

MIDEX

GUIDELINES FOR PHASE A CONCEPT STUDY REPORT PREPARATION

Revised ~~January~~ **March** 1999

The intent of this document is to provide guidelines for the preparation of the Concept Study Report. Proposals from the AO 98-OSS-03 solicitation will be selected and will be awarded contracts to conduct Phase A concept studies to better define the investigations, their implementation requirements, and their risks. Upon completion of the concept study, proposers will submit a Concept Study Report for NASA evaluation. The evaluation criteria to be used for evaluation of the Concept Study Report are the same as given in Section 7.2 of the AO; that is,

- Scientific Merit
- Technical merit and feasibility
- Feasibility of the proposed approach for mission implementation, including cost risk
- Plans for education, outreach, new technology, and small disadvantaged business activities

Any changes to science and science implementation will be carefully evaluated. Assuming that there are no changes to the proposed science and its implementation, the emphasis of the evaluation will be on the latter two criteria. Total cost to NASA will be a selection but not an evaluation criterion.

The required uniform Concept Study Report format and contents are summarized below. Failure to follow this outline may result in reduced ratings during the evaluation and selection process.

The Concept Study Report shall contain the following: the executive summary including the investigation fact sheet; the science discussion (repeated from the Proposal if no changes); education, outreach, technology, and small disadvantaged business plan; technical approach; management plan; Phase B/C/D study plan; cost plan; and Appendices. 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 should be clearly identified. The content of each requirement is discussed in the subsequent paragraphs. Please note that all program constraints, guidelines, and requirements given in the AO are still valid for the Concept Study Report.

The Report shall contain no more than 120 pages, including no more than seven foldout pages (28 x 43 cm; i.e., 11 x 17 inches). The cover page, table of contents, cost plan, delayed launch plan, and appendices will not be counted against the 120-page limit of the volume. The following page limits apply:

Section	Page Limit
Cover Page and Table of Contents	no page limit
Science Investigation description (changes highlighted)	20 pages
Executive Summary (including Fact Sheet) Education, Outreach, Technology, and Small Disadvantaged Business Plan Technical Approach Management Plan Phase B/C/D Plan	100 pages
Cost Plan	No page limit, but data must be presented in formats described; be brief
<u>Changes required for and implications of delaying investigation launch until June 2004</u>	<u>No page limit, but be brief</u>
Appendices (No other appendices permitted) Resumes Letters of Endorsement Mission Definition and Requirements Agreement SF 1411 Certifications Statement(s) of Work for Each Contract Option Any Incentive Plan(s) Relevant Experience and Past Performance International Agreement(s) NASA PI Proposing Teams Reference List (Optional) Acronyms List(Optional)	No page limit, but small size encouraged

A. COVER PAGE

The guidelines in AO Appendix B apply.

B. TABLE OF CONTENTS

The guidelines in AO Appendix B apply

C. EXECUTIVE SUMMARY INCLUDING FACT SHEET

The executive summary should provide an overview of the proposed baseline investigation, including its scientific objectives; technical approach; management plan; cost estimate; and educational, technological, and public outreach plans. This should be five to seven pages in length, and should include a Fact Sheet, using the guidelines as provided in AO Appendix B.

D. SCIENCE INVESTIGATION DESCRIPTION

This section should describe the science investigation resulting from the Concept Study. Any descoping of, or changes to, the investigation from the baseline mission defined in the proposal, including the rationale for the changes, should be discussed and highlighted in bold or column marking for easy identification. If there are no changes, this section should be repeated identically from the proposal.

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

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

1. Educational Program Activities. This section should discuss the degree to which this investigation will generate educational opportunities and contribute to the Nation's educational initiatives. The breadth of involvement of the educational program, including educators, researchers, amateur organizations, and the public at large should be discussed, as should educational activities to be implemented. Coordination and collaboration with educational institutions should be discussed, along with a discussion of how the mission team will implement the educational program. A summary of the proposed budget targeted to educational activities, including any potential leveraging of other resources, and a timeline for the execution of the education program, should be provided.
2. Public Awareness. This section should describe the degree to which the scientific investigation and discoveries will be communicated to the public. The public awareness plan should address how the progress of and results from the mission will be disseminated to the public; the interaction of the various team members; and a schedule of the public awareness activities with mission progression.
3. Small Disadvantaged Business. A summary plan is required specifying the proposed investigation's commitment to meet the SDB participation goal of 8% as described in Section XIII of Appendix A of the AO. In addition, as also specified in Appendix A, subcontracting plans will be required to execute the contract option for investigation implementation.
4. New Technology. This section should discuss how new technology relates to the proposed investigation, including: (1) insertion of new technology into the project, (2) transfer of new technology from the project to other projects or programs, and (3) commercialization of new technology. The functions that the new technology performs and how it will be demonstrated for the investigation should be described. Also to be discussed is the development of partnerships among space, 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.

