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and Space Administration

June 6, 2001  
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## **ANNOUNCEMENT OF OPPORTUNITY**

### **MARS RECONNAISSANCE ORBITER - 2005**

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Preproposal Conference:  
Notice of Intent due:  
Proposals due:

June 15, 2001  
July 6, 2001  
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MARS RECONNAISSANCE ORBITER 2005

Announcement of Opportunity  
Soliciting Proposals for Basic Research  
for Period Ending  
August 22, 2001

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Issued: June 6, 2001

Office of Space Science  
National Aeronautics and Space Administration  
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ANNOUNCEMENT OF OPPORTUNITY  
MARS RECONNAISSANCE ORBITER 2005

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## **1.0 DESCRIPTION OF THE OPPORTUNITY**

### **1.1 Overview of Mars Exploration Strategy**

In response to the recommendations by its advisory groups, NASA is currently undertaking a long-term systematic program of Mars exploration, the Mars Exploration Program (MEP). The overarching goal of the program is to answer the question, “*Did life ever exist on Mars?*” The scientific objectives established by the program to address this goal are to search for evidence of past or present life, to understand the climate and volatile history of Mars, to understand the surface and subsurface geology, and to assess the nature and inventory of resources on Mars in preparation for human exploration. The common thread that links these objectives is to understand the role of water.

The MEP is a sustained series of missions to Mars, each of which will provide important, focused scientific return. Taking advantage of launch opportunities available approximately every 26 months, the MEP is undertaking a set of missions that will ultimately provide for the return of surface samples sometime within the early part of the next decade. To achieve this goal, the basis for understanding the processes that have formed and modified the Mars environment along with providing a means to select the best sites for surface exploration will be achieved by orbital reconnaissance.

General scientific objectives for the exploration of the Solar System have been established by scientific advisory committees, including the Committee on Planetary and Lunar Exploration (COMPLEX) of the Space Studies Board of the National Research Council, and the Solar System Exploration Subcommittee of the National Aeronautics and Space Administration (NASA) Space Science Advisory Committee (SScAC). Specific goals for the exploration of Mars and the methods for achieving them are outlined by COMPLEX and the Mars Exploration Payload Analysis Group (MEPAG).

Management of NASA’s Mars program is the responsibility of the Mars Exploration Program located in the Office of Space Science (OSS), NASA Headquarters, Washington, DC. The Mars Reconnaissance Orbiter 2005 Project is managed by the Space Science Flight Directorate at the Jet Propulsion Laboratory (JPL), Pasadena, California, which also manages the Mars Global Surveyor, the Mars Odyssey 2001, and the Mars Exploration Rover 2003 Missions. The Space Science Flight Directorate is responsible for implementation of the MRO 2005 Mission and the operation of Mars exploration missions through the OSS JPL Mission Management Office.

### **1.2 The Mars Reconnaissance Orbiter 2005 Mission**

In the 2005 launch opportunity to Mars addressed by this Announcement of Opportunity (AO), the MEP intends to launch on an Intermediate-class launch vehicle (e.g., a Delta III/IV or Atlas

III/V) the Mars Reconnaissance Orbiter (MRO) 2005 mission having as its primary scientific objectives the Group I Science Objectives described in Section 2 of this AO.

This MRO 2005 mission will achieve the first of the three Group I Science Objectives through reflight of the scientific investigations lost with the failure of the Mars Climate Orbiter (MCO). The other two of the Group I Science Objectives are expected to be achieved through the flight of two types of new science investigations solicited by this AO, namely:

- (i) Science investigations that involve the provision of new flight hardware and the analysis of their data (hereafter called **Principal Investigator (PI) Instrument investigations**); and
- (ii) Science investigations that involve the analysis of data from mission-provided facility instruments and spacecraft engineering systems, which also involve service on related Facility Science Teams as a Team Leader, Deputy Team Leader, or as a Team Member (hereafter called **Facility Team Leader or Member investigations**, respectively).

In addition, the Mars Exploration Program offers unparalleled opportunities to engage both students and the public in the adventure of exploring another planet. Therefore, all MRO 2005 Instrument Investigation PI's are expected to be significantly involved in Education/Public Outreach (E/PO) activities both of their own choosing, as well as those organized and planned by the JPL Mars Program E/PO personnel. As noted in Section 2.3.1, Facility Team Leaders/Team Members will also be expected to participate in the Mars Exploration Program E/PO program.

All proposals submitted in response to this AO are to be prepared and submitted in accordance with the policies and provisions of Appendices A, B, and C of this AO. In the case of any conflict, the provisions of the AO take precedence. Appendix D provides a summary of the key documents necessary for the provision of a fully responsive proposal in response to this AO.

Proposals that specifically are not solicited by this AO are those for Interdisciplinary Scientist investigations or for Participating Scientist investigations. Should such investigations be solicited through future announcements, Interdisciplinary Scientists will be solicited for investigations that use the scientific data acquired by the different instruments on the mission and/or investigations that utilize data from several different MEP missions, while Participating Scientists will be solicited for instrument-specific investigations that only are carried out during the data analysis phases of the MRO 2005 Orbiter.

The MRO 2005 mission also is intended to provide a telecommunication relay proximity link to support landed operations of spacecraft and surface rovers to be launched at later Mars opportunities (see Section 5.1 of this AO).

Proposers interested in responding to this AO should be aware that funds are not currently available for awards under this Announcement. Therefore, the Government's obligation to make

award(s) is contingent upon the availability of appropriated funds from which payment can be made, as well as the receipt of proposals that NASA determines are acceptable for awards under this Announcement.

## **2.0 ANNOUNCEMENT OBJECTIVES**

### **2.1 Detailed Science Objectives**

To formulate and focus science requirements, NASA convened a Science Definition Team (SDT) that considered the range of science objectives appropriate for a Mars Reconnaissance Orbiter to be launched in 2005. These objectives are linked to priorities established by the MEPAG outlined in its document, “*Mars Exploration Program: Scientific Goals, Objectives, Investigations, and Priorities.*” The three Group I objectives given below were judged to have the highest priority, to be of equal priority, and to represent the minimum requirements for this mission’s goals. The four objectives listed in Group II are considered important but are of lower priority than those in Group I for the 2005 launch opportunity. This AO solicits science investigations that can best address these objectives within the allowable budget and spacecraft resources.

#### **Group I Science Objectives (highest priority)**

- ? Recover the Mars Climate Orbiter (MCO) atmosphere and climate science objectives by:
  - Characterizing Mars’ seasonal cycles and diurnal variations of water, dust, and carbon dioxide in order to understand processes of present and past climate change; and
  - Characterizing Mars’ global atmospheric structure, transport, and surface changes to elucidate factors controlling the variable distributions of water and dust.
  
- ? Search for sites showing evidence of aqueous and/or hydrothermal activity by:
  - Searching for localized areas showing past aqueous mineralization; and
  - Observing detailed geomorphology and stratigraphy of key locales to identify formation processes of geologic features suggesting the presence of liquid water.
  
- ? Map and characterize in detail the stratigraphy, geologic structure and composition of Mars surface features at many globally distributed targeted sites to better understand its complex terrain and to distinguish processes of eolian and noneolian transport.

#### **Group II Science Objectives (lower priority)**

- ? Detect on Mars the presence of liquid water and determine the distribution of ground ice in the upper surface, particularly within the near-surface regolith.
- ? Provide atmospheric observations in addition to the MCO capabilities to further define Mars' atmospheric structure and circulation.
- ? Characterize the Martian gravity field in greater detail to understand better Mars' geologic history and the structure of its crust and lithosphere.
- ? Explore additional ways of identifying sites with high scientific potential for future Mars landed investigations.

As noted in Section 1.2 of this AO, the MRO 2005 will be designed to accommodate a reflight of the Mars Climate Orbiter science investigations that were not completed owing to the loss of that mission. The two instruments involved in these investigations that will be reflown on MRO are a redesigned Pressure Modulator Infrared Radiometer (PMIRR-MkII) investigation provided by JPL, and the Wide-Angle component of the Mars Color Imager (MARCI-WA) provided by Malin Space Science Systems. It is expected that the first Group I Science Objective will be accomplished by these investigations. In order to provide context for other potential imaging instruments, the Medium-Angle component of the Mars Color Imager (MARCI-MA) will be modified and flown as a Facility Instrument, also provided by Malin Space Science Systems and operated by the MARCI investigation team. Furthermore, the MRO 2005 payload may include a Subsurface Sounding Radar Facility Instrument provided by a mission partner organization (note: NASA is still negotiating for the provision of this instrument at the time of the release of this AO). A UHF system for relay communication with future Mars missions will also be part of the MRO 2005 payload.

## **2.2 Categories of MRO 2005 Science Investigations**

The MRO 2005 mission is expected to carry four categories of science investigations as described in Section 2.2.1 through 2.2.4 below, of which new proposals are solicited through this AO for the last three. In addition, all investigations selected through this AO are expected to participate in an aggressive Education/Public Outreach program as described in Section 2.3. The MRO 2005 Proposal Information Package (PIP) provides a detailed description of the basic MRO 2005 spacecraft that will provide the platform for these investigations (for information on accessing the PIP, see Section 3.0 of this AO).

### **2.2.1 Recovery of Previously Selected Investigations**

**MRO-PMIRR.** The Pressure Modulator Infrared Radiometer (PMIRR) investigation was lost on both the failed Mars Observer (MO) and Mars Climate Orbiter (MCO) missions, and will be flown on MRO 2005 by its original team of investigators. This redesigned PMIRR retains its ability to profile the atmosphere through a combination of limb and on-planet sounding

with a target vertical resolution of 5 km for atmospheric profiles of temperature, dust extinction, water vapor, and ice aerosols. The science objectives of the MRO-PMIRR investigation remain:

- to explore the structure and the various aspects of the circulation of the atmosphere;
- to determine the time and space distribution, abundance, sources, and sinks of volatile material and dust over a seasonal cycle; and
- to monitor the polar radiative budget (the driver for variations in carbon dioxide).

**MRO MARCI-WA.** The Mars Color Imager (MARCI) investigation that was lost on the Mars Climate Orbiter mission was originally a dual camera system. The MARCI Wide-Angle (MARCI-WA) camera will be reflown on MRO 2005 by its original team of investigators to provide key, low-spatial-resolution observations of the atmosphere and surface in six multicolor channels. In addition to monitoring subtle changes in surface dust cover, MARCI-WA's two ultraviolet channels will allow monitoring atmospheric columns of ozone, which in the Mars atmosphere is known to be anticorrelated photochemically with water vapor distribution. The science objectives of the MARCI-WA are:

- to observe Martian atmospheric processes synoptically and at global scale, and
- to study details of the interaction of the atmosphere with the surface at a variety of scales in both space and time as part of the seasonal cycles of dust and volatiles.

Owing to their status as reflight investigations for MRO 2005, no proposals for membership in the PMIRR and MARCI-WA science teams are solicited through this AO.

## **2.2.2 New Facility Investigations**

**MARCI Medium Angle (MA/Context Imager).** The original objectives of the moderate resolution multicolor MARCI Medium Angle (MARCI-MA) camera are now being addressed by the 2001 Mars Odyssey THEMIS VIS experiment and, at lower spatial but higher spectral resolution, by instruments on the European Space Agency's 2003 Mars Express Orbiter. Therefore, for MRO 2005, the MARCI-MA will be redesigned to provide facility context-imaging for the anticipated high spatial resolution remote sensing instruments to be selected through this AO (see Section 2.2.3 below) by incorporating a panchromatic line array detector to provide a swath width = 30 km with a spatial resolution better than 10 m/pixel resolution from 400 km altitude. This camera will be operated by the existing MARCI science team as a Facility Instrument on MRO 2005, and is required by the MRO Project to provide context imaging for all high-resolution targeted observations by MRO and to acquire other special-purpose observations in support of the MEP objectives. The science team will also propose additional observations to address the MRO science objectives. The context images will be made available as quickly as possible to support the targeting and analysis of the higher spatial resolution instruments described in the next section.

No proposals for membership in the MARCI-MA science team are solicited through this AO.

**Subsurface Sounding Radar.** Pending the results of ongoing negotiations, a Subsurface Sounding Radar (SSR) may be provided by a partner organization as a Facility Instrument to provide data useful for characterizing the profile of the uppermost Martian regolith, having a goal of detecting liquid water and of profiling ice layers within the first kilometer of the subsurface with a vertical resolution of ~ 10 m and a horizontal resolution of a few kilometers (see Appendix B of the PIP). If this Sounding Radar is provided, its operation may be limited to the night side of the orbit to avoid effects of the daytime ionosphere, and it may be limited even further to avoid interference with the two eight hour downlink passes required to return the large volumes of MRO 2005 observational data.

In anticipation that a SSR will be available, this AO solicits proposals for U.S. investigations to participate as SSR Deputy Team Leader or as Facility Team Members. Since this instrument has not yet been constructed, proposals for the participation in the SSR Facility Science Team also may include a discussion as to how the investigator could contribute to the technical development of the instrument, as well as plans for analysis of its data. The data analysis plan needs to discuss contributions for the generation of products relative to the initial processing that will be performed by the instrument provider. Pending the submission of acceptable proposals of merit, a Deputy Facility Team Leader and up to four Facility Team Member proposals may be selected. Note that the partner organization that provides the SSR is expected to provide the equivalent of a Team Leader for this instrument. Proposers for this SSR Facility Team should be experienced with both the science and engineering aspects of design, sensor development, data processing, algorithm, development, calibration/validation, and operation, as well as data analysis for radar systems. Additional participating scientists may be selected through a future AO for detailed analysis of derived data products from the SSR.

### **2.2.3 New Remote Sensing Principal Investigator (PI) Instrument Investigations**

The mineralogical/morphological surface mapping investigations solicited through this AO are intended to address the remaining Group I objectives described in Section 2.1. It is anticipated that these objectives will be achieved by no more than two new science investigations, each led by a Principal Investigator and solicited by this AO, that provide and operate newly designed and constructed flight remote sensing instruments. Although interested proposers are free to propose any type of instrument(s) that would achieve the specified science objectives, the MRO Science Definition Team concluded that at a minimum they could be achieved by an imaging spectrometer and a high resolution imager having the following nominal capabilities:

#### Imaging Spectrometer:

- Wavelength range: 0.4 to 3.6 microns
- Ground resolution: = 50 m/pixel from 400 km altitude
- Spectral resolution: better than 10 wave numbers

- Swath width & down track traverses: = 10 km from 400 km altitude
- Signal to noise ratio: adequate to detect unambiguously the aqueous minerals of interest; adequate for operation in a 3:00 PM local mean solar time orbit

#### High Resolution Imager:

- Ground resolution: = 60 cm/pixel from 400 km altitude (=30 cm/pixel from 200 km)
- Swath width: = 6 km from 400 km (= 3 km from 200 km)
- Signal to noise: adequate for operation in a 3:00 PM local mean solar time orbit

By their nature, such high spatial and spectral resolution instruments will produce large volumes of data. The anticipated downlink capability per day for MRO 2005 is expected to be between 12 and 110 Gbits depending on the Mars-Earth range. Therefore, the number of targets observed at high spatial resolution will likely vary from one to two and up to several per day depending on the available downlink. For assessing constraints on downlink capabilities, information on data rates is described in the MRO 2005 Proposal Information Package (PIP), available electronically or on paper (see Section 3.0 of this AO for access information). It is anticipated that in addressing the above objectives, proposals for PI Instrument investigations will consider trade-offs between spatial resolution, areal coverage, and detection-sensitivity levels. In any event, proposals for investigations that provide new flight instruments must cover all aspects of the activity, including provision, testing, integration, and flight operation of the instrument through to data acquisition, reduction, analysis, archiving, and publications that address the key MRO 2005 science objectives.

