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New Millennium Program (NMP)

Guidelines for Preparing Concept Definition Study Reports: NMP Subsystem Flight Validation Projects

(as adapted for Space Technology 8)

Version 2

Guidelines for Preparing Concept Definition Study Reports: NMP Subsystem Flight Validation Projects

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Concept Definition Study Guidelines (Subsystems) Revision Log

Revision No	Changes	Program Manager Approval	Date	NASA Program Executive Approval	Date
Basic Version 1			10/29/ 03		
	1. Table 1.2-1 was revised to reflect that the oral presentation of the Study Report is given to the IRB technology area Peer Review Panel. 2. Adds new Section 1.7 to request breakout of cost information to facilitate rapid start-up of the Formulation Refinement Phase through SRR (also see Appendix Section 5.D., Statement of Work). 3. Adds list of questions and requests answers relative to experiment accommodation on the NMC-1 (see section 3.5.6, section 5 Appendices subsection F, and new Attachment A). 4. Specifies 10/1/04 for Cost Plan Formulation Phase start-up (see Section 4.2) 5. Provides update to the NASA Inflation Index (see Section 4.2.1) 6. Adds requirement for a WBS Dictionary (see Section 4.2.6) 7. Revises Table 4.5-1, WBS 5.0. 8. Summary of Cost information is also requested for Implementation Phase (see Section 4.2.7)				

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GUIDELINES FOR PREPARING CONCEPT DEFINITION STUDY REPORTS: FOR NMP SUBSYSTEM FLIGHT VALIDATION PROJECTS

(Adapted for Space Technology 8)

1 INTRODUCTION

This document provides guidelines for the Principal Investigators (PIs)[1], whose proposals were selected for the Concept Definition Phase ("Study Phase") of the NMP technology subsystem flight validation projects, for preparation of the Concept Definition Study Report ("Study Report"). During the Study Phase, the PIs will conduct studies to evolve their technology subsystem concepts, their approaches for proceeding into the Formulation Refinement and Implementation Phases, and their plans for conducting Education and Public Outreach (E/PO) activities. The results of the studies are summarized in the Study Report that NASA will evaluate and form the basis for the selection of concepts that proceed into the Formulation Refinement Phase. An important event at the end of the Study Phase will entail demonstrating that the technology maturity is at Technology Readiness Level (TRL) 4 or higher. For ST8, the viability and feasibility for the experiment's access-to-space accommodation is a key selection criterion.

Note: TRL definitions for NMP projects are provided in a separate document entitled *Technology Readiness Levels for the New Millennium Program.* The document is available at the following URL: http://nmp.jpl.nasa.gov/program/program-documents.html under NMP TRL Definitions.

1.1 Evaluation and Selection Process

The evaluation process will commence following the Study Phase and delivery of the Study Reports. NASA Headquarters will convene an Independent Review Board (IRB) to evaluate the Study Reports. A NMP Site Visit Team will also report on the PI's subsystem technology maturity demonstration.

The basis for selecting the technology subsystem concepts to proceed into the Formulation Refinement Phase will be determined on the consensus recommendations of the IRB, funding availability, cost/schedule reasonableness and realism, access-to-space accommodation, and experiment benefits to NASA. The Associate Administrator (AA) for the Office of Space Science (OSS) will be the Selection Official.

The Study Report evaluation criteria are presented in Section 6 of this document.

1.2 Concept Definition Phase Schedule of Events and Products

Key events and milestones are shown in Table 1.2-1.

[1] The NMP defines a PI as a Technology Provider who is the individual responsible for proposing a flight validation concept and for leading technology development, technology validation, and publication of results. The PI works though his/her parent organization, partners, and the NMP Office.

Table 1.2-1. Key Events and Milestones

Activity	Schedule Date (1)	Products Due
Concept Definition Phase Kick-Off Meeting	10/7/03	None
Mid-Term Report	~ 3-months after ATP (2)	MS PowerPoint Mid-Term Presentation See Section 1.5 below.
Concept Definition Study Reports Due	~ 6 months after ATP	Study Report
Technology Maturity Demonstrations	Within 3 weeks after Study Report Delivery	Technology maturity demonstration at PI's facility.
OSS AA Selects Concept(s) for Formulation Refinement	~ 30 days after IRB meetings	

Notes:
(1) Dates are approximate. Delivery date for the Study Report will be specified in the funding contract or other agreement.
(2) Authority to Proceed (ATP)

1.3 Notification of Selection or Non-Selection

The NASA OSS plans to formally notify all PIs of their selection or nonselection either by post or by electronic mail. A formal announcement listing the selected PIs and their associated institutions will be electronically posted on the NMP website following official notification to all Study Phase PIs by the OSS AA.

For the *selected* concepts, the subsystem technology title, the PI's name and institution, Co-Investigators (CoIs) names and institutions, and Fact Sheet are considered to be in the public domain; therefore, NMP will post this information on an appropriate publicly-accessible location. In anticipation of public disclosure, prospective PIs should refer to Section 3.3 in this guideline for Fact Sheet preparation instructions. Subject to contract terms or other agreements with NMP, selected PIs are free, but not required by NASA, to release any additional information about their Study Reports. It is NASA policy not to release to the public any information about the concepts that were not selected for Formulation Refinement.

1.4 Debriefings

Written notification letters will include the major Factor(s) that led to the acceptance or rejection of the Study Report. A PI may request a telephone debriefing, if desired.

1.5 Special Instructions for the Mid-Term Report

As part of the Mid-Term Report, each Study Phase team is requested to:

- Describe the experiment and expected results that will validate that the technology advance has achieved a level of technological maturity equivalent to TRL 4;
- Describe the "relevant environment" for the experiment that will be used in testing to validate that the technology advance has achieved a level of technological maturity equivalent to TRL 5;
- Identify the preferred access-to-space carrier and delineate preliminary carrier interface requirements, as applicable to the experiment access-to-space approach; and
- Provide 10 copies of the Mid-Term Report in MS Powerpoint format, and one CD-ROM copy.

1.6 Special Instructions for ST8 Access-to-Space Accommodation

As noted in the introduction, the viability and feasibility of the technology subsystem experiment's access-to-space accommodation is a significant decision criterion for ST8. As a baseline, the NMP plans to procure a small spacecraft bus (New Millennium Carrier, NMC-1) and a Pegasus-class launch vehicle for access-to-space for ST8. A special requirement for the NMC-1 is that PIs shall provide preliminary experiment and interface requirements no later than the delivery of the Study Phase Midterm Report. PIs may also propose the use of other access-to-space options, but are reminded that the viability and timeliness of alternate access will be considered in the evaluation of the Study Report. Information and instructions are provided for either option in Section 3.5.6.

1.7 Special Cost Plan Instructions for transition to Formulation Refinement Phase

Upon OSS notification of the technologies selected to go forward into the Formulation Refinement Phase, the NMP Office will provide additional funding and extend the period of performance of the existing contracts or other agreements for the selected technologies to incorporate the proposed Formulation Refinement Phase work up to the Confirmation Review (CR). Successful completion of the CR with the OSS AA's "approval" will result in the initiation of the Implementation Phase effort. The NMP Office contemplates extending the existing contracts employing a two-step process. In the first step, the existing contracts or other agreements will be extended and funded for the portion of the Formulation Refinement Phase through the System Requirements Review milestone. Accordingly, in addition to the cost information required under Section 4, Cost Plan, include with your Study Phase Cost Plan a subset of the cost information that covers the period of performance from the end of Concept Definition (8/6/2004) through Formulation Refinement Phase start-up (10/1/2004) and delivery of the System Requirements Review milestone.

