APPENDIX H

Guidelines for Investigations Proposing the PI-Mode

1. OVERVIEW

The following guidelines apply to the preparation of proposals by potential investigators selecting the PI-Mode of implementation in response to this Announcement of Opportunity. The material presented is merely a guide for the prospective proposer and not intended to be all encompassing. The proposer should, however, provide information relative to those items applicable or as otherwise required by this Announcement of Opportunity.

MIDEX PI-Mode teams may be led by Principal Investigators (PI's) at all categories of U.S. and non-U.S. organizations, including educational institutions, industry, nonprofit institutions, NASA Centers, and other Government agencies. Except as noted below, the NASA Goddard Space Flight Center (GSFC) will oversee selected PI-Mode investigations.

The PI-Mode should be implemented via teaming arrangements (consortia) among industry, university, and Government partners which optimize the talents of each of the organizations. The consortia may include members from one or more of the following: industry, a Federally Funded Research and Development Center (FFRDC), universities, and/or a Governmental organization, such as a NASA Center. Teams are encouraged to utilize industry participation to the fullest extent reasonable. NASA field centers, including the Jet Propulsion Laboratory, are welcome as mission team members. When a NASA field center participates as a member of a mission team, it should do so because it brings unique skills, facilities, and/or capabilities to the team. Teams will be led by the PI who will have the responsibility and accountability to accomplish the selected missions within the cost and schedule constraints of the program. Each PI-Mode investigation must have an experienced Project Manager (PM) who will oversee the technical and programmatic implementation of the mission. The role and experience of the PM must be adequate to insure that the technical needs of the investigation will be met. Investigator teams will be allowed to use their own processes, procedures, and methods to the fullest extent practical, but are encouraged to develop and implement new ways of doing business when cost, schedule, and technical improvements can be achieved. NASA oversight and reporting requirements will be limited to that which is essential to enable mission success and agreed upon science return in compliance with committed cost, schedule, performance, reliability, and safety requirements.

PI-Mode mission proposals must include all technical aspects of the investigation from Definition (Phase B) through delivery of the data and its analysis (Phase E). NASA Handbook (NHB) 7120.5 ("Management of Major System Programs and Projects") delineates activities, milestones, and products typically associated with each of these phases and should be used as a reference in defining a team's mission approach.

The management approach taken by the PI can vary, as best suits the mission design, skills/expertise of the team members, and resources. For example, the PI can choose to delegate project management responsibility to a given individual within his/her team, including an industry participant. This person would assume responsibility for the technical implementation of the mission, including acquisition of the science data. In this arrangement, the PI's main responsibility remains the scientific integrity of the mission, with ultimate accountability to NASA for mission success. Another arrangement may have the PI team with a NASA Center, which would serve as the project management organization. An experienced project manager would be designated by the Center, with PI concurrence, and he/she would be responsible for the successful implementation of the overall mission, including the acquisition of science data. Again, the PI would retain responsibility for the scientific integrity of the mission. A third option would have the PI retain both project scientist and project management responsibilities. He/she would, therefore, be responsible for all aspects of the mission, both technical and scientific.

Industrial or FFRDC partners can be responsible for the entire design, development, integration and test of the spacecraft, or for the provision of required subsystems or instruments. Arrangements with these organizations will require signed agreements from each party identifying personnel and resources to be committed to the project.

NASA Centers may play different roles in the program, also. The Center may be a full team member, providing a wide range of contract administration, project management and mission development services, or the NASA Center may provide limited services, such as mission operations support, that can be arranged for by the PI or Project Manager. In either case, a signed agreement must be reached with that Center's management, committing people, facilities, or other resources to the project.

Different mission organizational arrangements will require different management and procurement approaches, contract administration, and oversight arrangements. If the PI selects a team composed solely of private industry and academia, then the contract with the PI will be developed, executed, and administered by GSFC. In the case where the PI chooses to team with a NASA Center, NASA may request the participating Center to develop and administer the contract(s). This may also occur in cases where a Center is supporting a mission in a reduced capacity. When a Center provides the procurement service, mission resources will be transferred to the Center using standard NASA funding processes. If the PI teams with an FFRDC, then GSFC could work with the FFRDC sponsor agency to establish a task order for the mission as part of the existing FFRDC contract. Funding would be transferred from NASA to the sponsoring Agency via an interagency funding transfer. The PI is expected to recommend, as part of his teaming arrangement, the organizations and mechanisms the Government should use in awarding work to his team.

