW  
Suite 200  
Washington DC 20024  
202-479-9030

Please note that all program constraints, guidelines, definitions, and requirements given in the AO are still valid for the CSR except as noted herein.

Part I of this document discusses the criteria to be used by NASA for the evaluation of the CSR's. Part II provides guidance for preparation of the CSR's. Appendix A provides definitions of cost element terms used in the cost plan section of this document. Appendix B provides evaluation criteria, requirements, and guidelines for the Education and Public Outreach aspects of the CSR.

#### Changes from AO 03-OSS-01

The following are changes from the AO.

Table 1.1. Funding profile of the Magnetospheric Multiscale Mission in Real Year \$M is replaced by

	FY 04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	Total
Phase A	1.0										0.75
Phase B	1.25	6.5									8
Phase C/D			21	31	31	25	7.5				115.5

Phase E							2.5	5	5	3	15.5
Total	2.25	6.5	21	31	31	25	10	5	5	3	139.75

Proposals must provide a cost reserve of at least 20% for Phase C and D and 10% for Phase E.

5.1 Description of the MMS Mission

Replace the second paragraph with:

"The main responsibility of proposers is to present a scientific investigation that effectively addresses the primary MMS science objective of exploring and understanding the fundamental plasma physical process of magnetic reconnection. The MMS investigation defined by the STDT was used as a basis for planning for the development of this mission. An important feature of the STDT mission design was the baselining of a Delta 7925H launch vehicle. Proposers should give careful consideration to the results of the STDT study, but they are not required to duplicate the mission envisioned by the STDT."

Section 5.1.1 Nominal Payload Resources

Delete the last sentence of the first paragraph and Table 5.1

Replace with:

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Proposers are expected to work with the MMS Project in optimizing the instrument and spacecraft designs within the mission cost cap. The MMS Project will assist the proposer in identifying the resources available to the payload for a proposed mission design and spacecraft configuration. The MMS Project will also identify any impacts or benefits to the mission cost cap, spacecraft costs, launch vehicle margins, spacecraft margins and other technical issues for the proposed mission design and spacecraft configuration. The proposed instrument suite, mission design and spacecraft configuration must fit within the total mission resources with adequate margin and reserves for all mission resources.

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Section 5.1.6 Project Schedule is replaced by

- AO ISST Phase A Selection September 29, 2003
- Instrument Suite Phase A Concept Studies Complete April 24, 2004
- Instrument Suite Downselect September 9, 2004
- Instrument Suite Systems Requirements Review December 2004
- Initial Confirmation Review April 2005
- RSDO S/C Selection August 2005
- Instrument Suite Preliminary Design Review (PDR) Complete October 2005

- Mission PDR December 2005
- Mission Confirmation Review February 2006
- Instrument Suite Critical Design Review (ICDR) Complete October 2006
- Mission CDR December 2006
- Begin Instrument Suite Delivery June 2008
- Complete Instrument Suite Delivery December 2008
- Mission Environmental Testing Complete May 2009
- Launch Ready July 2009
- Launch (next launch opportunity after launch readiness) January 2010

### Phase A Study Activities and Support

During the Phase A Study period the GSFC MMS Project office will act as a resource to the proposer by providing information on the planned spacecraft interfaces, resources, operations, launch vehicle, and ground system. Since a supplier for a specific spacecraft design will not be under contract during the Phase A study, the GSFC MMS project office will also work with the proposer to conduct trade studies on instrument suite requirements and the planned spacecraft design. It is expected that the instrument study teams will interact with the project to optimize the instrument suite and spacecraft design during the Phase A period. During the Phase A study, the GSFC Project Office will develop a report on each proposal which identifies the proposals impact on spacecraft design, operations, and cost. This report will be turned in with the proposal. The information in the GSFC report will be shared with the proposer as it is developed during the Phase A study period. To support these activities the proposer should plan on frequent technical interchanges with GSFC during the Phase A study. Additional details and logistics of the GSFC support during the phase A will be discussed at the Kickoff meeting for the Phase A study.

After the Phase A Concept Study has been turned in the NASA evaluation team of the Phase A Concept Study Report will conduct a site visit for each proposed investigation. The timing of these site visits will be several weeks after the Phase A Concept Study reports are due and will be approximately one day in length. The specific date of the site visit will be discussed at the Kickoff meeting for the Phase A Concept Study.

## PART I - EVALUATION CRITERIA

The NASA evaluation of the Concept Study Reports will be conducted in much the same fashion as the evaluation of the proposals as discussed in Section 7.0 of the AO. However, in addition to considering any changes to the science objectives from those in the phase one proposal, this evaluation will consider in detail all factors related to the probability of mission success and to the realism of the proposed costs to NASA. This evaluation will also consider other factors that enhance the return on NASA's investment in the investigation such as education and public outreach, new technology transfer and infusion, small disadvantaged business activities and the involvement of minority institutions. It is expected that plans for these elements of the investigations will be taken to the next level of detail and maturity along with the development of the science, engineering, and cost.

Successful implementation of the MMS instrument suite demands, in addition to scientific merit, that the investigation be achievable within the established constraints on cost and schedule. The information requested in Part II of this document will enable the evaluation panel to determine how well each investigation team understands the complexity of its proposed investigation, its technical risks, and any weaknesses that require specific action during Phase B.

The criteria for evaluating the concept study are as follows:

- a. Scientific merit of the proposed investigation
- b. Technical merit and feasibility of the proposed investigation
- c. Feasibility of the proposed approach for investigation implementation, including cost risk to the mission and impact to spacecraft resources
- d. Quality of plans for education and public outreach (E/PO)
- e. Quality of plans for advanced technology infusion and transfer
- f. Quality of plans for small disadvantaged business activities and involvement of minority institutions.

The first criteria (criteria a above) is the same as described in Section 7.1 of the AO. The science objectives must not change from those given in the proposal. The second criteria is the same as the second criteria in section 7.1 without consideration of the spacecraft resources. Any changes to science implementation will be carefully evaluated. If there are no substantive changes in the science implementation, then the scientific merit of the proposed investigation (criteria a above and the technical merit of the science investigation (first half of criteria b) will not be reevaluated. In this case, the evaluations of scientific merit and of technical merit of science implementation of the original proposal will be used. Assuming that there are no changes to the proposed science or its implementation, the emphasis of the evaluation will be on the technical feasibility of the science implementation (2<sup>nd</sup> half of the criteria b) and on the latter four criteria (c, d, e, f, above), more fully described below. Of these criteria (2<sup>nd</sup> part of b, and c, d, e, and f above), the feasibility of proposed approach for investigation implementation (criteria c), including the technical feasibility of the science implementation (2<sup>nd</sup> half of criteria b), is of more importance than the combination of the other three criteria (d, e, f). E/PO (criteria d) is as important as the combination of the last two criteria (e, f), which are of equal importance. Total cost to NASA OSS will be a selection but not an evaluation criterion.

## **Feasibility of the Proposed Approach to Investigation Implementation, including Cost Risk**

The information requested in Part II of this document will be used to evaluate each investigation in detail for the feasibility of investigation implementation as reflected in the perceived risk of accomplishing the investigation within proposed resources. The feasibility criterion in the AO will be supplemented with the following considerations:

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. 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 investigation, including contributions). The experience and expertise of the development organizations will be important factors in assessing the probability of success. 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 investigations, etc.) used to develop and validate the estimated cost and must include a discussion of cost risks. Innovative cost effective features, processes, or approaches will be rewarded if proven sound.

The evaluation will consider the proposer's understanding of the processes, products, and activities required to accomplish development of all elements (e.g., multiple instrument suites, ground and data systems, etc.), the integration of all elements, and the adequacy of the proposed approach including reserves and margins. The technical approach will be examined in its entirety to ensure that: (1) all elements and processes are addressed, (2) weaknesses and design issues are understood and plans for resolution have been identified, (3) fundamental design trades have been identified and studies planned, and (4) primary performance parameters have been identified and minimum thresholds established. GFE, as defined in the AO, will be assessed to verify that it is being used within its intended capability. The overall approach (including schedule), the specific design concepts, and the known hardware/software will be evaluated for soundness, achievability, and maturity. Resiliency and design performance margins will be factors in this evaluation. Proposers must address how developmental problems with new technology will be addressed in order to ensure mission success.

The credibility and realism of the cost estimates and the planned financial resiliency will be evaluated. The underlying rationales for the cost estimates, including reserves, and the development schedule, including schedule margins, will be factors in this evaluation. The adequacy of reserves in the context of the recommendations of the NASA Integrated Action Team (NIAT) are also factored into this evaluation.

The information provided in the Management section must demonstrate the proposer's plans, processes, tools, and organization for managing and controlling the development and operation of the instrument suite, including performance measurement and reporting. The soundness and completeness of the approach and the probability that the management team can assure mission success will be evaluated by reviewing the organizational structure (including roles, responsibilities, accountability, and decision making process) and the processes, plans, and strategies the team will use to manage the various investigation elements through all phases of the mission. Factors in this evaluation will include: clear lines of authority, clean interfaces, prudent scheduling and cost control mechanisms, review processes, and demonstrated awareness of all necessary management processes. The adequacy with which risk management activities are planned and budgeted incorporating the recommendations of the NASA Integrated Action Team (NIAT) Report, are also factored into this evaluation. Additional factors in the evaluation of the probability of investigation success will include the experience, expertise, and commitment of key personnel and the organizations to which they are attached, the adequacy of facilities and equipment proposed for the mission, the adequacy of the team's approach to risk management, and the adequacy of the management and control mechanism. Innovative management processes and plans will be rewarded if proven to be sound.