F. TECHNICAL APPROACH

The Technical Approach section should detail the method and procedures for investigation definition, design, development, integration, ground operations, and flight operations. A discussion of all new technologies to be used for the investigation, including back-up plans with scheduled decision criteria for those technologies, should be provided. This section should also detail the expected products and end items associated with each phase. Mission teams have the freedom to use their own processes, procedures, and methods. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged when cost, schedule, and technical improvements can be demonstrated. The benefits of such processes and products should be discussed. This section must be complete in itself without the need to request additional data, although duplications may be avoided by reference to other sections of the Report if necessary. Note that the definitions and specified parameters of technical data required below are as defined in the AO, Appendix B.

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

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

2. Spacecraft. This section should describe the spacecraft design approach, particularly as it relates to new versus existing hardware and redundant versus single-string hardware. It should fully identify the spacecraft systems and describe their characteristics and requirements. A description of the flight system design with a block diagram showing the flight element subsystems and their interfaces should be included, along with a description of the flight software and the approach for its development, and a summary of the estimated performance of the flight system. The flight heritage or rationale used to select the flight system and its subsystems, major assemblies, and interfaces should be described. The discussion of heritage should address two important issues: (1) prior flight experience or flight-qualified design of specific subsystem components, and (2) overall subsystem design, whether new, modified, or exact repeat of a design flown previously. Cost savings that result from heritage will be quantified and explained in Section I (below). This section should also

discuss the design *process* used: trade studies, simulations, technology development, engineering models, prototypes, etc.

Subsystem characteristics and requirements should be described to the greatest extent possible. Such characteristics include current best estimate and contingency for: mass, volume, and power requirements; pointing knowledge and accuracy; new developments needed; space qualification plan; and logistics support. These subsystems may include: structural/mechanical, solar array/power supply (and batteries), electrical, thermal control, propulsion, communications, attitude control, command, and data handling, etc. Any design features incorporated to effect cost savings should be identified; however, benefits should be specified and enabling assumptions or risks should be identified. A summary of the resource elements of the flight systems design concept, including key margins, should be provided. The rationale for, and derivation of, margin allocations including mass, power, communication link, pointing accuracy, etc., should be provided. Those design margins that are driving costs should be identified. Provide data in tables to show the current estimate of computer memory margin and computer processor utilization margin. A Master Equipment List should summarize component-level information for all hardware subsystems of the spacecraft, any other hardware elements, and instruments.

3. Science Payload. This section should 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 should also be included. Subsystem characteristics and requirements should be described. Such characteristics include: mass, volume, and power requirements; pointing requirements; new developments needed; and a space qualification plan. Include where appropriate: block diagrams, layouts, calibration plans, operational and control considerations, and software development. Any design features incorporated to effect cost savings should be identified. A summary of the resource elements of the instrument design concept, including key margins, should be provided. The rationale for margin allocation should be provided. Those design margins that are driving costs should be identified.
4. Payload Integration. This section should characterize the interface between the instruments and the flight system. These include, but are not limited to: volumetric envelope, fields of view, weight, power requirements, thermal requirements, command and telemetry requirements, sensitivity to or generation of contamination (e.g., electromagnetic interference, gaseous effluents, etc.), data processing requirements, as well as the planned process for physically and analytically integrating them with the flight system. The testing strategy of the science payload, prior to integration with the spacecraft, should be discussed.
5. Manufacturing, Integration, and Test. This section should describe the manufacturing strategy to produce, test, and verify the hardware/software necessary to accomplish the mission. It should include a description of the main processes/procedures planned in the fabrication of flight hardware,

software, production personnel resources, incorporation of new technology/materials, and the preliminary test and verification program. The environmental tests planned should be discussed and proposed test margins and durations for the environmental test program specified. Part burn-in requirements that will be used for the program should also be defined. Describe the approach for transitioning from design to manufacturing and specify data products which will be used to assure producibility and adequate tooling availability.