The second step of this two-step process (on-going during this extension period) involves the NMP Office and JPL contracts personnel finalizing the statement of work for the remaining Formulation Refinement Phase effort, establishing a contract option for the Implementation Phase work (to be exercised upon successful completion of the NASA Confirmation Review process), completing contract negotiations, and executing a definitive modification to the existing ST8 contracts or other agreements; thereby, incorporating the Formulation Refinement/Implementation Phase scopes of work.

This approach is expected to facilitate a smooth and orderly transition from the Concept Definition Phase into the subsequent Formulation Refinement effort; while also establishing a vehicle (option) by which the Implementation Phase transition may be accomplished in a timely and seamless manner.

2 SUBMISSION OF INFORMATION

2.1 Certifications and Assurances

In addition to any other certifications and assurances, the original copy of the Study Report shall include a Letter of Commitment signed by an official of the providing organization. This official shall certify institutional support and sponsorship for the technology, its validation approach, and its management and financial proposal. Similar letters of commitment from any "sponsor"[2] shall also be included in the Study Report Appendices (see Table 2.3-1).

2.2 Quantity and Address

Provide separately the following in three-ring binders:

- One original and 25 copies of the Study Report (excluding the cost plan)
- One original and 25 copies of the Study Report Cost Plan.

Provide one CD-ROM copy of the Study Report with separate (.pdf) files for the Technical/Management approaches, E/PO Plan, and Cost Plan.

Deliver the above requested items in accordance with requirements of the Jet Propulsion Laboratory Study Phase contract. For PIs from other than the private sector, deliver Study Reports as requested above to:

New Millennium Program Office
Mail Stop 301-330
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109

2.3 Study Report Format and Content

The required Study Report format is as follows:

- Single-spaced, typewritten using easily readable type fonts having no more than 15 characters per inch (typically 12-point font) on white 8.5x11 inch paper, in single or double columns with at least 1-inch margins all around
- Double-sided (duplex) printing preferred, but not required
- Strictly adhere to the page limits shown in Table 2.3-1 below
- Foldout pages must be 28 x 43 cm (i.e., 11 x 17 inches) and will be counted as 2 pages each when printed on a single side - no limit on the number of fold out pages
- References to electronic media or websites will not be considered in the evaluation
- Use the International System of Units (SI) per NASA Policy Directive NPD 8010.2, *Use of the Metric System of Measurements in NASA Programs*
- Use of the Metric System of Measurement in NASA Programs throughout the Study Report.

[2] A "sponsor" is a participating organization that has committed to contribute funding, personnel, material, non-recurring engineering, testing support, facilities, hardware, and/or software.

The required Study Report content and page limits are summarized in Table 2.3-1. Note that the Study Report is limited to 67 pages and that the Cover Page, Table of Contents, E/PO Plan, Cost Plan, and Supplemental Information (including any optional reference and acronyms lists) will not be counted against the 67-page limit. The following individual page limits apply:

Table 2.3-1. Study Report Format and Page Limits

Section	Page Limit
Cover Page and Table of Contents	Not included in page limit.
Fact Sheet	1 page (also provide electronic copy)
Executive Summary Technology Validation Plan Overview	2 pages 2 pages
Body of Report · Technical Approach · Management Approach	62 pages total
Education and Public Outreach Plan	Not included in Study Report's page limit, but itself limited to 4 pages. See Section 3.7.
Study Report Cost Plan	Not included in page limit, but data shall be presented in formats described in Section 4. The Cost Plan shall be provided in a separate three-ring binder.
Section 5, Appendices (No other appendices will be considered) Required Supplemental Information A. Resumes B. Letters of Commitment and Endorsement C. Relevant Experience and Past Performance D. Statements of Work for Formulation Refinement and Implementation Phases E. PI Information F. Experiment Accommodation Information Optional Supplemental Information: G. References List H. Acronyms List	Not included in page limit.

3 CONTENTS

3.1 Cover Page

The cover page contains the following information:

- The name, " New Millennium Program Space Technology 8 (ST8)"
- Title of the subsystem technology concept
- Date of submission
- The organization submitting the Study Report
- PI name and contact information
- CoI name(s) and institution(s).

If a Study Report contains proprietary information that should not be used/disclosed for any purpose other than evaluation, it should be clearly marked by placing the following legend on the Study Report response cover page:

NOTICE

"The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government and the Jet Propulsion Laboratory/California Institute of Technology ("Institute") in confidence with the understanding that it will not, without permission of the proposer, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal, the Government or the Institute shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's or Institute's right to use or disclose this information (data) if obtained from another source without restriction."

3.2 Table of Contents

Follow the Table of Contents outline section headings (paragraphs 3.4 through 4.4) to the greatest extent possible.

3.3 Fact Sheet

Provide a one-page Fact Sheet (see Figure 3.3-1) with pictorial material for use in making public announcements. Information that is proprietary or information that is restricted under International Traffic in Arms Regulation (ITAR) or Export Administration Regulations (EAR) should not be included. To facilitate the ease of public announcement, also provide the Fact Sheet on a CD-ROM in both Acrobat Reader (.PDF) and Microsoft Word (.doc) formats. Include a written approval from the proposing institution(s) permitting release of the Fact Sheet information in a public announcement, along with a certification of ITAR/EAR compliance.

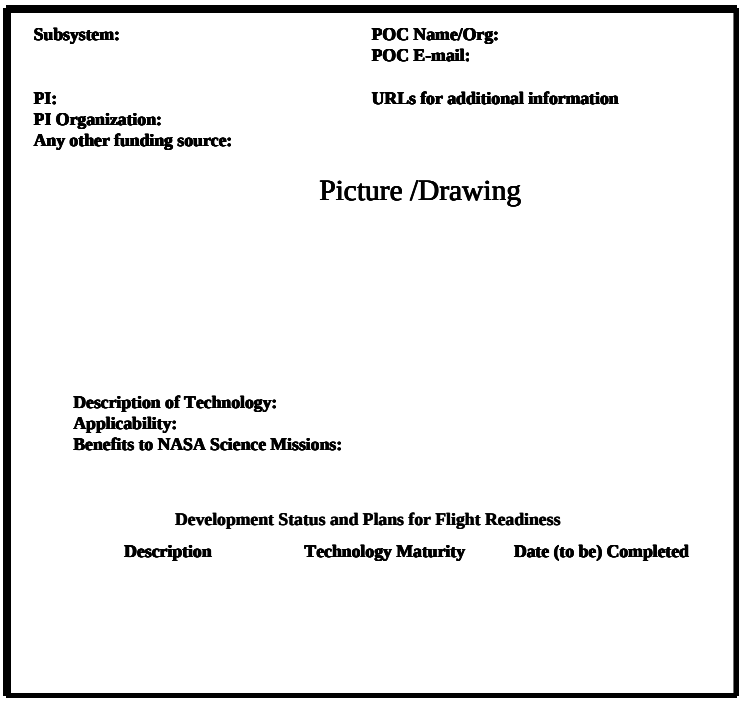

Figure 3.3-1. Fact Sheet Example

3.4 Executive Summary and Technology Validation Plan Overview

Submit a two-page Executive Summary of the proposed investigation in language suitable for understanding by a technically educated person who is familiar with but not a specialist in the field. Similarly, submit a two-page high-level summary of the Technology Validation Plan that includes the planned ground tests, accomplishments needed to demonstrate that the experiment is at TRL 5, in-space operational events, measurements, and data acquisition for validating the subsystem experiment in space and derived benefits for target infusion candidates.