### **2.2.4 New Facility Investigations Using Spacecraft Engineering Systems**

In order to make optimal scientific use of hardware required for successful functional operation of MRO 2005, this AO solicits Facility Science Team investigations whose Principal Investigators (PI's) will pursue investigations that utilize the data described below. However, MRO 2005 is a highly cost-constrained mission that is still in the early design phase, and the potential objectives described below were defined by the MRO Science Definition Team as Group II objectives. Therefore, while it is intended to select Facility Team proposal(s) as noted below, the continuation of any such investigations into the later implementation and operational phases of this mission is contingent on the provision of the required spacecraft hardware and the final mission design, as well as available funding. In spite of these uncertainties, Facility Team Leader, as well as Team Member investigations are solicited through this AO that would utilize data from three types of spacecraft engineering systems (note that unless specifically stated otherwise in the proposal, a proposer for Facility Team Leader will be considered for Facility Team membership only if he/she is not selected as the Leader):

- Atmospheric Structure via Accelerometer Data. Its current mission architecture calls for MRO 2005 to aerobrake for four to six months, with periapsis altitudes ranging from 90 to 150 km altitude. Onboard accelerometers will sense the deceleration of the spacecraft due to atmospheric drag and thus provide a measure of the density structure in the upper atmosphere of Mars during each aeropass. The upper limit of the height range over which density can be retrieved will depend on the accelerometers selected and how they are packaged to support the spacecraft aerobraking needs (see Appendix C of the PIP for possible capabilities). Facility Team proposals are solicited to support analysis of the aerobraking data in near real time to support MRO aerobraking operations, to improve engineering models of the upper atmosphere of Mars for future missions, and to advance understanding of the structure and circulation of the upper atmosphere of the planet. Selected investigators will work with the mission and spacecraft teams to support aerobraking planning and operations within an MRO Project Atmospheric Advisory Group. Pending the submission of acceptable proposals of merit, one Accelerometer Data Team Leader and two Team Member proposals may be selected through this AO.

- Gravity Models via Tracking Data. At present, MRO 2005 is planned to operate in a 200 x 400 km or other similar low-altitude orbit during a significant part of the primary science mission. The detailed characteristics of this orbit, as determined by the mission's tracking data, are a direct reflection of any anomalies of the Martian gravity field and can, therefore, be used to derive sophisticated high degree and order models of the planet's mass distribution. Such improved gravity models will support both the planning and operations of future spacecraft at Mars, as well as allow comparison of anomalous gravity features with other physical data sets to improve our understanding of the solid planet. Facility Team proposals are solicited to support analysis of the spacecraft's tracking data to improve the present gravity models of Mars. Pending the submission of acceptable proposals of merit, one Tracking Data Team Leader and two Team Member proposals may be selected through this AO.

- Atmosphere and/or Surface Characteristics via Radio Occultation Data. Occultation events of MRO's telemetry signal in its near-polar orbit around Mars provides limited but regular opportunities to probe the atmosphere and surface of Mars. In addition, there may be an onboard ultrastable oscillator that can be used for radio science purposes (see Appendix C of the PIP). Therefore, Facility Team proposals are solicited to plan and analyze radio occultation data. Pending the submission of acceptable proposals of merit, one Radio Occultation Data Team Leader and two Team Member proposals may be selected through this AO.

## **2.3 Education, Public Outreach, Technology, and Small Disadvantaged Business**

### **2.3.1 Education and Public Outreach (E/PO)**

The Office for Space Science (OSS) expects education and public outreach to be a significant part of each OSS flight program and research discipline, and strongly encourages space science

researchers to engage actively in education and public outreach as an important component of their NASA-supported professional activities. In order to achieve this goal, OSS has developed a comprehensive approach for making education at K-14 education levels, as well as the enhancement of public understanding of space science, integral parts of all of its missions and research program. The two key documents that establish the basic policies and guide all OSS education and outreach activities are a strategic plan entitled *Partners in Education, A Strategy for Integrating E/PO Into NASA's Space Science Programs* (March 1995), and an accompanying implementation plan entitled *Implementing the OSS E/PO Strategy* (1996). Both can be accessed by selecting "Education and Outreach" from the menu on the OSS homepage at Internet URL <http://space.science.nasa.gov>, or from Dr. Jeffrey Rosendhal, Office of Space Science, Code S, NASA Headquarters, Washington, DC 20546-0001, USA.

Beyond this general mandate, the comprehensive exploration of Mars through a long-term series of missions is expected to provide a singular opportunity to draw on broad popular interest about Mars to both engage the public and to work with the formal education system to improve the teaching of science, mathematics, and technology in the United States. Therefore, E/PO will be an integral element of the Mars Exploration program in general and MRO 2005 in particular. In accord with established OSS policies, 1-2 percent of the total Mars Exploration Program budget will be allocated to E/PO, and all selected NASA-funded scientific participants in the Mars Exploration Program will be expected to become actively involved in planning and implementing an E/PO program as follows.

The approach being taken to involve scientists participating in the MRO 2005 Mission in E/PO has been specifically tailored to recognize that, in general, there are two classes of scientific participants whose investigations will be of very different scientific and financial scope. Consequently, expectations concerning the nature of participation in E/PO for these two classes of scientific investigations are commensurately different as follows:

- PI Instrument investigations are required to include an E/PO component as a part of their overall proposals. OSS expects that a substantive education and outreach program will be an integral element of the investigation and that proposers will devote adequate resources to the planning and implementation of such an effort. The general funding guidelines of 1-2% of the total budget for E/PO for the Mars Exploration Program as a whole also apply to the E/PO component of each PI Instrument investigation within each mission. Therefore, proposals must include the Principal Investigator's approach for planning an education/outreach program, arranging for appropriate partners and alliances, implementing the education/outreach program (including appropriate evaluation activities), and plans for disseminating education/outreach products and materials. See Appendix C for further information on expected proposal content. The E/PO components of PI Instrument proposals will be evaluated by appropriately qualified scientific, education, and outreach personnel, and those evaluations will be considered by the Selecting Official as part of the overall selection process. Sections 7.2 and 7.4 contain further information on the proposal

evaluation and selection process and the role of E/PO in that selection process. As indicated in that section, E/PO will not be considered as part of the Categorization process—which will be based entirely on the scientific and technical merits of the proposal—but as one of the other factors to be considered in evaluating the merits of closely competing proposals in subsequent stages of the selection process.

- Facility Team Members and Team Leaders will be expected to participate in the common Mars Exploration Program E/PO program (see below) that is now underway. Individual participating Facility scientists (including any members of their supporting team) must be prepared to spend an average of ~ 5 % of their time, as part of their normal ongoing work, supporting E/PO activities, including those of the MEP. Such activities may include, but not be limited to: developing ideas for creative and worthwhile educational materials; preparing written background information suitable for primary and secondary school educational resources; and preparing portions of their mission's data for use in E/PO materials. Therefore, Facility Team proposals must include an explicit statement in the Contractual Statement of Work that proposers are willing to participate in E/PO on this basis and must budget appropriately for such work as part of their proposal.

Specific instructions for including proposals for E/PO efforts can be found in the appropriate Guidelines for Proposal Preparation Appendix B and in Appendix C. Other important information concerning the expected content of E/PO proposals, the evaluation criteria to be used to rate proposals, and assistance available from the OSS Education/Outreach Support Network can be found in Appendix C.

As noted above, in addition to their individual E/PO programs, selected, NASA-funded instrument teams, together with Facility Team members, will be expected to become actively involved in the overarching Mars Exploration Program E/PO program being carried out through the Jet Propulsion Laboratory. Several steps will be taken after selection to define, ensure and enable active participation in one common program and to coordinate and integrate unique instrument investigator E/PO programs into the overall program. Components will be integrated through a variety of collaborative processes designed to produce one overall E/PO Plan that will meet NASA's and OSS's education and outreach goals and objectives. Budgets should include provisions for participation in such activities.

Additional information on the OSS E/PO Program can be found in the *Explanatory Guide to the NASA OSS E/PO Evaluation Criteria* (April 1999), the *OSS FY 2000 Annual Report* (January 2001). These two documents can be accessed through the OSS homepage following the directions given at the beginning of this section.

### **2.3.2 Technology Development and Transfer**

The Mars Exploration Program represents an opportunity for NASA to develop and test new technologies and applications and to transfer those technologies and applications to the U.S. private sector. The means by which NASA OSS plans to implement new technology is described in “*The Space Science Enterprise Integrated Technology Strategy* (October 1998).” Mars Exploration Program missions are expected to help NASA achieve the goal of technology transfer, defined here as the transition of scientific and engineering knowledge from one entity to another for a potentially useful purpose. Emphasis is placed on technology transfer from NASA to the U.S. private sector, including the nonaerospace industry, for use in or as a commercial product or process. Therefore, proposals in response to this AO must include a description of any expected new technology(ies), and how it(they) will be developed, tested, and transferred to the private sector. This plan will be judged as part of the proposal evaluation; see Section 7.1.

### 2.3.3 Small Disadvantaged Business and Minority Institutions

The PI and team members for PI instrument investigations shall agree to use their best efforts to assist NASA in achieving its goal for the participation of Small Disadvantaged Businesses (SDB’s), Women Owned Small Businesses (WOSB’s), Historically Black Colleges and Universities (HBCU’s), and other Minority Educational Institutions (MEI’s) in NASA procurements. Investment in these organizations reflects NASA’s commitment to increase the participation of minority concerns in the aerospace community, and it is to be viewed as an investment in the Nation’s future. In addition, proposers for the PI Instrument investigations, other than small business concerns, are advised that their proposals are required to contain a plan that includes goals for subcontracting with small, small disadvantaged, women-owned, and Historically Underutilized Business Zone (HUBZone) small business concerns. Special note: Fostering participation of HBCU’s and other MEI’s in NASA’s space science missions may be achieved through and be a critical component of any proposed E/PO program, thereby satisfying two requirements simultaneously.

## 2.4 Summary of Selections Desired Through this AO

The following table summarizes the selections solicited through this AO and the desired number of selections pending the availability of funds and the submission of proposals of merit. In addition, the last column identifies the type of E/PO activity to be proposed for each solicited investigation.

Name/Type of Investigation	PI + Team Selection	Facility Team Leader Selection	FacilityTeam Member Selections	Type of Assoc. E/PO Participation*
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<b>PIMRR-Mk II</b>	None; PI team exists from previous msn.	None	None	Per original selection
<b>MARCI-WA</b>	None; PI team exists from previous msn.	None	None	Per original selection
<b>MARCI-MA</b>	Operated as Facility by MARCI team	None	None	Per original selection
<b>Subsurface Sounding Radar</b>	None	None; provided by mission partner	Deputy Team Leader plus $\leq 4$	A
<b>New MRO Instruments</b>	2	None	None	B
<b>Accelerometer Data (MRO)</b>	None	1	$\leq 2$	A
<b>MRO Orbit Tracking Data</b>	None	1	$\leq 2$	A
<b>MRO Radio Occultation Data</b>	None	1	$\leq 2$	A

\* Types of E/PO proposals:

A: Participation in the overall Mars Explorations E/PO program managed by the Jet Propulsion Laboratory.

B: New stand-alone program (1 - 2 % of proposal budget) plus participation in the overall Mars Exploration E/PO program managed by the Jet Propulsion Laboratory.

### 3.0 BACKGROUND

Achieving the objectives given in Section 2.1 above will require an orbiter carrying a suite of remote sensing instruments that combine global monitoring of seasonal changes in the atmosphere and surface, regional surveys of the surface and possibly of the subsurface, as well as dedicated targeting of hundreds of sites at unprecedented high spatial and spectral resolutions. These requirements for MRO 2005 are based on the report, titled "*Mars Exploration Program: Scientific Goals, Objectives, Investigations and Priorities*," prepared by the Mars Exploration Payload Analysis Group (MEPAG) chartered by NASA's Office of Space Science (OSS). These objectives and potential technical approaches are discussed in the document, "*Report of the Science Definition Team for the Mars Reconnaissance Orbiter*," prepared by the MRO 2005 Science Definition Team (SDT) chartered by OSS to recommend scientific objectives of the 2005 Orbiter mission.

This AO is available electronically via Internet host <http://spacescience.nasa.gov/> by opening "Research Opportunities" from the menu. Additional information about this AO may be obtained from the Acting MRO 2005 Program Scientist:

Dr. James Garvin  
Research Program Management Division  
Code SR  
Office of Space Science  
NASA Headquarters  
Washington, DC 20046-0001

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Facsimile: 202-358-3095

E-mail: james.garvin@hq.nasa.gov

A Proposal Information Package (PIP) that contains the Technical Descriptions and Instrument Interface Definitions for the MRO 2005 Mission and that will be needed for the preparation of a formal proposal to this AO is available through the MRO 2005 Program Library (Appendix D). Paper copies of the PIP and further information on its access procedures may be obtained from:

Mr. William Mateer

Mail Stop 301-486

Jet Propulsion Laboratory

4800 Oak Grove Drive

Pasadena, CA 91109-8099

USA

Facsimile: 818-393-5239

E-mail: wmateer@pop.jpl.nasa.gov

Questions regarding clarification of items in the PIP should be submitted in writing or electronically to William Mateer at the above address. Responses to inquiries received will be available electronically on the site given above. Anonymity of persons who submit questions will be preserved.

A number of reports are referenced in this AO are available electronically from the MRO Library, including the *Report of the Science Definition Team....*,” and the MEPAG Report, “*Mars Exploration Program....*” noted above; see Appendix D.

#### **4.0 PROPOSAL OPPORTUNITY PERIOD**

This AO is issued for the singular opportunity of the Mars Reconnaissance Orbiter 2005 mission as described herein. Proposals for all solicited investigations are due by the single date given in Section 8.0 below.

#### **5.0 MRO 2005 MISSION REQUIREMENTS AND CONSTRAINTS**

##### **5.1 Mission Overview**

The MRO 2005 spacecraft will be launched on an Intermediate-class (e.g., Delta III/IV or Atlas III/V) launch vehicle in August 2005. It is expected to arrive at Mars in March 2006, where an onboard propulsion system will insert it into an elliptical polar orbit with a period of

~35 hours. Four to six months of aerobraking will then place the spacecraft into a 200 x 400 km elliptical orbit with an equatorial nodal crossing near 3:00 PM Mean Solar Time. In this configuration, the periapsis of the orbit will rotate around the planet, giving low-altitude access to all latitudes and longitudes. After an extended period of high spatial resolution mapping, the periapsis altitude will be raised by onboard propulsion to a near-circular orbit of approximately 400 km. The timing of this change in orbit will be decided during the primary science phase of the MRO mission. The equatorial node crossing will remain near 3:00 PM Mean Solar Time. Owing to this anticipated range of orbit altitudes, all proposed remote-sensing instruments must be able to acquire meaningful data over the range 200 to 400 km.