The completeness of the Phase B plans will be considered in determining the adequacy of the Phase B approach. This will include an evaluation of the activities/products, the organizations responsible for those activities/products, and the schedule to accomplish the activities/products.

### **Quality of Plans for Education and Public Outreach**

All proposed investigations must include an Education/Public Outreach component as part of their Concept Study Report. The criteria to be used to evaluate the E/PO component are given in Appendix B of this document. See also section 5.5.1 of the AO, and section H1 and Appendix B of this document for further details on the E/PO requirements.

### **Quality of Plans for Advanced Technology Infusion and Transfer**

The technology plan will be reviewed to determine the extent to which it meets the requirements given in section 5.5.2 of the AO. See section H2 of this document for further information.

### **Quality of Plans for Small Disadvantaged Business Activities and involvement of Minority Institutions.**

The small disadvantaged business plan will be evaluated to determine the extent to which it meets the participation requirements and goals given in section 5.5.3 of the AO. See section H3 of this document for further information.

## PART II - REQUIRED QUANTITIES, MEDIA, FORMAT, AND CONTENT

Forty paper copies of the Concept Study Report are required. An additional 25 copies of the Fact Sheet (see Section C, below) are required. It is required that each paper copy of the CSR be accompanied by a CD containing an electronic version of the CSR in a single file to facilitate searching for specific information (the PDF format is preferred) that is readable by a PC and a Mac computer. The PDF document must be searchable and bookmarks must be used to outline major sections of the document. In addition, a tab delineated file must be included in the CD for all cost tables. The required uniform format and contents are summarized below. Failure to follow this outline may result in reduced ratings during the evaluation process.

When changes have been made to any data provided with the original proposal as a result of the concept study, these changes from the proposal must be clearly identified. The content of each requirement is discussed in the subsequent paragraphs. Note that all program constraints, guidelines, requirements, and definitions given in the AO are still valid for the Concept Study Report except as noted herein.

The CSR shall contain no more than 121 (section B-I) pages, including no more than seven foldout pages (28 x 43 cm; i.e., 11 x 17 inches). Three-ring binders may be used.

- A foldout page counts as one page
- All pages other than foldout 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 may contain more than 55 lines of text and the type font must not be smaller than 12-point except within figures and tables, where the type font must not be smaller than 10-point.

The following page limits apply:

<b>Section</b>	<b>Page Limit</b>
A. Cover Page and Investigation Summary	No page limit, but be concise
B. Table of Contents	2
C. Fact Sheet	2
D. Executive Summary	5
E. Science Investigation (changes highlighted)	47
F. Technical Approach and Mission Design G. Management Plan H. Education, Public Outreach, New Technology, and Small Disadvantaged Business Plans I. Phase B Plan	75
J. Cost Plan for Phases A through E	No page limit, but data must be presented in formats described; be brief
K. Appendices (No other appendices permitted) 1. Letters of Endorsement 2. Relevant Experience and Past Performance 3. Resumes 4. Statement(s) of Work for Each Contract Option 5. Data Management Plan 6. Any Incentive Plan(s) 7. Any NASA PI Proposing Team 8. Technical Content of Any International Agreements 9. Discussion on Compliance with U.S. Export Laws and Regulations – Update from Proposal 10. Mission Definition and Requirements Agreement 11. Acronyms List 12. Reference List (Optional)	No page limit, but small size encouraged

## A. COVER PAGE AND INVESTIGATION SUMMARY

A Cover Page and Investigation Summary must be a part of the proposal, but will not be counted against the page limit. It must be signed by the Principal Investigator and an official by title of the investigator's organization who is authorized to commit the organization. Create a custom cover page which contains the following information. The full names of the Principal Investigator and the authorizing official, their addresses with zip code, telephone and fax numbers, and electronic mail addresses, are required, as well as the names, institutions, and E-mail addresses of all participants, the type of investigation proposed, the total NASA OSS Cost, and a 200-word Summary. A hard copy version of this Cover must be printed in time to acquire signatures and include with the original hard copy of the CSR.

## B. TABLE OF CONTENTS

The CSR shall contain a table of contents that parallels the outline provided in Sections C through K below.

## C. FACT SHEET

A Fact Sheet that provides a brief summary of the proposed investigation must be included. The information conveyed on the Fact Sheet must include the following: science objectives (including the importance of the science to the NASA Sun-Earth Connection science theme), investigation overview (including investigation objectives and major mission characteristics), science payload, major elements of the E/PO program, investigation 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. EXECUTIVE SUMMARY

The Executive Summary is to be a summary of the contents of the CSR and is to include an overview of the proposed baseline investigation including its scientific objectives, the technical approach, management plan, cost estimate, education and public outreach, technology, and small disadvantaged business plans. The Executive Summary must be no more than 5 pages in length.

## E. SCIENCE INVESTIGATION

This section shall describe the science investigation resulting from the Concept Study. Any descoping of, or changes to, the investigation from the baseline and minimum mission science defined in the proposal must be identified and the rationale for the change(s) given. Changes may be highlighted in bold with column marking for easy identification or may be provided in a change matrix giving the original (proposed) requirement, the new requirement, rationale for the change, and its location within the CSR. If there are no changes, this section must be repeated identically from the proposal with a statement that there are no changes.

Special attention must be given to assuring that both the planning and resources are adequate to analyze, interpret, process, and archive all the data produced by the investigation in the appropriate data archive. Resources include cost, schedule, and work-hours for scientific interpretation of results and publication.

It is expected that changes will be required in the description of the science implementation, especially as relates to the criterion for feasibility. A page quota larger than that in the step 1 proposal has been allotted for this purpose.

## F. TECHNICAL APPROACH AND MISSION DESIGN

The Technical Approach section must detail the method and procedures for investigation definition, design, development, testing, integration, ground operations, and flight operations. A discussion of all new/advanced technologies planned for the investigation must be provided and include backup plans with scheduled decision criteria if those technologies cannot be made ready. This section must also detail the expected products and end items associated with each phase. Investigation teams have the freedom to use their own processes, procedures, and methods. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged when cost, schedule, technical improvements, and risk containment can be demonstrated. The benefits and risks, if any, of any such processes and products must be discussed. This section must be complete in itself without the need to request additional data, although duplications may be avoided by reference to other sections of the CSR if necessary.

1. Technical Approach Overview. This section must provide a brief overview of the technical approach including its key challenges.
2. Science Payload. This section must describe the science payload for the investigation. Highlight any changes to the payload or individual instruments or their performance since submission of the proposal. Information pertinent to the accommodation of the instrumentation on the spacecraft must also be included. Subsystem characteristics and requirements must be described. Such characteristics include: mass, volume, and power requirements; pointing requirements; new developments needed; and a space qualification plan. Include where appropriate: block diagrams, lower-level mass breakouts listing major components (master equipment list – see a sample master equipment list in Figure 8) layouts, calibration plans, operational and control considerations, and software development. Any design features incorporated to effect cost savings must be identified. A summary of the resource elements of the instrument design concept, including key margins, must be provided. The rationale for margin allocation must be provided. Those design margins that are driving costs must be identified. Reference may be made to Section E of the CSR to avoid duplication. Discussions of the plans for new technology and back-up alternatives must be discussed. The Office of Space Science requires all enabling technology required must be at a level of TRL 5 or higher before a project may enter phase B. Also, all enabling technology must be at TRL level 6 or beyond to transition from phase B to C (Formulation to Implementation)

3. Science Impacts on Mission Operations. This section should fully describe the science requirements that impact the operational phase of the mission. It should include information on science requirements that may affect the proposed launch date, and launch window constraints (if any). This section should also describe the underlying science requirements for the tetrahedron configuration for each phase of the mission. (The system engineering team will use these requirements to determine mission design parameters such as Delta V budget; the separation strategy and necessary station keeping required to maintain the observatories in the tetrahedral formation during each phase; Luna fly-by concept; etc.)
4. Spacecraft Accommodations. This section should describe in detail the accommodations required of the spacecraft bus and manufacturing facility to support the suite. A “traceability matrix” showing how the proposed instrument accommodations comply with the stated objectives, requirements and constraints of the proposed investigation must be included. The instrument accommodations must include a discussion of all suite requirements that impact the various spacecraft subsystems, including attitude control (pointing, pointing stability, spin rate, etc), mechanical (individual mass, mounting constraints, co-alignment requirements between instruments of the instrument suite, etc.), C&DH (peak and average data rates, daily data volume, timing requirements within and between spacecraft, etc.), power (peak, average and survival & operational heater power, etc.), thermal (operational and survival, etc.), propulsion (contamination sensitivity, etc.) and ranging (inter-spacecraft time correlation, range accuracy, constraints on antenna height, etc.) Requirements for spacecraft simulators should be stated, if there are such requirements.
5. Major Spacecraft Trades. This section should discuss the major trades between the instruments and spacecraft. The criteria for the final choices should also be presented. This section should include an overall proposed architecture for the suite, including describing interdependencies of the suite hardware. If there are major departures from the design of the instruments, spacecraft or mission described in the STDT report, they should be explained here. The accuracy required and other salient requirements for the ranging systems should be discussed in this section. This section should also describe the future areas for trades between the suite and the spacecraft.
6. Ranging System. A ranging system will be available on the mission. However, study teams are encouraged to work with the MMS systems team to define and refine the system specification. The ranging system is briefly described in the STDT report and the salient specifications have remained the same. Teams wishing to change the specifications should work with the MMS Project. Describe in this section the specifications for the ranging system required by the investigation as a result of the discussions during the phase A study period.
7. Fabrication and Test. Discuss the manufacturing strategy to produce, test, and verify the hardware/software necessary to accomplish the science goals of the suite. Include a description of the main processes and procedures planned in the fabrication of flight hardware, software, production personnel resources,

incorporation of new technology/materials, and the preliminary test and verification program. Provisions and facilities required to produce four instrument suites should be described. Discuss past experience, if any, at producing multiple identical sets of instruments. Describe plan to manufacture identical instruments, and workforce plan to staff fabrication of four identical sets of instruments. Discuss how the fabrication flow will support the project schedule. A description of the approach for transitioning from design to manufacturing should be included. The ability to assure reproducibility and adequacy of tooling availability should be addressed.