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

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

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

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

7. Facilities. Provide a description of any new, or modifications to existing, facilities, laboratory equipment, and ground support equipment (GSE) (including those of the team's proposed contractors and those of NASA and other U.S. Government agencies) required to execute the investigation. The

outline of new facilities and equipment should also indicate the lead time involved and the planned schedule for construction, modification, and/or acquisition of the facilities.

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

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

1. Team Member Responsibilities. This section should describe the roles, responsibilities, time commitment, and experience of all team member organizations and key personnel, with particular emphasis placed on the responsibilities assigned to the Principal Investigator, the Project Manager, and other key personnel. In addition, information should be provided which indicates what percentage of time key personnel will devote to the mission, the duration of service, and how changes in personnel will be accomplished. (Note: The experience of the PI and science team members does not need to be included in this section since it would have been addressed in the proposal.)
 - a. Organizational Structure. The management organizational structure of the investigation team must be described in the Study Report. The Report must describe the responsibilities of each team member organization and its contributions to the investigation. Each key position, including its roles and responsibilities, how each key position fits into the organization, and the basic qualifications required for each position, must be described. A discussion of the unique or proprietary capabilities that each member organization brings to the team, along with a description of the availability of personnel at each partner organization to meet staffing needs, should be included. The contractual and financial relationships between team partners should be discussed.

Summarize the relevant institutional experience in this section, and refer to supporting detail included in Appendix J.9: Relevant Experience and Past Performance. If experience for a partner is not equivalent to, or better than, the requirements for the proposed mission, explain how confidence can be gained that the mission can be accomplished within cost and schedule constraints.

- b. Experience and Commitment of Key Personnel. Provide a history of experience explaining the relationship of the previous experience to each key individual's role; include the complexity of the work and the results.

- i. Principal Investigator. The role(s), responsibilities, and time commitment of the Principal Investigator should be discussed. Provide a reference point of contact, including address and phone number.
 - ii. Project Manager. The role, responsibilities, time commitment, and experience of the Project Manager should be discussed. Provide a reference point of contact, including address and phone number.
 - iii. Other Key Personnel. The roles, responsibilities, time commitments, and experience of other key personnel in the investigation should be described.
2. Management Processes and Plans. This section should describe the management processes and plans necessary for the logical and timely pursuit of the work, accompanied by a description of the work plan. This section should also describe the proposed methods of hardware and software acquisition. The management processes which the investigator team proposes, including the relationship between organizations and key personnel should be discussed, including the following, as applicable: systems engineering and integration; requirements development; configuration management; schedule management; team member coordination and communication; progress reporting, both internal and to NASA; performance measurement; and resource management. This discussion should include all phases of the mission including preliminary analysis, technical definition, the design and development, and operations phases, along with the expected products and results from each phase. Unique tools, processes, or methods which will be used by the investigation team should be clearly identified and their benefits discussed. All project elements should be covered to assure a clear understanding of project-wide implementation.
3. Schedules. The schedule and work flow for the complete mission life-cycle should be clearly defined, and the method and tools to be used for internal review, control, and direction discussed. Schedules for all major activities, interdependencies between major items, deliveries of end items, critical paths, schedule margins, and long-lead procurement needs (defined as hardware procurements required before the start of Phase C/D) should be clearly identified.
4. Risk Management. This section should describe the approach to, and plans for, risk management to be taken by the team, both in the overall mission design and in the individual systems and subsystems. Particular emphasis should be placed on describing how the various elements of risk, including new technologies used, will be managed to ensure successful accomplishment of the mission within cost and schedule constraints. Investigations dependent on new technology will be penalized for risk if adequate plans to ensure success of the investigation are not described. The top 3 risks and their mitigation plans should be discussed.

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

5. Government Furnished Property, Services, Facilities, etc. This section should clearly delineate the Government-furnished property, services, facilities, etc. required to accomplish all phases of the mission.
6. Reporting and Reviews. This section should clearly describe the approach to reporting progress to the Government and the reviews the Government is invited to attend to provide independent oversight. The process, including the individual or organization responsible for reporting integrated cost, schedule, and technical performance should be discussed. A description of the information to be presented should be included.