The MRO instruments will routinely be nadir-pointed throughout the mission except for occasional times (perhaps a few per day) when the spacecraft will point the instruments up to 30° off-nadir in the cross-track direction to enable targeted observations of key areas of interest. Proposed science instruments requiring different or routine off-nadir pointings must provide their own articulation devices as part of the flight hardware. During the primary science mission, MRO 2005 is expected to view hundreds of sites at high spatial resolution. Therefore, even though its data rate will be an order of magnitude larger than that of earlier Mars missions, the main limitation on the number of sites that may be targeted is likely to be the downlink data rate.

Towards the end of its primary science mission, MRO 2005 is intended to provide navigational and telecommunications support for missions launched in the 2007 Mars launch opportunity. During this relay period, MRO will give priority first to its support role for the arrival and primary operations period of the Mars 2007 mission(s) and second to the continuation of its own global and seasonal coverage, in addition to limited targeted observations. Upon completion of its primary science mission, the MRO will remain on station as a telecommunication relay for future Mars missions, perhaps through 2010. Extended science operations, including reconnaissance of future landing sites, will require future approval and funding of an extended MRO science mission.

Certain constraints are mandated by NASA's commitment to cost efficiency in the MRO 2005 mission. The cost constrained nature of the mission requires that the scientific payload will be limited by available payload resources for mass, energy, volume, data rate, duty cycle, and other key resources as specified in the PIP. Therefore, proposed instruments must demonstrate adequate reserves and margins consistent with contemporary design principles and engineering practices.

The PIP contains detailed descriptions of the 2005 Orbiter Mission and spacecraft, the environments in which the instruments are expected to survive and operate, Principal Investigator (PI) responsibilities and deliverables, and the capabilities of the MEP ground system and mission operations. In case of a conflict between this AO and the PIP, the AO takes precedence.

The Mission Management Office (MMO) has been established within the Planetary Flight Projects Directorate at the Jet Propulsion Laboratory to provide cost-effective mission operations support to all space science missions at JPL. The MMO will provide the mission operations support with multimission capabilities and MRO 2005 mission specific capabilities. The goal of the MMO is to provide such support with minimum cost and maximum benefit.

## **5.2 Mass Constraints:**

For all instruments proposed in response to this AO, innovative design approaches that incorporate technological advances in low cost, light weight, high performance instruments are encouraged.

The current best estimate of the total mass allocation for the investigations solicited by this AO is 63 kg. The report by the MRO Science Definition Team (see MRO Library, Appendix D) suggested mass targets of 40 kg for a high resolution imager and 23 kg for an imaging spectrometer. To accomplish the MRO science objectives, no single instrument should use all, or nearly all, of the 63 kg mass allocation. Mass margins are discussed in the PIP (Section 3.2.1).

## **5.3 Investigation Phases and Schedule Constraints**

For investigations selected for MRO, the following phases are defined:

### Formulation Phase

- |         |  |
|---------|--|
| Phase A | Investigation Definition<br>Period: 2-3 months, starting from time of Selection<br>(Target: November 2001 – January 2002)<br>[Phase ends with initial Confirmation Review] |
| Phase B | Investigation Design<br>Period: 6 months, from End of Phase A<br>(Target: February – July 2002)<br>[Phase ends with Project PDR and final Confirmation Review]             |

### Implementation Phase

- |           |  |
|-----------|--|
| Phase C/D | Investigation Detailed Design, Build, Test, and Integration<br>Period: From End of Phase B through Launch plus 30 days<br>(Target: August 2002 – September 2005) |
| Phase E   | Investigation Operations and Data Analysis<br>Period: Launch plus 30 days to end of Primary Science Phase* + 6 months<br>(Target: October 2005 – May 2009)       |

\*For investigations using the spacecraft accelerometer data, Phase E ends 6 months after the end of aerobraking (Target: September 2005 – May 2007).

In order to meet the launch window in August 2005, adherence to the following nominal program schedule is anticipated:

Commence Phase A studies for PI Instrument investigations	November 2001
Initial Review and Confirmation for Flight of new instruments	January 2002
Project Preliminary Design Review (PDR)	June 2002
Final Review and confirmation for Flight of new instruments	July 2002
Critical Design Review	April 2003
Delivery of flight hardware to JPL	April 2004
Mission launch	August 2005

#### **5.4 Cost Constraints**

It is the intent of NASA to select a combined payload that best satisfies the Group I science requirements within the most favorable combination of payload mass and combined instrument cost. Presently, the MRO Project is budgeting guidelines of \$18M and \$32M, respectively, for the Imaging Spectrometer and the High Resolution Imager (or their equivalents). These guidelines include all investigation reserves and cover all phases of development activity through Launch plus 30 days.

Furthermore, the MRO funding profile is highly constrained during the first part of the MRO development, with the bulk of funding to come after FY 2002, which should be reflected in the funding profiles for each proposal involving instrument development. For the phase A/B period (running from start of contract until successful confirmation of the investigation after Project PDR; see section 5.3), the funds available for the instrument development are constrained. The total obligations for the Phase A/B period are no more than \$2.7M for the imaging spectrometer and \$3.7M for the High Resolution Imager (or equivalents). These limits include all financial obligations, including any contracts for long lead items needing to be placed during this period. Finally, note that 1 to 2 percent of the MRO total run-out cost for each selected instrument investigation (see Section 2.4) is to be reserved for E/PO activities, where it is expected that the bulk of these activities and their funding will come in the operational phases of the MRO mission.

Cost realism and overall cost effectiveness are important criteria in the selection of the Principal Investigator Instruments, and a favorable funding profile is one that reduces the funding requirements needed in the early years. However, a realistic schedule for development is required, including the identification and proposed development of long-lead items. Investigators must recommend reserves for mass, power, and funding based on the maturity of

the proposed design. The reserves will be evaluated and the finding factored into the best value assessment. Investigators must define descope options (if any are practical), decision dates for implementation, costs avoided, and science impact associated with each descope option (if any).

For Facility Team members (see Section 2.4), the budget guidelines for Phases A-D (4 years: Selection through Launch plus 30 days) are as follows:

**SSR** Deputy Team Leader: \$500K and Team Members: \$240K each

**OTHER**\* Team Leaders: \$170K each; Team Members: \$100K each

\*Accelerometer, Orbit Tracking, and Radio Occultation

It is expected that activity will increase toward the end of Phase D, which should be reflected in the proposed cost profiles as appropriate. The greater amounts for the SSR Facility Team members are based on the expectation that U.S. Team Members will be actively involved in the design and development of the instrument to be provided by a partnering organization.

Proposing Facility Team Leaders and Members are to estimate Phase E costs by year for the nominal period October 2005 to May 2009 (end of the primary science phase plus 6 months) for all investigations except those proposing to study Accelerometer data, for which the period is October 2005 to May 2007 (end of aerobraking plus 6 months). The budget guidelines in Phase E for the SSR Deputy Team Leader is \$150K per year and for Team Members \$100K per year. Guidelines in Phase E for other Facility Team Leaders are \$100K per year and Team Members \$50K per year.

Each Team Leader/Team Member proposal is to come from a single Principal Investigator without any Co-Investigators or collaborators. However, a very restricted number of ancillary personnel may be included in such proposals provided that they are very well justified by way of their proposed responsibilities and that it is clear the PI him/herself is committed to serving on the Team and not merely to be represented by a member of his/her proposal team, no matter how well qualified.

## **5.5 Science Operations Requirements**

It is expected that each PI of an Instrument investigation selected through this AO will develop and maintain a science operations facility at their own institution to provide instrument command generation and transmission to the MRO 2005 Project office at JPL and to retrieve essential instrument telemetry data for instrument performance assessment and health and welfare assessment. The PI science operations facility and network configuration must meet TMOD security requirements. The plans and budget for the design and staffing of these individual PI science operations facilities must be provided in the proposals.

To enable these activities, the MRO Project will provide to each PI of an instrument investigation a Science Operations and Planning Computer (SOPC), complete with operations compatible software, connections to an acceptable network, and maintenance. Implementation of science operations facilities and capability in time to support spacecraft/instrument testing and operations will be monitored by the MMO and the MRO Project by means of schedule, reviews, meetings, documentation, and configuration control.

MRO is expected to target hundreds of sites throughout its primary science mission, although the number of sites that can be observed on any given day will vary throughout the mission, from 1-2 per day when Mars is at greatest range, up to several per day when data downlink rates are high. The MRO MARCI MA facility camera will provide context imaging for targeted high-resolution observations, and many targeted observation sequences will require co-located observations by several MRO instruments. Some fraction of the targeted observing sequences will be dedicated to selection and characterization of future landing sites and of other sites having high priority within the MEP. NASA also reserves the right to direct (coordinated) observing of additional sites in response to requests from the broader scientific community and in support of public outreach activities. All of the MRO targeted observations will be coordinated through the Project Science Group's Targeting Acquisition Group (TAG).

## **5.6 Data Policies and Validation Requirements**

The MRO 2005 Project requires that raw data, calibration records, and processed data be maintained in an updated form throughout the period of investigation. Specifically, each selected Instrument PI and Facility Investigation Team must plan:

- To maintain a continually updated record of the "best version" of the data until meaningful changes in data calibration no longer occur;
- To release data in an appropriate manner for public access as soon as feasible;
- To make appropriate data records available to other investigators and project and personnel during the mission for shared analysis; and
- To support the timely processing and distribution of data, including their deposition in the Planetary Data System (PDS).

It is NASA policy that PI's do not have exclusive use of data taken during the course of their investigation for any proprietary period. In order to engage the public more fully, investigators are strongly encouraged to release subsets of particularly interesting initial data on a daily to weekly basis or during special campaigns to be defined by the MRO Project Science Group and Project Management (plans for, and actual release of, data for public engagement will be coordinated through the MRO Project Science Group). Therefore, as part of a proposer's data release plan, discussion of the volume and timing of data for early release must be

addressed, and the necessary preparations costed accordingly. NASA, through the MRO Project, reserves the right to direct or conduct processing and release of data needed for mission or program planning (e.g., to define targets for observation or to characterize landing sites for future missions) and also to support public engagement.

PI's selected for instrument investigations must plan to archive their Data Products in the Planetary Data System (PDS) in a PDS-compatible data format. Plans must conform to policy and requirements for the validation and archiving of data presented in the document, "*Mars Exploration Program Data Management Plan*" (see Appendix D). After a short period for verification and validation, not to exceed six months, the PI must deposit the validated data in the PDS; analysis, preparation, distribution and archiving of all instrument team data products are to be completed within six months of the end of the primary mission. Exceptions to this guideline are to be identified and appropriate justification given. Data Products will be archived in the PDS as soon as they are available, on a time scale commensurate with the level of data processing to be identified in the Science Data Management Plan. Image data will be made available publicly shortly after reception on the ground.

Initial data analyses for the investigations solicited here will be accomplished by the PI's and their teams. Therefore, proposers are expected to include, as part of their proposed Mission Operations and Data Analysis activities, a clear definition of the roles of all the science team members and a data analysis plan that is consistent with PDS archiving activities. Cost estimates for PI Investigation Instrument team activities will cover all phases, including Mission Operations and Data Analysis.

In addition, because of the requirement for deposition of data in the PDS, all PI Instrument Investigation proposals in response to this AO must specifically include the costs of calibration, verification, and preparation of data for transfer to the archive. Level 0 (raw data) will be archived by the MRO Project. Information required for use of data acquired or provided by spacecraft systems (e.g., accelerometer data or context images) will be provided by the MRO Project and need not be budgeted in the proposed investigations; however costs for archiving of higher level, derived data products should be addressed.

Facility team members must likewise define appropriately scoped data plans, emphasizing needed interactions with the Project and facility hardware providers during prelaunch development activities and/or prior to the start of data acquisition at Mars. Plans should identify specific data products and provide a schedule for the required data analysis and distribution, including archiving, of all data products. Analysis, preparation, distribution and archiving of all data products are to be completed within six months of the end of data acquisition (end of aerobraking or end of the primary mission, as appropriate).

The MRO mission is expected to play a key role in identifying and evaluating surface sites for future landers. As such, NASA will require coordinated observations between the various

instruments, with data being available in a timely fashion, to support programmatic and E/PO activities of the MEP.

## **5.7 Reducing Instrument and Instrument Operations Costs**

Because of the firm overall limitation on the science costs and the total costs to NASA of the 2005 MRO mission, prospective investigators are encouraged to seek innovative approaches to reducing both instrument and instrument operation costs, as well as the resources required from the Orbiter (for example, through the sharing of spacecraft resources). Such a strategy would be presented as an option in the proposal. Another approach to U.S. (NASA) cost savings is to share payload development costs through collaboration with other U.S. Government agencies or with private industry, and/or through international collaboration. International cooperative agreements can add to management complexity and risk, however, proposers should ensure that such arrangements offer significant benefits while maintaining clear technical and management interfaces. In any case, however, adequate resources must be budgeted for the deposition of appropriately reduced and calibrated data in the PDS (see Section 5.5 above).

## **5.8 Technical and Management Requirements for Principal Investigator Instrument Investigations**

### **5.8.1 Technical Requirements**

A proposal in response to this AO must address all technical aspects of its investigation from the beginning of funding through delivery of the data for archiving, the publication of results in the peer-reviewed literature, and the conduct of an appropriate E/PO program. Proposers are encouraged to propose innovative processes, techniques, and activities to accomplish these objectives and to demonstrate cost, schedule, and technical efficiencies. Based on the science objectives outlined for this mission, it is anticipated that the instruments will generate extremely large volumes of data. Therefore, proposals involving the provision of flight experiments should clearly discuss strategies for any type of data compression that may be implemented.

As part of the accommodation and integration of an instrument on the MRO 2005 spacecraft, the Project will provide suitably designed mounting brackets. However, the cost and development of any deployable booms and other mechanisms needed by an instrument will be the responsibility of the proposer. The proposer must ensure that any such booms or mechanisms do not interfere with the operation of the spacecraft.

The proposer is responsible for the scientific success of his/her investigation. The proposal must describe the technical approach for every element of the investigation to ensure that the investigation does not exceed the bounds of the available spacecraft or financial resources. The proposal must demonstrate that any proposed hardware will operate reliably, must clearly spell

out the roles of all Co-I's, and must show that the resulting data can be interpreted in a way to achieve the investigation's stated objectives.

### **5.8.2 Management Requirements**

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

## **6.0 PROPOSAL SUBMISSION INFORMATION**

### **6.1 Notice of Intent to Propose**

A Notice of Intent (NOI) signifying the writer's intent to submit a proposal in response to this AO is requested to be submitted by all proposers via the World Wide Web site <http://props.oss.hq.nasa.gov> by the schedule noted below. Proposers without access to the Web or who experience difficulty in using this site should send an E-mail to [dtripp@hq.nasa.gov](mailto:dtripp@hq.nasa.gov) requesting assistance.

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

- Name, address, telephone number, fax number, E-mail address, and institutional affiliation of the PI.
- Full names and institutional affiliations of any Co-Investigators (Co-I's). If any Co-I's or other team members are from non-U.S. institutions, the organization that will provide support for these people should be identified in the Comments box on the form.
- A brief statement (150 words or less) that includes all of the following:
  - The scientific objectives of the proposed investigation;
  - Identification of new technologies that may be proposed as part of the investigation; and
  - The Education/Public Outreach objectives of the proposed investigation.
- The name of the Lead Representative from each partner organization (industrial, academic, nonprofit, and/or Federal) included in the proposing team.

Note that all information provided in an NOI is for NASA planning purposes only, is confidential, and is replaced by information in the final proposal.