8. Suite Integration and Test. The environmental tests planned should be discussed, and proposed test margins and durations for the environmental test program described. The approach, techniques, and facilities planned for integration, test and verification, and launch operations phases (including launch site testing and processing), consistent with the proposed schedule and cost, should be described. A preliminary schedule for manufacturing, integration, calibration and test activities should be included. A description of the planned end items, including engineering and qualification hardware, should be included.
9. Suite Calibration and Inter-calibration. This section should describe the approach to calibrating, and inter-calibrating the instruments. Pre-launch and post-launch calibrations should be discussed. As defined in the MMS Project Definition Document, the MMS Project does not anticipate any hardware removal after the constellation is stacked. Any activities and constraints that will impact on the observatory level processing (e.g. removal of instruments after observatory environmental test) should be discussed. Any activities that impact on mission operations (e.g. changing observatory orientation) after launch should be discussed.
10. Science Data Analysis. If new analysis methods are required, or if existing algorithms need to be modified, the process should be described in this section.
11. Instrument Suite Operations. This section should discuss the pre-planned campaigns, which should include science requirements for tetrahedron separation, orientation, and maintenance. The planned approach for managing instrument operations and all flight operations support, including inputs to mission planning and scheduling, suite command sequence generation, and data analysis should be discussed. A discussion of the system by which the instrument operations will be modified during the mission should be included. Describe all inter-facility communications, computer security, or near real-time ground support requirements, and indicate any special equipment or skills required of ground personnel. The Level 1 data products, software tools, and the timeframe they will be made available to the science community should also be discussed.
12. Facilities. Provide a description of any new, or modifications to existing, facilities, laboratory equipment, and ground support equipment (GSE) (including those of the team's proposed contractors and those of NASA and

other U.S. Government agencies) required to execute the investigation. The outline of new facilities and equipment must also indicate the lead time involved and the planned schedule for construction, modification, and/or acquisition of the facilities.

13. Mission Assurance, Reliability and Safety. This section should describe the process by which product quality is assured to meet the NASA mission specifications, including identification of trade studies, the parts selection strategy, and the plans to incorporate new technology. Further information on the MMS mission assurance requirements is detailed in the “Mission Assurance Requirements (MAR) for MMS”, which is available from the proposal web library. This section should also describe any waivers to the requirements of the MAR that the suite team plans to submit. Also include plans for problem/failure reporting, inspections, quality control, parts selection and control, reliability, safety assurance, and software validation. In addition, investigators should be aware of mission assurance topics of recent Agency-level special emphasis for all NASA missions. Such topics include the Integrated Review Team Process, subsystem-level Failure Mode Effects Analysis, Probabilistic Risk Assessment (PRA) with its subset of analysis tools, Continuous Risk Management, and Software Independent Verification and Validation. In view of the need for multiple operating suites, a preliminary PRA should be included in the final report.
14. Mission Design. This section should describe the mission design in sufficient detail that it can be verified that the resources for the mission are available with sufficient margins and reserve. Resources summaries at the launch vehicle level and the spacecraft level showing all resources and the margins and reserves must be provided.

## G. MANAGEMENT PLAN

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

1. Team Member Responsibilities. This section must describe the roles, responsibilities, time commitment, and experience of all team member organizations and key personnel, with particular emphasis placed on the

responsibilities assigned to the Principal Investigator (PI), the Project Manager, and other key personnel. In addition, information must be provided which indicates what percentage of time key personnel will devote to the mission, the duration of service, and how changes in personnel will be accomplished. (Note: The experience of the PI and science team members does not need to be included in this section since that is addressed in the science investigation section.)

- a. Organizational Structure. The management organizational structure of the investigation team must be described in the CSR. A Work Breakdown Structure (WBS) must be provided. The CSR must describe the responsibilities of each team member organization and its contributions to the investigation. Each key position, including its roles and responsibilities, how each key position fits into the organization, and the basic qualifications required for each position, must be described. A discussion of the unique or proprietary capabilities that each member organization brings to the team, along with a description of the availability of personnel at each partner organization to meet staffing needs must be included. The contractual and financial relationships between team partners must be discussed. An example of a WBS is included in the MMS online library.

Summarize the relevant institutional experience in this section, and refer to supporting detail included in Section K2, Relevant Experience and Past Performance. If experience for a partner is not equivalent to, or better than, the requirements for the proposed investigation, explain how confidence can be gained that the investigation can be accomplished within cost and schedule constraints.

- b. Experience and Commitment of Key Personnel. Provide a history of experience explaining the relationship of the previous experience to each key individual's role; include the complexity of the work and the results.
    - i. Principal Investigator. The role(s), responsibilities, and time commitment of the Principal Investigator must be discussed. Provide a reference point of contact, including address and phone number.
    - ii. Project Manager. The role, responsibilities, time commitment, and experience of the Project Manager must be discussed. Provide a reference point of contact, including address and phone number.
    - iii. Other Key Personnel. The roles, responsibilities, time commitments, and experience of other key personnel in the investigation including Co-Investigators must be described. Those investigations that include Co-Is or other key personnel that are not identified as having key specific responsibilities will be penalized.
2. Management Processes and Plans. This section must describe the management processes and plans necessary for the logical and timely pursuit of the work (including E/PO), accompanied by a description of the work plan. This section must also describe the proposed methods of hardware and software acquisition.

The management processes which the investigator team proposes, including the relationship between organizations and key personnel must be discussed, including the following, as applicable: systems engineering and integration; requirements development; configuration management; schedule management; team member coordination and communication; progress reporting, both internal and to NASA; performance measurement; and resource management. This discussion must include all phases of the mission including preliminary analysis, technical definition, the design and development, descope concepts and instrument operations phases, along with the expected products and results from each phase. Unique tools, processes, or methods which will be used by the investigation team must be clearly identified and their benefits discussed. The philosophy to be used for spares should be defined and discussed. It is required that in addition to the suite of instruments for each spacecraft, each instrument in the suite will provide one fully qualified flight spare. All project elements must be covered to assure a clear understanding of project-wide implementation.

3. Schedules. The schedule and workflow for the complete mission life-cycle must be clearly defined, and the method and tools to be used for internal review, control, and direction discussed. Schedules for all major activities, interdependencies between major items, deliveries of end items, critical paths, schedule margins, and long-lead procurement needs (defined as hardware procurements required before the start of Phase C/D) must be clearly identified and discussed.
4. Risk Management. This section must describe the approach to, and plans for, risk management to be taken by the team, both in the overall mission design and in the individual systems and subsystems. Plans for using standard risk management tools, especially fault tree analysis, probabilistic risk assessments, and failure modes and effects analyses, must be described. A preliminary risk assessment must be performed which identifies the major technical, programmatic and budget risks associated with the suite development. The top 3 risks and their mitigation plans must be discussed. Particular emphasis must be placed on describing how the various elements of risk, including new technologies used, will be managed to ensure successful accomplishment of the mission within cost and schedule constraints. Investigations dependent on new technology will be penalized for risk if adequate plans to ensure success of the investigation are not described.

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

schedule, and performance must be fully discussed. When considering potential descope options, consider the investigation as a total system including instrument(s), ground system, and operations.

5. Government Furnished Property, Services, Facilities, etc. This section must clearly delineate the Government-furnished property, services, facilities, etc. required to accomplish all phases of the investigation.
6. Reviews. This section must list the major project reviews expected to be conducted during the project's life cycle and the approximate time frame of each. The objective of each review must be indicated. The formal review program covering mandatory reviews is described in the MMS Instrument MAR. Allowance must also be made for government-initiated independent assessment reviews, such as Confirmation Assessments, Independent Annual Reviews and Red Team Reviews. Note that regular reviews of the progress of the E/PO component of the missions must be held in the same way that progress on the scientific and technical aspects are reviewed. This section should also describe the peer review process to be implemented by the instrument suite.
7. Reporting. This section must clearly describe the approach to reporting progress to the Government and indicate the progress reviews the Government is invited to attend to provide independent oversight. The process, including the individual or organization responsible for reporting integrated cost, schedule, and technical performance must be discussed. A description of the information to be presented must be included. Planned project status reporting must include quarterly presentations to the governing Program Management Council (PMC), monthly status reporting to the GSFC Program Office, and after the Project Critical Design Review (CDR), a brief weekly summary of progress via a web-based NASA Office of Space Science reporting site.

