RECORD OF DECISION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MARS EXPLORATION PROGRAM (MEP)
PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT (PEIS)

A. Background

In 1978, following the successful Viking Orbiter and Lander missions to Mars, the Committee on Planetary and Lunar Exploration (COMPLEX) of the National Academy of Sciences identified a list of prioritized, interconnected primary objectives for the continued exploration of Mars. These are to:

- intensively study local areas of the planet;
- explore the structure and general circulation of the Martian atmosphere;
- explore the structure and dynamics of Mars' interior;
- establish the nature of the Martian magnetic field and the character of the upper atmosphere and its interaction with the solar wind; and
- establish the global chemical and physical characteristics of the Martian surface.

COMPLEX further stated that "… the global and in situ studies of the planet and the return of Martian material are complementary components of an overall program of investigation; each of the components is separately necessary," and that "… the return of unsterilized surface and subsurface samples to Earth is a major technique for the exploration of Mars."

COMPLEX later extended and revised these objectives for the exploration of Mars, emphasizing that:

- the importance of the scientific objectives of study of the Martian atmosphere, interior, magnetic field, and global properties should be given equal priority with the objective of intense study of local areas; and
- the geochemical, isotopic, and paleontological study of Martian surface material for evidence of previous living material should be a prime objective of future in situ and sample return missions.

With the MEP, NASA would establish a series of objectives to address the open scientific questions recommended by COMPLEX as being important in the exploration of the planet. These objectives have been organized into a set of three goals to be pursued by the program. These goals are:

- determine if life exists or has ever existed on Mars
    - determine if life exists today
    - determine if life existed on Mars in the past

- assess the extent of organic chemical evolution on Mars

- understand the current state and evolution of the atmosphere, surface, and interior of Mars
  - characterize the current climate and climate processes of Mars
  - characterize the ancient climate of Mars
  - determine the geological processes that have resulted in formation of the Martian crust and surface
  - characterize the structure, dynamics, and history of the planet's interior
- develop an understanding of Mars in support of possible future human exploration
  - acquire appropriate Martian environmental data such as those required to characterize the radiation environment
  - conduct in situ engineering and science demonstrations.

The purpose of the action addressed in this PEIS is to further the scientific goals of the MEP by continuing the exploration and characterization of the planet through systematic, coordinated missions. The scientific objectives for Mars exploration group naturally into those best achieved from orbit, on the planet's surface, or with returned samples, and form the basis for individual mission objectives. The MEP has been structured in such a way as to systematically achieve as many of the scientific objectives as feasible within the practical constraints of available funding and technology readiness. Each mission would contribute incrementally to the overall program objectives, gathering scientific data and demonstrating technological advancements which build upon the knowledge and insights gained from prior missions. Thus, Mars Global Surveyor, launched in 1996, and Mars Odyssey, launched in 2001, continue the global reconnaissance of the planet with studies of the Martian atmosphere, interior, magnetic field, and chemical and physical characteristics of the surface. The Spirit and Opportunity rovers, launched in 2003, continue to intensively study diverse, local areas of the planet's surface and provide data that are essential for placing the global data in a more meaningful context.

Future missions encompassed by the MEP would continue the systematic exploration of Mars begun by NASA with Mars Global Surveyor, building upon the scientific data already returned and expected to be returned.

B. Introduction to the PEIS

The PEIS was developed to address all major elements of the MEP. NASA published a Notice of Intent on July 22, 2003 in the *Federal Register* (FR) (68 FR 43378) to prepare a Tier 1 EIS and conduct scoping for the MEP. The scoping period ended September 5, 2003. One scoping comment was received during this period from an individual who proposed a scientific methodology for detecting the presence of microbial life on the surface of Mars.

NASA published its Notice of Availability (NOA) for the Draft PEIS (DPEIS) for the MEP on April 22, 2004 (69 FR 21865), and mailed copies to 72 Federal, State and local agencies, organizations, and individuals. In addition, NASA made the DPEIS available in electronic format on its web site. The U.S. Environmental Protection Agency (EPA) published its Notice of Availability on April 23, 2004 (69 FR 22025), initiating the 45-day review and comment period.

The comment period for the DPEIS closed on June 7, 2004. A total of 10 comment submissions (letters and e-mails) were received from Federal, State and local agencies. No comment submissions were received from any private organizations or individuals. The comments received included “no comment” and recommendations to clarify or correct specific sections of text. These comments were considered in development of the Final PEIS (FPEIS).