## **6.2 Preproposal Conference**

In order to provide the community of interested proposers with the latest and best information about this MRO 2005 mission, as well as to answer questions about this AO, NASA will host a Preproposal Conference to be held in the James E. Webb Memorial Auditorium at NASA Headquarters on the date given in Section 8.0 below starting promptly at 9:30 AM and ending by 3:30 PM. Note that all expenses and arrangements for attending this meeting are the responsibility of the attendee, and NASA funds may not be used to defray any of the associated costs. Questions may be submitted in advance in writing or by E-mail to the MRO 2005 Program Scientist identified in Section 3.0 of this AO. Every effort will be made to answer all questions submitted at least one week in advance of the Conference at the meeting. Questions submitted at the Conference itself will be answered to the extent possible; those not answered at that time, as well as the answers to all questions submitted in advance, will be posted on the Web site of this AO within two weeks of the Conference. In all cases the anonymity of the author of the questions will be preserved.

## **6.3 Format of Proposals**

Appendix B provides detailed information concerning the contents and format of proposals submitted in response to this AO. Note that two types of proposals are solicited, those for Investigations Involving Flight Instrumentation and those for Investigations Involving Membership in a Facility Team, which are treated separately in Sections 2.0 and 3.0 of Appendix B, respectively. Section 1.0 of this Appendix provides overview guidance applicable to *both* types of proposals.

## **6.4 Proposals with non-U.S. Participation**

NASA welcomes proposals having participants from non-U.S. institutions provided that they are offered on a no-exchange-of-funds basis and also comply with current U.S. restrictions concerning the export of technology. Foreign proposals and proposals including foreign participation must include a section discussing compliance with U.S. export laws and regulations, *e.g.* 22 CFR Parts 120-130 and 15 CFR Parts 730-774 as applicable to the circumstances surrounding the particular foreign participation. A full statement of the policies concerning such proposals, whether from a U.S. organization with non-U.S. Co-I's or from a non-U.S. organization with or without U.S. Co-I's, is given in Section 6.0 of Appendix B. In either case, letters of endorsement from all organizations sponsoring non-U.S. participants must be received at the address given in Section 6.5 by the schedule given in Section 8.0.

## **6.5 Submission of Proposals**

The signed original plus 40 copies of instrument proposals; 30 copies of Facility Team Member/Leader proposals, must be received at the following address by the schedule in Section 8.0 below:

Mars Reconnaissance Orbiter 2005  
NASA Peer Review Services  
Suite 200  
500 E Street, SW  
Washington, DC 20024-2760  
Tel: 202-479-9030

NASA's policy concerning late delivery of proposals is given in Appendix A, Section VII.

## **7.0 PROPOSAL EVALUATION, SELECTION, AND IMPLEMENTATION**

### **7.1 Evaluation Criteria**

The fundamental aim of the NASA investigation acquisition process is to identify scientific ideas that are tested and verified by unique instrumental and/or analytical capabilities that best suit the overall scientific and cost objectives of the program as described in the AO. The following criteria will be used in evaluating all proposals submitted in response to this AO. The weight of each criterion is given in parentheses.

#### **1. Scientific Merit**

The scientific merit of the proposed investigation and its relevance to this specific opportunity and to the established mission plans and objectives. (35 %)

#### **2. Technical Merit and Feasibility**

For Principal Investigator Instrument proposals: The adequacy of the proposed instrument for the proposed investigation with particular regard to the instrument's ability to supply the data needed for the proposed investigation within mission constraints such as mass, volume, available energy, available data storage and transmission rates, and sequencing of operations and the adequacy of plans for data analysis and archiving. (30 %)

For Facility Team proposals: The appropriateness of the proposed investigation to the data that will be supplied by the mission's facility instrument or engineering system (as described in the PIP for this AO). (30%)

#### **3. Implementation risk, including cost realism and reasonableness, and implementation approach.**

For Principal Investigator Instrument proposals: In all cases, cost realism and cost reasonableness will be used to determine an overall cost risk (uncertainty) associated

with the investigation. Implementation aspects include demonstrated capability to adhere to sound business practices. (20 %).

For Facility Team proposals: Cost realism and reasonableness will be used to determine an overall cost risk. (20 %)

4. The competence and relevant experience of the proposer and any proposed investigative team as an indication of their ability to carry the investigation to a successful conclusion, including timely archiving and distribution of data, and the commitment of the proposer's institution as measured by the willingness of the institution to provide the necessary support (logistics, facilities, etc.) to ensure that the investigation can be satisfactorily completed. (15 %)

## **7.2 Evaluation Procedures**

Proposals received in response to this AO will be evaluated in accordance with the provisions of NASA Federal Acquisition Regulations (FAR) Supplement Part 1872, "*Acquisition of Investigations*," that may be accessed through the Internet host <http://www.hq.nasa.gov/office/procurement/regs/1872.htm>.

All proposals will be subjected to a preliminary screening to determine their suitability and responsiveness to the AO. Proposals that are not in compliance with the constraints, requirements, and guidelines of this AO will be handled as technical correspondence and returned to the proposer without further review. Those proposals that are responsive to the AO will then be subjected to a preliminary technical, management, and cost assessment.

Following these preliminary actions, the scientific and technical aspects of each proposal will be assessed by panels composed of reviewers who are scientific and technical peers of the proposers. The purpose of this peer evaluation will be to determine the scientific and technical merit of each proposal, expressed in terms of its major and minor strengths and weaknesses.

The Educational/Public Outreach plan for the Principal Investigator Instrument proposals will be appraised by a panel of personnel having professional credentials in those fields, as well as scientists who have demonstrated experience in E/PO activities.

## **7.3 Categorization Process**

After all scientific, technical, management, and cost evaluations are completed based on the criteria given in Section 7.1 above, an *ad hoc* Categorization Subcommittee of the Space Science Steering Committee (SScSC; see further below in Section 7.4), consisting of U.S. Civil Servants, will meet to categorize the submitted proposals according to the definitions in NASA FAR Supplement 1872.403, as follows:

Category I: Well conceived and scientifically and technically sound investigations pertinent to the goals of the program and the AO's objectives and offered by a competent investigator from an institution capable of supplying the necessary support to ensure that any essential flight hardware or other support can be delivered on time and that the data can be properly reduced, analyzed, interpreted, and published in a reasonable time. Investigations in Category I are recommended for acceptance and normally will be displaced only by other Category I investigations.

Category II: Well conceived and scientifically and technically sound investigations, which are recommended for acceptance, but at a lower priority than Category I.

Category III: Scientifically or technically sound investigations which require further development. Category III investigations may be funded for development and may be reconsidered at a later time for the same or other opportunities.

Category IV: Proposed investigations which are recommended for rejection for the particular opportunity under consideration, whatever the reason.

Note that neither the total cost of a proposed investigation nor the evaluation of a proposal's plans for E/PO activities, Technology Development and Transfer, and Small and Small Disadvantaged Business and Minority Institutions will be used for the categorization process.

At any time during the evaluation process, NASA reserves the right to invite the PI's of proposals to answer questions of clarification about their proposals, including plans for E/PO activities. If such an activity is planned, the request to participate, as well as all questions to be answered, will be submitted in writing to the proposers. The response to the questions will be returned by mail. This exercise will be only for NASA to clarify perceived uncertainties in understanding or interpretation of the material in the proposals and will not be an opportunity for the proposer to revise or otherwise augment a submitted proposal.

## **7.4 Selection Process**

Following the evaluations described above, the Mars Exploration Program of the Office of Space Science at NASA Headquarters will develop a recommendation for selection based on the available Category I and II proposals. This recommendation and all peer review and categorization materials for all proposals will be presented to the SScSC, composed of Civil Service personnel appointed by the Associate Administrator for Space Science, for an independent review of the evaluation and categorization processes and records. After this review, the final evaluation results, including the evaluation results for the E/PO, technology, and Small and Small Disadvantaged Business and Minority Institution participation will be forwarded to the Associate Administrator, who will make the selection(s). The selection will also take into account the total cost and cost profile of each candidate investigation. The merit of plans for E/PO activities, Technology Development and Transfer, and Small Disadvantaged Business and

Minority Institutions will be used to discriminate among proposals that are otherwise equal in the final selection process. Proposers are also advised that the selection process may take into account programmatic and/or budgetary circumstances that may arise after this AO is issued.

Proposers are advised that, in accordance with Section 2.0 of Appendix A, NASA may desire to select only a portion of the proposer's investigation and/or may also desire the proposer's participation with other investigators in a joint investigation. In such a case, the proposer(s) will be given the opportunity to accept or decline the offer. Declination of such an offer may lead to nonselection for this flight opportunity.

Selected PI Instrument investigations will conduct two-month Phase A studies. An initial Review and Confirmation for Flight will be held at the completion of Phase A (see Section 5.3 of this AO); approval to proceed to Phase B will depend on passing the initial Confirmation for Flight Review successfully. Approval to proceed to Implementation Phases C/D will depend on passing the final Review and Confirmation for Flight successfully at the completion of Phase B. These Phase A/B studies will focus on whether the proposed hardware can be completed and delivered on a schedule consistent with the mission schedule given in Section 5.3.

For Facility Team investigations, the Phase A/B studies will focus on the ability of the SSR (if it is confirmed for the mission) and the spacecraft engineering system to deliver the data necessary for their associated investigations.

## **7.5 Implementation Procedures**

Selected proposers will be notified by telephone and by letter; the letter will provide instructions concerning the steps necessary to initiate funding of their award. Non-government awardees will receive subcontracts from JPL. It is expected that all selected PI's will attend a first meeting of the Project Science Group (PSG; see Section 7.6 below) within several weeks of selection notification.

Those proposers not selected will be notified by letter and offered a debriefing based on the strengths and weaknesses of their proposals. This debriefing may be by telephone or in person at NASA Headquarters at the discretion of the proposer; however, in the latter case, NASA funds may not be used to defray travel costs.

## **7.6 Formation Of Project Science Group**

Subsequent to the selection of investigations by NASA through this AO, a MRO 2005 Project Science Group (PSG) will be established, composed of the PI's of the Instrument investigations and the Facility Team Leaders selected through this AO, as well as the PI's of the PMIRR-MkII and the MARCI-WA investigations and a representative of the Subsurface Sounding Radar (if one is offered to and accepted by NASA for this mission). Any Interdisciplinary and/or Participating Scientists selected through future solicitations will also become members of

the PSG. The PSG will be co-chaired by the MRO Project Scientist from the Jet Propulsion Laboratory and the MRO Program Scientist from NASA Headquarters. The PSG will meet regularly through the lifetime of the MRO 2005 Mission with a charter to work with the Mars Exploration Program Office to maximize the scientific return of this mission within the existing resources.

One key activity of the MRO 2005 PSG will be to coordinate targeting requests, including the simultaneous observation of sites by more than one of the MRO instruments. The Targeting Acquisition Group (TAG) will be a subgroup of the PSG augmented by Mars Exploration Program (MEP) representatives for the purpose of coordinating targets for high-resolution observation. MRO is expected to target hundreds of sites throughout its primary science mission, although the number of sites that can be observed on any given day will vary throughout the mission, from a few per day when Mars is at greatest range to many per day when data downlink rates are high. Although the majority of targeted sites will be proposed by the mission PI's as coordinated through the TAG, proposers to this AO should understand that some fraction of these targeted observing sequences will be dedicated to sites having high priority within the MEP, for example, to aid in the selection of landing sites for future Mars missions.

## **8.0 SCHEDULE**

The following schedule applies to this Announcement of Opportunity:

AO release .....	June 6, 2001
Preproposal Conference .....	June 15, 2001
Notice of Intent due .....	July 6, 2001
Proposal due by 4:30 p.m. EST .....	August 22, 2001
Non-U.S. Letters of Endorsement due .....	September 19, 2001
Selections announced (target).....	November 2001

Proposals are to be delivered to the address given in Section 6.5 above. Note that proposals received after the deadline indicated above will be handled in accordance with the policy for late proposals as given in Section 7.0 of Appendix A.

## **9.0 CONCLUSION**

The objectives of the Mars Reconnaissance Orbiter 2005 mission are wide ranging and represent a significant step forward in the systematic study of Mars by performing detailed orbital remote sensing science investigations that will both greatly expand our knowledge about this planet and also help prepare for the future of exploration of its surface. NASA's Office of Space Science sincerely invites the international community of interested scientists to participate in this important and exciting mission.

Edward Weiler  
Associate Administrator for  
Space Science

## **APPENDIX A**

### **GENERAL INSTRUCTIONS AND PROVISIONS**

(NASA Federal Acquisition Regulations (FAR) Supplement (NFS) 1872.705-1)

#### **I. INSTRUMENTATION AND/OR GROUND EQUIPMENT.**

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

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

By submitting a proposal, the investigator and the organization agree that NASA has the option to make a tentative selection pending a successful feasibility or definition effort. NASA has the option to contract in phases for a proposed experiment, and to discontinue the investigative effort at the completion of any phase. The investigator should also understand that NASA may desire to select only a portion of the proposed investigation and/or that NASA may desire the individual's participation with other investigators in a joint investigation, in which case the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its team leader or contact point.

#### **III. SELECTION WITHOUT DISCUSSION.**

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

#### **IV. FOREIGN PROPOSALS.**

See Appendix B, Section 6.

#### **V. TREATMENT OF PROPOSAL DATA.**

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

##### **RESTRICTION ON USE AND DISCLOSURE OF PROPOSAL AND QUOTATION INFORMATION (DATA)**

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

#### **VI. STATUS OF COST PROPOSALS (U.S. PROPOSALS ONLY).**

The investigator's institution agrees that the cost proposal is for proposal evaluation and selection purposes, and that following selection and during negotiations leading to a definitive contract, the institution may be required to resubmit cost information in accordance with FAR 15.403-5.

## **VII. LATE PROPOSALS.**

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

## **VIII. SOURCE OF SPACE TRANSPORTATION SYSTEM INVESTIGATIONS.**

Investigators are advised that candidate investigations for Space Transportation System (STS) missions can come from many sources.

## **IX. DISCLOSURE OF PROPOSALS OUTSIDE GOVERNMENT.**

NASA may find it necessary to obtain proposal evaluation assistance outside the Government. Where NASA determines it is necessary to disclose a proposal outside the Government for evaluation purposes, arrangements will be made with the evaluator for appropriate handling of the proposal information. Therefore, by submitting a proposal the investigator and institution agree that NASA may have the proposal evaluated outside the Government. If the investigator or institution desire to preclude NASA from using an outside evaluation, the investigator or institution should so indicate on the cover. However, notice is given that if NASA is precluded from using outside evaluation, it may be unable to consider the proposal.

## **X. EQUAL OPPORTUNITY (U.S. PROPOSALS ONLY).**

By submitting a proposal, the investigator and institution agree to accept the following clause in any resulting contract:

### **EQUAL OPPORTUNITY**

During the performance of this contract, the Contractor agrees as follows:

- (a) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.
- (b) The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay

or other forms of compensation, and (8) selection for training, including apprenticeship.

(c) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(d) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(e) The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding the notice to be provided by the Contracting Officer, advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(f) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(g) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. Standard Form 100 (EEO-1), or any successor form, is the prescribed form to be filed within 30 days following the award, unless filed within 12 months preceding the date of award.

(h) The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.