#### H. EDUCATION AND PUBLIC OUTREACH, NEW TECHNOLOGY, AND SMALL DISADVANTAGED BUSINESS PLAN

The education and public outreach, new technology, and small disadvantaged business plan must provide a summary of the benefits offered by the mission beyond the scientific benefits brought by obtaining and analyzing the desired scientific data.

1. Education and Public Outreach Activities. This section must build upon and extend the discussion of E/PO activities given in the proposal. See Appendix B of this document for guidance. As noted earlier in these Guidelines, it is expected that the Concept Study plans will be substantially refined and expanded beyond the level of detail contained in the original proposal. Plans for product development and dissemination, contributions to the training of underserved and/or underutilized groups in science and technology, arrangements with partners, schedules and budgets for activities, and etc., are to be defined in sufficient detail that they can be evaluated at an appropriate level of depth. Where appropriate, references should be made to the Management Plan and other relevant sections for information on

how the work is to be arranged, directed, implemented, reviewed, and reported. Letters of support/commitment from partners/subcontractors and resumes from key E/PO personnel must be included as appendices to the concept study report.

2. Small Disadvantaged Business and Other Minority Institutions. A summary plan is required specifying the proposed investigation's commitment to meet NASA's SDB and other minority institution participation goals as described in Section XIII of Appendix A of the AO. In addition, as also specified in Appendix A, subcontracting plans will be required to execute the contract option for investigation implementation. Phase A funds can no longer be used to develop subcontracting plans. Reimbursement for subcontracting plans can only be as an indirect, so-called bid and proposal, cost.
3. New Technology. This section must 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 must be described. Also to be discussed is the development of partnerships among space, non-space 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.

#### I. TECHNICAL DEFINITION (PHASE B) PLAN

This section must describe the plans and products for the technical definition phase (Phase B) of the Project. The key investigation tradeoffs and options to be investigated during the Phase B must be identified. This section must identify those issues, technologies, and decision points critical to mission success. These plans must include a detailed schedule and define the products (including a Project Plan) and the schedule for their delivery.

#### J. COST PLAN

The cost plan must provide information on the anticipated costs for phases A through E for the baseline launch date. A detailed cost proposal is required for Phase B/C/D. Cost estimates are required for Phase E, including a description of the estimating techniques used to develop the cost estimates. (Note: see Section L for requirements for any Phase F costs.) A discussion of the basis of estimate must be provided with a discussion of heritage and commonality with other projects. Quantify and explain any cost savings that result from heritage. All costs, including all contributions made to the investigation, must be included. Proposers must complete a summary of total mission cost by fiscal year as shown in **Figure 1**, Total Mission Cost Funding Profile. The purpose of this summary is to present all costs for the project *on one page*, by project phase (A through E), by participating organization, and by fiscal year. If obligation authority in excess of identified costs is required, the proposal must also indicate the authority needed by year. (Note: "fiscal year" shall be interpreted to be Government Fiscal Year throughout this document unless specified otherwise.)

In addition, for each phase of the investigation (A, B/C/D, and E) a Time Phased Cost Breakdown for each Work Breakdown Structure (WBS) element, as shown in **Figure 2**, must be completed. Use only the line items shown in Figure 2 that are relevant for each phase of the project. The purpose of this set of Figures is to provide detailed insight into how the project allocates funding during each phase of work.

The cost of the entire project must be summarized on one page, and presented in the format shown in **Figure 3**. The purpose of Figure 3 is to (1) provide detailed insight into project costs by cost element and (2) provide a basis for comparison of the project proposed cost with the evaluation team's independent cost analysis. Identify each reserve amount to the lowest level consistent with the proposed reserve management strategy. For example, if each subsystem manager will have spending authority over a reserve for the subsystem, each such amount must be identified separately. If more convenient, the reserve details may be shown in a separate table, with totals reported as shown in Figure 3. Show costs for all development elements by recurring and non-recurring components in the format of **Figure 4**. Show costs (NASA OSS and contributed) associated with each Co-Investigator in the format of **Figure 5**. All co-investigators must be included in Figure 5. Note that all contributions, including Co-I support, must be documented by a Letter of Endorsement. Proposer must also provide a detailed cost breakout organized by their project –specific WBS as part of the cost plan.

Proposers must include all contributions provided by non-OSS NASA Centers, including Civil Servant services, as well as the cost for the use of Government facilities and equipment on a full-cost accounting basis. All direct and indirect costs associated with the work performed at NASA Centers must be fully costed and accounted for in the proposal and summarized using the template provided in **Figure 6**. The purpose of this data is twofold: 1) to determine those costs that are included in the NASA OSS cost but are not funded out of the MMS program, and 2) to determine civil service contributions that are not included in the NASA OSS cost. Teams should work with their respective NASA Centers to develop estimates for these costs.

Note that the definitions for cost element terms shown in the cost figures are given in Appendix A of this document. This is not to be confused with the elements of cost listed in 1.e below.

The inflation index provided in Appendix B (Table B4) of the AO must be used to calculate all real-year dollar amounts, unless an industry forward pricing rate is used. If something other than the provided inflation index is used, the rates used must be documented.

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

1. Definition, Design, and Development (Phase B/C/D) Cost Proposal. This section provides a detailed cost proposal for performing Phase B/C/D. The cost

proposal should correlate with the plans set forth in the Science, Technical Approach, and Management sections of the concept study

- a. Work Breakdown Structure. A Work Breakdown Structure (WBS) must be included for Phase B/C/D. The structure of the WBS should be consistent with the plans set forth in the Technical Approach and Management sections of the concept study and the Statement of Work provided as an Appendix to the concept study. The WBS shall be described to the major component level for more complicated instruments. All other elements of the WBS must be at least to the major task level (e.g., Project Management, Systems Engineering, Ground Support Equipment).
- b. Workforce Staffing Plan. Provide a workforce staffing plan which is consistent with the Work Breakdown Structure. This workforce staffing plan must include all team member organizations and must cover all management, technical (scientific and engineering), and support staff. The workforce staffing plan must be phased by fiscal year. Time commitments for the Principal Investigator, Project Manager, Co-Investigators, and other key personnel must be clearly shown.
- c. Proposal Pricing Technique. Describe the process and techniques used to develop the Phase B/C/D cost proposal. For portions of the cost proposal developed using a grass-roots methodology, provide the bases from which the estimates were derived and details on how the estimates were extrapolated from the bases. For portions of the cost proposal derived from vendor quotes/historical actuals/catalogue prices/etc. include sufficient information to understand the fidelity of the values. For portions of cost the proposal derived from analogies, describe the value of and the methodology for extrapolating the analogy. For portions of the cost proposal derived parametrically, provide a description of the cost-estimating model(s) and techniques used in the Phase B/C/D cost estimate. Discuss the heritage of the models and/or techniques applied to this estimate, including any known differences between instruments contained in the model's data base and key attributes of the proposed instrument. Include the assumptions used as the basis for the Phase B/C/D cost and identify those which are critical to cost sensitivity in the investigation. If any "discounts" were assumed in the cost estimates for producing multiple copies of identical instruments, business practice initiatives or streamlined technical approaches, describe how these have been incorporated in the cost estimate and will be managed by the investigation team.
- d. Phase B/C/D Time-Phased Cost Summary. Provide a summary of the total Phase B/C/D costs consistent with Figure 2. The Phase B/C/D cost summary should be developed consistent with the Work Breakdown Structure and must include all costs to NASA OSS along with all contributed costs. The Phase B/C/D time phased cost summary must be phased by fiscal year.
- e. Elements of Cost Breakdown. To effectively evaluate the Phase B/C/D cost proposals, NASA requires cost or pricing data as defined in FAR 15.401 and

supporting evidence stating the basis for the estimated costs by the WBS levels used in Figure 2. This information is in addition to that provided in Figures 1 through 6. Provide Tables for each phase in the format in **Figure 7A**. The proposal will include, but is not limited to the following elements of cost:

- i. Direct Labor.
  - (1) Explain the basis of labor-hour estimates for each of the labor classifications.
  - (2) State the number of productive work-hours per month.
  - (3) Provide a schedule of the direct labor rates used in the proposal. Discuss the basis for developing the proposed direct labor rates for the team member organizations involved; the forward-pricing method (including midpoint, escalation factors, anticipated impact of future union contracts, etc.); and elements included in the rates, such as overtime, shift differential, incentives, allowances, etc.
  - (4) If available, submit evidence of Government approval of direct labor rates for proposal purposes for each labor classification for the proposed performance period.
  - (5) If Civil Servant labor is to be used in support of the Phase B/C/D study, but is not to be charged directly to the investigation, then this labor must be considered as a contribution by a domestic partner, subject to the same restrictions as other contributions by domestic or foreign partners. A discussion of the source of funding for the Civil Servant contributions must be provided.
- ii. Direct Material. Submit a summary of material and parts costs for each element of the WBS.
- iii. Subcontracts. Identify fully each effort (task, item, etc. by WBS element) to be subcontracted, and list the selected or potential subcontractors, locations, amount budgeted/proposed, and types of contracts. Explain the adjustments, if any, and the indirect rates (or burdens) applied to the subcontractors' proposed amounts anticipated. Describe fully the cost analysis or price analysis and the negotiations conducted regarding the proposed subcontracts. Phase A funds can no longer be used to develop subcontracting plans. Reimbursement for subcontracting plans can only be as an indirect, so-called bid and proposal, cost.
- iv. Other Direct Costs.
  - (1) Travel, Relocation, and Related Costs. Provide a summary of the travel and relocation costs including the number of trips, duration, and purpose of the trips.
  - (2) Computer. Provide a summary of all unique computer-related costs.
  - (3) Consultants. Indicate the specific task area or problem requiring consultant services. Identify the proposed consultants, and state the quoted daily rate, the estimated number of days, and associated costs (such as travel), if any. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.