Note: Guidelines for preparing the Technology Validation Plan are available at the following URL: http://nmp.jpl.nasa.gov/program/program-documents.html under Guidelines for Technology Validation and Infusion Plans.

3.5 Technical Approach

The Study Report Technical Approach Section should include the following subsections:

3.5.1 Technology Description

Describe the overall subsystem technology concept including its principle of operation. Specifically identify the technology advance(s) to be validated. Summarize how the projected subsystem technology performance will meet the OSS technology capability needs as set forth in Appendix A of the NASA Research Announcement (NRA) describing this flight opportunity. Explain any differences between the technology developments in the Study Report from that proposed in response to the NRA describing this flight opportunity.

3.5.2 Experiment Objectives

- Identify and describe the technology validation experiment objectives.
- Summarize the proposed technology Level-1 requirements for the experiment.

- Show the overall schedule.

Note: Guidelines for preparing Level-1 requirements are available at the following URL: http://nmp.jpl.nasa.gov/program/program-documents.html.

3.5.3 Technology Maturation Status

Describe the technology maturity and the rationale (including environmental conditions, experiments performed, data taken, models, etc.) used to establish that the TRL achieved during the Study Phase is at TRL 4 or higher.

3.5.4 Technology Subsystem Validation

Describe the approach to technology validation. Include discussion of the following:

3.5.4.1 Maturation issues and actions to resolve them

- Describe the approach (planned tests and correlation with models) proposed, and the rationale for that approach, by which ground-based testing will demonstrate that TRL 5 has been achieved (required for the Confirmation Review prior to entry into the Implementation Phase) and that TRL 6 (prior to launch of the space experiment) has been achieved.
- Describe the approach proposed to consolidate the results of ground test, modeling, and the results of the in-space validation testing to demonstrate that TRL 7 has been achieved.
- Identify and discuss the experiment success criteria.

3.5.4.2 Validation flight experiment scenario

- Discuss how the scenario provides an environment that is relevant to technology validation.
- Describe the key elements such as the orbital configuration, preliminary experiment timeline, data acquisition, data downlink, and other elements as necessary.

3.5.4.3 Selection of flight validation measurements

- Describe the data required to accomplish validation.
- Describe the methods for acquiring the data.

3.5.4.4 Correlation of data with predictive models

- Identify and discuss models for predicting technology performance.
- Discuss how the data will be used to calibrate the models and test key model assumptions.
- Discuss how the data will be used to validate the predictive models beyond the bounds of the validation experiment, including any potential extrapolations of environmental stress parameters and system scaling.
- Describe the scalability of the validated models and the resulting applications envelope as well as the cost, schedule, and risk reduction benefits anticipated for future applications resulting from this validation activity.

3.5.4.5 Technology infusion approach

Describe the approach for infusion of the subsystem technology into future NASA science missions. This will include documentation of the technology validation effort in a *Technology Validation Report* and presentation of the technology validation results to potential technology

users and mission planners at a *Technology Validation Symposium* to be held within six months of completion of the flight experiment. PIs are encouraged to identify other forums for presentation of technology validation results as well as to identify potential future non-NASA users of the technology subsystem to be contacted. In addition, the PI will prepare a summary for the NASA Advanced Technology and Mission Studies (AT&MS) database.

Note: Prepare the *Technology Validation Report* in accordance with the guidelines for preparation of the *Technology Validation Plan* at URL: http://nmp.jpl.nasa.gov/program/program-documents.html

3.5.5 Engineering Development

Describe the implementation approaches used to design, develop, produce, test, and integrate the hardware and the software required for the Formulation Refinement and Implementation Phases.

Specifically:

- Identify and discuss engineering development issues, trade studies, and anticipated methods for resolution of these issues.
- Describe how cost/schedule/performance trades and decisions will be made.
- Identify all special test equipment, processes/procedures planned, and any independent software verification and validation tasks, if required.
- Describe the approach to product assurance and product safety, including plans for problem/failure reporting, inspections, quality control, parts selection and control, reliability, system safety, and software validation. If applicable, discuss plans for use of deterministic methods such as Failure Modes and Effects Analysis (FMEA), Fault Tree Analysis (FTA), and Probabilistic Risk Assessment (PRA) and software Independent Verification and Validation (IV&V).

3.5.6 Access-to-Space

The ST8 project baseline is to accommodate the access-to-space needs of the technology experiments that are down-selected to go forward into the Formulation Refinement Phase. Accordingly, the NMP plans to proceed with the procurement of a NMC-1 spacecraft upon completion of this Study Phase. The NMP will also coordinate with NASA Kennedy Space Center (KSC) for the acquisition of a Pegasus XL launch vehicle. In order to prepare for the procurement process, the NMP will require a preliminary understanding of the subsystem technology experiment and interface requirements (listed below) no later than the delivery of the Study Phase Midterm Report.

Irrespective of the access-to-space approach, the Study Report shall describe the overall approach for access-to-space and how this approach meets the validation experiment objectives. The Study Report shall contain a sufficient level of detail in experiment payload requirements and the operational environment for the flight validation to support mission design and spacecraft procurement. See Evaluation Criterion T5 in Section 6 of this document.

The following information shall be provided:

- Experiment Timeline: experiment start time after the on-orbit checkout of the NMC-1, duration of experiment, need for repetitive cycles, description of each experiment operating mode (off, standby, normal operations, etc).
- Desired orbital characteristics: apogee/perigee altitude, inclination.
- Attitude control: pointing knowledge, accuracy, and stability.
- Physical accommodation: mass, volume (stowed and deployed, if applicable), mounting area required, mount location (internal, external on specific face/axis), orientation relative to nadir/zenith or velocity vector, required space or Earth views and keep-out requirements.
- Command and data handling: interface type (Firewire – IEEE 1394, RS-422, Mil-Std- 1553B, etc.), data rate and storage required during experiment, command and uplink requirements, real-time commanding.
- Electrical, power: number and value of supply voltages required from carrier, special high voltage requirements, power levels required for various operating modes (max power, standby power), power requirements while on the ground and integrated with the launch vehicle prior to launch.
- Thermal: operating temperature range, method of thermal control (passive, active, radiator sizing requirements, thermal isolation.
- Special requirements: e.g. high voltage, deployment clearances, contamination, radiation.

The following information is desired:

- Answers to experiment questions listed under Attachment A for NMC-1 advanced planning Provide this information in Appendix 5.F. of the Study Report. (Note: This information is not for evaluation and will not be considered in the Study Report page count).

If the access-to-space approach is other than the NMC-1, the Study Report shall also:

- Identify and describe the host platform system characteristics required to accommodate the technology subsystem experiment, including any modifications to the host spacecraft, and any logistics support required.
- Explain the relationship between the PI's organization and the host spacecraft provider
- Identify any NASA support to be requested.
- Provide a letter from an authorized official in the host platform provider's organization, indicating their commitment to provide support to the validation experiment and its planned launch accommodation and launch date.

3.5.7 Experiment Operations

Discuss the approach for experiment operations support, including experiment planning and required ground data processing. Identify any plan to use existing facilities (government or commercial) and the need for any unique facilities.