(i) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, the contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

(j) The Contractor shall include the terms and conditions of subparagraph 1 through 9 of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

(k) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as means of enforcing these terms and conditions, including sanctions for non-compliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

## **XI. PATENT RIGHTS.**

(a) For any contract resulting from this solicitation awarded to other than a small business firm or nonprofit organization, the clause at 1852.227-70, "New Technology," shall apply. Such contractors may, in advance of contract, request waiver of rights as set forth in the provision at 1852.227-71, "Requests for Waiver of Rights to Inventions."

(b) For any contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at FAR 52.227-11, "Patent Rights--Retention by the Contractor (Short Form)" (as modified by 1852.227-11), shall apply.

## **APPENDIX B**

### **GUIDELINES FOR PROPOSAL PREPARATION AND SUBMISSION**

#### **1.0 General Guidelines**

The following guidelines apply to the preparation of proposals by investigators in response to this AO. The material presented is a guide only and it is not intended to be all encompassing. The proposer should provide information relative to those items applicable or as otherwise required by this AO.

In order to provide a firm basis for the comparison of proposals received in response to this AO, the information concerning the Mars Reconnaissance Orbiter (MRO) 2005 capabilities and constraints, the expected flight environments, the ground system capabilities and constraints, and the requirements for data archiving, as described in the MRO Proposal Information

Package (PIP) must be used for proposal preparation (for information on accessing the PIP, see Section 3.0 of this AO and Appendix D).

The proposal must consist of only one bound volume with readily identified sections. All documents must be typewritten in English, use metric units, and be clearly legible. Proposals must be printed on 8.5 x 11 inches or A4 European standard stock. Proposals may contain two-page fold-outs up to 11 x 17 inches (or European equivalent), but such fold-outs count as two pages each, or four pages if printed on both sides, against the page limits (see Tables 1 and 6 below). Proposals may not reference a World Wide Web site for any data or material needed to understand or evaluate the proposal, nor may any proposal material be submitted by any type of electronic medium such as audio tape, videotape, floppy disk, etc.

Single- or double-column format is acceptable. In complying with the page limit, no page is to contain more than 55 lines of text, the margins all around must be one inch wide or wider, and the type font must not be smaller than 12-point (i.e., must have  $\leq 15$  characters per inch). Figure captions must be in 12 point font although text in the figures and in cost tables may contain smaller font as long as they are easily legible.

In order to allow for recycling of proposals, all proposals and copies must be submitted on plain white paper only (e.g., no cardboard stock or plastic covers, no colored paper, etc.). Photographs and color figures are permitted if printed on recyclable white paper. The signed original proposal (including cover page, certifications, and non-U.S. endorsements) must be bound in a manner that makes it easy to disassemble for reproduction. Except for the original, two-sided copies are preferred. Every side upon which printing appears will be counted against the page limits. The other copies for review must be stapled but not otherwise bound.

In all proposals, a science investigation must be clearly defined. The description of any proposed instrumentation must provide adequate technical information to permit evaluation of both the concept and the practical feasibility of the investigation in terms of the MRO spacecraft resources, configurations, or special requirements necessary for successful implementation. The proposal should also contain the best possible description of the proposer's plans for data processing, management, and archiving, all as appropriate. Many of the details of the MRO program data management procedures are not established at this time, but the proposal should include as much information as possible concerning the investigator's plans, requirements, and costs, especially those for unique data management requirements (hardware and software).

## **2.0 Contents of Proposals for Investigations Providing Flight Instrumentation**

Each proposal must be submitted as a single bound document that contains four parts as indicated in Table 1:

1. Part 1: Science Investigation and Technical Plan;
2. Part 2: Management and Cost Plan;

3. Part 3: Plans for Education/Public Outreach, Technology Development & Transfer, and Small Disadvantaged Business and Minority Education Institution; and
4. Appendices.

**Table 1.** Page Limits for Investigations Providing Flight Instrumentation

<b>Section of Proposal</b>	<b>Page Limit</b>
Cover Page/Investigation Summary	Printed from web site <a href="http://props.oss.hq.nasa.gov">http://props.oss.hq.nasa.gov</a>
Table of Contents	No limit
Instrument Summary Fact Sheet	2 pp.*
Part 1: Science Investigation and Technical Plan	25 pp. (incl. $\leq 2$ foldout pp.)*
Part 2: Management and Cost Plan	25 pp. (incl. $\leq 2$ foldout pp.)
Part 3: E/PO, Tech. Dev. & Trans., and Sm. Disad. Business/Minority Educational Institutions Plans	4 E/PO: 4 pp text. + budget 1. TD&T + SDB/MEI: 2 pp.
<u>Appendices</u> (no others permitted) <ul style="list-style-type: none"> <li>• Cost and budget tables and supporting data</li> <li>• Resumes (2 pages maximum each)</li> <li>• Statements of Commitment from Proposal Participants</li> <li>• Letter(s) of Endorsement from Non-U.S. Participants (as appropriate)</li> <li>• Contractual Statement(s) of Work</li> <li>• NASA PI Hardware Selection Process (as appropriate)</li> <li>• References (as appropriate)</li> <li>• Abbreviations and Acronyms</li> </ul>	No page limits but minimum size encouraged.

\* The page limits for the Instrument Summary Fact Sheet and Part I are respectively increased to 4 pp. and 50 pp. (including  $\leq 4$  foldouts) if more than one major flight instrument is proposed by a single investigation.

## **2.1 Cover Page/Investigation Summary**

A *Cover Page/Proposal Summary* is an integral part of the proposal and is generated by accessing the Web site located at <http://props.oss.hq.nasa.gov> and filling in the requested information. It is then both printed out in hard copy for submission with the proposal, as well as submitted electronically to that Web site. The *Cover Page* form requires the full names of the Principal Investigator (PI) and the authorizing institutional official, their addresses with zip code, telephone and fax numbers, and electronic mail addresses, as well as the names, institutions, and E-mail addresses of all participants, and the total NASA Office of Space Science (OSS) Cost. The *Proposal Summary* form provides the equivalent of about one-half page of space for a

brief description of the intended science investigation, as well as a brief statement of the objectives for Education/Public Outreach. Note that NASA enters the Summaries of all investigations selected for its various programs into a publicly accessible database. Therefore, the *Proposal Summary* should not contain any proprietary or confidential information that the submitter wishes to protect from public disclosure.

Proposers must not reformat this *Cover Page/Proposal Summary* after it is printed, since the information thereon is automatically entered into NASA's main data base for the proposal. This form may be accessed for editing of submitted material up to the time of the proposal submission deadline by following the instructions at this Web site. Proposers without access to the Web or who experience difficulty in using this site may contact the Help Desk by E-mail at [dtripp@hq.nasa.gov](mailto:dtripp@hq.nasa.gov) for assistance. Finally, note that submission of the electronic *Cover Page/Proposal Summary* does not satisfy the deadline for proposal submission.

The printed copy of this *Cover Page* that is submitted with the proposal must be signed by the PI and the official of the investigator's organization who is authorized to commit the organization to the completion of the investigation should it be selected. This authorizing signature now also certifies that the proposing institution has read and is in compliance with the three required certifications printed in full in Section 7 of this Appendix; therefore, these certifications do not need to be submitted separately.

## **2.2 Table of Contents**

The proposal must contain a Table of Contents that parallels the outline provided below in Sections 2.3 through 2.5

## **2.3 Proposal Summary Fact Sheet**

A Proposal Summary Fact Sheet that provides a brief description, including a table listing the major instrument parameters or specifications, of the proposed investigation must be included in the proposal. The information conveyed on this Fact Sheet should include the following: science objectives, schematic description of the proposed instrument (including figures or drawings at the proposer's discretion), objectives for Education/Public Outreach and new technology, operations overview (including how science operations fit with major mission characteristics), mission management overview (including teaming arrangement as known), schedule, and cost estimate. This Fact Sheet is restricted to two pages (preferably a double-sided single sheet).

## **2.4 Part 1: Science Investigation and Technical Plan**

Part 1 of the proposal must provide a clear statement of the proposed investigation and how it will address the science goals/objectives of the Mars Reconnaissance Orbiter 2005 mission. The proposal should contain enough background information to be meaningful to a reviewer

who is generally familiar with the field, although not necessarily a specialist. The main body of Part 1 will generally contain the following:

1. Investigation. Provide a full description of the concept of the proposed science investigation and the method and procedures for carrying out the investigation, including such factors as its relationship to past and any current efforts. This description should indicate in detail the kinds of data that will be needed to carry out the stated objectives, the experiment concept for obtaining these data, and how these data would be analyzed once obtained (for example, comparison with current data or models, the production of geological maps, etc.). As appropriate, the proposal should indicate how the investigation relates to other mission investigations as solicited in this AO, and the specific approach being taken to coordinate measurement goals and/or to share instrument hardware.
2. Instrumentation. Provide a full description of the experiment hardware proposed to be supplied that will produce the data necessary to complete the activities described in the Investigation, including all information necessary to plan for its development, integration, ground operations, and flight operations. The proposal must describe the technical approach for every element of the investigation to ensure that the investigation's requirements do not exceed available spacecraft and/or financial resources. This section must be complete without the need for additional information for its full understanding.
  - i. Payload Instrument Description. Fully describe the proposed flight instrumentation, including any associated deployment and/or pointing devices, and indicate items that are proposed to be developed, and/or the use of existing instrumentation or heritage from previous instrumentation. Performance characteristics should be directly related to the stated investigation objectives. Strategies for any type of data compression that may be implemented should be discussed clearly. The proposal should describe any technology developments that are anticipated for development of the instrument, and also describe backup strategies in the event that the expected technologies become unavailable. The proposal should also describe any recognized need for supporting laboratory research or ground-based, airborne, or other activities required to support development of the instrument and/or its operation during the mission.
  - ii. Payload/Instrument Integration. Describe all parameters of the instrument pertinent to the accommodation of the instrument on the spacecraft, including but not limited to: volumetric envelope (including view angle requirements); weight, power, energy, thermal, and telemetry requirements; sensitivity to or generation of contamination (e.g., electromagnetic interference, gaseous effluent); data processing requirements, and any

particular required ground handling equipment. A time profile of power requirements should be described. This section must include an illustration with key dimensions of the proposed instrument and any ancillary hardware that would be integrated onto the spacecraft.

- iii. Ground Operations. Describe all requirements for pre- and post-launch ground operations support, science site implementation, and configuration control. Include an estimate of the cost of developing and maintaining a science operations facility at the Principal Investigator's home institution (see Section 5.5 of this AO).
  - iv. Flight Operations. Describe all requirements for flight operations support, including instrument testing, calibration, and mission planning, including any special communications or near real-time ground support requirements, and indicate any special equipment or skills required of ground personnel.
3. Data Reduction and Validation. Discuss the data reduction and validation plan including a definition of archival data products and, insofar as possible, the method of their production and expected format. Include an estimate of the cost of (ground) processor capabilities required for data reduction, validation, analysis, and archiving. The data plan should include discussion of the volume and timing of data for early release, a schedule for the submission of validated archival products to the Planetary Data System (PDS), and the plan for submission of final interpretive papers to the peer-reviewed literature, with an estimate of the costs for these activities (see Section 5.6 of this AO).
  4. Roles and Responsibilities. Describe specific roles and responsibilities of the PI and of each Co-Investigator, along with a time-phasing of their activities. Every named participant must have an identified, specific function that makes a demonstrable contribution to the development and/or implementation of the investigation. A condensed description of all prospective participants' relevant background, experience, and selected publications (if appropriate) should be provided (note: this requirement is not displaced by the resumes as specified as an appendix; see Table 1 above).

## **2.5 Part 2: Management and Cost Plan**

The management plan sets forth the investigator's approach for developing and implementing the investigation. It should, in particular, provide a discussion with regards to managing the work, for the recognition of essential management functions, and for the overall integration of these functions in order to meet the established review and delivery dates. When necessary or to avoid duplication, references can be made to Part 1 sections, charts, and information. This section provides insight into the organization proposed for the implementing the investigation, including the distribution of the work, the internal operations and lines of authority with delegations, together with internal interfaces and relationships with NASA, major

subcontractors, and associated investigators. A Work Breakdown Structure (WBS) shall be defined as a part of this proposal that clearly links the investigation organization with the cost information in the cost plan (see Section 5.8.2 of this AO). At a minimum, the elements of the proposed WBS should include the following which also need to be reflected in the Total Mission Cost Funding Profile (see section 2.7, Tables 3 and 4):

- 1.0 Management
  - 1.1 Management Staff
  - 1.2 Reviews
  - 1.3 Mission Assurance
  - 1.4 Science Investigations
  - 1.5 Reserves
- 2.0 Education & Public Outreach
- 3.0 Systems Engineering
- 4.0 Instrument System
  - 4.1 Design & Fabrication
  - 4.2 Instrument I & T
  - 4.3 ATLO Support To Orbiter
- 5.0 Mission Operations & Data Analysis
  - 5.1 Mission Ops Development
  - 5.2 Mission Ops Support
  - 5.3 Science Data Analysis
- 6.0 Science Data Processing
  - 6.1 Computers & SA Support
  - 6.2 Data Communications
  - 6.3 Algorithms & Software

This section should summarize the investigator's proposed implementation approach for the complete investigation, including the E/PO activities, by discussion of the management organization (which should be illustrated with an organization chart), the decision-making process, and the teaming arrangements. The responsibilities of team members, including contributors and institutional commitments should be discussed. Unique capabilities that each team member organization brings to the team, as well as previous experience with similar systems and equipment, should be addressed. U.S. investigations that include cooperative arrangements with international partners must be structured on a no exchange of funds basis (see Appendix B, Section 6.0).

The specific roles and responsibilities of the PI and Project Manager (PM) must be described. If key project personnel (e.g., the PM, Systems Engineer, E/PO lead, etc) are identified, their experience and qualifications should be cited here or in their resumes. Risk management and risk mitigation plans must be described including the top three to five risks, descoping strategies, if relevant, and management strategies for control, allocation and release of technical, cost, and

schedule reserves. When major subcontracts are required, the acquisition strategy, including the incentive strategy and the use of performance incentives, should be described.

The transfer of technical data or hardware to foreign parties may require export licenses or exemptions. In some cases, Technical Assistance Agreements may be needed by U.S. entities to work with foreign partners. The proposal should outline plans to meet these requirements, where applicable.

A project schedule to meet the MRO launch date with appropriate investigation delivery milestones and covering all phases of the investigation should be provided. The schedule should include, as a minimum, proposed major project review dates; instrument development; instrument-to-spacecraft integration and test; mission operations; data analysis; and implementation of the E/PO program. The schedule should also show the proposed project's critical path from the beginning of Phase B to launch, and should be supported by a brief explanation of the principal factors driving this schedule path. Schedule reserve should be clearly identified (see Section 5.3 of this AO).

The following items must be supplied in Part 2.