The EPA published a finding of no objection (*i.e.*, LO – Lack of Objection) to the Proposed Action regarding NASA’s DPEIS on June 18, 2004 (69 FR 34162).

NASA published its NOA for the FPEIS on April 12, 2005 (70 FR 19102) and mailed copies to 82 Federal, State and local agencies, organizations, and individuals. In addition, NASA made the FPEIS available in electronic format on its web site. The EPA published its NOA on April 15, 2005 (70 FR 19951), initiating the 30-day waiting period, which ended on May 16, 2005. Three pieces of correspondence, in the form of one e-mail and two letters, were received by NASA during this period. This correspondence neither raised new issues nor provided any additional data or information relevant to the adequacy of the FPEIS.

C. <u>Alternatives Considered</u>

The alternatives addressed in the PEIS were:

1. The Proposed Action (Alternative 1), which would consist of a long-term program that, as a goal, sends at least one spacecraft to Mars during each launch opportunity extending through the first two decades of the twenty-first century. Efficient launch opportunities to Mars occur approximately every 26 months. MEP missions likely would be launched on expendable launch vehicles (*e.g.*, Delta or Atlas class) from either Cape Canaveral Air Force Station (CCAFS), Florida, or Vandenberg Air Force Base (VAFB), California. The MEP could include international missions in which NASA proposes to be a participant and that are to be launched from a foreign site.

   Under the Proposed Action, the MEP would consist of a series of robotic orbital, surface, and atmospheric missions to Mars. Some spacecraft could use radioisotope power systems (RPS) for continuous electrical power, radioisotope heater units (RHU) for thermal control, and small quantities of radioisotopes in science instruments for experiments and instrument calibration.

   Missions beyond 2011 could include the first mission to return Martian samples to Earth. As new information and techniques become available during the course of the program, the timing, focus, and objectives of future MEP missions could be redirected.

   This alternative would best accomplish the scientific goals and objectives established for the program. The Proposed Action (Alternative 1) was designated NASA’s preferred alternative in the FPEIS.

2. Alternative 2, in which NASA would continue to explore Mars through 2020, but on a less frequent, less comprehensive, mission-by-mission basis. These missions may include international partners. Any mission proposed to continue the exploration of Mars would be

developed and launched within the broader context of all other missions proposed for exploring other parts of the solar system, rather than in the context of a Mars-focused program. Robotic orbital, surface, and atmospheric missions could be used to explore Mars and could include sample return missions. Landed spacecraft could use RPSs for power generation or RHUs for thermal control of temperature-sensitive components in the spacecraft. Some spacecraft may carry small quantities of radioisotopes in science instruments for experiments and for instrument calibration.

3. The No Action Alternative, in which NASA would discontinue planning for and launching robotic missions to Mars through 2020. Currently operating NASA spacecraft at or en route to Mars would continue their missions to completion. New science investigations of Mars would only be made remotely from Earth-based assets (i.e., ground- or space-based observatories), or from spacecraft developed and launched to Mars by non-U.S. space agencies.

The evaluation of program alternatives led to the following determinations. A fundamental precept of the Proposed Action (Alternative 1) is the incremental and cumulative gains in knowledge that can be achieved through the planned missions. NASA, and its international partners in the MEP, would maintain a level of flexibility in the planning of future missions, possibly redirecting the type and focus of specific missions based on the findings from prior missions. The ability to conduct long-term, detailed exploration of selected sites on the planet's surface is a critical aspect of this process, as is planning for the eventual return to Earth of samples of Martian soil and rock.

Under Alternative 2, NASA would abandon plans for sending coordinated scientific spacecraft to Mars during every possible launch opportunity through 2020. A decision to proceed with a mission to Mars in any future launch opportunity would be based on the merits of the proposed mission's specific science objectives and the resources available to implement it. The objectives of such a mission may not necessarily build upon the knowledge gained from previous missions to Mars; furthermore, any succeeding missions may not necessarily build upon the proposed mission's accomplishments.

Under the No Action Alternative, NASA would abandon plans for sending robotic scientific spacecraft to Mars through 2020. After currently-operating spacecraft have completed their missions, no new science would be gathered by NASA spacecraft from Mars orbit or from the planet's surface.