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

v. Indirect Costs.

- (1) List all indirect expense rates for the team member organizations. Indirect expense rates (in the context of this AO) include labor overhead, material overhead, general and administrative (G&A) expenses, and any other cost proposed as an allocation to the proposed direct costs.
- (2) If the proposal includes support services for which off-site burden rates are used, provide a schedule of the off-site burden rates. Include a copy of the company policy regarding off-site vs. on-site effort.
- (3) If available, submit evidence of Government approval of any/all projected indirect rates for the proposed period of performance. Indicate the status of rate negotiations with the cognizant Government agency, and provide a comparative listing of approved bidding rates and negotiated actual rates for the past five (5) fiscal years.
- (4) Discuss the fee arrangements for the major team partners.

2. Science Operations and Data Analysis (Phase E) Cost Estimate. This section provides a cost estimate for performing the Science Operations and Data Analysis Phase (Phase E) portion of the mission. The Phase E cost estimates should correlate with the plans set forth in the Science, Technical Approach, and Management sections. In completing this section, the following guidelines will apply:

- a. Work Breakdown Structure. A Work Breakdown Structure (WBS) must be included for the Science Operations and Data Analysis Phase of the mission. The WBS should be consistent with the plans set forth in the Technical Approach and Management sections and the Statement of Work that is provided as an Appendix.
- b. Cost Estimating Technique. Describe the process and techniques used to develop the Phase E cost estimate. For portions of the cost proposal developed using a grass-roots methodology, provide the bases from which the estimates were derived and details on how the estimates were extrapolated from the bases. For portions of the cost proposal derived from vendor quotes/historical actuals/catalogue prices/etc. include sufficient information to understand the fidelity of the values. For portions of cost the proposal derived from analogies, describe the value of and the methodology for extrapolating the analogy. For portions of the cost proposal derived parametrically, provide a description of the cost-estimating model(s) and techniques used in your Phase E cost estimate. Discuss the heritage of the models applied to this estimate including any known differences between instruments contained in the model's database and key attributes of the proposed instruments. Include the assumptions used as the basis for the Phase E cost and identify those which are critical to cost sensitivity in the investigation. If any "discounts" were assumed in the cost estimates for operating multiple identical instruments, business practice initiatives or

streamlined technical approaches, describe how these have been incorporated in the cost estimate and will be managed by the investigation team.

- c. Workforce Staffing Plan. Provide a workforce staffing plan (including civil service) which is consistent with the Work Breakdown Structure. This workforce staffing plan must include all team member organizations and must cover all management, manufacturing, technical (scientific and engineering), and support staff. The workforce staffing plan must be phased by fiscal year. Time commitments for the Principal Investigator, Co-Investigators, Project Manager, and other key personnel must be clearly shown.
  - d. Phase E Time-Phased Cost Summary. Provide a summary of the total Phase E costs consistent with Figure 2. The Phase E cost summary should be developed consistent with the Work Breakdown Structure and must include all costs to NASA OSS, along with all contributed costs. The Phase E time phased cost summary must be phased by fiscal year.
  - e. Elements of Cost Break Down. Provide cost or pricing data as defined in FAR 15.401 and supporting evidence stating the basis for the estimated cost including but not limited to the elements of cost described under section K.1.e above.
3. Total Investigation Cost Estimate. This section must summarize the estimated costs to be incurred in Phases A through E including: Concept Study (Phase A), Technical Definition (Phase B); Design and Development Phase (Phase C/D); Science Operations and Data Analysis Phase (Phase E); and other ground system costs; and cost of activities associated with social or educational benefits (if not incorporated in any of Phases A through E). Figure 1 must be used to summarize these costs. The total investigation cost estimate should be developed consistent with the Work Breakdown Structure. Detailed plans for any aspects of the mission not discussed elsewhere in the CSR must be discussed here. The funding profile must be optimized for the mission. Contributions not included in the NASA OSS cost must be clearly identified as separate line items.
  4. Total E/PO Cost Estimate: This section must summarize the estimated costs to be incurred in Phases A through E of the investigation for the E/PO component. This summary should be consistent with and relate directly to the top-level E/PO budget lines in Figures 1 through 6 as appropriate and describe how these costs relate to the activities, products, programs, partnership arrangements, etc., defined in Section H.

**FIGURE 1**  
**TOTAL MISSION COST FUNDING PROFILE TEMPLATE**  
(FY costs\* in Real Year Dollars, Totals in Real Year and FY 2003 Dollars)

Item	FY03	FY04	FY05	FY06	FY07	...	FY12	Total (Real Yr.)	Total (FY 2003)
Phase A	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
- Organization B									
- etc.									
Phase B	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase C/D	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase E									
- Organization A									
E/PO	\$	\$	\$	\$	\$	\$	\$	\$	\$
Other (specify)	\$	\$	\$	\$	\$	\$	\$	\$	\$
<b>NASA OSS Mission Cost</b>	\$	\$	\$	\$	\$	\$	\$	\$	\$
Contributions by Organization (Non-U.S. or U.S.) to:									
Phase A	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase B	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase C/D	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase E									
- Organization A									
E/PO	\$	\$	\$	\$	\$	\$	\$	\$	\$
Other (specify)	\$	\$	\$	\$	\$	\$	\$	\$	\$
<b>Contributed Costs (Total)</b>	\$	\$	\$	\$	\$	\$	\$	\$	\$
<b>Mission Totals</b>								\$	\$

\* Costs must include all costs including fee

**FIGURE 2**

(Time Phased costs in Real Year Dollars, Totals in Real Year and FY2003 Dollars)

<b>TIME PHASED COST BREAKDOWN BY WBS AND MAJOR COST CATEGORY</b>					
<b>WBS/Cost Category Description</b>	<b>FY03</b>	<b>FY04</b>	<b>...</b>	<b>Total (RYS)</b>	<b>Total (FY2003\$)</b>
<b>Total Direct Labor Cost</b>	\$	\$	\$	\$	\$
WBS 1.0 Management					
WBS 2.0 Instrument 1					
Lower-level WBS elements for Instrment 1					
etc.					
<b>Total Subcontract Costs</b>	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
<b>Total Materials &amp; Equipment Cost</b>	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
<b>Total Reserves</b>	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
<b>Total Other Costs</b>	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
Fee					
E/PO					
Other (Specify)					
<b>Total Contract Cost</b>	\$	\$	\$	\$	\$
<b>Total Other Costs to NASA OSS</b>	\$	\$	\$	\$	\$
Ground Segment					
E/PO					
Other (Specify)					
<b>Total Contributions (Non-U.S. or U.S.)</b>	\$	\$	\$	\$	\$
Organization A:					
WBS # and Description					
etc.					
Organization B:					
WBS # and Description					
etc.					
<b>TOTAL COST FOR PHASE</b>	\$	\$	\$	\$	\$

**Figure 3**  
**TOTAL MISSION COST FUNDING PROFILE**  
**FY Costs in Real Year Dollars (to nearest thousand), Totals in RY and Fixed Year '03 Dollars**

Cost Element **	Formulation		SUBTOTAL Formulation*		Implementation			SUBTOTAL Implementation*		TOTAL LIFE CYCLE	
	FY1	FYx	RY \$	FY03\$	FY1	É	FYz	RY \$	FY03\$	RY \$	FY03\$
<b>Start to Launch + 90 Days (Phases A/B/C/D)</b>	<b>Enter each cost element</b>										
Phase A Concept Study											
Proj. Mgmt/Miss. Analysis/Sys. Eng.											
Instrument A											
Instrument B											
Instrument É											
Instr. Integration, Assembly and Test											
<i>Subtotal - Instruments</i>											
Spacecraft Accommodations											
S/C Integration, Assembly and Test											
Launch Ops (Launch +90 days)											
<i>Subtotal - Spacecraft</i>											
Science Team Support											
Pre-Launch GDS/MOS Development											
DSN/Tracking											
Other (2)											
<i>Subtotal Phases A-D before Reserves</i>											
Instrument Reserves											
Other Reserves											
<b>Total Phases A/B/C/D</b>											
<b>Launch + 90 Days to End of Mission (Phase E)</b>	<b>Enter each cost element</b>										
Mission Operations & Data Analysis (including Project Management)											
DSN/Tracking											
Other (2)											
<i>Subtotal Phase E before Reserves</i>											
Reserves											
<b>Total Phase E</b>											
<b>Launch Services</b>											
<b>Phase F (Extended Mission if Applicable)</b>											
<b>Total NASA Cost</b>											
Contributions (2)											
Total Contributions											
<b>Total Mission Cost =</b> →											