Specifically:

- Describe all communications, and ground support requirements
- Determine if access-to-space is other than NMC-1, provide the plan for space-to-ground communications and operational support
- Describe the need (if any) for experiment command and data handling ground and flight software development, and any special communications, computer security, near real-time ground support, and special equipment or ground personnel skill requirements
- Describe any post-flight ground operations support needed for data processing and analysis.

3.6 Management Approach

The Study Report shall reflect the integration of the PI's task management plan with the project organization (See Figure 3.6-1). Moreover, each technology subsystem experiment will be organized and designated as a discrete technology subsystem Task under the NMP Project organization. At the time of selection, the OSS AA will designate the NASA Center responsible for managing the subsystem-level flight validation project. PIs shall plan to support the Project/task management functions, including but not limited to:

- Developing Level-1 requirements
- Project/task planning
- Contract management, if required
- Managing project/task resources
- Reporting performance and status
- Supporting project/task reviews
- Performing product assurance and safety functions
- Performing risk management
- Supporting E/PO activities
- Certifying flight readiness
- Delivering validation data
- Reporting validation results.

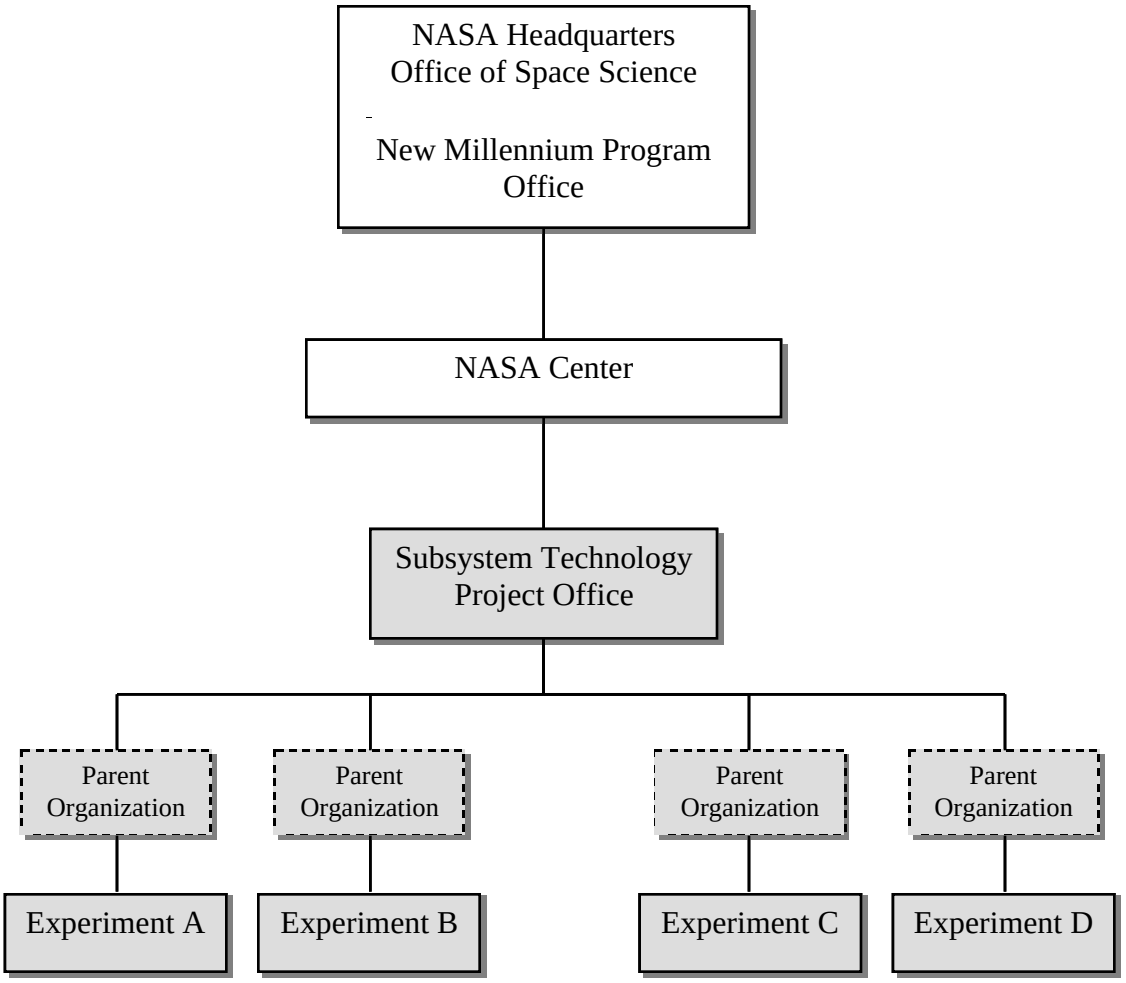

Figure 3.6-1. NMP/Subsystem Validation Project Reporting Structure

The Study Report Management Approach Section should include the following subsections, as applicable:

3.6.1 Task Experiment Management Structure

Describe the approach for managing the technology subsystem task. Discuss how the management approach will be structured to support the project management functions. Give insight into the organization proposed to manage the technology subsystem task. Include the internal lines of authority with delegations, and external interfaces (e.g., NASA), subcontracts, and partners. Identify the organizational commitments of partners, and their respective organizational roles, authority, and responsibilities (see Section 5.B., APPENDICES).

Provide an organizational structure for the technology subsystem task. Describe each organizational element's contribution and responsibilities to the technology subsystem experiment. Describe key positions, including their roles and responsibilities. Explain how each key position fits into the organization. Describe the experience and time commitment of the individuals who fill these key positions.

Include a discussion of the unique or proprietary capabilities that each member organization brings to the technology subsystem experiment. Describe the contractual and financial relationships between partners.

Summarize the relevant institutional experience and organizational capability with reference to supporting details included under Section 5.C.

3.6.2 Management Processes

Describe the management processes by which the technology subsystem experiment team will execute the technical approach in Section 3.5 above. Your process discussion should include, but not be limited to, how you plan to manage and control:

- Staffing
- Technology development progress
- Design activities
- Configuration Management for hardware, software, and documentation
- Risk management
- System engineering
- Mission Assurance
- System Safety
- Subcontracts, including make-or-buy decisions
- Resource allocation, including reserves
- Integration and verification testing activities, including final checkout and calibration on the ground and in space
- Launch and experiment operations
- Reviews and progress reporting
- Participating organizational elements and document agreements
- Technology infusion and public information dissemination.

3.6.3 Decision-Making

Describe the specific decision points and the decision-making analyses to be employed, including how potential descoping activities will be handled. Identify the individual or position with ultimate decision-making authority.

3.6.4 Risk Management

Describe how various elements of risk (particularly the risk associated with technology development) will be managed to ensure the successful accomplishment of the technology flight validation task experiment within cost and schedule constraints. Describe the team's process for identification of all significant risks, risk assessment, and mitigation planning consistent with Section 14.0, *Risk Management* of the NMP Program Plan available at the following URL: http://nmp.jpl.nasa.gov/program/program-documents.html. Explain the relationship between risk management and allocation of reserves.

Identify the prioritized descope options and their potential impact to the validation experiment, along with their estimated cost and schedule reductions should descopes be required to stay within resource constraints. Also identify the schedule decision points at which descope options can be implemented effectively. The E/PO program element is not a descope option.