Contracts for PI-Mode missions will require the approval of NASA, regardless of the procurement organization, prior to issuance to the contractor. Cost and performance incentive fee contracts are strongly encouraged, particularly where performance incentives are measured based on flight performance.

NASA will assure that the program and its missions are being conducted properly by empowering appropriate organizations to conduct oversight activities in relation to mission and contract execution. The level of oversight and the organizations responsible will vary, depending on which phase the program is in and the teaming arrangements. Product assurance, contract administration and cost, schedule, and technical oversight are the principal areas for oversight.

Reporting and review requirements will vary according to the phase of the mission. Missions in Phase B will have a kick-off meeting, provide a midterm report and submit required information for the Phase B final review. The midterm report and final review will cover cost, schedule, and technical status.

Missions in Phase C/D will be subject to one independent cost, schedule and technical review per year, typically tied to a major mission milestone (e.g., CDR). The independent review board participants will be selected by NASA, and members could come from any private or Government concern. This review board will have the authority to make recommendations for continuance or termination of the project. In addition, if either the PI or GSFC determines that the mission cannot be completed within the agreed upon constraints, a termination review will be scheduled.

Missions will be expected to report progress on a periodic basis. Specific formats and reporting periods will be mutually defined by the Project and the PI. The scope of each report will vary by Phase but should contain cost, schedule and technical status. Generally, reports generated by the team for their own internal management reviews will be adequate to meet Government reporting requirements. The PI will be required to submit cost and obligation plans on an annual basis and to submit monthly reports of actual costs and obligations.

2. PROPOSAL INSTRUCTIONS

The proposer should first submit a Step-One Proposal, as outlined below. Based on the evaluation of Step-One Proposals, NASA will select a number of investigations for further consideration. Each of these investigations will then submit a Step-Two Proposal, with evaluation leading to selection of two primary and two alternate missions, as described in Section I.B of the body of this AO.

The guidelines for the Cover Letter, Table of Contents, Identifying Information, and Investigation Summary Form apply to both the Step-One and Step-Two Proposals. Guidelines specific to each proposal step follow.

Cover Letter

A letter or cover page should be forwarded with the proposal. It should be signed by the investigator and by an institutional official who is authorized to certify institutional support and sponsorship of the investigation and of the management of the proposal. It should also be signed by the authorizing official from each organization represented on the team who is authorized to commit that institution to the proposed investigation.

Table of Contents

The proposal should contain a table of contents.

Identifying Information

The proposal should contain a short descriptive title for the investigation; the names of all investigators; the names of all participating organizations or institutions; and the full name, address, and telephone number of the Principal Investigator (PI).

Investigation Summary Form

The salient features of the proposed investigation should be summarized in an "Investigation Summary Form," which is provided as Figure H-6 at the back of this Appendix. A figure or drawing of the instrument and/or spacecraft may be included at the proposer's discretion.

STEP-ONE PROPOSAL

1. SCIENCE INVESTIGATION AND INVESTIGATION PLAN

This section should address the following:

a. Summary. A concise statement describing the investigation, its conduct, and the anticipated results.

b. Objective and Significant Aspects. A brief definition of the objectives, their value, and their relationships to past, current, and future effort. The history and basis for the proposal, including demonstration of the need for such an investigation. A statement of present development in the discipline field.

c. Investigation Approach
   1. Fully describe the concept of the investigation.
   2. Detail the method and procedures for carrying out the investigation.

The above information will constitute the Baseline Mission. This section must also identify a minimum acceptable data and scientific return for the mission (the Minimum Science Mission), below which the mission would not be worth pursuing. Options for descoping the mission from the Baseline Mission to the Minimum Science Mission, and their impact to the investigation, should be briefly discussed. Proposals should include only one Baseline Mission and one Minimum Science Mission. NASA will not consider more than one Baseline Mission or Minimum Science Mission per proposal.