H. ~~DEFINITION, DESIGN, AND DEVELOPMENT (PHASE B/C/D)~~TECHNICAL DEFINITION (PHASE B) PLAN

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

I. COST PLAN

The cost plan should provide information on the anticipated costs for all phases of the mission for the preferred baseline launch date. Section J contains guidance on information needed regarding the alternate launch date of June 2004. A detailed cost proposal is required, including a completed SF 1411, for Phase B/C/D. Cost estimates are required for Phase E, including a description of the estimating techniques used to develop the cost estimates. A discussion of the basis of ~~the~~ estimate should be provided with a discussion of heritage and commonality with other programs. Quantify and explain the cost savings that result from heritage. All costs, including all contributions made to the investigation, should be included. Proposers should complete a summary of total mission cost by fiscal year as shown in Figure 1. The purpose of Figure 1 (Total Mission Cost Funding Profile) is to present all costs *on one page for the entire project* by project Phase, 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.**

In addition, for each phase of the investigation (B/C/D, and E) a Time Phased Cost Breakdown for each Work Breakdown Structure (WBS) element, as shown in Figure 2, should 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, expressed in Fixed FY 1998 dollars, should 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 ~~team's cost estimate~~proposed cost with the evaluation team's independent cost ~~estimate~~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 should be identified separately. If more convenient, the reserve details may be shown in a separate table, with totals reported as shown in Figure 3. Finally, show costs for all development elements by recurring and non-recurring components in the format of Figure 4.

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

The inflation index provided in Table B3 of the AO, Appendix B should be used to calculate all real-year dollar amounts, unless an industry forward pricing rate is used. If something other than the provided inflation index is used, the rates used should be documented.

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

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

- a. Contract Pricing Proposal Cover Sheet. A completed Contract Pricing Proposal Cover Sheet, SF 1411, must be included with the proposal for Phase B/C/D. The SF 1411 must be signed by the proposer's authorized representative.
- b. Work Breakdown Structure. A Work Breakdown Structure (WBS) should be included for Phase B/C/D. The structure of the WBS should be consistent with the plans set forth in the Technical Approach and Management sections of the ~~proposal~~concept study and the Statement of Work provided as an Appendix to the ~~proposal~~concept study. The WBS shall be described to the subsystem level (e.g., Attitude Control System, Propulsion, Structure and Mechanisms) for the spacecraft and to at least the instrument level for ~~the payload~~simple instruments and to the major component level for more complicated instruments. All other elements of the WBS should be to the major task level (e.g., Project Management, Systems Engineering, Ground Support Equipment).
- c. Workforce Staffing Plan. Provide a workforce staffing plan which is consistent with the Work Breakdown Structure. This workforce staffing plan should include all team member organizations, by organization, and should cover all management, technical (scientific and engineering), and support staff. The workforce staffing plan should be phased by ~~month~~fiscal year. Time commitments for the Principal Investigator, Project Manager, and other key personnel should be clearly shown.
- d. Proposal Pricing Technique. Describe the process and techniques used to develop the Phase B/C/D cost proposal. 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 ~~Provide~~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 missions contained in the model's data base and key attributes of the proposed mission. Include the assumptions used as the basis for the Phase B/C/D cost and identify those which are critical to cost sensitivity in the investigation. ~~Identify~~If any "discounts" were assumed in the cost estimates for business practice initiatives or streamlined technical ~~approaches.~~Describe approaches, describe how these have been incorporated in the cost estimate and will be managed by the investigation team.
- e. Phase B/C/D Time-Phased Cost Summary. Provide a summary of the total Phase B/C/D costs consistent with Figure 2. The Phase B/C/D cost summary should be developed consistent with the Work Breakdown Structure and

should include all costs to NASA along with all contributed costs. The Phase B/C/D time phased cost summary should be phased by ~~month~~fiscal year.