- 1) Method of Instrument/Payload Acquisition. Describe the proposed method of instrument acquisition including the following, as applicable:
  - (i) Rationale for the investigator to obtain the payload instrument through or by the investigator's institution.
  - (ii) Method and basis for the selection of the proposed payload instrument fabricator.
  - (iii) Unique or proprietary capabilities of the payload instrument fabricator that are not available from any other source.
  - (iv) Contributions or characteristics of the proposed fabricator's payload instrument that make it an inseparable part of the investigation.
  - (v) Availability of supporting personnel in the institution to successfully administer the payload instrument contract and technically monitor the fabrication.
  - (vi) Status of development of the payload instrument, e.g., what additional development is needed, areas that need further design or in which unknowns are present. and backup options for any function or hardware requiring technology development.
  - (vii) Method(s) by which it is proposed to:
    - (a) Prepare payload instrument hardware and software specifications;
    - (b) Review development progress and maintain configuration control;
    - (c) Review design and fabrication changes;
    - (d) Participate in testing program;
    - (e) Participate in final checkout and calibration;
    - (f) Provide for integration of instrument/payload;
    - (g) Support the flight operations;

- (h) Coordinate with Co-Investigators, other related investigations, and the payload integrator;
    - (i) Assure safety, reliability, and quality; and
    - (j) Control cost.
  - (viii) For proposals seeking NASA funding, describe:
    - (a) Planned participation by small and/or minority business in any subcontracting for instrument fabrication or investigative support functions;
    - (b) Commitments for all major facilities, laboratory equipment, and ground-support equipment (GSE) (including those of the investigator's proposed contractors and those of NASA and other U.S. Government agencies) essential to the experiment in terms of its system and subsystems, distinguishing insofar as possible between those in existence and those that will be developed in order to execute the investigation; and
    - (c) The outline of new facilities and equipment with the lead time involved and the planned schedule for construction, modification, and/or acquisition of the facilities.
- 2) Schedules and Responsibilities. Part 2 must include schedules necessary for the logical and timely pursuit of the work, accompanied by a description of the investigator's work plan and deliverables to the Mars Reconnaissance Orbiter 2005 Project, and the responsibilities of the Co-Investigators. Discuss the specific roles that each of the participants and their institutions intend to play in the investigation, including a statement of the portion of time that each participant expects to devote to the investigation and of the institutional resources on which each can draw.

Cost Plan For Proposals Requesting NASA Support. The Cost Plan must provide a discussion of the anticipated costs for all phases of the investigation. This discussion, along with required supporting cost tables and data which may be included in an Appendix where there are no page count limits, will be used to assess the realism of the proposed costs. Top-level cost considerations and rationale must be discussed, and the costs for all work should be allocated and shown to the proposed WBS as discussed in the Management section. All costs shall also be consistent with the program maximum funding levels and constraints described in Section 5.4 of this AO.

In the Cost Plan, the methodology used to estimate all costs (analogies, parametric models, past experiences, cost estimating relationships, etc) must be discussed. Budget reserve strategy, including budget reserve levels as a function of mission phase, must also be discussed. Provide all assumptions used in developing cost estimates to facilitate reviewer's understanding of proposed cost estimates, particularly with regard to Government-furnished equipment and services. Also, the proposal must provide cost information (in FY 2002, fixed year dollars) about any items that provide heritage to the investigation. Details on Cost Proposal Certifications are provided in Appendix A (General Instructions and Provisions) to this AO.

In addition, a detailed cost proposal which may be included in the Appendix and can be used for contracting is required for the formulation phase (Phase A/B), for the implementation phase (Phase C/D), and for investigation totals. Proposers should also submit budgets for Phase E (Mission Operations and Data Analysis) and describe their expected activities for science operations, generation, validation, archiving of data products, and data analysis activities leading to publication of the initial results of their investigations, as well as for E/PO activities (see further below). While there is a fixed budget for MRO for its Phase E activities, no sub-allocation for science investigations has been determined at the time of this AO; the MMO, working with the MRO Project office, will negotiate these budgets with the Principal Investigators selected for the MRO 2005 Mission from the basis of the Phase E costs that they have proposed. In the cost plan, in addition to submitting the Contract Pricing Proposal Cover Sheet/SF 1411, proposers should summarize, in real-year dollars, and by Government Fiscal Year (October 1 to September 30), the total investigation cost by major categories of cost, as well as by support function as defined below. Investigation cost tables and backup data may be included in an Appendix where there are no page count limits; however, top level numbers and rationale should be discussed in this section.

Note that it is expected that the funding profile for proposed E/PO activities for this mission will normally peak during the Phase E of the program. The E/PO funding guideline of 1-2% of a proposed PI Instrument investigation's budget refers to the mission as a whole and not each individual year. PI's will have the flexibility to work within this overall funding envelope to develop a funding profile that optimizes the output of the proposed E/PO effort.

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, including civil service labor, and the percentage of time each individual will devote to the effort. NASA civil service labor and supporting NASA Center infrastructure must be costed on a full cost accounting basis. If NASA guidance for full cost accounting has not been fully developed by the closing date for proposal submission, NASA Centers may submit full cost proposals based on the instructions in the NASA Financial Management Manual, Section 9091-5, Cost Principles for Reimbursable Agreements. If any NASA costs are to be considered as contributed costs, the contributed item(s) must be separately funded by an effort complimentary to the proposed investigation, and the funding sources must be identified. Other Federal Government elements of proposals must follow their agency cost accounting standards for full cost. If no standards are in effect, the proposers must then follow the Managerial Cost Accounting Standards for the Federal Government as recommended by the Federal Accounting Standards Advisory Board.

- b. Overhead. Include indirect costs that, because of their inclusion for common or joint objectives, are 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. Provide the total cost of the bill of materials, including estimated cost of each major item, including lead time of critical items.
- d. Subcontracts. List subcontracts over \$5,000, specifying the vendor and the basis for estimated costs and including any baseline or supporting studies.
- e. Special Equipment. List special equipment with lead and/or development time, including number of units and types.
- f. Travel. List estimated number of trips, destinations, duration, purpose, number of travelers, and anticipated dates.
- g. E/PO. E/PO costs should be summarized here. Note that the Budget Summary forms and narrative (see Appendix C of this AO) required for E/PO activities should provide enough information for a complete understanding of those costs (see Section 2.6 of this appendix).
- h. Other Costs. Provide all costs not covered elsewhere.
- i. General and Administrative Expense. Include the expenses of the institution's general and executive offices and other miscellaneous expenses related to the overall business.
- j. Contribution Costs. Contributions of any kind, whether cash or noncash (property and services), for instrument development by space organizations other than the OSS are welcome but must be shown as part of the cost of the proposed investigation. Values for all contributions of property and services shall be established in accordance with applicable cost principles. A letter of endorsement that provides evidence that the responsible institution and/or Government officials are aware and supportive of the proposed investigation, and will pursue funding for the investigation if selected by NASA, must be submitted with the proposals for all U.S. contributions. For non-U.S. contributions to proposals, see Section 6 below. The cost of contributed hardware should be estimated as either: (i) the cost associated with the development and production of the item if this is the first time the item has been developed and if the mission represents the primary application for which the item was developed; or (ii) the cost associated with the reproduction and modification of the item (i.e., any recurring and mission-unique costs) if this is not a first-time development. If an item is being developed

primarily for an application other than the one in which it will be used in the proposed investigation, then it may be considered as falling into the second category (with the estimated cost calculated as that associated with the reproduction and modification alone).

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

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

- k. Fee. List any applicable fee for the submitting organization. Incentives on major contracts to the PI investigation are to be based, at least in part and as appropriate, on performance under the contract.

## **2.6 Part 3: Education/Public Outreach; Technology Development and Transfer; and Small Disadvantaged Business and Minority Education Institutions**

Within a page limit of 4 pp. for the text (see Table 1 in this Appendix) and consistent with the guidance given in Section 2.3.1 of the AO and Appendix C of the AO, discuss the plans for the following subject:

Education/Public Outreach. Describe plans for Education and Public Outreach activities of the proposed investigation, arrangements for appropriate partners and alliances, implementation of proposed activities, and dissemination of any products and materials, including a statement of intent and plans (budget and personnel) for participation in the umbrella Mars Exploration E/PO Program. See Appendix C for further guidance on the content of the E/PO section of the proposal. This section should also include the E/PO Budget Summaries given in Appendix C with a single Budget Summary form for each year of the proposed effort, a Budget Summary for the total effort and, without page limit, sufficient budget narrative to fully understand the entries and demonstrate how the budget is linked to and supports the proposed program of activities.

Within a page limit of 2 pp. (see Table 1 in this Appendix) and consistent with the specific guidance given in Sections 2.3.2 and 2.3.3 of the AO, respectively, discuss the plans for the following two subjects:

Technology Development and Transfer. Consistent with the specific guidance given in Section 2.3.2 of the AO, discuss how new technology developments may be expected through the proposed investigation, including insertion of the development(s) into the investigation, transfer of new technology to other activities, and any expected commercial possibilities. Also discuss any expected development of partnerships among for-profit, educational, nonprofit, and/or Government organizations that might facilitate technology transfer and commercialization.

Small Disadvantaged Business and Minority Education Institutions. Consistent with the specific guidance given in Section 2.3.3 of the AO, submit an appropriate subcontracting plan.

## **2.7 Appendices**

The following additional information is required to be supplied with the proposal as Appendices. They have no specific page limits but their length should be minimized. No other appendices are permitted.

- 1) Cost and Budget Tables and Data. All detailed cost and budget data may be contained in this appendix. The cost proposal for a contract may, for example, be included in this appendix. In addition, specific required cost data will be provided for evaluation purposes as follows: the estimated cost of the investigation that encompasses all proposed activities, divided into two budgets, one for the development Phases B-D (up through the end of FY 2005) and one for the operations Phase E. The budget line items must correspond to the elements at the second level of the proposed Work Breakdown Structure with one budget line summarizing the E/PO effort. At a minimum, to assure uniformity in submittals, the Budget Summary forms (Tables 3, 4 and 5 below) must be completed and included in the proposal. Additional budget information aligned with the proposed WBS in the format of the proposer's own institution may be included without page limit, however, brevity is requested.

For budgetary costing purposes (estimation of FY costs in Real Year Dollars), the NASA inflation index is given in the Table 2 below.

**Table 2.** Inflation Index for Proposals for the MRO 2005 (use 2.8% for years beyond 2008).

Fiscal Year	2002	2003	2004	2005	≥2006
-------------	------	------	------	------	-------

Inflation Rate	0.0%	2.8%	2.8%	2.8%	2.8%
Cumulative Inflation Index	1.000	1.028	1.057	1.086	1.148

**Table 3. Total Mission Cost Funding Profile Template: NASA OSS Costs**

Note: Separate templates for Phase A/B, C/D, and E  
(FY costs<sup>1</sup> in Real Year Dollars, Totals in Real Year and 2002 Dollars)

<b>Item</b>	<b>FY1</b>	<b>FY2</b>	<b>FY3</b>	<b>FY4</b>	<b>FY5</b>	<b>...</b>	<b>FYn</b>	<b>Total (Real Yr.)</b>	<b>Total (FY 2002)</b>
<b><u>NASA OSS Cost</u></b>									
1.0 Management									
1.1 Management Staff									
1.2 Reviews									
1.3 Mission Assurance									
1.4 Science Investigations									
1.5 Reserves									
2.0 Education/Public Outreach									
3.0 Systems Engineering									
4.0 Instrument System A <sup>2</sup>									
4.1 Design & Fabrication									
4.2 Instrument I&T									
4.3 ATLO Support to Orbiter									
5.0 MO&DA <sup>3</sup>									
5.1 Mission Ops Development									
5.2 Mission Ops Support									
5.3 Science Data Analysis									
6.0 Science Data Processing									
6.1 Computers & SA Support									
6.2 Data Communications									
6.3 Algorithms & Software									
7.0 Other (specify)									
<b>Total NASA OSS Cost</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>	<b>\$</b>
2-Month Bridge Phase <sup>4</sup>									

1. Costs should include all costs including any fee
2. Include a separate breakout for each instrument if more than one is proposed
3. MO&DA - Mission Operations and Data Analysis
4. Also include within Total NASA OSS cost

**Table 4. Total Mission Cost Funding Profile Template: Contributions**

Note: Separate templates for Phase A/B, C/D, and E  
(FY costs<sup>1</sup> in Real Year Dollars, Totals in Real Year and 2002 Dollars)

<b><u>Item</u></b>	<b><u>FY1</u></b>	<b><u>FY2</u></b>	<b><u>FY3</u></b>	<b><u>FY4</u></b>	<b><u>FY5</u></b>	<b><u>...</u></b>	<b><u>FYn</u></b>	<b>Total (Real Yr.)</b>	<b>Total (FY 2002)</b>
<b><u>Contributions</u></b>									
1.0 Management									
1.1 Management Staff									
1.2 Reviews									
1.3 Mission Assurance									
1.4 Science Investigations									
1.5 Reserves									
2.0 Education/Public Outreach									
3.0 Systems Engineering									
4.0 Instrument System A <sup>2</sup>									
4.1 Design & Fabrication									
4.2 Instrument I&T									
4.3 ATLO Support to Orbiter									
5.0 MO&DA <sup>3</sup>									
5.1 Mission Ops Development									
5.2 Mission Ops Support									
5.3 Science Data Analysis									
6.0 Science Data Processing									
6.1 Computers & SA Support									
6.2 Data Communications									
6.3 Algorithms & Software									
7.0 Other (specify)									
<b>Contributions</b>	\$	\$	\$	\$	\$	\$	\$	\$	\$

1. Costs should include all costs including any fee
2. Include a separate breakout for each instrument if more than one is proposed
3. MO&DA - Mission Operations and Data Analysis

**Table 5. Mission Phase Summary For NASA OSS Cost**  
(FY costs\* in Real Year Dollars, Totals in Real Year and 2002 Dollars)

<u><b>Mission Phase</b></u>	<u><b>FY1</b></u>	<u><b>FY2</b></u>	<u><b>FY3</b></u>	<u><b>FY4</b></u>	<u><b>FY5</b></u>	<u><b>...</b></u>	<u><b>FYn</b></u>	<b>Total (Real Yr.)</b>	<b>Total (FY 2002)</b>
Phase A									
Phase B									
Phase C/D									
Phase E									
<u><b>NASA OSS Cost, FY</b></u>	\$	\$	\$	\$	\$	\$	\$	\$	\$
<u><b>Totals</b></u>									

\* Costs should include all costs including any fee

- 2) Resumes. Resumes or curriculum vitae must be provided for each member of the Investigation's science team identified in Part 1 and for other key personnel (such as the individuals leading the E/PO work) in Part 2. Each resume must clearly show experience related to the job the individual will perform on the proposed investigation. Resumes or curriculum vitae are restricted to 2 pp. for each team member.
- 3) Statements of Commitment from Co-Investigators. Every Co-I and Collaborator (including E/PO personnel involved in the investigation), whether from a U.S. or a non-U.S. institution (including the PI's own institution), who is identified as a participant in the proposal must submit a brief, signed statement of commitment that acknowledges his/her participation. Multiple Co-I's and/or Collaborators may submit a single statement so long as each is identified by their institution. Such statements may be a facsimile so long as an original signature is included, or an E-mail so long as the identity of the sender is provided as a typed signature, as well as being given by the header of the message.

"I(we) acknowledge that I(we) am(are) identified by name as Co-Investigator(s) [or Collaborator(s)] to the investigation entitled <name of proposal> that is submitted by <name of Principal Investigator> to the Mars Reconnaissance Orbiter 2005 opportunity AO, and that I(we) intend to carry out all responsibilities identified for me(us) in this proposal. I(we) understand that the extent and justification of my(our) participation as stated

in this proposal will be evaluated during peer review in determining the merits of this proposal, and that, as a condition for possible selection, NASA may direct the removal of personnel from this team who are considered unwarranted for the successful completion of the proposed investigation."