(1) Other Hardware Elements: Probes, Sample Return Canister, Etc.  
(2) Specify each item on a separate line; include Education & Public Outreach, Tech Infusion/Transfer, facilities, etc.  
\* Note: Formulation = Phase A + B; Implementation = Phase C + D + E  
\*\* See *Program Cost Elements* document in Appendix A

**Figure 4**  
Phase C/D Development Costs  
in Real Year Dollars (to nearest thousand)

<b>Cost Element</b>	Non-Recurring	Recurring	Total (RY\$)	Total (FY2003\$)
Instrument A*				
Instrument B*				
Instrument n*				
<i>Subtotal - Instruments</i>				
Any other elements (specify)				
<i>Subtotal - Other elements</i>				
<b>Total NASA OSS Development Cost</b>				

\* Specify each instrument by subsystem/components where possible

**FIGURE 5**  
**CO-INVESTIGATOR COMMITMENT AND COST**  
**FUNDING PROFILE TEMPLATE**

(Phase costs in Real Year Dollars, Totals in Real Year and FY2003 Dollars)

	Phase B	Phase C/D	Phase E	Total (Real Year)	Total (FY 2003)
<b><i>NASA OSS Cost</i></b>					
Co-I #1 Name/Organization					
Percent Time					
Cost					
Co-I #2 Name/Organization					
Percent Time					
Cost					
Co-I #n Name/Organization					
Percent Time					
Cost					
<b>Total NASA OSS Co-I Cost</b>					
<b><i>Contributions</i></b>					
Co-I #1 Name/Organization					
Percent Time					
Cost					
Co-I #2 Name/Organization					
Percent Time					
Cost					
Co-I #n Name/Organization					
Percent Time					
Cost					
<b>Total Contributed Co-I Cost</b>					

**FIGURE 6**  
**NASA CIVIL SERVICE COSTS**  
**FUNDING PROFILE TEMPLATE**  
(FY costs in Real Year Dollars, Totals in Real Year and FY2003 Dollars)

Item	FY03	FY04	FY05	FY06	FY07	...	FY12	Total (Real Yr.)	Total (FY 2003)
Workforce	\$	\$	\$	\$	\$	\$	\$	\$	\$
- NASA Center A									
- NASA Center B									
- etc.									
Facilities	\$	\$	\$	\$	\$	\$	\$	\$	\$
- NASA Center A									
E/PO, Other*	\$	\$	\$	\$	\$	\$	\$	\$	\$
- NASA Center A									
<b>NASA Civil Service Costs included in NASA OSS Cost</b>	\$	\$	\$	\$	\$	\$	\$	\$	\$
<b>Contributions by NASA Centers</b>									
Workforce	\$	\$	\$	\$	\$	\$	\$	\$	\$
- NASA Center A									
- NASA Center B	\$	\$	\$	\$	\$	\$	\$	\$	\$
- etc.	\$	\$	\$	\$	\$	\$	\$	\$	\$
Facilities									
- NASA Center A									
E/PO, Other*									
- NASA Center A									
<b>Contributed NASA Civil Service costs</b>	\$	\$	\$	\$	\$	\$	\$	\$	\$
<b>Mission Totals</b>									\$

\*Specify each item on a separate line.

**Figure 7a Summary Of Elements Of Costs (\$K) (See Instructions)**

**Real Year Dollars**

WBS #/Title: \_\_\_\_\_

Check One:      \_\_\_\_\_ PHASE B      \_\_\_\_\_ PHASE C/D      \_\_\_\_\_ PHASE E

	<b>FY02</b>	<b>FY03</b>	<b>FY04</b>	<b>FY05</b>	<b>FYn</b>	<b>Total</b>
Direct Labor Hrs: (By skill categories)						
Direct Labor Cost: (by skill categories)						
Total Direct Labor Costs						
Overhead (by cost Centers)						
Other Direct Costs						
Subcontracts						
Materials						
Material Burdens						
Travel						
Other Direct Costs						
Subtotal						
G&A Expense (by cost pools)						
Subtotal						
Cost of Money (by direct pools & overhead centers)						
Profit/Fee						
Total Cost Plus Fee						

### **Figure 7b Cost Table Instructions For Figure 7a**

The Summary of Elements of Cost and Basis of Estimate for Phase B, C/D and E should contain the following direct and indirect elements, as applicable:

- **DIRECT LABOR HOURS** – Show productive hours by individual skill categories.
- **DIRECT LABOR COSTS** – The labor costs should be itemized by skill categories. The basis for the rates should be described. Provide a schedule of the direct labor rates used in the proposal. Discuss the basis for developing the proposed direct labor rates for the team member organizations involved; the forward-pricing method (including midpoint, escalation factors, anticipated impact of future union contracts, etc.); and elements included in the rates, such as overtime, shift differential, incentives, allowances, etc. If available, submit evidence of Government approval of direct labor rates for proposal purposes for each labor classification for the proposed performance period. If Civil Servant labor is to be used in support of a phase, but is not to be charged directly to the investigation, then this labor must be considered as a contribution by a domestic partner, subject to the same restrictions as other contributions by domestic or foreign partners. A discussion of the source of funding for the Civil Servant contributions must be provided.
- **LABOR OVERHEAD** – Overhead should be itemized by overhead cost centers (engineering, manufacturing, etc.) as well as associated rates.
- **SUBCONTRACTS** – Identify fully each effort (task, item, etc. by WBS element) to be subcontracted, and list the selected or potential subcontractors, locations, amount proposed, and types of contracts.) Explain the adjustments, if any, and the indirect rates (or burdens) applied to the subcontractors' proposed amounts anticipated. Describe fully the cost analysis or price analysis and the negotiations conducted regarding the proposed subcontracts. Note that during the negotiation of any contract award, the Government reserves the right to obtain the same level of detail as requested from the proposer.
- **MATERIALS** – Provide supporting details for major vendors. Burden rates must be identified.
- **TRAVEL** – Provide supporting details for destination, purpose, number of people per trip, transportation costs, per diem costs, and miscellaneous costs.
- **OTHER DIRECT COSTS** – Identify cost and purpose.
- **GENERAL AND ADMINISTRATIVE (G&A) EXPENSE** – G&A expense represents the institution's general and executive offices and other miscellaneous expenses related to business. G&A expense should be itemized by cost pool, and rates should be documented.

- **COST OF MONEY (COM)** – COM represents interest on borrowed funds invested in facilities. COM should be itemized by indirect pools and overhead centers. Rates should be documented.
- **PROFIT/FEE** – Document the basis, rate, and amount of fee. Document the fee arrangements for the major team partners.
- **ESCALATION FACTORS** – document the escalation factors used to determine real year dollars.

# Figure 8

MASTER EQUIPMENT LIST Template - Items shown are for example purposes only

Subsystem	Component	Unit Mass, Current Best Estimate (CBE)	# of Units				Flight Hardware Summary			Other Component Information	
			Flight Units	Flight Spares	Engrng Models	Proto- types	Total Mass, CBE	Contingency %	Total Mass w/ Contingency	Description (Vendor, Part #, Heritage Basis)	Other characteristics/issues (volume, power, other componen specific items)
<b>Instruments/Payload</b>											
Instrument 1 (separate breakout for each instrument)	Structures										
	Mechanisms										
	MLI										
	Radiators										
	Cryocoolers										
	Heat pipes										
	Optics										
	Focal Plane - Detectors										
	Focal Plane - R/O Electr										
	Cmd & Cntrl Electr										
Others											

## K. APPENDICES

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

1. Letters of Endorsement. Letters of endorsement must be provided from all organizations participating in and critical to the investigation. This requirement also applies to all organizations making contributions. Letters of endorsement must be signed by both the lead representative from each organization represented on the team, and by institutional and Government officials authorized to commit their organizations to participation in the proposed investigation. If government funding is required to support a contribution, a letter of support or commitment is required from the government funding agency, signed by an official authorized to commit the agency. Signed letters of support or commitment must be provided from all E/PO partners or subcontractors detailing their commitment to or involvement in the E/PO effort. Institutional letters of endorsement for all Co-Investigators are required as part of the Phase A concept study report.
2. Relevant Experience and Past Performance. Proposals must include a discussion of relevant experience and past performance by the major team partners in meeting the requirements of projects similar to the subject of this CSR. For this part of the CSR, we are seeking information about the partner organizations rather than individuals. Projects that ended more than 5 years ago need not be included in the discussion. The discussion of relevant experience and past performance must include a description of each project; its relevance to the subject of the CSR; the proposed performance and the actual performance; the proposed cost and actual cost; the proposed schedule and actual schedule; an explanation of any differences between proposed performance, cost and schedule and what was actually achieved; and points of contact for the past project's customer. If the customer for the past project was the United States government, then the contract number must be included along with current technical point(s) of contact and phone number(s). For projects that are not yet complete, the current projected performance, cost, and schedule must be used in place of actual values.