3.6.5 Furnished Property, Services, and Facilities

Delineate the required property, services, and facilities to be provided by the Government and/ or a commercial source (if any) that are required to accomplish all phases of the technology subsystem experiment. Include approval letters from the cognizant government contracting officer, or an equivalent commercial agent, for the use of the property, services, or facilities, if applicable.

3.6.6 Progress Reporting and Reviews

During the Formulation Refinement and Implementation Phases, the PI's organization and team shall provide informational and other support to the ST8 Project reports and reviews presented to NMP and NASA Headquarters. PIs shall plan to participate with the ST8 Project in conducting key review meetings listed in Table 3.6-1 and any other appropriate key reviews associated with the launch vehicle provider and launch site.

Accordingly:

- Discuss the team's methods and systems for reporting cost, schedule, and technical performance.
- Identify the individual or organization responsible for reporting.
- Identify the experiment reviews the NMP/NASA is invited to attend.

Table 3.6-1. NMP Reviews

Formulation Refinement Phase	Implementation Phase
Kickoff Meeting (1)	Critical Design Review (1)(2)
Systems Requirements Reviews (1)(2)	Pre-Environmental Review (1)(2)
Preliminary Design Reviews (1)(2)	Pre-Ship Reviews (1)(2)
Technology Readiness Review (1)	Launch Readiness Review (1)
NMP Independent Cost Assessment (2)	Flight Validation Readiness Review (1)
NMP Confirmation Assessment Review (2)	Mission Operations Review (1)
NASA Confirmation Review (2)	
Monthly Project Status Reviews (3)	Monthly Project Status Reviews (3)
NASA Quarterly Reviews (3)	NASA Quarterly Reviews (3)

Notes:
(1) Experiment reviews at PI's facility
(2) Flight system reviews at a location designated by NMP
(3) Normally, PI informational input is obtained by "desktop" or telephone report

3.6.7 Schedule

Provide a detailed schedule of the Formulation Refinement Phase activities and a summary schedule of critical events for the Implementation Phase. Lay out the technology subsystem schedule and workflow; clearly show the critical path, schedule margins and schedule slack, deliveries of end items, and major interdependencies. Discuss the planned schedule reserve relative to NMP guidelines for schedule reserve in the NMP Program Plan, Section 14.4, *NMP Risk Mitigation Requirements and Guidelines (also see Section 4.2.10 below)*

3.7 OSS Education and Public Outreach Plan

The OSS is committed to fostering the broad involvement of the space science community in E/PO with the goal of enhancing the Nation's formal education system and contributing to the broad public understanding of science, mathematics, and technology. The NMP is an important part of the OSS effort and focuses on the area of technology.

For the Study Report, the PI will provide an E/PO Plan that demonstrates coherence with the overall NASA OSS and NMP E/PO programs, emphasizes technology education, and identifies the intellectual linkage to unique aspects of the proposed technology investigation.

The plan should describe how the project's E/PO activities will meet the requirements set forth in Section 3 of the NRA, and should be responsive to the E/PO evaluation criteria outlined at http://spacescience.nasa.gov/education/scientists/index.htm under the link to "NASA/OSS EPO Evaluation Criteria." The E/PO Plan should emphasize the contributions that the particular project will make to the overall NMP E/PO Program, rather than simply restating existing elements or aspects of the NMP E/PO Program. Particular attention should be directed to appropriate alignment with standards for technology education (http://www.iteawww.org/TAA/TAA.html) and teacher professional development (http://stills.nap.edu/html/nses/4.html).

The E/PO Plan shall also include:

- A discussion of the approach for working with the NMP Office to provide technical expertise in support of the overall NMP E/PO program.
- Phased schedule for execution of the E/PO program.
- A time phased E/PO budget including potential sponsorship from other resources. The budget and supporting narrative justification should address individual personnel costs and associated time commitments, benefits, travel, equipment, supplies, subcontracts, consultant, facilities, administrative costs, other applicable costs. The E/PO budget should be approximately 1% of the total proposed budget for Formulation Refinement and Implementation.

For further information regarding NMP E/PO activities, visit the NMP Website, http://nmp.jpl.nasa.gov and the "Spaceplace" http://spaceplace.jpl.nasa.gov/, or contact Ms. Nancy Leon (telephone: (818) 354-1067; E-mail: Nancy.J.Leon@jpl.nasa.gov). Questions and/or comments and suggestions about the OSS E/PO program are sincerely welcomed and may be directed to Dr. Larry Cooper (telephone (202) 358-1531; E-mail: lcooper1@hq.nasa.gov).

4 COST PLAN

4.1 Introduction

The Cost Plan shall provide information on the estimated costs for the Formulation Refinement and Implementation Phases of the total technology subsystem experiment, including technology validation, reporting, and E/PO. Cost information shall be provided in sufficient detail to enable a fair and reasonable assessment of the total cost attributable to the technology subsystem experiment and to NASA/NMP. The Cost Plan shall consist of detailed cost data to Work Breakdown Structure (WBS) Level-3 for the Formulation Refinement Phase through the Confirmation Review, and the Implementation Phase through the completion of flight validation and final report. The same information is needed for any sponsored funding sources. Include the reviews listed under Table 3.6-1. See Section 1.7 above for special cost plan information to facilitate start-up of the Formulation Refinement Phase.

Several Cost Plan templates, as well as requests for supporting information, are included under Section 4.5 for use in assessing the cost and funding realism of the technology subsystem experiment. All costs shall be in U.S. real-year dollars. Real-year dollars are current fiscal year (FY) dollars adjusted to account for inflation in future years. The cost plan shall provide data by U.S. Government FY (October 1 – September 30).

4.2 Cost Estimating and Basis of Estimate

Assume an October 1, 2004 start-up date for the Formulation Refinement Phase.
Describe the methods and assumptions by which the cost estimates are derived. Provide a complete "grassroots" estimate. In addition, provide data derived from cost models for those aspects of the technology subsystem experiment amenable to credible cost modeling. Since the proposed scope and cost details for the Implementation Phase are not fully defined until the conclusion of Formulation Refinement, proposed cost estimates for the Implementation Phase may be generated with models or cost estimating relationships from analogous experiments in addition to a "grass roots" estimate.

Explain the total expenditures to accomplish the technology subsystem experiment. Identify the amount that is to be funded by NASA/NMP plus any sponsored funding from all other sources (i.e., civil service, non-NASA funded contributions, and NASA funding from other programs). This will include, but is not limited to:

- Direct and indirect labor costs
- Sponsored funding from NASA enterprises other than the Space Science Enterprise;
- Sponsored funding from non-NASA sources
- Full cost for civil service salaries and benefits (including the assumptions used to develop the full cost) that contribute to the technology subsystem experiment (i.e., support to the technology subsystem experiment, technologies provided, management staff, technical advisors, facilities, etc.) regardless of the funding source(s)
- E/PO activities
- Subcontracting costs (including fees)
- Analysis of technology validation data, reporting results of the data analysis, and delivery of the data in archival format
- Ground systems

- Space flight operations activities
- Reserves (including reserve for schedule margin)
- Contract fees and other assessments (e.g., procurement burdens, award fees, treatment of sick leave and vacation forecast variables, etc.

4.2.1 NASA Inflation Index for NASA Centers and Other Government Agencies

PIs from NASA Centers and other government agencies should use the inflation rate index shown in Table 4.2-1 to calculate all real-year dollar amounts.