- 4) Letters of Endorsement for Non-U.S. Organizations. Letters of endorsement must be provided from all non-U.S. organizations offering goods and/or services (including the support of members of the science team) on a no-exchange-of-funds basis. Such letters of endorsement must be signed by institutional and/or Government officials authorized to commit their organizations to participation in the proposed investigation. Letters of endorsement are to be included in and submitted with the proposal. Copies of faxed or E-mailed letters from non-U.S. participants may be substituted in the submitted proposals as long as original signed letters are received by the date and time specified in Section 6.0 of the AO. See Section 6 below in this Appendix for further information on non-U.S. proposals. Proposals that involve non-U.S. participants should be especially aware of the restrictions concerning the transfer of technology as given in Section 6.2 below in this Appendix.

It is NASA policy to establish formal agreements with foreign partners in cooperations on flight missions. Whether an agreement is required during the concept study phase must be determined on a case-by-case basis. For major contributions, either by a foreign partner to a U.S. program or by a NASA-funded party to a foreign-led program, these agreements will be either a Memorandum of Understanding (MOU) or an implementing agreement under a framework agreement. Examples of major contributions are provision of an entire instrument, a launch, or a major spacecraft subsystem.

For less significant exchanges, the agreement for the entire cooperation may take the form of a Letter of Agreement (LOA). Furthermore, for some major exchanges that will eventually be covered by a MOU or implementing agreement, it may be necessary to establish a study phase LOA that will remain in force until later entry into force of the MOU or implementing agreement. A common example of the latter situation would be a study phase award that entails only a minor U.S. Government financial commitment but requires the legal and/or export control framework provided by a formal international agreement.

For those cooperative contributions that will entail execution of a LOA (in lieu of a MOU) for either reason, the sponsoring foreign entity's letter of endorsement to support (if selected) the proposed foreign contribution must contain either (1) a clear statement that the sponsoring foreign entity is legally empowered to bind its own national government or (2) advance agreement that any LOA's required will be governed by U.S. law.

- 5) Contractual Statements of Work. For investigations managed from non-Government institutions, provide a Statement of Work to be used in a JPL subcontract with the investigator. For investigations managed from Government institutions, provide a Statement of Work as if the institution were non-Government. The Statement of Work must include general task statements for the development phase and for the operations phase of the investigation. All Statements of Work must include the following as a minimum: Scope of Work, Deliverables (including science data), and Government Responsibilities (as applicable). Statements of Work need not be more than a few pages in length. If more than one contractual arrangement between NASA and the proposing team is required, funding information must be provided that identifies how funds are to be allocated among the organizations.
- 6) NASA PI Hardware Selection Process (applicable only for proposals that have NASA employees as Principal Investigators). Proposals headed by NASA employees as the Principal Investigators must contain the following information concerning the process by which non-Government participants were included in the proposal: (i) indicate that the supplies or services of the proposed non-Government participant(s) are available under an existing NASA contract; (ii) make it clear that the capabilities, products, or services of these participant(s) are sufficiently unique to justify a sole source acquisition; or (iii) describe the open process that was used for selecting proposed team members. While a formal solicitation is not required, the process cited in (iii) must include at least the following competitive aspects: A notice of the opportunity to participate to potential sources; submissions from and/or discussions with potential sources; and the objective criteria for selecting team members among interested sources. The proposal must also address how the selection of the proposed team members followed the objective criteria and is reasonable from both a technical and cost standpoint. The proposal must also include a representation that the Principal Investigator has examined his/her financial interests in or concerning the proposed team members and has determined that no personal conflict of interest exists. Finally, the proposal must provide a certification by a NASA official superior to the Principal Investigator verifying the process for selecting contractors as proposed team members, including the absence of conflicts of interest.
- 7) References. This section provides a list of any reference documents used in preparing the proposal. Note that if the documents themselves are submitted with the proposal, they must be included within the prescribed page count; that is, they cannot be submitted as an appendix.
- 8) Acronyms and Abbreviations. A list that defines all acronyms and abbreviations in the proposal may be included at the proposer's discretion.

### **3.0 Contents of Proposals for Membership in a Facility Science Team**

Each proposal must be submitted as a single bound document that contains all parts as indicated in Table 6. It is anticipated that proposals for Facility Science Team membership will come from a single Principal Investigator without any Co-Investigators or collaborators. However, a very restricted number of ancillary personnel may be included in such proposals provided that they are very well justified by way of their proposed responsibilities and that it is clear the PI him/herself is committed to serving on the Team and not merely to be represented by a member of his/her proposal team, no matter how well qualified. Also note that unless specifically stated otherwise in the proposal, a proposer for Facility Team Leader will be considered for Facility Team membership only if he/she is not selected as the Leader.

**Table 6.** Page Limits for Proposals for Membership in a Facility Team

Section of Proposal	Page Limits
Cover Page/Investigation Summary	Printed from web site <a href="http://props.oss.hq.nasa.gov">http://props.oss.hq.nasa.gov</a>
Table of Contents	No limit
Description of Scientific Investigation	15 pp.
Expertise offered	3 pp.
Plans for Team Leadership (if offered)	3 pp.
Management Plan	5 pp.
Statement of E/PO Commitment/Ideas	1 p.
<u>Appendices</u> (no others permitted) <ul style="list-style-type: none"> <li>• Cost and budget tables and data</li> <li>• Resumes (2 pp. maximum each)</li> <li>• Statements of Commitment from Proposal Participants</li> <li>• Letter(s) of Endorsement from Non-U.S. Participants (as appropriate)</li> <li>• Contractual Statement(s) of Work</li> <li>• References (as appropriate)</li> <li>• Abbreviations and Acronyms</li> </ul>	No page limit, but minimum size encouraged

### 3.1 Cover Page/Investigation Summary

A *Cover Page/Proposal Summary* is an integral part of the proposal and is generated by accessing the Web site located at <http://props.oss.hq.nasa.gov> and filling in the requested information. Then it is both printed out in hard copy for submission with the proposal, as well as submitted electronically to that Web site. The *Cover Page* form requires the full names of the Principal Investigator (PI) and the authorizing institutional official, their addresses with zip code,

telephone and fax numbers, and electronic mail addresses, as well as the names, institutions, and E-mail addresses of all participants, and the total NASA Office of Space Science (OSS) Cost. The *Proposal Summary* form provides the equivalent of about one-half page of space for a brief description of the intended investigation. Note that NASA enters the Summaries of all investigations selected for its various programs into a publicly accessible database. Therefore, the *Proposal Summary* should not contain any proprietary or confidential information that the submitter wishes to protect from public disclosure.

Proposers must not reformat this *Cover Page/Proposal Summary* after it is printed, since the information thereon is automatically entered into NASA's main data base for the proposal. This form may be accessed for editing of submitted material up to the time of the proposal submission deadline by following the instructions at this Web site. Proposers without access to the Web or who experience difficulty in using this site may contact the Help Desk at [dtripp@hq.nasa.gov](mailto:dtripp@hq.nasa.gov) for assistance. Finally, note that submission of the electronic *Cover Page/Proposal Summary* does not satisfy the deadline for proposal submission.

The printed copy of this *Cover Page* that is submitted with the proposal must be signed by the PI and the official of the investigator's organization who is authorized to commit the organization to the completion of the investigation should it be selected. This authorizing signature now also certifies that the proposing institution has read and is in compliance with the three required certifications printed in full in Section 7 of this appendix; therefore, certifications do not need to be submitted separately.

## **3.2 Table of Contents**

The proposal must contain a table of contents that parallels the outline provided below in Sections 3.3 through 3.10 of this section of the appendix.

## **3.3 Description of Scientific Investigation**

The description of the proposed investigation must include the scientific objectives, a clear specification of the data needed in order to accomplish those objectives, any operational constraints that might be required to take the data, how the data will be analyzed, and how the data products will be used to achieve the scientific objectives. In addition, members of Facility Science Teams are expected to participate at a minimum in the Education/Public Outreach activities of the MRO 2005 project, and must include a statement of commitment to that effort as evidenced in the proposed management and budget portions of the proposal.

1. Scientific Goals and Objectives. This section must consist of a discussion of the goals and objectives of the investigation and the value of the investigation to the Group I and/or Group II scientific objectives as stated in this AO. It must describe the history and basis for the proposal and must discuss the need for such an investigation.

2. Data Requirements. Discuss measurements to be taken in the course of the mission, the data to be returned, and the approach that will be taken in analyzing the data to achieve the scientific objectives of the investigation. This description must identify the quality of the data to be returned (resolution, coverage, pointing accuracy, measurement precision, etc.), as well as the quantity of data needed (bits, etc.) for the proposed investigation. The relationship between the data products generated and the scientific objectives must be explicitly described, as must the expected results. Finally, the plan for producing and delivering data to the Planetary Data System must be described.
3. Mission Requirements. This section must describe expected requirements and constraints on the operation of the mission as the data are acquired. The relationship between the proposed scientific objectives, the data required to achieve those objectives, and the instrument performance and mission operations needed to obtain those data must be quantitatively presented in the proposal in a clear and unambiguous way.

### **3.4 Expertise Offered**

Facility Team proposals must clearly state what technical contributions the PI expects to make to the collection and analysis of data, and demonstrate relevant experience, skills, and knowledge relevant to one of the following fields of facility investigations:

1. Radar Sounder (surface topography and subsurface structure),
- Accelerometer and Radio Science (atmospheric structure and dynamics), or
- Spacecraft Doppler Tracking (global and localized gravity models).

### **3.5 Proposal for Team Leadership (if offered)**

If the proposer is offering to serve as the Team Leader for a Facility Science Team, the proposal must include a section on plans for leading the Team and that describes the experience the investigator has that is relevant to the task of Team leadership.

The plans for leading the Team must include a discussion of the investigator's vision of what will make the Team successful and what the proposer plans to do in order to ensure that success. The leading problems that are envisioned as possibly facing the Team should be discussed, as well as a strategy on how to organize the Team, a system for Team operations, and the desired mix of Team member skills and experience. The amount of time each year that the proposer proposes to dedicate to leading and representing the Team must be given and should reflect the intensity of anticipated activities as a function of mission phase.

The special material for Team Leadership must also describe the proposer's experience in leading any similar teams or groups, including any experience in flight mission planning and operations, that would be relevant to this opportunity.

### 3.6 Management and Cost Plans

This section must summarize the proposed management approach in the context of the work to be accomplished. The responsibilities of proposer, including contributors and institutional commitments must be discussed. The Management Plan must include a master schedule for accomplishing the proposed work. The cost anticipated for participation in E/PO activities must also be included as a part of each budget.

The Cost Plan must summarize the total investigation cost, divided into two budgets, one for the development phase and one for the operations phase, using the categories of cost given below. Each budget must be presented twice, once in real year dollars and once in fixed, Fiscal Year 2001 dollars. Table 2 of section 2.7 gives the inflation model that must be used in converting from real year dollars to Fiscal Year 2002 dollars. The development phase runs from the start of the contract (nominally as a JPL subcontract) to launch plus 30 days. The operations phase runs from the end of the development phase through the date given for the end of analysis in the body of the AO.

For investigators offering to serve as Team Leaders, the management plan and budget for the proposed scientific investigation must stand alone, and an additional management plan and budget must be presented for the activities specific to that of team leadership.

For each budget, the first page must give a summary for the total effort for the phase, covering all years, and the following pages must give a summary for each fiscal year. These amounts must represent the need for new budget authority allotted to the contract (nominally a JPL subcontract) in each Fiscal Year.

The categories of cost must include the following:

1. 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.
2. Overhead. Include indirect costs (usually this is in the form of a percentage of the direct labor costs).
3. Materials. Give the total cost of the bill of materials, including estimated cost of each major item, including lead time of critical items.
4. Subcontracts. List items over \$25,000, specifying the vendor and the basis for estimated costs and including any baseline or supporting studies.
5. Special Equipment. Provide a list of special equipment required for the investigation with lead and/or development time.

6. Travel. List estimated number of trips, destinations, duration, purpose, number of travelers, and anticipated dates.
7. Education/Public Outreach Costs.
8. Other Costs. Provide costs not covered elsewhere.
9. General and Administrative Expense. Include the expenses of the institution's general and executive offices and other miscellaneous expenses related to the overall business.
10. Fee. List any applicable fee for the submitting organization..

In addition to the costs to NASA described using the budget categories above, the budget must include an evaluation of goods and services offered at no cost to NASA.

### **3.7 Statement of Commitment for Education/Public Outreach**

Every proposal for a Facility Scientist must include a statement of commitment that the Principal Investigator understands and intends to participate in and contribute the Mars Exploration Education and Public Outreach program as planned and executed by the JPL Mars Program Office. As noted in Section 2.3.1 of this AO, facility scientists will be expected to spend approximately 5% of their time on MEP E/PO activities. In addition, proposers for Facility Scientists are encouraged to suggest ideas for E/PO activities of either a national or regional nature that he/she thinks would be particularly worthwhile and/or unique.

### **3.8 Appendices**

The following additional information is required to be supplied with the proposal as Appendices. They have no specific page limits but their length should be minimized. No other appendices are permitted.

- 1) Cost and Budget Table. Provide the estimated cost of the investigation that encompasses all proposed activities, divided into two budgets, one for the development Phases B-D (up through launch plus 30 days) and one for the operations Phase E. At a minimum, to assure uniformity in submittals, the Budget Summary forms (Tables 7 and 8 below) must be completed and included in the proposal.

#### **Table 7. NASA Cost Funding Profile Template for Facility Scientists**

Note: Separate Templates for Phase A/B, C/D, E  
(FY costs<sup>1</sup> in Real Year Dollars, Totals in Real Year and 2002 Dollars)

<b><u>Item</u></b>	<b><u>FY1</u></b>	<b><u>FY2</u></b>	<b><u>FY3</u></b>	<b><u>FY4</u></b>	<b><u>FY5</u></b>	<b><u>...</u></b>	<b><u>FYn</u></b>	<b>Total (Real Yr.)</b>	<b>Total (FY 2002)</b>
Science									
MO&DA <sup>2</sup>									
Education/Public Outreach									
Reserves									
Other (specify)									
<i>Total NASA OSS Cost</i>	\$	\$	\$	\$	\$	\$	\$	\$	\$
2-Month Bridge Phase <sup>3</sup>									

1. Costs should include all costs including any fee
2. MO&DA - Mission Operations and Data Analysis
3. Also include within Total NASA OSS cost

**Table 8. Mission Phase Summary For NASA OSS Cost**  
(FY costs\* in Real Year Dollars, Totals in Real Year and 2002 Dollars)

<b><u>Mission Phase</u></b>	<b><u>FY1</u></b>	<b><u>FY2</u></b>	<b><u>FY3</u></b>	<b><u>FY4</u></b>	<b><u>FY5</u></b>	<b><u>...</u></b>	<b><u>FYn</u></b>	<b>Total (Real Yr.)</b>	<b>Total (FY 2002)</b>
Phase A									
Phase B									
Phase C/D									
Phase E									
<i>NASA OSS Cost, FY Totals</i>	\$	\$	\$	\$	\$	\$	\$	\$	\$

\* Costs should include all costs including any fee.