In evaluating the CSR, NASA will consider the past performance of the major partner organizations. The evaluation of past performance will not be arithmetic; instead, the information deemed to be most relevant and significant will receive the greatest consideration. Relevant experience will be viewed as the demonstrated accomplishment of work which is comparable or related to the objectives of the CSR. In conducting the evaluation, NASA reserves the right to use all information available.

The team is cautioned that omissions or an inaccurate or inadequate response to this evaluation item will have a negative effect on the overall evaluation, and while NASA may consider data from other sources, the burden of providing relevant references that NASA can readily contact rests with the team.

3. Resumes. Provide resumes for all key personnel identified in the Management section. Also provide resumes for key E/PO lead personnel. Include resume data on experience that relates to the job these personnel will be doing for the proposed investigation.
4. Statements of Work for each Contract Option. Provide draft Statement(s) of Work for all potential contracts with NASA. These Statement(s) of Work must (as a minimum) be for each contract option (i.e., Phase B/C/D, and Phase E) and clearly define all proposed deliverables (including science data) for each option, potential requirements for Government facilities and/or Government services, and a proposed schedule for the entire mission.
5. Data Management Plan A draft Data Management Plan is required.
6. Incentive Plan(s). Draft Incentive Plans (if applicable) must be included with the concept study. Incentive Plans must outline contractual incentive features for all major team members. Incentive Plans must include both performance and cost incentives, as appropriate.
7. NASA PI Proposing Teams. The same guidelines as in AO Appendix B apply.
8. Technical Content of any International Agreement(s). Draft language for the technical content of any International Agreement(s) are required for all non-U.S. partners in the investigation. A sample agreement is available in the MMS Program Library. The draft language must include (i) a brief summary of the mission and the foreign partner's role in it, (ii) a list of NASA's responsibilities within the partnership, and (iii) a list of the non-U.S. partner's responsibilities in within the partnership. Note that NASA prefers to establish agreements with government funding agencies, not with the institution which will be funded to perform the work.
9. Discussion on Compliance with U.S. Export Laws and Regulations. Provide an update to the discussion in the proposal. 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 URLs <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 are therefore subject to the provisions of the International Traffic in Arms Regulations, 22 CFR 120-130, *et seq.*

10. Mission Definition and Requirements Agreement. A draft Mission Definition and Requirements Agreement must be provided. An example of a Mission Definition and Requirements Agreement is provided in the MMS online library. The proposer may leave the mission information blank. The proposer must provide the science requirements to meet the full mission success criteria and the minimum mission success criteria.
11. Acronyms List.
12. References List (Optional) Concept studies may provide, as an appendix, a list of reference documents and materials used in the concept study. The documents and materials themselves cannot be submitted, except as a part of the concept study.

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APPENDIX A

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PROGRAM COST ELEMENT DEFINITIONS

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**Introduction**

This is a short dictionary of definitions for the cost elements shown in the figures and tables and discussed in the body of this *Criteria and Guidelines for Concept Study* document.

**Project Management/Systems Engineering**

Project management costs include all efforts associated with project level planning and directing of prime and subcontractor efforts and interactions, as well as project-level functions such as quality control and product assurance. Systems engineering is the suite-level engineering required to ensure that all instrument subsystems function properly to achieve mission goals and requirements. This cost element also includes the data/report generation activities required to produce internal and deliverable documentation.

**Instruments**

Instrument costs include costs incurred to design, develop and fabricate the individual scientific instruments or instrument systems through delivery of the instruments to the spacecraft for integration. Costs for instrument suite integration, assembly, test, and ground support equipment are to be shown separately from instrument development. Costs incurred for integration of the instruments to the spacecraft are included in the Spacecraft Integration, Assembly & Test cost element (see below).

**Spacecraft Integration, Assembly & Test (IA&T)**

S/C integration, assembly and test is the process of integrating all spacecraft subsystems and payloads into a fully tested, operational satellite system. The total cost of IA&T for a satellite includes research/requirements specification, design and scheduling analysis of IA&T procedures, ground support equipment, systems test and evaluation, and test data analyses. Typical satellite system tests include thermal vacuum, thermal cycle, electrical and mechanical functional, acoustic, vibration, electromagnetic compatibility/interference, and pyroshock. This element encompasses only the support required from the instrument suite to support observatory IA&T. The spacecraft vendor will provide facilities and support personnel for the spacecraft element of the observatory IA&T

**Launch Checkout & Orbital Operations**

Launch checkout and orbital operations support costs are those involving pre-launch planning, launch site support, and the first 90 days of flight operations.

**Pre-Launch Science Team Support**

Includes all Phase B/C/D (pre-launch) support costs for the science team. (See below for post-launch component.)

**Pre-Launch GDS/Mission Operations Services (MOS) Development**

Includes costs associated with development and acquisition of the ground infrastructure used to process science data. Includes development of science data processing and analysis capability. Also includes pre-launch training of the science team, support for the development and execution of operations simulations, sequence development, and flight control software. It may be assumed that data and commanding will be provided via links between the instrument operations control center and the mission operations center.

**Instrument Suite Operations**

Instrument suite operations comprise all activities required to plan and execute the science objectives, including suite control, suite health monitoring, and calibration. Costs include all post-launch costs for people, procedures, services, hardware and software to carry out these activities.

**Data Analysis (DA)**

This cost element refers only to Phase E (after launch plus 60 days), and must not include costs of any proposed extended mission (“Phase F”), Participating Scientist Program (PSP), or Data Analysis Program (DAP). Data analysis activities include collecting, processing, distributing and archiving the scientific data in the appropriate data archive. Costs include all post-launch budgets for people, procedures, services, hardware and software to carry out these activities. Includes science team support budgets post-launch.

**Education and Public Outreach**

Includes all costs associated with developing and implementing the proposed project’s programs for education and public outreach.

**Project-Unique Facilities**

If the proposed project requires construction or lease of any ground facilities, include here only the portion of costs to be borne by the proposed project, with description of the nature and extent of any cost-sharing arrangements assumed.

**Reserves**

The proposer must include sufficient budget reserve such that all instrument or instrument suite issues can be accommodated and resolved within the total budget proposed. The project will not hold any reserves to handle any instrument development, suite development and integration issues. The project will only hold reserve to accommodate impacts to the suite cause by changes outside control of the suite such as a change in resources cause be a change in launch vehicle.

Reserves must be adequate to mitigate contingencies or underestimation of resources. Reserves must be reported according to the proposed reserve management strategy. For example, if the reserve is divided into funds to be individual instruments within a suite, another portion held at the suite level, specific dollar amounts to fund each must be identified.

**NASA Center Costs (all categories)**

Additional costs borne by the project for NASA Center participation. For example, there may be additional project management/systems engineering costs, above those incurred by the suite prime contractor, which are due to NASA employee participation. These costs must be reported on a full-cost accounting basis.

APPENDIX B

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EDUCATION/PUBLIC OUTREACH  
CRITERIA, REQUIREMENTS, AND GUIDELINES

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The education and public outreach (E/PO) element of the Concept Study Report should provide a summary of the benefits offered by the investigation beyond the purely scientific benefits. This section of the proposal should contain a description of the E/PO objectives and the planned activities to be undertaken to achieve those objectives; demonstrate how those plans will actually be implemented; discuss how the program will be evaluated; describe the intended involvement of the Principal Investigator and or key science team members in the E/PO effort; address the involvement of appropriate educational personnel as well as plans/commitments for partnerships and collaborations with education and outreach organizations; describe how the effort will be organized and managed (including the identification of key personnel who will actually be responsible for overseeing and implementing the E/PO effort); and explain the requested E/PO budget showing how that budget is related to and supports the planned program. Plans for developing and disseminating education/outreach products and materials, for contributing to the training of underserved and/or underutilized groups in science and technology, and for coordination of the planned E/PO program with the umbrella Solar Terrestrial Probes (STP)/Living With a Star (LWS) E/PO program should be addressed. Details of organizational and management arrangements described in the Management and Cost Plan may be included by reference and do not have to be repeated in this section of the proposal. Letters of support/commitment from partners and resumes of key E/PO personnel should be included in the appendices to the proposal. Note that no separate submittal of the E/PO proposal component is required.

Based on the funding guidelines given in the AO, E/PO programs will involve the expenditure of substantial resources. Therefore, it is expected that proposed E/PO programs will have a breadth and depth commensurate with these resources. Such programs are expected to be multi-faceted in nature, address a number of different aspects of education and outreach contained in the specific criteria, and have state, regional, or national scope. An umbrella STP/LWS E/PO program that is currently being defined will plan and implement a number of national efforts. An overview of this program is included in the MMS Library (see Appendix C of the AO), and questions about it can be addressed to Ms. [Evelina Felicite-Maurice](mailto:efilicit@pop400.gsfc.nasa.gov) at [efilicit@pop400.gsfc.nasa.gov](mailto:efilicit@pop400.gsfc.nasa.gov).

#### I. EVALUATION CRITERIA

E/PO portions of the Concept Study Report (CSR) will be evaluated by appropriately qualified scientific, education, and outreach personnel. The results of those evaluations will be explicitly considered by the OSS Selecting Official as an integral part of the overall evaluation and selection process.