2. TECHNICAL APPROACH

The Technical Approach should describe the method and procedures for mission definition, design, development, integration, ground operations, and mission operations. This section should also describe the expected products and end items associated with each phase.

a. Mission Operations Concept and Requirements — This section should address the operational phase of the mission from launch to end of mission. The following elements should be addressed:

   1. Mission operations scenarios
   2. Spacecraft pointing requirements
   3. Attitude determination
   4. Orbit determination
   5. Communications requirements
   6. Mission lifetime
   7. Launch and/or operational (data collection) window(s)
   8. Orbital requirements
   9. Use of NASA ground system and operations functions and capabilities defined in Appendix C

b. Instrumentation — This section should describe the instrumentation and the criteria used for its selection. A description of the instrument, including layout and block diagrams, should be provided. The state of maturity of the instrument, including breadboards, prototypes, existing instrumentation, and heritage, should be described. Prior instrument investigation studies performed should be summarized. Instrument performance requirements should be related to the investigation goals and objectives for both the Baseline Mission and Minimum Science Mission as described in Section 1 above. A description of the technology/development risks and the plan to address them should be included. The following basic instrument information should be provided:

   1. size
   2. mass
   3. shape
   4. mechanical interface with the spacecraft
   5. field of view
   6. power consumption (nominal, peak, duty cycle, standby)
   7. basic functional description
   8. basic operational description

9. power interface
10. telemetry and command interface

c. Spacecraft — This section should describe the spacecraft design concept and requirements. The basis for the spacecraft concept, such as another spacecraft of known cost, should be provided. Required spacecraft resources should be described. A description of the payload layout and configuration should be included. Key features and sensitivities of the spacecraft, as they apply to the investigation, should be identified, including electrostatic discharge, magnetics, contamination, electromagnetic interference, etc.

3. DATA REDUCTION AND ANALYSIS PLAN

This plan should detail the method and format of the data reduction and analysis effort. A plan and schedule for distribution of reduced data to Co-investigators should be included. The plan should also include a schedule for the submission of reduced data to the National Space Science Data Center (NSSDC), Greenbelt, MD. Justification must be provided for the need for, and duration of, any proprietary rights for the PI for any data obtained as part of the mission's scientific investigation.

4. MANAGEMENT PLAN

This section should summarize the investigator's proposed management approach. The programmatic rationale and justification for carrying out the investigation using the PI-Mode management approach shall be described. The management organization and decision-making process should be described, teaming arrangements should be discussed, and responsibilities of team members and institutional commitments should be detailed. Unique capabilities that each member organization brings to the team, as well as previous experience with similar systems and equipment, should be addressed.

A top-level schedule for the definition and development phases should be provided. Key interdependencies, critical paths, and long lead procurements should be identified.

5. COST PLAN (U.S. INVESTIGATIONS ONLY)

The cost plan should summarize the total mission cost by major categories of cost. Top level costs should be provided for the definition, development, and operations phases. Proposers should refer to the Work Breakdown Structure (WBS) in Figure H-3 for cost elements to be considered in developing the top level costs.

The cost plan should include the following:

a. Breakdown of development and operations costs into the following broad categories (including budget reserve for each category):
   1. Instrument
   2. Spacecraft
   3. Mission systems integration and test
   4. Operations preparations
   5. MO&DA
b. Definition phase cost for the following cases:
   1. 10-month definition phase
   2. 22-month extended definition phase
c. Alternate investigation funding for 1 or 2 years
d. Rationale for cost and budget reserve

STEP-TWO PROPOSAL

VOLUME I

INVESTIGATION AND TECHNICAL PLAN

1. SCIENCE INVESTIGATION AND INVESTIGATION PLAN

This section should only address changes to the Science Investigation and Investigation Plan from the Step-One Proposal. Any descoping of the investigation from the Baseline Mission defined in Step-One should be identified.

2. TECHNICAL APPROACH

The Technical Approach section should detail the method and procedures for mission definition, design, development, manufacturing, integration and test, ground operations, and mission operations. 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 experience and qualifications of performing organizations should by discussed.