Table 4.2-1. NASA New Start Inflation Rate Index

FY	2005	2006	2007	2008	2009	2010
Inflation Rate	0.0%	2.0 %	2.1 %	2.1 %	2.10 %	2.0%
Cumulative Inflation Index	1.000	1.020	1.041	1.063	1.0845	1.106

Source: NASA New Start Index dated December 2003.

4.2.2 Forward Pricing Rates for Industry and Universities

PIs from industry or academia should use their approved forward pricing rates to calculate real year dollar amounts.

4.2.3 Treatment of Heritage

If an estimate is based on heritage, provide the following information:

- Performance and cost parameters that the proposed technology subsystem has in common with previous or existing technologies:
  - Basis of the heritage cost information
  - Program cost information (i.e., any known issues that impacted program cost)
  - Technical description data
  - Key technical parameters of the heritage program (e.g., mass, power, dimensions, parts/shelf life)
- Discussion of the impacts of cost risk on the proposed cost estimates; and
- Details on software heritage:
  - Original program information for this application (i.e., software cost, lines of code, software labor hours, issues that impacted cost)
  - Expected percentage of heritage software to be reused.

4.2.4 Sponsored Funding Sources

If any part of the technology subsystem is dependent upon funding from a source other than NMP (“sponsored funding”), this assumption shall be detailed in the Study Report accompanied by written indications that such funding is consistent with the current budget planning of the sponsored funding source. Provide a copy of any signed agreements or endorsements for sponsored funding to be provided from sources outside of the NMP (See Section 6, M1.B.).

4.2.5 Access-to-Space

Include the technology subsystem experiment estimated accommodation cost on the NMC-1 or on a proposed alternative access-to-space platform.

4.2.6 Cost Breakdown by Work Breakdown Structure

PIs may define their own Work Breakdown Structure (WBS); however, a sample product-oriented WBS is provided in Table 4.5-1, which may be tailored to fit the specific technology subsystem experiment. Accordingly, provide the estimated cost by WBS to WBS Level-3. Also provide summary cost breakdown information time-phased by FY for each WBS element, as shown in Table 4.5-1 or as tailored to the experiment.

Include a WBS Dictionary that describes the work effort contained in each cost account.

4.2.7 Summary of Cost Elements

Provide a summary of the cost elements by FY for the Formulation Refinement Phase and the Implementation Phase. A template for this summary is provided in Table 4.5-2 followed by the associated Cost Table Instructions. Sponsored funding cost estimates from partners should not be included in these summaries.

4.2.8 Total Experiment Cost by Organization

Complete a summary of the total technology subsystem experiment cost by FY as shown in Table 4.5-3. The purpose of this summary is to present all costs for the experiment on one page, by organization, by project phase (Formulation Refinement and Implementation), and by FY.

4.2.9 Technology Subsystem Development Cost

Show the estimated cost by phase for developing the technology subsystem. Show the estimated cost for both NMP and non-NMP-sponsored funding elements in the format of Table 4.5-4.

4.2.10 Summary of Cost Reserves and Margins

Provide a summary of cost reserves and margins identified by FY including associated rationale. For this purpose, NMP Risk Mitigation Requirements and Guidelines as set forth in the NMP Program Plan require a minimum of 30% cost reserve and a minimum of 20% funded schedule margin at the start of the Implementation Phase. As a minimum, PIs are advised to assume and incorporate these cost reserve and schedule margin percentage guidelines in their proposed Implementation Phase cost plan.

4.3 Cost Plan Supporting Information

a. Workforce Staffing Plan. Provide a workforce-staffing plan (including civil service) that is consistent with the WBS. Include all team member organizations and cover all management, manufacturing, technical, E/PO, and support staff in the workforce-staffing plan (i.e., task manager), subcontract, resource, product assurance, etc, as required. Phase the workforce-staffing plan by FY. Clearly delineate time commitments for the PI, and other key personnel.

b. Pricing Techniques. Describe the cost estimating techniques used to develop the cost estimates for the Formulation Refinement and Implementation Phases including a description of the cost-estimating model(s) used. Discuss the heritage of the models applied to this estimate including any known differences between missions contained in the model's database and key attributes of the technology subsystem experiment. Include the assumptions used as

the basis for the cost for each phase and identify those that are critical to cost sensitivity of the technology subsystem experiment.

c. Cost Element Breakdown. Provide supporting evidence stating the basis for the estimated costs including, but not limited to:

(1) Direct Labor.

- Explain the basis of labor-hour estimates for each of the labor classifications
- State the number of productive work-hours per month
- Provide a schedule of the direct labor rates
- Discuss the basis for developing the proposed direct labor rates for the team member organizations involved, the forward-pricing method (including midpoint, escalation factors), and elements included in the rates (e.g., overtime, shift differential, incentives, allowances, etc.
- If available, submit evidence of Government approval of direct labor rates for proposal purposes for each labor classification for the proposed performance period.

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

(3) Subcontracts. Fully identify each effort (e.g., task, item, etc. by WBS element) to be subcontracted, and list the selected or potential subcontractors, locations, amount budgeted/proposed, and types of contracts to be employed. Subcontract estimates for the Formulation Refinement Phase should be based on a cost proposal from the prospective subcontractor (including forward pricing rates). Explain any adjustments, and the indirect rates (or burdens) applied, to the subcontractors' proposed anticipated amounts. Fully describe the cost or price analysis and the negotiations conducted regarding the proposed subcontracts.

d. Cost Management. Define the specific methods that will be used to track, manage, and report costs.

4.4 Funding Profile.

Provide a profile of required NMP funding by FY. The funding profile is derived from the cost profile, which is the basis of the proposed experiment cost. The funding for a given FY is determined from the estimated costs in that year, less funding carried over from the previous FY, plus the forward funding needed to cover the costs of the first month in the following FY. Because of forward funding, costs will not equal funding in any given FY. Total costs shall equal total funding at task completion.

4.5 Cost Plan Templates

Table 4.5-1. Cost Breakdown by WBS
Cost Breakdown by PI's WBS – Generic Example (All costs in Real Year Dollars)*

WBS / Cost Category Description	FY04 $	FY05 $	FY0n $	Total (RY$)
WBS 1.0 Experiment Management				
1.1 Experiment Management				
1.2 Business Management				
1.3 Risk Management				
1.4 Planning Support				
1.5 Review Support				
1.6 Facilities				
1.7 Project Reserves				
1.8 Etc.				
WBS 2.0 Experiment Systems Engineering				
2.1 Systems Engineering				
2.2 Experiment & Navigation Design				
2.3 S/W Engineering				
2.4 Info Sys Engineering				
2.5 Configuration Management				
2.6 Verification and Validation				
2.7 Etc.				
WBS 3.0 Experiment Assurance				
3.1 EA Management				
3.2 System Safety				
3.3 Environments				
3.4 Reliability				
3.5 EEE Parts Engineering				
3.6 H/W & S/W QA				
3.7 S/W IV&V				
3.8 Operational Assurance				
3.9. Etc.				
WBS 4.0 Technology Subsystem Payload				
4.1 Development				
4.2 System Engineering				
4.3 Fabrication				
4.4 Flight S/W				
4.5 Testbeds				
4.6 Integration and Test				
WBS 5.0 Experiment Operations				
5.1 Ground Data System				
5.2 Pre Launch Accommodation (I&T)				
5.3 Post Launch Operational Support				
WBS 6.0 Technology Validation				
6.1 Technology Validation Team				
6.2 Technology Data Analysis				