- f. Cost Elements Breakdown. To effectively evaluate the Phase B/C/D cost proposals, NASA requires costs and supporting evidence stating the basis for the estimated costs. The proposal will include, but is not limited to:
- i. Direct Labor.
 - (1) Explain the basis of labor-hour estimates for each of the labor classifications.
 - (2) State the number of productive work-hours per month.
 - (3) Provide a schedule of the direct labor rates used in the proposal. Discuss the basis for developing the proposed direct labor rates for the team member organizations involved; the forward-pricing method (including midpoint, escalation factors, anticipated impact of future union contracts, etc.); and elements included in the rates, such as overtime, shift differential, incentives, allowances, etc.
 - (4) If available, submit evidence of Government approval of direct labor rates for proposal purposes for each labor classification for the proposed performance period.
 - (5) If Civil Servant labor is to be used in support of the Phase B/C/D study, but is not to be charged directly to the investigation, then this labor must be considered as a contribution by a domestic partner, subject to the same restrictions as other contributions by domestic or foreign partners. A discussion of the source of funding for the Civil Servant contributions must be provided.
 - ii. Direct Material. Submit a summary of material and parts costs for each element of the WBS.
 - iii. Subcontracts. Identify fully each effort (task, item, etc. by WBS element) to be subcontracted, and list the selected or potential subcontractors, locations, amount budgeted/proposed, and types of contracts. Explain the adjustments, if any, and the indirect rates (or burdens) applied to the subcontractors' proposed amounts anticipated. Describe fully the cost analysis or price analysis and the negotiations conducted regarding the proposed subcontracts.
 - iv. Other Direct Costs.
 - (1) Travel, Relocation, and Related Costs. Provide a summary of the travel and relocation costs including the number of trips, duration, and purpose of the trips.
 - (2) Computer. Provide a summary of all unique computer-related costs.
 - (3) Consultants. Indicate the specific task area or problem requiring consultant services. Identify the proposed consultants, and state the quoted daily rate, the estimated number of days, and associated costs (such as travel), if any. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.
 - (4) Other. Explain and support any other direct costs included in the Phase B/C/D proposal in a manner similar to that described above.
 - v. Indirect Costs.

- (1) List all indirect expense rates for the team member organizations. Indirect expense rates (in the context of this AO) include labor overhead, material overhead, general and administrative (G&A) expenses, and any other cost proposed as an allocation to the proposed direct costs.
 - (2) If the proposal includes support services for which off-site burden rates are used, provide a schedule of the off-site burden rates. Include a copy of the company policy regarding off-site vs. on-site effort.
 - (3) If available, submit evidence of Government approval of any/all projected indirect rates for the proposed period of performance. Indicate the status of rate negotiations with the cognizant Government agency, and provide a comparative listing of approved bidding rates and negotiated actual rates for the past five (5) fiscal years.
 - (4) Discuss the fee arrangements for the major team partners.
2. Mission Operations and Data Analysis (Phase E) Cost Estimate. This section provides a cost estimate for performing the Mission Operations and Data Analysis Phase (Phase E) portion of the mission. The Phase E cost estimates should correlate with the plans set forth in the Science, Technical Approach, and Management sections of the proposal. In completing this section, the following guidelines will apply:
- a. Work Breakdown Structure. A Work Breakdown Structure (WBS) should be included for the Mission Operations and Data Analysis Phase of the mission. The WBS should be consistent with the plans set forth in the Technical Approach and Management sections of the proposal and the Statement of Work that is provided as an Appendix.
 - b. Cost Estimating Technique. Describe the process and techniques used to develop the Phase E cost estimate. 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 Provide 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 missions contained in the model's data base and key attributes of the proposed mission. Include the assumptions used as the basis for the Phase E cost and identify those which are critical to cost sensitivity in the investigation. Identify If any "discounts" were assumed in the cost estimates for business practice initiatives or streamlined technical approaches, and the basis for these discounts. Describe describe how these have been incorporated in the cost estimate and will be managed by the investigation team.

- c. Workforce Staffing Plan. Provide a workforce staffing plan (including civil service) which is consistent with the Work Breakdown Structure. This workforce staffing plan should include all team member organizations and should cover all management, manufacturing, technical (scientific and engineering), and support staff. The workforce staffing plan should be phased by fiscal year. Time commitments for the Principal Investigator, Project Manager, and other key personnel should be clearly shown.
 - d. Phase E Time-Phased Cost Summary. Provide a summary of the total Phase E costs consistent with Figure 2. The Phase E cost summary should be developed consistent with the Work Breakdown Structure and should include all costs to NASA, along with all contributed costs. The Phase E time phased cost summary should be phased by fiscal year.
3. Total Mission Cost (TMC) Estimate. This section should summarize the estimated costs to be incurred in Phases A through E including launch vehicle, upper stages, and launch services; ground segment costs; and cost of activities associated for social or educational benefits (if not incorporated in any of Phases A through E). The total mission cost estimate should be developed consistent with the Work Breakdown Structure.

This section should include:

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

- a. Total Mission Cost. A summary of the Total Mission Cost time-phased by fiscal year must be included in the format shown in Figure 1. This summary should represent the optimum funding profile for the mission. Assets provided as contributions by international or other partners should be included, and clearly identified, as separate line items.