This section must be complete in itself without the need to request additional data. Failure to furnish complete data may preclude evaluation of the proposal.

a. Mission Design — This section should fully describe the operational phase of the mission from launch to end of mission. The following mission elements should be addressed:

   1. Mission operations scenarios — preliminary mission timeline covering typical science operations scenarios indicating periods of acquisition, data downlink, etc.,
   2. Spacecraft pointing requirements:
      - where, when, which axis
      - accuracy
      - stability
      - special requests (maneuvers, Sun/Moon/Earth avoidance, etc.)
   3. Attitude determination
      - when
      - stability/accuracy
   4. Orbit determination — in-track, across-track, altitude, frequency
   5. Communications requirements — facilities, data rates, bit error rate, etc.
   6. Mission lifetime
   7. Launch and/or operational (data collection) window(s)
      - science related
      - other
   8. Orbital requirements:
      - required
      - desired
      - constraints (SAA avoidance, etc.)

b. Instrumentation — This section should fully describe the instrumentation and the criteria used for its selection. It should indicate items that are proposed to be developed, as well as any existing instrumentation or design heritage. Particular attention should be paid to describing any required technology development, the risks involved, and alternative approaches. Performance characteristics of the instrumentation should be related to the measurement and investigation objectives as stated in the Section 1, for both the Baseline Mission and the Minimum Science Mission. The following basic instrument information should be included:

1. size
2. mass
3. center of gravity
4. shape
5. mechanical interface with the spacecraft
6. thermal paths
7. field of view
8. power consumption (nominal, peak, duty cycle, standby)
9. basic functional description
10. basic operational description
11. power interface
12. telemetry and command interface

c. 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 and describe its characteristics and requirements. A preliminary description of the spacecraft design with a block diagram showing the spacecraft subsystems and their interfaces should be included, along with a description of the flight software and a summary of the estimated performance of the spacecraft. The flight heritage or rationale used to select the spacecraft and its subsystems, major assemblies, and interfaces should be described.

Subsystem characteristics and requirements should be described to the extent possible. Such characteristics include: mass, volume, and power requirements; pointing knowledge and accuracy; new developments needed; flight qualification plan; and logistics support. These subsystems may include: structural/mechanical, solar array/power system (and batteries), electrical, thermal control, propulsion, communications, attitude control, command and data handling, etc. Adequate margins should be identified. Any design features incorporated to effect cost savings should be identified. A summary of the resource elements of the spacecraft 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.

Plans for all phases of software development or use of existing software (including "commercial off-the-shelf") should be described. The method planned for development and validation of flight software, and the method for resolving any major open spacecraft issues, major systems trades, and technology development planned to be addressed in Phase B should be addressed. A preliminary schedule for the spacecraft development should be included. Along with a description of the payload layout and configuration, this section should address accommodation of the instrumentation by the spacecraft as follows:

1. preferred launch orientation
2. instrument location constraints:
    - relative to other instruments
    - relative to spacecraft components
3. alignment to axis
4. baffling or other protection
5. thermal environment/temperature limits:
    - operational
    - survival
6. data processing (onboard and on the ground)
7. telemetry — type, quantity, sample rate, time tagging, format
8. commands — type, quantity, function, timing constraints, frequency
9. timing (clocks) — resolution, accuracy, transfer method
10. environmental sensitivities — electrical cleanliness, magnetic fields, contamination
11. data collection and storage — volume, frequency, speed/rate, bit error rate
12. required U.S. Government support — Government furnished equipment, services, facilities

d. Manufacturing, Integration, and Test — This section should describe the manufacturing strategy to produce and test the hardware/software necessary to accomplish the mission. It should include a description of the main processes/procedures planned in the fabrication of flight hardware, software, transitioning from design to production, production personnel resources, incorporation of new technology/materials, and the preliminary test and verification program.

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. The use of any existing test facilities and processes should be described.

e. Mission Operations — This section should identify requirements for mission operations support including mission planning. Requirements should be referenced to the baseline functions and capabilities defined in Appendix C. Requests for enhancements beyond the baseline should be specifically identified. Special communications facilities that are needed must be described. Any special orbital requirements, such as time of month, time of day, phase of moon, and lighting conditions are to be given in detail. Describe real-time ground support requirements and indicate any special equipment or skills required of ground personnel.

f. Ground and Data Systems — This section should discuss the ground operations support required for the proposed investigation. Requirements should be referenced to the baseline functions and capabilities defined in Appendix C. Requests for enhancements beyond the baseline should be specifically identified. The approach to the development of the ground and data system (GDS), including the use, if any, of existing facilities should be described. Details of communications needs, tracking needs, and special techniques should be delineated. Describe the communications facilities that will be used, including any NASA facilities or special facilities. All usage of NASA communication facilities should be explicitly described. Any mission-unique facilities must be adequately described. Describe all communications, tracking, and ground support requirements. Describe the software development approach and its relationship to the spacecraft software development.

g. Performance Assurance — This section should contain the approach to performance assurance as described in Appendix D.

h. New Technology and Technology Transfer — This section should describe those technologies to be considered for potential application to the mission and their rationale. The methods by which these new technologies will be assessed and their risks reduced, as well as the means to validate these technologies, should be described. The potential for transfer of new technology from this mission to other applications in NASA, the Federal Government, and/or in the private sector should be described. Alternative approaches to the use of these new technologies should be identified.