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

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

- The quality, scope, realism, and appropriateness of the proposed E/PO program, including the general intellectual linkage to the science objectives of the parent research proposal or mission;
- The adequacy, appropriateness, and realism of the proposed budget including demonstration of effective use of funds;
- The capabilities and commitment of the proposer and the proposer's team to carry out the proposed E/PO program, including the direct involvement of one or more science team members in overseeing and carrying out the proposed E/PO program, as well as the establishment or continuation of effective partnerships with institutions and/or personnel in the fields of education and/or public outreach as the basis for and as an integral element of the proposed E/PO program; and
- The appropriateness of plans for evaluating the effectiveness and impact of the proposed education/outreach activity.

To ensure that the goals and objectives of the OSS E/PO strategy are realized in practice, proposals will also be evaluated using one or more of the following specific criteria as appropriate. The specific E/PO criteria are:

- When dealing directly or strongly affecting the formal education system (e.g., teacher workshops or student programs carried out at public institutions, such as science museums and planetariums), the degree to which the proposed E/PO effort is aligned with and linked to nationally recognized and endorsed education reform efforts and/or efforts at the state or local levels;
- The degree to which the proposed E/PO effort contributes to the training, involvement, and broad understanding of science and technology by underserved and/or underutilized groups; and
- The potential for the proposed E/PO activity to expand its scope by having an impact beyond the direct beneficiaries (e.g., reaching relatively large audiences, being suitable for replication or broad dissemination, and/or drawing on resources beyond those directly requested in the proposal).

The mission criterion to be explicitly considered as part of the evaluation of the E/PO component of all proposals is:

- The relationship of the planned E/PO program to any unique scientific or technical aspects of the mission.

Plans for coordination of the proposed activities with the umbrella STP/LWS E/PO program and other ongoing OSS E/PO efforts will also be explicitly considered in the evaluation process.

In all cases, note that while creativity and innovation are certainly encouraged, none of these criteria focuses on the originality of the proposed effort. Instead, NASA seeks assurance that the proposer is personally committed to the E/PO effort and the PI and/or appropriate research team members will be actively involved in carrying out a meaningful, effective, credible, and appropriate E/PO activity; that such an activity has been

thoughtfully planned and will be carefully executed; and that the proposed investment of resources will make a significant contribution toward meeting OSS E/PO goals and objectives. OSS expects E/PO to be handled just as thoroughly and professionally as are the scientific and engineering aspects of OSS missions.

To aid proposers in the preparation of their proposals, as well as to ensure that reviews are carried out on a consistent basis aligned with the OSS Education Strategy and Implementation Plan, an Explanatory Guide to the E/PO evaluation criteria has been prepared and may be found in the MMS Program Library (see Appendix C of the AO).

The two key documents that establish the basic policies and guide all OSS education and outreach activities are a strategic plan entitled *Partners in Education, A Strategy for Integrating E/PO Into NASA's Space Science Programs* (March 1995), and an accompanying implementation plan entitled *Implementing the OSS E/PO Strategy* (1996) (see Appendix C). Both can also be accessed by selecting "Education and Outreach" from the menu on the OSS homepage at Internet URL <http://spacescience.nasa.gov>, or from Dr. Jeffrey Rosendhal, Office of Space Science, Code S, NASA Headquarters, Washington, DC 20546-0001, USA. Additional information on the ongoing OSS E/PO Program (including information on how to contact the E/PO leads of current programs) can be found in the OSS E/PO Annual Reports, which may be accessed at <http://ossim.hq.nasa.gov/ossepo/>.

## II. ASSISTANCE FOR THE PREPARATION OF E/PO PROPOSALS

NASA OSS has established a nation-wide support network of space science education/public outreach groups whose purpose is to directly aid space science investigators in identifying and developing high quality E/PO opportunities. This support network 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 network (also described in more detail in the OSS education/outreach implementation plan referred to above):

- Four OSS science theme-oriented E/PO "Forums" sponsored by NASA OSS 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
- Seven regional E/PO "Broker/Facilitators" sponsored by NASA OSS 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. However, while these Forums and Broker/Facilitators are commissioned by OSS to provide help, the

responsibility for actually developing an E/PO program and writing the proposal is that of the proposer. Points of contact and addresses for the E/PO Forums and Broker/Facilitators may be found by opening Education and Public Outreach from the menu of the OSS homepage at <http://www.space.science.nasa.gov/>.

### III. PREPARATION AND SUBMISSION OF AN E/PO PROPOSAL

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

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

### IV. ADDITIONAL INFORMATION

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

Rosalyn A. Pertzborn  
Program Planning Specialist  
Code S  
Office of Space Science

NASA Headquarters  
Washington, DC 20546

Email: [rpertzbo@hq.nasa.gov](mailto:rpertzbo@hq.nasa.gov)

Telephone: 202/358-1953

# E/PO Template #1

## E/PO Program Budget

(FY costs in Real Year Dollars, Totals in Real Year and FY 2002 Dollars)

	FY1	FY2	FY3	FYn	Total (Real Yr.)	Total (FY 2002)
Personnel						
Subcontract #1						
Subcontract #2						
Subcontract #n						
Consultants						
Equipment						
Supplies						
Travel						
Other Direct Costs						
Facilities						
Administration						
Other Indirects						
Subtotal						
Cost Sharing						
TOTAL						

## INSTRUCTIONS FOR E/PO BUDGET SUMMARY – TEMPLATE #1

- Provide, as attachments, detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost as follows.
  1. **Personnel:** Attachments must list the number and titles of personnel, amounts of time to be devoted to the project, and rates of pay including salaries, wages, and fringe benefits.
  2. **Subcontracts/Partners/Co-I Institutions:** Attachments must describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting. Enter the annual totals on this budget summary page. In addition, complete a more detailed budget summary form describing the subcontractor's/partner's/Co-I institution's use of NASA funds that the proposer requested through this solicitation (see Template #2 format).
  3. **Consultants:** Identify consultants to be used, why they are necessary, the time (number of days) they will spend on the project, and quoted daily rates of pay. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.
  4. **Equipment:** List separately. Explain the need for items costing more than \$5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Contracting Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the work proposed and why it cannot be purchased with indirect funds.
  5. **Supplies:** Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
  6. **Travel:** Describe the purpose of the proposed travel in relation to the contract and provide the basis of estimate, including information on destination, number of trips, and number of travelers where known.
  7. **Other Direct Costs:** Enter the total of direct costs not covered by 1 through 6. Attach an itemized list explaining the need for each item and the basis for the estimate.
  8. **Facilities and Administration (F&A) Costs:** Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.
  9. **Other Indirects:** Enter the total of indirect costs not covered by 8. Attach an itemized list explaining the need for each item.
  10. **Subtotal:** Enter the sum of items 1 through 9.
  11. **Cost Sharing:** Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.
  12. **Total:** Enter the total after subtracting item 11 from item 10.

## **E/PO Template #2**

### **Subcontract Budgets**

(Costs in Real Year Dollars, Totals in Real Year and FY 2002 Dollars)

	Subcontract #1	Subcontract #2	Subcontract #n
Personnel			
Consultants			
Equipment			
Supplies			
Travel			
Other Direct Costs			
Facilities			
Administration			
Other Indirects			
Subtotal			
Cost Sharing			
TOTAL (Real Yr.)			
TOTAL (FY 2000)			

## INSTRUCTIONS FOR E/PO BUDGET SUMMARY – TEMPLATE #2

- Provide, as attachments, detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost as follows.
  1. Personnel: Attachments must list the number and titles of personnel, amounts of time to be devoted to the project, and rates of pay including salaries, wages, and fringe benefits.
  2. Consultants: Identify consultants to be used, why they are necessary, the time (number of days) they will spend on the project, and quoted daily rates of pay. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.
  3. Equipment: List separately. Explain the need for items costing more than \$5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Contracting Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the work proposed and why it cannot be purchased with indirect funds.
  4. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
  5. Travel: Describe the purpose of the proposed travel in relation to the project and provide the basis of estimate, including information on destination, number of trips, and number of travelers where known.
  6. Other Direct Costs: Enter the total of direct costs not covered by 1 through 5. Attach an itemized list explaining the need for each item and the basis for the estimate.
  7. Facilities and Administration (F&A) Costs: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.
  8. Other Indirects: Enter the total of indirect costs not covered by 7. Attach an itemized list explaining the need for each item.
  9. Subtotal: Enter the sum of items 1 through 8.
  10. Cost Sharing: Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.
  11. Total Estimated Costs: Enter the total after subtracting item 10 from item 9.

### E/PO Template #3

#### Key Personnel

(Percent Time Committed/Direct Costs, Including Benefits,  
in Real Year Dollars, Totals in Real Year and FY 2002 Dollars)

	FY1	FY2	FY3	FYn	Total (Real Yr.)	Total (FY 2002)
Institution 1						
PI (% time)						
PI (direct cost)						
E/PO lead (% time)						
E/PO (direct cost)						
Institution 2						
PI (% time)						
PI (direct cost)						
E/PO lead (% time)						
E/PO (direct cost)						
Institution n						
PI (% time)						
PI (direct cost)						
E/PO lead (% time)						
E/PO (direct cost)						

#### INSTRUCTIONS FOR E/PO BUDGET SUMMARY – TEMPLATE #3

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