FIGURE 1
TOTAL MISSION COST FUNDING PROFILE TEMPLATE
(FY costs* in Real Year Dollars, Totals in Real Year and FY 1998 Dollars)

Item	FY1	FY2	FY3	FY4	FY5	FYn	...	Total (Real Yr.)	Total (FY 1998)
Phase A	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
- Organization B									
- etc.									
<u>Phase B/C/D</u>	\$	\$	\$	\$	\$	\$	\$	\$	\$
<u>Phase B</u>	\$	\$	\$	\$	\$	\$	\$	\$	\$
- <u>Organization A</u>									
<u>Phase C/D</u>	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase E									
- Organization A									
Launch services	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Ground Data System Dev	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Other (specify)	\$	\$	\$	\$	\$	\$	\$	\$	\$
NASA Mission Cost	\$	\$	\$	\$	\$	\$	\$	\$	\$
Contributions by Organization (Non-U.S. or U.S.) to:									
Phase A	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
<u>Phase B/C/D</u>	\$	\$	\$	\$	\$	\$	\$	\$	\$
<u>Phase B</u>	\$	\$	\$	\$	\$	\$	\$	\$	\$
- <u>Organization A</u>									
<u>Phase C/D</u>	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Phase E									
- Organization A									
Launch Services	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Ground Data System Dev	\$	\$	\$	\$	\$	\$	\$	\$	\$
- Organization A									
Other	\$	\$	\$	\$	\$	\$	\$	\$	\$
Contributed Costs (Total)	\$	\$	\$	\$	\$	\$	\$	\$	\$
Mission Totals									\$

* Costs should include all costs including fee

FIGURE 2
(Phased costs in FY98 Dollars, Totals in FY98 and Real Year Dollars)

TIME PHASED COST BREAKDOWN BY WBS AND MAJOR COST CATEGORY					
WBS/Cost Category Description	Month 1 or FY1	Month 2 or FY2	...	Total (FY98\$)	Total (RYS)
WBS/Cost Category Description	FY1	FY2	...	Total (FY98\$)	Total (RYS)
Total Direct Labor Cost	\$	\$	\$	\$	\$
WBS 1.0 Management					
WBS 2.0 Spacecraft					
WBS 2.1 Structures & Mechanisms					
WBS 2.2 Propulsion					
etc.					
Total Subcontract Costs	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
Total Materials & Equipment Cost	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
Total Reserves	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
Total Other Costs	\$	\$	\$	\$	\$
WBS # and Description					
:					
etc.					
Fee					
Other (Specify)					
Total Contract Cost	\$	\$	\$	\$	\$
Total Other Costs to NASA	\$	\$	\$	\$	\$
Launch Services					
Ground Segment					
Other (Specify)					
Total Contributions (Non-U.S. or U.S.)	\$	\$	\$	\$	\$
Organization A:					
WBS # and Description					
etc.					
Organization B:					
WBS # and Description					
etc.					
TOTAL COST FOR PHASE	\$	\$	\$	\$	\$

Figure 3 Fiscal Year Costs in FY 1998 Dollars (to nearest thousand)
(Totals in Real Year and Fiscal Year 1998 Dollars)

Cost Element¹	FY1	FY2	FY3	...	FYn	Total (FY 1998)	Total (RY\$)
Phase A							
Reserves							
Total Phase A							
Phase B							
Reserves							
Total Phase B							
Phase C/D							
Instrument A							
Instrument B							
Instr Integ, Assy & Test							
<i>Subtotal - Instruments</i>							
Spacecraft Bus							
Spacecraft Integ, Assy & Test							
Other Hardware Elements							
Launch Ops							
<i>Subtotal - Spacecraft</i>							
Proj Mgmt/Miss Analysis/Sys Eng							
Science Team Support							
Prelaunch GDS/MOS Development							
Other ²							
<i>Subtotal Phase C/D before Reserves</i>							
Instrument Reserves							
Spacecraft Reserves							
Other Reserves							
Total Phase C/D							
Phase E							
MO&DA							
Tracking Services							
Other ²							
<i>Subtotal Phase E before Reserves</i>							
Reserves							
Total Phase E							
Launch Services							
Total NASA Cost	\$	\$	\$	\$	\$	\$	\$
Contributions ²							
Total Contributions	\$	\$	\$	\$	\$	\$	\$
Total Mission Cost							\$

Notes to Figure 3

- 1 Refer to definitions of Program Cost Elements at end of this Guidelines document
- 2 Specify each item on a separate line; include Education & Public Outreach, facilities, etc.