6.3 Validation Report and Dissemination				
WBS 7.0 E/PO				
	$	$	$	$
Total Cost to NASA/NMP				
Total Sponsored Funding by Other Organizations				
Organization A:				
WBS # and Description				
Etc.				
Organization B:				
WBS # and Description				
Etc.	$	$	$	$
Total Experiment Cost By Fiscal Year				

* Complete to WBS Level-3

Table 4.5-2. Summary of Cost Elements (see Instructions)

Technology Subsystem Title:

	FY04			FY05			FY06			Total		
	Hours	Rate	Cost	Hours	Rate	Cost	Hours	Rate	Cost	Hours	Rate	Cost
Direct Labor												
Labor Hrs/ Costs: (by skill Categories)		$	$		$	$		$	$		$	$
Total Direct Labor Costs		$	$		$	$		$	$		$	$
Overhead (by cost Centers)		%	$		%	$		%	$		%	$
Other Direct Costs			$			$			$			$
Subcontracts			$			$			$			$
Materials			$			$			$			$
Material Burdens			$			$			$			$
Travel			$			$			$			$
Other Direct Costs			$			$			$			$
Subtotal			$			$			$			$
G&A Expense (by cost pools)		%	$		%	$		%	$		%	$
Subtotal			$			$			$			$
Cost of Money (by direct pools & overhead centers)		%	$		%	$		%	$		%	$
Profit/Fee		%	$		%	$		%	$		%	$
Total Cost Plus Fee			$			$			$			$

Cost Table Instructions

The Summary of Cost Elements and Basis of Estimate should contain the following direct and indirect elements, as applicable:

DIRECT LABOR HOURS – Show productive hours by individual skill categories.

DIRECT LABOR COSTS – The labor costs should be itemized by skill categories. The basis for the rates should be described.

LABOR OVERHEAD – Overhead should be itemized by overhead cost centers (engineering, manufacturing, etc.) as well as by associated rates.

SUBCONTRACTS – Supporting information, such as name/address, cost, fee/profit, basis of estimate, etc., should be provided for each of the major subcontracts greater than $500 thousand.

MATERIALS – Provide supporting details for major vendors for equipment purchases greater than $5 thousand. Burden rates must be identified.

TRAVEL – Provide supporting details for destination, purpose, number of people per trip, transportation costs, per diem costs, and miscellaneous costs.

OTHER DIRECT COSTS – Identify cost and purpose.

GENERAL AND ADMINISTRATIVE (G&A) EXPENSE – G&A expense represents the institution's general and executive offices and other miscellaneous expenses related to business. G&A expense should be itemized by cost pool, and rates should be documented.

COST OF MONEY (COM) – COM represents interest on borrowed funds invested in facilities. COM should be itemized by indirect pools and overhead centers. Rates should be documented.

PROFIT/FEE – Document the basis, rate, and amount of fee.

ESCALATION FACTORS – document the escalation factors used to determine real-year dollars.

Table 4.5-3. Total Experiment Cost By Organization
(FY costs in Real-Year Dollars, Totals in Real- Year Dollars) Costs shall include all costs including fee

Cost Center	FY1	FY2	FY3	FY4	...	FYn	Total (Real Yr.)
Concept Definition Phase							
- Organization A	$						$
- Organization B							
- Etc.							
Subtotal Concept Definition Phase	$						$
Formulation Refinement							
- Organization A	$	$	$	$	$	$	$
- Organization B							
- Etc.							
Subtotal Formulation Refinement Phase	$	$	$	$	$	$	$
Implementation							
- Organization A	$	$	$	$	$	$	$
- Organization B							
Other (specify)	$	$	$	$	$	$	$
Subtotal Implementation Phase	$	$	$	$	$	$	$
Total Cost to NMP	$	$	$	$	$	$	$
Additional Sponsored Funding by other Organizations to:							
Total Formulation Refinement	$	$	$	$	$	$	$
- Organization A							
Total Implementation	$	$	$	$	$	$	$
- Organization A							
Other (specify)	$	$	$	$	$	$	$
Sponsored Costs (Total)	$	$	$	$	$	$	$
			Experiment Total	$			

Table 4.5-4. Technology Subsystem Development Cost

(FY costs in Real-Year Dollars)

	Formulation Refinement	Implementation	Total (Real Year)
Experiment Development Cost to NMP			
- Organization A	$	$	$
- Organization B			
- Etc.			
Total	$	$	$
Sponsored Experiment Development Cost			
- Organization A	$	$	$
- Organization B			
- Etc.			
Total Development Costs	$	$	$

5 APPENDICES

The following additional information must be supplied with the Study Report. This information can be included as Appendices to the Study Report and is not counted within the page limits.

A. Resumes. Provide resumes for all key personnel identified in the Management Approach Section and named on the Cover Page. Include resume data on experience that relates to the job these personnel will perform for the proposed flight validation experiment. Limit the length to two pages for each person.

B. Letters of Commitment and Endorsement from Participating Organizations. Provide a letter from each supporting organization signed by the appropriate authority indicating their commitment to the flight validation experiment. The letter should address sponsor-provided resources to the flight validation experiment, including the phasing and amount of funding to be provided.

C. Relevant Experience and Past Performance. Discuss relevant experience and past performance (successes and failures) of the major team partners in meeting cost and schedule constraints in similar technology development activities within the last ten years. Provide a description of each project, its relevance to the flight validation experiment, cost, and schedule performance, and points of contact (including addresses and phone numbers).

D. Statement(s) of Work. Provide a draft Statement of Work for all potential contracts or, in the case of Government sources, "other agreements." These Statement(s) of Work will include general task statements for the Formulation Refinement and Implementation Phases (Note: Specifically delineate the milestone deliverables through SRR as requested for start-up of the Formulation Refinement Phase and discussed under Section 1.7 of this guideline). Clearly define the scope of work, all proposed deliverables (including flight validation data), and potential requirements for Government facilities and/or Government services, and a proposed delivery schedule.

E. Principal Investigator (PI) Information.

- Point of contact, mailing address, telephone number, FAX number, and e-mail address of the business office person.
- PI's name and full institutional mailing address, telephone number, FAX number and e-mail address.
- The institutional endorsement with the name and title of the authorizing institutional office, the full legal name of the proposing institution, signature, and date.
- PI's signature and date.

F. Response to Questions for ST8 Experiment Accommodation for Access-to-Space. Provide information for the experiment's access-to-space accommodation in response to questions listed under Attachment A to these guidelines.

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

G. References List. As an appendix, the Study Report may include a list of reference documents and materials. The documents and materials themselves cannot be submitted, except as a part of the Study Report.

H. Acronyms List. Inclusion of an acronym list is strongly encouraged.

6 EVALUATION CRITERIA

The Study Report evaluation criteria are listed below. The Technical Area is weighted more than the Management Area. Evaluation criteria within each of the Technical and Management Areas are considered to be of equal importance. The IRB will evaluate each Study Report and will derive a consensus criterion numerical score, adjective rating, and associated strengths and/or weakness. E/PO criteria will be used to discriminate between Study Reports that are otherwise equal in the final selection process. Factors listed under each criterion are considered to the extent they contribute to deriving the overall criterion consensus.

6.1 Technical Criteria

(Weighted 60%)

T1. Technology subsystem description and validation experiment objectives: Degree to which the Study Report describes a thorough and credible approach to validating the technology subsystem. Factors to be considered are:

A. Technology subsystem description. Clarity of the technology subsystem description, technology advance (s), and principles of operation.