D. Key Environmental Issues Evaluated

The environmental impacts of the Proposed Action and Alternatives are discussed in the FPEIS from a programmatic perspective. Because the FPEIS has been prepared during the planning stages for the MEP, specific proposed projects and missions within the MEP are only addressed in terms of a broad, conceptual framework. All MEP missions will individually require additional environmental documentation. For MEP missions to be launched from the U.S., this documentation could be either (1) a Tier 2 environmental assessment (EA) or EIS under this PEIS, or (2) an environmental checklist specified in the *Final Environmental Assessment (EA) for Launch of NASA Routine Payloads on Expendable Launch Vehicles from Cape Canaveral Air Force Station Florida and Vandenberg Air Force Base California* (June 2002) (Routine

Payloads EA). U.S. participation in foreign MEP missions may require documentation under Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*.

Each project or mission within the MEP that would propose use of RPSs or RHUs would be the subject of either an EA or EIS, with associated opportunities for public involvement. While detailed analyses and test data for each spacecraft-launch vehicle combination are not yet available, there is sufficient information from previous programs and existing National Environmental Policy Act (NEPA) documentation to assess the potential environmental impacts.

A major component of the MEP is continued planning for one or more missions that would return samples from Mars. At the time of publication of the FPEIS, preliminary concepts for a sample return mission are being studied and would continue to be refined and evaluated. A sample return mission would be the subject of a separate EA or EIS, as would the location, design and operational requirements for a returned-sample receiving facility.

The environmental impacts associated with normal spacecraft launches from both CCAFS and VAFB have been addressed in previous U.S. Air Force (USAF) and NASA environmental documentation. Rocket launches are discrete events that cause short-term impacts on local air quality. However, because launches are relatively infrequent events and winds rapidly disperse and dilute the launch emissions to background concentrations, long-term effects from exhaust emissions would not be anticipated. If solid rocket motors are used, surface waters in the immediate area of the exhaust cloud might temporarily acidify from deposition of hydrogen chloride. Launching a mission during each opportunity to Mars (approximately every 26 months) under the Proposed Action (Alternative 1) or less frequently under Alternative 2 would result in negligible release of ozone-depleting chemicals with no anticipated long-term cumulative impacts.

One or more of the missions to Mars could propose the use of radioisotopes under the Proposed Action (Alternative 1) and Alternative 2. Small quantities of radioisotopes may be used for instrument calibration or to enable science experiments, and RHUs or RPSs containing varying amounts of plutonium dioxide may be used to supply heat and electric power, respectively. Under both alternatives NASA will determine the appropriate level of NEPA documentation required for any mission proposing use of radiological material. Many of the parameters that determine the risks for a specific mission are expected to be similar to those associated with previous missions (*e.g.*, Galileo, Ulysses, Cassini, and the Spirit and Opportunity rovers). Mission-specific factors that affect the estimated risk include the amount and type of radioactive material used in a mission, the protective features of the devices containing the radioactive material, the probability of an accident which can damage the radioactive material, and the accident environments (*e.g.*, propellant fires, debris fragments, and blast overpressure). The risks associated with a Mars exploration mission carrying radioactive material are, therefore, expected to be similar to those estimated for earlier missions. The population and individual risks associated with prior missions that have made use of radioactive material have all been shown to be relatively small.

There would be no environmental impacts associated with the No Action Alternative.

E. Environmental Consequences of the Alternatives

1. Normal Launches

The environmental impacts of normal launches of expendable vehicles at CCAFS and VAFB have been addressed in other NEPA documentation (*e.g.*, the USAF's Evolved Expendable Launch Vehicle Program Final and Supplemental EISs, and NASA's Routine Payloads EA). In considering the consequences of the Proposed Action and Alternative 2, the primary environmental impacts of a normal MEP mission launch will be associated with airborne emissions, particularly from any strap-on solid rocket motors that could be used on the launch vehicles. Air emissions from the liquid propellant engines on the core vehicle, although large in magnitude, will be relatively inconsequential in terms of environmental effects. These effects will include short-term impacts on air quality within the exhaust cloud at and near the launch pads, and the potential for acidic deposition from the solid motor exhaust on the vegetation and surface water bodies at and near each launch complex. Neither short-term nor long-term impacts to threatened or endangered species are expected, though scorched vegetation in the immediate vicinity of the launch pads will occur. No significant impacts are expected on nearby communities, and no impacts are expected to cultural, historical, or archeological resources as a result of any MEP mission launch.