Figure 4
Phase C/D Development Costs
in FY98 Dollars (to nearest thousand)

Cost Element¹	Non-Recurring	Recurring	Total (Real Yr.)	Total (FY 1998)
<u>Cost Element¹</u>	<u>Non-Recurring</u>	<u>Recurring</u>	<u>Total (FY 1998)</u>	<u>Total (Real Yr.)</u>
Instrument A ²				
Instrument B ²				
Instrument n ²				
<i>Subtotal - Instruments</i>				
Structure and Mechanisms				
Attitude Control				
Power				
Subsystem n				
<i>Subtotal - Spacecraft Bus</i>				
Any other elements (specify)				
<i>Subtotal - Other elements</i>				
Total NASA Development Cost				

- 1 Refer to definitions of Program Cost Elements at end of this Guidelines document
- 2 Specify each instrument by subsystem/components where possible

J. CHANGES REQUIRED FOR AND IMPLICATIONS OF DELAYING INVESTIGATION LAUNCH UNTIL JUNE 2004

In order to quickly execute a contract for the mission selected to be launched in June 2004, the proposer must provide sufficient information to understand the implications of this delay to the science investigation and to the implementation of the mission. The information should be provided in the following format:

1. Science Investigation Implications. Describe the implications to achieving the proposed science investigation objectives if the mission is delayed.
2. Implementation Plan Changes: Describe how the proposed implementation activities would be affected by the delay and include a revised version of the schedule presented in the baseline concept study. Describe in detail what tasks would be accomplished in the extended Phase B and provide the same level of information requested in Section H. If Phases C/D are modified, address any risks that might be added to the mission as a result of the delay and how those risks would be managed and mitigated. It is not expected that Phase E will change, but if it does, provide similar information as requested for previous phases.
3. Cost Plan Changes: If the work/cost content does not change from the baseline, only provide new versions of Figures 1,3 and 4. The information in the Implementation Plan Changes section should correlate with the revised cost profile. If the content changes, then a new version of Figure 2 is required with sufficient explanation to understand the differences between the baseline costs and the alternate launch date costs. Inflation is not considered a content change.

NOTE:

1. The MIDEX NASA cost cap of \$140 million (FY 98 \$) applies to this alternative.
2. The level of funding available for the initial period of Phase B is unknown due to the uncertainties in the first mission's funding profile. The Team should plan an intelligent and efficient development approach to the delayed launch date with a revised funding profile which meets this new plan. If proposed funding levels for this option exceed the available annual resources, NASA will work with the Team to arrive at a mutually acceptable funding profile within the \$140M cap.

K. APPENDICES

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

1. Resumes. Provide resumes for all key personnel identified in the Management section. Include resume data on experience which relates to the job these personnel will be doing for the proposed investigation.
2. Letters of Endorsement. Letters of endorsement must be provided from all organizations participating in and critical to the investigation. Letters of endorsement should be signed by both the lead representative from each organization represented on the team, and by institutional and Government officials authorized to commit their organizations to participation in the proposed investigation.
3. NASA PI Proposing Teams. The same guidelines as in AO Appendix B ~~for the proposal~~ apply.
4. Mission Definition and Requirements Agreement. A draft Mission Definition and Requirements Agreement should be provided. An example of a Mission Definition and Requirements Agreement is provided in the Explorer Program Library.
5. SF 1411. A Standard Form 1411 Contract Pricing Proposal Cover Sheet is required for Phase B and all subsequent phases as provided in AO Appendix A Section VI.
6. Certifications. The same certifications that were required in AO Appendix F are again required.
7. Statements of Work for each Contract Option. Provide draft Statement(s) of Work for all potential contracts with NASA. These Statement(s) of Work should (as a minimum) be for each contract option (i.e., Phase B/C/D, and Phase E) and clearly define all proposed deliverables (including science data) for each option, potential requirements for Government facilities and/or Government services, and a proposed schedule for the entire mission.
8. Incentive Plan. A draft Incentive Plan should be included with the ~~proposal~~ concept study. This Incentive Plan should outline contractual incentive features for all major team members. Incentive Plans should include both performance and cost incentives, as appropriate.
9. Relevant Experience and Past Performance. Relevant experience and past performance (successes and failures) of the major team partners in meeting cost and schedule constraints in similar projects within the last ten years should be discussed. A description of each project, its relevance to the proposed investigation, cost and schedule performance, and points of contact (including addresses and phone numbers), should be provided.
10. International Agreement(s). Draft International Agreement(s) are required for all nondomestic partners in the investigation.