B. Validation experiment description. Clarity and substantiation of objectives and `Level-1 requirements for the proposed validation experiment.

T2. Technology maturation status: Degree to which the Study Report provides substantiation, preferably with experimental data, that the proposed technology currently meets the criteria for TRL 4. Factors to be considered are:

A. A “component” or “breadboard” version of the technology advance has been implemented and tested in a laboratory environment.

B. Analytical models of the technology advance fully replicate the TRL 4 test data.

C. Analytical models of the performance of the component or breadboard configuration of the technology advance predict its performance when operated in its “laboratory environment” and the environments to which the technology advance would be exposed during qualification testing for an operational mission.

T3. Technology subsystem validation: Degree to which the plans for technology subsystem validation will deliver an experiment of adequate maturity to measure performance in space, sufficiently reduce its risk, and to determine the technology’s readiness for infusion into a future space science mission**.** Factors to be considered are:

A. Technology maturation approach**.** Clarity and adequacy of the proposed approach to advance the technology to TRLs 5, 6, and 7 (i.e., experiments, demonstrations, specification of relevant environments, data, and documents).

B. Appropriateness of proposed in-flight measurements**.** Extent to which the proposed in-space measurements adequately characterize the proposed technology advance in its relevant environment.

C. Models for Correlating Measurement with Predictions**.** Availability of appropriate mathematical models for prediction of the parameters to be measured in T3.B. above; suitability of these models, once validated and/or calibrated by the space experiment, to be used for scaling/tailoring the technology to meet the needs of future missions;

and the extent to which these models have (a) been verified by ground testing, and (b) have clearly demonstrated an understanding of required data from the space experiment, and how this data will be used to increase confidence in the applicability and predictive capabilities of these models.

D. Technology Infusion**.** Feasibility of the approach for inserting the validated technology into future NASA missions.

T4. Engineering development: Degree to which the proposed implementation approaches used to design, develop, produce, test, and integrate the hardware and software are applicable to and can be accomplished during the Formulation Refinement and Implementation phases. Factors to be considered are:

A. Identification and discussion of engineering development issues, trade studies, and anticipated methods for resolution of these issues.

B. Adequacy of approach to making cost/schedule/performance trades and decisions.

C. Adequate identification of all special test equipment, processes/procedures planned, and independent software verification and validation tasks.

D. Adequacy of approaches to product assurance and safety.

T5. Access-to-space and experiment operations: Degree to which the experiment can be accommodated with ease on the proposed host platform, and validated in the proposed space environment. Factors to be considered are:

A. Adequacy of the specification of payload/host interfaces, and orbital considerations.

B. Soundness of any partnering arrangements for operations, and host platform availability.

C. Experiment operations. Soundness of the experiment operations approach to support the proposed subsystem flight validation experiment.

6.2 Management Criteria

(Weighted 40%)

M1-Management Plan: Degree to which the experiment management plan describes a thorough and credible approach for communicating and controlling project/task management functions and resources for the Formulation Refinement and Implementation Phases. Factors to be considered are:

A. Management Structure. Effectiveness of the proposed management structure to execute the proposed management plan for the total technology subsystem experiment

effort, including authority, roles and responsibilities, experience, and availability of key personnel.

B. Relationship with partners. Soundness of the proposed relationships between members of the experiment team, and strength of the organizational commitment.

C. Adequacy of the management systems and processes proposed by which the experiment team will measure performance against plans, report progress, and make critical decisions.

D. Risk Management. Efficacy of the approach to identifying and managing significant risks, including the associated mitigation approaches and descope options.

M2-Capability and experience of the proposed management staff: Degree to which the proposed management team and participating organizations have demonstrated the requisite experience and organizational capability to plan and deliver the experiment in a flight-worthy configuration. Factors to be considered are:

A. Level of commitment from the organization's management.

B. Adequacy of the staffing plan and capability of the staff to carry out the management functions required to implement a NMP flight validation experiment.

C. Experience of the PI and organizational capability in delivering hardware and software similar to that required for the technology subsystem experiment.

M3-Cost and Schedule Realism: Degree to which the Study Report cost and schedule reflect a clear understanding of the technical/management complexity of the effort, and their associated schedule and budget risks. Factors to be considered are:

A. Basis of the cost estimate and schedule. Level of detail, realism, reasonableness, and completeness of the cost estimate and schedule (Formulation Refinement and Implementation Phases), and adequacies of the cost reserve and funded schedule margin to assure the likelihood that the flight validation experiment can be accomplished for the Study Report cost and schedule.

B. Consistency of the estimated cost with the scope of work and schedule availability to achieve TRL 5 at the end of the Formulation Phase, TRL 6 prior to launch of the space experiment, and TRL 7 (including access-to-space and experiment operations) at the conclusion of the flight validation experiment.

6.3 Education and Public Outreach Criteria

E1. Education and Public Outreach: The E/PO plan will be evaluated on the basis of its overall quality and its general intellectual linkage to unique aspects of the proposed technology subsystem experiment following criteria given at http://spacescience.nasa.gov/education/scientists/index.htm under the link to "NASA/OSS EPO Evaluation Criteria." Plans for coordination with the overall NMP E/PO program will also be explicitly considered as part of the evaluation process. The merit of the plans for E/PO activities will be used to discriminate between Study Reports that are otherwise equal in the final selection process.

Attachment A, Questions for ST8 Experiment Accommodation for Access-to-Space

Provide experiment-specific information and answers to these questions in Appendix 5.F. of the Study Report. This information is requested for NMC-1 planning. It is not part of the evaluation process and will not be included in the Study Report page count limitation.

1. Does the mass, power, and volume of the experiment include the diagnostics instruments and other observation gear used by the experiment? For example, if a camera is needed, is it included in the mass, power, and volume for the experiment?

2. Does any equipment need to be placed in special locations separate from the experiment, or does any equipment have special accommodation requirements or constraints? For example, a camera mounted at opposite end of the spacecraft on the same face as another element, positioned to be protected from looking at the Sun.

3. What are the durations of all of the experiment's phases? (e.g., minimal start to finish, desired duration) Use minutes, hours, orbits, days as appropriate. Include duration from power-on to experiment completed. Also identify how long the experiment can be without power.

4. What is power consumption of the experiment during all phases/durations of the experiment? Minimal phases include: start-up, check out, experiment operations at full power, operations at nominal power, operations at survival power (e.g., for commissioning phase: start up payload, consume #w for X hours, go into stand-by consume #w until commanded, operate at #w for X minutes each orbit, …).

5. Are there key phases of the experiment when being in real time communications is desired/needed? Typical communications passes will average about 9.5 minutes in a single orbit. There are also orbits each day where communications are not possible.

6. What, if any, data latency requirements are there for the experiment? Can you wait hours/days for the data to get back? Is quick turn around (within minutes) of data and commanding required during check out?

7. What is the operational tempo of the experiment? Are there short periods with a lot of commanding and telemetry each day? Is the tempo relaxed after check out where a data return once a week is adequate and maybe commanding once a month?

8. Most telemetry rates estimated for the experiments do not have duration associated with them. Is the given rate a steady state rate for as long as the experiment is active? Are there burst data rates? Are there different telemetry rates for different experiment phases?

9. How long does the payload require for commissioning before the experiment starts? Also, how long to check out and stabilize after powering up the experiment before starting the experiment activities?