Some short-term ozone degradation will occur along the flight path as the launch vehicle passes through the stratosphere and deposits ozone-depleting chemicals from the exhaust products of the solid rocket motors. However, it has been estimated that the depletion trail from a launch vehicle is largely temporary, and would be self-healing within a few hours of the vehicle's passage. The total contribution from large expendable launch vehicles with solid rocket motors to the average annual depletion of ozone has been estimated by the USAF to be small (approximately 0.014 percent per year). Because launches at CCAFS and VAFB are always separated by at least a few days, combined impacts in the sense of holes in the ozone layer combining or reinforcing one another cannot occur.

Rocket launches also result in the emission of greenhouse gases. Emissions of greenhouse gases from launch vehicles have been previously estimated, and these estimates indicate that exhaust emissions from proposed MEP mission launches through 2020 would be a very small fraction of the annual net greenhouse gases emitted by the United States.

The proposed MEP launches through 2020 would not increase previously analyzed launch rates or use launch vehicles or systems beyond the scope of approved programs from CCAFS or VAFB. Since the launch rate for either the Proposed Action or Alternative 2 would be within the rates previously approved for these vehicles at these launch sites, there would not be any substantial increase in cumulative impacts for payload processing and launch of MEP missions. Therefore, long-term cumulative effects to the local and global environment by either the Proposed Action or Alternative 2 would not be substantial.

There would be no environmental consequences associated with the No Action Alternative.

The consequences of potential accidents associated with launch of MEP missions are addressed in paragraph E.2 below.

2. Potential Accidents

A variety of accidents could occur during preparations for and launch of an expendable launch vehicle. Only two types of nonradiological accidents would potentially have consequences beyond the immediate vicinity of the launch site: a large liquid propellant spill during fueling operations, and a launch failure.

The most severe propellant spill accident scenario postulated would involve release of nitrogen tetroxide during propellant transfer. Because nitrogen tetroxide rapidly converts to nitrous oxides in the air, toxic effects of the release would be limited to the immediate vicinity of the launch pad. Workers performing propellant loading will be equipped with protective clothing and breathing apparatus.

The potential nonradiological short-term effects of a launch failure accident could include a localized fireball, falling fragments from explosion of the vehicle, release of unburned propellants and propellant combustion products, and for on-pad or very low altitude explosions, destruction or damage to nearby biota and brush fires near the launch pad. A MEP launch vehicle failure on or near the launch area during the first few seconds of flight could result in the release of the propellants (solid and liquid) onboard the launch vehicle and spacecraft. The resulting emissions would chemically resemble those from a normal launch. A launch vehicle failure would result in the prompt combustion of a portion of the liquid propellants, depending on the degree of mixing and ignition sources associated with the accident, and somewhat slower burning of any solid propellant fragments. Falling debris would be expected to land on or near the launch pad resulting in potential secondary ground-level explosions and localized fires. After the launch vehicle clears land, debris from an accident would be expected to fall over either the Atlantic Ocean or the Pacific Ocean, depending on the mission launch site. Modeling of accident consequences with meteorological parameters that would result in the greatest concentrations of emissions over land areas indicates that the emissions would not reach levels threatening public health. Some unburned solid and liquid propellants could enter surface water bodies and the ocean. Unburned solid and liquid propellants entering surface water bodies could result in short-term, localized degradation of water quality and toxic conditions to aquatic life. Such chemicals entering the ocean would be rapidly dispersed and buffered, resulting in no long-term impact on water quality and resident biota.