The following information is not required, but may be provided.

1. References List. ~~Proposals~~Concept studies may provide, as an appendix, a list of reference documents and materials used in the ~~proposal~~concept study. The documents and materials themselves cannot be submitted, except as a part of the ~~proposal~~concept study.
2. Acronyms List. Inclusion of an acronyms list is strongly encouraged.

Appendix to MIDEX Phase A Study Guidelines

Program Cost Elements

Introduction

This is a short dictionary of definitions for the cost elements shown in the figures and tables and discussed in the *Revised Guidelines for Concept Study Report Preparation* document.

Project Management/Mission Analysis/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. Mission Analysis includes preflight trajectory analysis and ephemeris development. Systems engineering is the project-level engineering required to ensure that all satellite subsystems and payloads function properly to achieve system 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 incurred for integration of the instruments to the spacecraft are included in the Spacecraft Integration, Assembly & Test cost element (see below).

Spacecraft Bus

Spacecraft bus costs include costs incurred to design, develop, and fabricate (or procure) the spacecraft subsystems. Costs for integration and assembly are not included in this element. Component level test and burn-in is included in this cost element. System tests are included in Spacecraft IA&T (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.

Launch Checkout & Orbital Operations

Launch checkout and orbital operations support costs are those involving pre-launch planning, launch site support, launch-vehicle integration (spacecraft portion), and the first 30 days of flight operations.

Science Team Support

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

Pre-Launch GDS/MOS Development

Includes costs associated with development and acquisition of the ground infrastructure used to transport and deliver the telemetry and other data to/from the Mission Operations Center and the Payload Operations Center. (For more information, refer to *MIDEX Ground Data Systems and Mission Operations and Data analysis* document in the EPL.) Includes development of science data processing and analysis capability. Also includes pre-launch training of the command team, development and execution of operations simulations, sequence development, and flight control software. This element includes any mission-unique tracking network development costs.

Mission Operations and Data Analysis (MO&DA)

This cost element refers only to Phase E (post-launch), and has two major components: Mission Operations and Data Analysis. Mission operations comprises all activities required to plan and execute the science objectives, including spacecraft and instrument navigation, control, pointing, health monitoring, and calibration. Data analysis activities include collecting, processing, distributing and archiving the scientific data. MO&DA costs include all post-launch costs for people, procedures, services, hardware and software to carry out these activities. Includes science team support costs post-launch.

Tracking Services including DSN

This line item includes all costs associated with this service for the specific proposed mission profile. (Refer to *MIDEX Ground Data Systems and Mission Operations and Data analysis* document in the EPL.)

Education and Public Outreach

Includes all costs associated with developing and implementing the proposed projects 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.

Launch Services

Launch vehicles and services are either procured and provided by NASA to launch spacecraft under fixed price contracts, or provided by the proposer. Launch services can be either ELV or Shuttle opportunities. In the case of an ELV launch, launch service price includes procurement of the ELV, spacecraft-to-launch vehicle integration, placement of spacecraft into designated orbit, analysis, post-flight mission data evaluation, oversight of the launch service and coordination of mission-specific integration activities. In the case of a Shuttle launch, launch services cost based on payload weight/volume will be provided by the Space Shuttle upon request by the proposer. Costs will include mission unique, upper stage(s), and integration costs.

(For more information, refer to the *MIDEX Expendable Launch Opportunities Document* or the *MIDEX Space Shuttle Launch Opportunities Document* in the Explorer Program Library.)

Reserves

In that NASA maintains no reserves for missions, reserves should include those project funds that are not allocated specifically to estimated resources, but are held against contingencies or underestimation of resources to mitigate the investigation risk. Reserves should be reported according to the proposed reserve management strategy. For example, if the reserve is divided into funds to be pre-allocated to the flight system and instrument payload, with another portion held at the project level, specific dollar amounts to fund each must be identified.

NASA Center Costs (all categories)

Additional costs borne by the program for NASA Center participation. For example, there may be additional program management/systems engineering costs, above those incurred by the spacecraft prime contractor, which are due to NASA employee participation.

Reference

Explorer Program Library (EPL), located on the World Wide Web at:
<http://explorer.larc.nasa.gov/explorer/epl.html>

MIDEX Downselect Page, located on the World Wide Web at
<http://spacescience.nasa.gov/codesr/midex/midex.html>