3. DATA REDUCTION AND ANALYSIS PLAN

This section should only address changes to the Data Reduction and Analysis Plan from the Step-One Proposal.

VOLUME II

MANAGEMENT PLAN

The Management Plan should describe the management approach and the facilities and equipment required. The plan shall include the programmatic rationale and justification for carrying out the investigation using the PI-Mode management approach. 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 when cost, schedule, and technical improvements can be demonstrated.

a. Management Processes and Plans, Schedule, and Procurement Strategy — This section should describe the management processes and plans, schedules, and procurement strategy 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. Specifically, it should include the following, as applicable:

    1. Unique or proprietary capabilities that each member organization brings to the team, as well as previous experience with similar systems and equipment.

    2. Management processes which the investigator team proposes to:

        a. develop and maintain the hardware and software requirements and specifications;

        b. manage and control development progress;

        c. manage and conduct technology development;

        d. manage and conduct design;

        e. manage, review, and control hardware/software, documentation, etc. changes;

        f. manage and conduct systems engineering and integration;

        g. manage and conduct procurement including make or buy decisions, subcontract management, etc.;

h. manage and conduct the testing and verification programs, including final checkout and calibration;

i. assure safety, reliability, and quality;

j. manage and conduct launch and mission operations;

k. manage and conduct data reduction, analysis, and archiving;

l. coordinate with team members and document agreements;

m. manage and control finances within cost limitations;

n. report progress to NASA.

3. Rationale for the investigator to obtain the spacecraft through or by the investigator's institution.

4. Method and basis for the selection of the proposed spacecraft fabricator, including contract type and rationale.

5. Availability of supporting personnel in the institution to successfully administer the spacecraft contract and technically monitor the design, development, and test.

6. Development status of the spacecraft, including areas requiring further design or development or in which unknowns are present.

7. The specific decision-making process regarding all aspects of the mission, including mission descoping, and the individual with ultimate decision-making authority in such cases.

8. Availability of proposed personnel on the team to successfully administer the investigation contract and technically monitor the implementation.

The schedule and work flow should be clearly laid out, and the method for internal review, control, and direction discussed, including whether or not a form of performance measurement system will be used.

b. Roles, Responsibilities, and Experience of Team Members — The roles, responsibilities, time commitment, and experience of all key personnel must be described in this section, with particular emphasis placed on the responsibilities assigned to the PI and the Project Manager. In addition, information should be provided which indicates what percentage of time will be devoted to the mission, the duration of service, and how changes in personnel will be accomplished.

1. Principal Investigator. The role(s), responsibilities, and time commitment of the Principal Investigator should be discussed here.

2. Project Manager. The role, responsibilities, time commitment, and experience of the Project Manager should be discussed in this section.

3. Other Key Personnel. The roles, responsibilities, time commitments, and experience of the Co-Investigators and other key

personnel in the investigation should be described in this section.

The management structure of the mission team must be described in the proposal. The proposal must identify the teaming approach to be used and describe the responsibilities of each team member and their contributions to the mission.

Financial responsibilities of all team partners must be described. The mechanisms (contracts, subcontracts, cooperative agreements, memoranda of agreement, letters of endorsement, etc.) by which organizations commit to participate as partners on a proposing team must be clearly identified. Include a description of the fee strategy, where appropriate, and the rationale. The proposal signature page must include the signature of an official from each organization represented on the team or contributing to the mission who is authorized to commit that organization to the proposed mission. Failure to include any such authorization may be grounds for rejection of the proposal. Non-U.S. organizations participating as team partners must also meet this requirement.