Some MEP missions under both the Proposed Action (Alternative 1) and Alternative 2 may propose to use devices with varying amounts of radioactive material, such as RHUs for heat generation or RPSs for electric power generation, and small quantities of radioisotopes in some science instruments. These types of devices have been used in prior NASA missions and have been previously analyzed for their potential impact resulting from this use. Risk assessments addressing the environmental impacts associated with missions that use radioactive material have been performed in support of EISs for five NASA flight projects: Galileo, Ulysses, Cassini, Mars Surveyor 2001 (Draft), and Mars Exploration Rovers (MER)–2003 project (consisting of the Spirit and Opportunity rovers). The risk assessments associated with these EISs provide a historical perspective of the potential risk factors associated with the missions proposed for the MEP that may utilize radioactive material. The population and individual risks associated with the earlier missions identified above have all been shown to be relatively small. Estimates of the risk of one cancer fatality (over a long-term period) within a potentially exposed population have been very small, on the order of 1 in 100,000 or less. Estimates of the risk of fatal cancer (over a long-term period) to the average potentially exposed individual have been extremely small, on the order of 1 in 10 million or less. These risk assessments also provide an historical perspective on the increasing level of completeness, accuracy, and detail that NASA and the U.S. Department of Energy (DOE) have incorporated into each mission risk assessment.

In addition to the potential human health consequences of launch accidents that could result in a release of radioactive material, potential environmental impacts due to land contamination were also examined in the earlier risk assessments. These included contamination of natural vegetation, wetlands, agricultural land, cultural, archaeological and historic sites, urban areas, inland water, and the ocean. Land areas estimated to be contaminated above a predefined screening level are identified in these risk assessments for the purpose of evaluating the need for potential characterization and cleanup.

A risk assessment was developed for the MER–2003 project. Additional environmental documentation would be required for any MEP mission that proposes to use radioactive material. Should that documentation take the form of an EA or EIS, a mission-specific risk assessment would be performed. The parameters that determine the risks for a specific mission have been identified in the above referenced mission risk assessments. The risks associated with a MEP mission carrying radioactive material are, therefore, expected to be driven by the same risk factors identified in the earlier mission risk assessments. Mission-specific factors that affect the estimated risk include: the amount and type of radioactive material used in a mission; the safety features of the devices containing the radioactive material; the probability of an accident which can threaten containment of the radioactive material; and, the accident environments.

Accident environments associated with all of the launch vehicles currently considered for the MEP missions are expected to be similar to the environments that have been analyzed for the earlier NASA missions. Those environments include blast overpressure, fragments, fires, and mechanical impacts. The previous risk assessments considered combinations of accident environments to assess the potential for damage to the devices containing radioactive material. Blast impacts are the static and dynamic pressures resulting from explosive failure of the propellant tanks. Fragments result from the explosive failure of propellant tanks; fragments can come from the tank itself as well as other launch vehicle and spacecraft components. Liquid propellant fires are typically modeled as fireballs that consume available fuel. The solid propellant fire environments of concern are associated with collocation of the radioactive devices and blocks of solid propellant. Ground impact that could cause mechanical damage to a RHU or RPS heat source module is considered for accidents near the launch pad and for accidents leading to suborbital or orbital reentry.

In addition to identifying the factors that determine the radiological risks associated with a mission, the development of a risk assessment provides the opportunity to generate feedback into the mission design to possibly reduce the impact of these factors. For example, in preparation for the MER–2003 project, an issue was identified associated with the potential risk of ground impact of the spacecraft, containing RHUs, in a configuration that included an intact third stage with a solid propellant motor. To address this issue, a break-up system was added to the third stage motor that would reduce the probability of an intact impact of the spacecraft with the third stage during an early launch phase accident. NASA has used, and will continue to use, this process to assess and manage potential radiological risks associated with each mission. Each mission risk assessment would build upon the information and insights developed in earlier assessments of all types of launches and tailor the assessment to the specific mission parameters. It is reasonable to expect that risk and safety assessments performed for future MEP missions may result in mission modifications intended to address mission-specific risk factors.

The risk assessments performed for the previous missions provide significant insight into what could be the expected risk drivers and risks associated with any MEP missions that may involve use of radioactive material. These previous EIS risk assessments indicate that the potential radiological risks have not been sufficient to preclude launch. While these risk assessments have identified likely contributors to mission risk, the process of understanding and analyzing the factors affecting risk continues to evolve. The mission-specific risk assessments required for any MEP mission that proposes use of radioactive material would continue to build upon the knowledge base and insights developed in earlier assessments as well as provide feedback into the MEP mission design.

Under the No Action Alternative, NASA would discontinue launching robotic missions to Mars. The No Action Alternative would not entail any of the environmental consequences associated with potential MEP mission accidents. There would only be potential socioeconomic impacts in that some jobs in selected industries could be displaced or lost, and potential tourism for viewing MEP launches would not occur.