- 2) Resume. Resumes or curriculum vitae must be provided for each member of the investigation's science team. Each resume must clearly show experience related to the job the individual will perform on the proposed investigation. Resumes or curriculum vitae must not exceed two pages in length for each participant.
- 3) Statements of Commitment from Co-Investigators. Although Co-I's are expected to be the exception for this category of investigation, every Co-I and Collaborator, whether from a U.S. or a non-U.S. institution (including the PI's own institution), who is identified as a participant in the proposal must submit a brief, signed statement of commitment that acknowledges his/her participation. Multiple Co-I's and/or Collaborator's from a given institution may submit a single, multiplied-signed statement. Each statement should be addressed to the PI, may be a facsimile or E-mail, and must contain the following, or approximately similar, language:

"I(we) acknowledge that I(we) am(are) identified by name as Co-Investigator(s) [or Collaborator(s)] to the investigation entitled *<name of proposal>* that is submitted by *<name of Principal Investigator>* to the Mars Reconnaissance Orbiter 2005 opportunity AO, and that I(we) intend to carry out all responsibilities identified for me(us) in this proposal. I(we) understand that the extent and justification of my(our) participation as stated in this proposal will be evaluated during peer review in determining the merits of this proposal."

In case of E-mails, names typed after the statement will be construed as signatures so long as the header of the message provides a reasonable identity of the sender.

- 4) Letters of Endorsement for Non-U.S. Organizations. Letters of endorsement must be provided from all non-U.S. organizations offering goods and/or services (including the support of members of the science team) on a no-exchange-of-funds basis. Such letters of endorsement must be signed by institutional and/or Government officials authorized to commit their organizations to participation in the proposed investigation. Letters of endorsement are to be included in and submitted with the proposal. Copies of faxed or E-mailed letters from non-U.S. participants may be substituted in the submitted proposals as long as original signed letters are received by the date and time specified in Section 6.0 of the AO. Proposals that involve non-U.S. participants should be especially aware of the restrictions concerning the transfer of technology as given in Section 6.2 below in this Appendix.

It is NASA policy to establish formal agreements with foreign partners in cooperations on flight missions. Whether an agreement is required during the concept study phase must be determined on a case-by-case basis. For major contributions, either by a foreign partner to a U.S. program or by a NASA-funded party to a foreign-led program, these agreements will be either a Memorandum of Understanding (MOU) or

an implementing agreement under a framework agreement. Examples of major contributions are provision of an entire instrument, a launch, or a major spacecraft subsystem.

For less significant exchanges, the agreement for the entire cooperation may take the form of a Letter of Agreement (LOA). Furthermore, for some major exchanges that will eventually be covered by a MOU or implementing agreement, it may be necessary to establish a study phase LOA that will remain in force until later entry into force of the MOU or implementing agreement. A common example of the latter situation would be a study phase award that entails only a minor U.S. Government financial commitment but requires the legal and/or export control framework provided by a formal international agreement.

For those cooperative contributions that will entail execution of a LOA (in lieu of a MOU) for either reason, the sponsoring foreign entity's letter of endorsement to support (if selected) the proposed foreign contribution must contain either (1) a clear statement that the sponsoring foreign entity is legally empowered to bind its own national government or (2) advance agreement that any LOA's required will be governed by U.S. law.

- 5) Contractual Statements of Work. For investigations managed from non-Government institutions, provide a Statement of Work to be used in a JPL subcontract with the investigator. For investigations managed from Government institutions, provide a Statement of Work as if the institution were non-Government. The Statement of Work must include general task statements for the development phase and for the operations phase of the investigation. All Statements of Work must include the following as a minimum: Scope of Work, Deliverables (including science data), and Government Responsibilities (as applicable). Statements of Work need not be more than a few pages in length. If more than one contractual arrangement between NASA and the proposing team is required, funding information must be provided that identifies how funds are to be allocated among the organizations.
- 6) References This section provides a list of any reference documents used in preparing the proposal. Note that if the documents themselves are submitted with the proposal they must be included within the prescribed page count; that is, they cannot be submitted as an appendix.
- 7) Definitions of Acronyms and Abbreviations.

## 4.0 Certification

All proposals must be signed by an institutional official authorized to certify institutional support and sponsorship of the investigation as well as of the management and financial parts of the proposal. This is accomplished through the authorizing institutional signature on the Cover Page (see Sections 2.1 and 3.1 in this Appendix).

## **5.0 Proposal Submission**

The requirements for the submission of proposals from both U.S. and non-U.S. institutions in response to this Announcement of Opportunity are given in Section 6 of the AO.

## **6.0 Guidelines Applicable to Non-U.S. (Foreign) Proposals and Proposals Including Non-U.S. Participation.**

### **6.1 General Policies**

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

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

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

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

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

## **6.2 Export Control Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation**

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

## **7.0 Required Certifications**

All proposals requesting NASA funding must demonstrate compliance with the policies set forth in the following certifications and assurances. Note that this information is supplied in this Appendix only for reference; the authorizing institutional signature on the Cover Page form (see Section 2.1 and 3.1 in Appendix B) certifies that the submitting institution has read and is in compliance with these policies.

### **7.1 Certification Regarding Debarment, Suspension, And Other Responsibility Matters**

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 14 CFR Part 1265, Participant's responsibilities. The regulations were published as Part VII of the May 26, 1988 Federal Register (pages 19160-19211).

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
- d. Have not within three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

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

## **7.2 Certification Regarding Lobbying**

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

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

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

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for

making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000 for each such failure.

### 7.3 Assurance Of Compliance With The NASA Regulations Pursuant To Nondiscrimination In Federally Assisted Programs

#### The "Applicant"

HEREBY AGREES THAT it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1972 (20U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.) and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and HEREBY GIVES ASSURANCE THAT it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance shall obligate the Applicant for the period during which the Federal financial assistance is extended to it by NASA.

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

## APPENDIX C

## **EDUCATION AND PUBLIC OUTREACH**

### **3. Proposal Content (Instrument Investigations Only)**

The education and public outreach (E/PO) element of the proposal should provide a summary of the benefits offered by the investigation beyond the purely scientific benefits. This section of the proposal should contain a description of E/PO objectives and the planned activities to be undertaken to achieve those objectives; demonstrate how those plans will actually be implemented; discuss how the program will be evaluated; describe the intended involvement of the Principal Investigator and or key science team members in the E/PO effort; address the involvement of educational personnel as well as plans/commitments for partnerships and collaborations with education and outreach organizations; describe how the effort will be organized and managed (including the identification of key personnel who will be actually responsible for overseeing and implementing the E/PO effort); and explain the requested E/PO budget showing how that budget is related to and supports the planned program. Plans for developing and disseminating education/outreach products and materials, for contributing to the training of underserved and/or underutilized groups in science and technology, and for coordination of the planned E/PO program with the umbrella Mars Exploration E/PO program should be addressed. Details of organizational and management arrangements described in the Management and Cost Plan may be included by reference and do not have to be repeated in this section of the proposal. Letters of support/commitment from partners and resumes of key E/PO personnel should be included in the appendices to the proposal.

### **2. E/PO Evaluation Criteria for Principal Investigator Instrument Proposals**

Based on the funding guidelines given elsewhere in this AO, the E/PO programs submitted by PI Instrument proposals in response to this Announcement may involve the expenditure of substantial resources. It is generally expected that such E/PO programs will have a breadth and depth commensurate with these resources; will be multifaceted in nature; address a number of different aspects of education and outreach contained in the specific criteria; and have state, regional, or national scope. However, the umbrella JPL Mars Exploration E/PO program is already planning and implementing a number of national efforts. Therefore, the E/PO programs associated with PI Instrument proposals may be more focused and regional in nature and will be judged accordingly. The long-range goal of having Instrument PI's (and their Teams) associated with individual Mars missions involved in E/PO is to establish a network of Mars

scientists across the country who are both carrying out their own E/PO programs and acting as local agents for the Mars Program's national efforts.

There are two classes of evaluation criteria against which Principal Investigator Instrument E/PO activities will be evaluated. The general criteria to be applied to the evaluation of all such proposals and that reflect requirements necessary for further consideration of a proposal, are:

- The quality, scope, and realism of the proposed E/PO program including the adequacy, appropriateness, and realism of the proposed budget;
- The capability and commitment of the proposer and the proposer's team and the direct involvement of one or more science team members in overseeing and carrying out the proposed E/PO program;
- The establishment or continuation of effective partnerships with institutions and/or personnel in the fields of education and/or public outreach as the basis for and an integral element of the proposed E/PO program;
- The adequacy of plans for evaluating the effectiveness and impact of the proposed education/outreach activity.

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

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

Plans for coordination of the proposed activities with the umbrella Mars Exploration E/PO program will also be explicitly considered in the evaluation process.

In all cases, note that while creativity and innovation are certainly encouraged, neither of these sets of criteria focuses on the originality of the proposed effort. Instead, NASA seeks assurance that the proposer is personally committed to the E/PO effort and the PI and/or appropriate research team members will be actively involved in carrying out a meaningful,

effective, credible, and appropriate E/PO activity; that such an activity has been thoughtfully planned and will be carefully executed; and that the proposed investment of resources will make a significant contribution toward meeting OSS E/PO plans and objectives. OSS wants to see E/PO handled just as thoroughly and professionally as are the scientific and engineering aspects of OSS missions.

To aid proposers in the preparation of their proposals, as well as to ensure that reviews are carried out on a consistent basis aligned with the OSS Education Strategy and Implementation Plan, an *Explanatory Guide* to the E/PO evaluation criteria has been prepared and may be found by linking through *Education and Public Outreach* at the Web site

<http://www.spacescience.nasa.gov>.

### **3. Assistance for the Preparation of E/PO Proposals**

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

- Four OSS science theme-oriented E/PO "Forums" are sponsored by NASA OSS to help orchestrate and organize in a comprehensive way the education/outreach aspects of OSS space science missions and research programs, and provide both the space science and education communities with ready access to relevant E/PO programs and products; and
- Five regional E/PO "Broker/Facilitators" are sponsored by NASA OSS to search out and establish high leverage opportunities, arrange alliances between educators and OSS supported scientists, and help scientists turn results from space science missions and programs into educationally appropriate activities suitable for regional and/or national dissemination

Prospective proposers are strongly encouraged to make use of these groups to help identify suitable E/PO opportunities and arrange appropriate alliances. However, while these Forums and Broker/Facilitators are commissioned by OSS to provide help, the responsibility for actually developing a E/PO program and writing the proposal is that of the proposer. Points of contact and addresses for all of these E/PO Forums and Broker/Facilitators may be found by

opening Education and Public Outreach from the menu of the OSS homepage at <http://www.space.science.nasa.gov>.

## **4. Additional Information About the JPL Mars Exploration E/PO Program**

Questions about the Mars Exploration E/PO program may be directed to:

Ms. Michelle Viotti  
JPL Education and Outreach Coordinator  
Mail Stop 264-438  
Jet Propulsion Laboratory  
4800 Oak Grove Drive  
Pasadena, CA 91109-8099  
  
Telephone: 818-354-8774  
E-mail: [Michelle.Viotti@jpl.nasa.gov](mailto:Michelle.Viotti@jpl.nasa.gov)

**BUDGET SUMMARY**  
**for**  
**EDUCATION/PUBLIC OUTREACH**  
**PROPOSAL**

**For** (check one):

\_\_\_ Total Period of Performance from (M/Y) \_\_\_\_\_ to \_\_\_\_\_  
/or/  
\_\_\_ Year \_\_\_ of \_\_\_ from (M/Y) \_\_\_\_\_ to \_\_\_\_\_

1. Direct Labor (salaries, wages, and fringe benefits)	
2. Other Direct Costs:	
a. Subcontracts	
b. Consultants	
c. Equipment	
d. Supplies	
e. Travel	
f. Other	
3. Facilities and Administrative Costs	
4. Other Applicable Costs	
5. SUBTOTAL--Estimated Costs	
6. Less Proposed Cost Sharing (if any)	
7. Total E/PO Estimated Costs	

APPENDIX D

MRO 2005 LIBRARY  
<http://mro.larc.nasa.gov/mro/mrolibrary.html>

- **Questions and Answers About this AO (posted by 8:30 A.M. on Monday of each week starting June 11, 2001, through August 13, 2001);**  
<http://mro.larc.nasa.gov/mro>
- **Minutes of the Preproposal Conference to be posted on or about July 9, 2001;**  
<http://mro.larc.nasa.gov/mro>

## • **Office of Space Science Strategies and Policies**

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

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

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

This document describes the overall strategy for integrating education and public outreach (E/PO) into NASA's space science programs.

3. Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy (October 1996)

This document describes OSS's overall approach to implementing its E/PO strategy.

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

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

5. OSS FY 2000 Annual Report (January 2001)

6. The Space Science Enterprise Integrated Technology Strategy (October 1998)

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

## • **Space Science Roadmaps**

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

7. Mission to the Solar System: Exploration and Discovery, A Mission and Technology Roadmap, 2000-2025 (March 1998) (Document Unavailable - Out of Date)

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

- Space Science Supporting Documents

9. NRC Committee on Planetary and Lunar Exploration: An Integrated Strategy for the Planetary Sciences: 1995-2010 (1996)

- MRO Guidelines and Requirements Documents

10. NASA's Mission Operations and Communications Services (May 2000)

Describes the functions and costs of Ground Data Systems and Mission Operations and Data Analysis. (Document revised May 2000) Also, for more complete information about, and requirements for obtaining Deep Space Network (DSN) and Advanced Multi-Mission Operations System (AMMOS) services see the Future Mission Planning Office's Homepage at <http://deepspace.jpl.nasa.gov/advmiss/>

11. Navigation and Ancillary Information Facility Services for Discovery Missions

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

12. Mars Exploration Program: Scientific Goals, Objectives, Investigations, and Priorities (December, 2000)

13. Report of the NASA Science Definition Team for the Mars Reconnaissance Orbiter (MRO) (February, 2001)

14. Mars Exploration Program Data Management Plan (Draft) (November, 2000)

15. Mars Exploration Program Mars Reconnaissance Orbiter Announcement of Opportunity Proposal Information Package (June, 2001)

This and its supporting documents provide technical information on the Mars Reconnaissance Orbiter for the accommodation of science investigations.

- General Guideline and Requirements Documents

16. NPD 8610.7--Launch Services Risk Mitigation Policy

17. Example Mission Definition and Requirements Agreement

Example of such an agreement.

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

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

19. ISO 9000 Series

The following ISO 9000 quality documents describe current national and NASA standards of quality processes and procedures.

American National Standard, "Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation, and Servicing," ANSI/ASQC Q9001-1994.

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

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

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

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

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

20. Planetary Data System (June 11, 1998)

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

21. Planetary Protection Requirements

Includes information on Planetary Protection Requirements for NASA spacecraft missions, and for non-NASA missions with NASA participation.

NPD 8020.7E (Biological Contamination Control For Outbound And Inbound Planetary Spacecraft) [Version information: Effective Date February 19, 1999]

NPG 8020.12B (Planetary Protection Provisions for Robotic Extraterrestrial Missions) [Version information: Effective Date April 16, 1999]

NPG 5340.1D (NASA Standard Procedures for the Microbiological Examination of Space Hardware) [Version information: Final Review Draft dated January 10, 2000]

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

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

- Directives and Procurement-Related Information

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

23. Acquisition of Investigations

24. NASA Online Directives Information System (NODIS) II.

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

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

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

27. NASA Financial Management Manual

(URL: <http://www.hq.nasa.gov/fmm/> )

28. NPG 5800.1D -- Grant and Cooperative Agreement Handbook (July 1996)

(URL: <http://ec.msfc.nasa.gov/hq/grcover.htm> )

29. Environmental Quality Regulations

(URL: <http://www.access.gpo.gov/nara/cfr/index.html> )