Any experience (successes and failures) of team partners in meeting cost and schedule constraints in similar projects within the last ten years should be discussed.

c. Risk Management and Descope Options — This section should describe the approach to risk management to be taken by the team. Particular emphasis should be placed on describing how the various elements of risk will be managed to ensure successful accomplishment of the investigation within cost and schedule constraints. In the event risks cannot be managed successfully and mission objectives must be revised toward the Minimum Science Mission, then this section should briefly describe the descope options available, their phasing, and their effect on mission performance relative to the previously defined Minimum Science Mission. This section should identify the latest possible dates at which descope options may be implemented and the procedure by which they would be accomplished.

d. Facilities and Equipment — All major 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) essential to the mission in terms of its system and subsystems are to be indicated, distinguishing insofar as possible between those already in existence and those that will be developed in order to execute the mission. 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.

e. Educational and Public Outreach — This section should discuss the degree to which this mission will generate educational opportunities and contribute to the Nation's educational initiatives. The involvement of teachers and/or students in the mission should be documented here, as should any educational activities to be implemented. Coordination and collaboration with educational institutions should be discussed. Activities to enhance the level of understanding and awareness of space science by the public should be described.

f. Small and Small Disadvantaged Businesses — This section should describe the opportunities offered by the mission for small and small disadvantaged businesses. It should also describe the breadth of participation in the mission by members of the industry, academic, not-for-profit, and Federal communities, as well as discussing the opportunities offered by the mission for other members of these communities. This section should identify the percentage of work, expressed as percentage of total subcontract cost/price and total contract cost/price, to be performed by small businesses (SB's) and small disadvantaged businesses (SDB's). Goals for SB and SDB subcontracting are contained in Appendix E.

VOLUME III

COST PLAN (U.S. Investigations Only)

The cost plan should summarize the total mission cost by major categories of cost as well as by function. The plan should address the definition, development, and operations phases.

1. The categories of cost should include the following:
   a. Direct Labor. List by labor category, with labor hours and rates for each. Provide actual salaries of all personnel and the percentage of time each individual will devote to the effort.
   b. Overhead. Include indirect cost, which because of its incurrence for common or joint objectives, is not readily subject to treatment as a direct cost. Usually this is in the form of a percentage of the direct labor costs.
   c. Materials. This should give the total cost of the bill of materials including estimated cost of each major item. Include lead time of critical items.
   d. Subcontracts. List those over $25,000, specify the vendor and the basis for estimated cost. Include any baseline or supporting studies.
   e. Other Costs. Costs not covered elsewhere.
   f. General and Administrative Expense. This includes the expenses of the institution's general and executive offices and other miscellaneous expenses related to the overall business.
   g. Fee (if applicable).

2. Separate schedules summarizing cost by category and phase (in the format shown in Figures H-1 and H-2) should be provided for each functional element of the mission, as defined by the proposer's Work Breakdown Structure (WBS). A reference WBS for a PI-Mode mission is included as Figure H-3. Costs should be presented at level 2 of the WBS (i.e., 1.0 Management; 2.0 Science Support; etc.) except where significant development work is included (e.g., 4.0 Instruments; or 5.0 Spacecraft). In these areas, costs should be allocated and presented to the subsystem level (e.g., 5.3.1 Spacecraft Attitude Control), and a rationale for the estimate should be included. Costs should be presented in FY 1994 dollars. A NASA inflation index is included as Figure H-4. These rates will be used to convert FY 1994 dollars to bid rates unless the proposing organization has formally negotiated other rates. If this is the case, the negotiated rates should be provided in Figures H-1 and H-2.

3. Separate and complete cost plans are required for the case of a 10-month definition phase as well as a 22-month definition phase, as shown in Figures H-1 and H-2. Note that for the 22-month definition phase, funding for the first year is limited to $500,000. In addition, proposers shall complete a Standard Form (SF) 1411, included as Figure H-5, for Phases I and II.

4. Proposers shall also separately propose costs necessary to cover 1 or 2 years of effort to maintain a nucleus of the investigation team, if selected as an alternate investigation.

SUMMARY OF ELEMENTS OF COST
(FY94 DOLLARS)

	PHASE I 10-MONTH DEFINITION	PHASE II 3-MONTH INITIAL DESIGN AND DEVELOPMENT	PHASE III DESIGN, DEVELOPMENT & OPS (LAUNCH + 30 DAYS) YEAR 1* YEAR 2 YEAR3	TOTAL DEF., DESIGN & DEVEL.	PHASE IV MO&DA (BEGINS 31 DAYS AFTER LAUNCH) YEAR 1 YEAR 2 YEAR3 TOTAL
DIRECT LABOR					
HOURS (BY LABOR CATEGORIES)					
COSTS (BY LABOR CATEGORIES)					
OVERHEAD ($/%)					
OTHER DIRECT COSTS					
SUBCONTRACTS**					
MATERIALS					
OTHER					
TOTAL ODC					
SUBTOTAL					
G&A ($/%)					
TOTAL COST					
FEE ($/%)					
TOTAL FY94$					
INFLATION FACTOR					

* COVERS A 9 MONTH PERIOD, I.E., PHASES II & III TOTAL 36 MONTHS

** FOR SUBCONTRACTS OVER $25,000, THE CONTRACTOR WILL PROVIDE THE SAME DETAILS AS IN THEIR OWN PROPOSAL.

FIGURE H-1 SUMMARY OF ELEMENTS OF COST

SUMMARY OF ELEMENTS OF COST
(FY94 DOLLARS)

	PHASE I 22-MONTH DEFINITION YEAR1 YEAR2	PHASE II 3-MONTH INITIAL DESIGN AND DEVELOPMENT	PHASE III DESIGN, DEVELOPMENT & OPS (LAUNCH + 30 DAYS) YEAR 1* YEAR 2 YEAR3	TOTAL DEF., DESIGN & DEVEL.	PHASE IV MO&DA (BEGINS 31 DAYS AFTER LAUNCH) YEAR 1 YEAR 2 YEAR3 TOTAL
DIRECT LABOR					
HOURS (BY LABOR CATEGORIES)					
COSTS (BY LABOR CATEGORIES)					
OVERHEAD ($/%)					
OTHER DIRECT COSTS					
SUBCONTRACTS**					
MATERIALS					
OTHER					
TOTAL ODC					
SUBTOTAL					
G&A ($/%)					
TOTAL COST					
FEE ($/%)					
TOTAL FY94$					
INFLATION FACTOR					

* COVERS A 9 MONTH PERIOD, I.E., PHASES II & III TOTAL 36 MONTHS

** FOR SUBCONTRACTS OVER $25,000, THE CONTRACTOR WILL PROVIDE THE SAME DETAILS AS IN THEIR OWN PROPOSAL.

FIGURE H-2 SUMMARY OF ELEMENTS OF COST (EXTENDED DEF.)

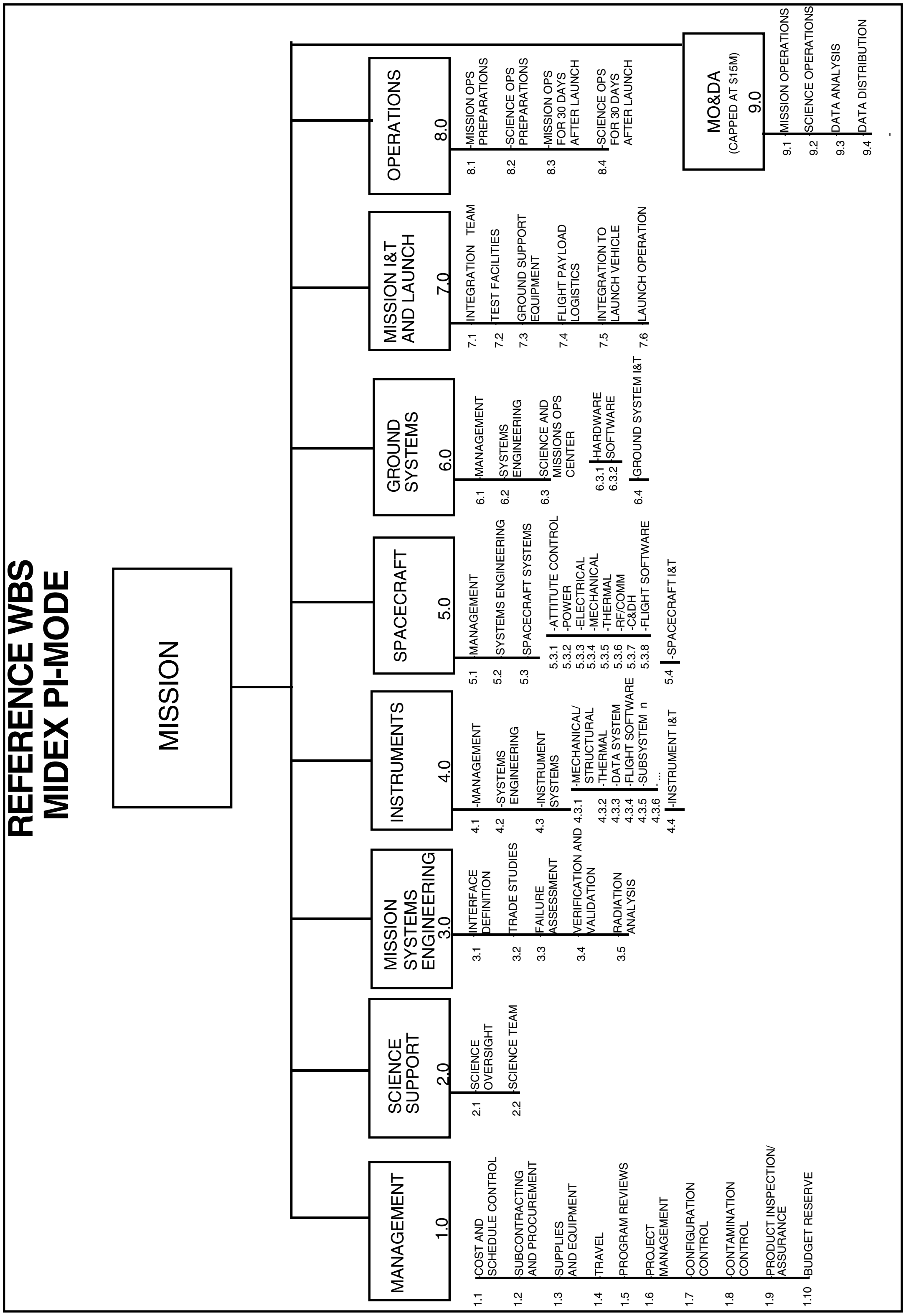

FIGURE H-3 REFERENCE WBS

Fiscal Year	**Inflation Rate**
FY 1995	4.7%
FY 1996	4.8%
FY 1997	5.1%
FY 1998	5.1%
FY 1999	4.7%
FY 2000	4.4%
FY 2001	4.4%
FY 2002	4.4%
FY 2003 and Outyears	4.6%

FIGURE H-4 NASA INFLATION INDEX

FIGURE H-5 SF 1411 (CONTRACT PRICING PROPOSAL COVER SHEET)

Proposal #
NASA Use Only

Medium - Class Explorer (MIDEX)
Investigation Summary Form

PRINCIPAL INVESTIGATOR			
INSTITUTION			
DEPARTMENT			
ADDRESS / STREET			
CITY / TOWN	STATE	ZIP / POSTAL CODE	COUNTRY
TELEPHONE	FAX	E-MAIL ADDRESS	

INVESTIGATION TITLE

INVESTIGATION ABSTRACT

DISCIPLINE AREA (CHECK AS APPLY)

[ ] SPACE PHYSICS
- [ ] IONOSPHERIC
- [ ] MESOSPHERIC
- [ ] THERMOSPHERIC
- [ ] COSMIC
- [ ] MAGNETOSPHERIC
- [ ] HELIOSPHERIC
- [ ] SOLAR

[ ] ASTROPHYSICS
- [ ] RADIO
- [ ] INFRARED
- [ ] SUBMILLIMETER
- [ ] OPTICAL
- [ ] ULTRAVIOLET
- [ ] X-RAY
- [ ] GAMMA-RAY
- [ ] GRAVITY

SPACECRAFT MODE (CHECK ONE)
- [ ] NASA-PROVIDED
- [ ] PI-MODE

TOTAL BUDGET AMOUNT (EXCLUDING MO&DA)

$ ____________________________

TOTAL MO & DA BUDGET

$ ___________________

FIGURE H-6 INVESTIGATION SUMMARY FORM

Proposal #
NASA Use Only

PRINCIPAL INVESTIGATOR

INVESTIGATION TITLE

LIST OF CO-INVESTIGATORS

NAME	INSTITUTION

INSTITUTIONAL ENDORSEMENT

INSTITUTION NAME

NAME AND TITLE OF AUTHORIZING OFFICIAL

SIGNATURE DATE

FIGURE H-6 (CONT.) INVESTIGATION SUMMARY FORM