F. Choice of Alternatives

In view of the small risks associated with the MEP, it is my intention to select the Proposed Action, Alternative 1 (above, page 3), based on the following.

Alternative 1 enables the best return of scientific and technical information, makes most effective use of fiscal, human, and material resources, and avoids disruption of the Nation's program for the exploration of Mars.

Under the Proposed Action, NASA would implement a series of missions to Mars through the second decade of the twenty-first century to begin addressing fundamental scientific questions about the planet and its history. A fundamental precept of the Proposed Action is the cumulative gains in knowledge that can be achieved through the planned missions. NASA, and its international partners in the MEP, would maintain a level of flexibility in the planning of future missions, possibly redirecting the type and focus of specific missions based on the findings from prior missions. The ability to conduct long-term, detailed exploration of selected sites on the planet's surface is a critical aspect of this process, as is planning for the eventual return to Earth of samples of Martian soil and rock.

Under Alternative 2, NASA would not implement a coordinated MEP, but would continue to explore Mars on a less comprehensive, mission-by-mission basis. Any future robotic missions to Mars through 2020 would need to be proposed and compete for resources with all other missions under consideration by NASA for continuing exploration of the solar system. A decision to proceed with a mission to Mars in any future launch opportunity would be based upon the merits of the proposed mission's specific science and technology objectives and the resources available to implement it. The objectives of such a mission could, but may not necessarily, build upon the knowledge gained from previous missions to Mars; furthermore, any succeeding missions could, but may not necessarily, build upon the proposed mission's accomplishments. The potential for achieving cumulative gains in knowledge through a coordinated series of missions could take many more years to fully realize.

Considering the MEP in isolation, Alternative 2 is the environmentally preferable alternative because it may involve fewer rocket launches than Alternative 1 over the period through 2020 (although at a cost of time and effectiveness in gaining scientific and technical knowledge). However, it is possible that the resources potentially saved by reducing the number of Mars missions during this period would be diverted to other space missions, leaving the overall environmental impacts from Alternatives 1 and 2 essentially the same.

Alternative 3, the No Action Alternative, would be the environmentally preferred alternative, except that it will not meet the objectives for the exploration of Mars. Under the No Action Alternative NASA would abandon further exploration of Mars by new, robotic missions to the planet through 2020. Current NASA missions to Mars (i.e., Mars Global Surveyor, Mars Odyssey, the Spirit and Opportunity rovers, and the Mars Reconnaissance Orbiter, planned for launch in August 2005) would continue. After these missions have ended, no new science would be gathered by NASA spacecraft from Mars orbit or from the planet's surface. New science investigations of Mars would only be made remotely from Earth-based assets (*i.e.*, ground-based observatories or space-based observatories such as the Hubble Space Telescope) or from spacecraft developed and launched to Mars by non-U.S. space agencies. U.S. scientists could continue to participate in foreign missions to Mars. As NASA continues to plan and implement missions to explore other bodies and regions in the solar system, the No Action Alternative would leave a significant gap in the expected knowledge to be gained.

The selection of the Proposed Action (Alternative 1) is fully consistent with the mandate of the National Aeronautics and Space Act to contribute to the expansion of human knowledge of phenomena in space.

G. Additional Information

In addition to the requirements under the NEPA and NASA policy and procedures, there is a separate and distinct Executive Branch interagency process for evaluating the nuclear launch safety of any MEP mission that proposes to use RPSs or RHUs. Pursuant to paragraph 9 of Presidential Directive/National Security Council Memorandum #25 (PD/NSC-25) a nuclear Safety Analysis Report (SAR), including an uncertainty analysis, would be prepared by DOE and reviewed by an *ad hoc* Interagency Nuclear Safety Review Panel (INSRP), who would then prepare a Safety Evaluation Report (SER) for each such MEP mission. The Science Mission Directorate would be fully briefed on the outcome of the SAR and the INSRP evaluation prior to launch of each such MEP mission.

In the event there are significant differences between the risk assessment for that mission's EA or EIS and the results of the final safety analyses and evaluations, those differences would be considered and a determination made as to the need for any additional NEPA documentation.

H. Mitigation

The only expected or immediate environmental impacts of launching individual missions within the MEP are the same as those for the launch of every currently-available Delta and Atlas class vehicle, and mitigation will accordingly be the same. This PEIS addressed both potential nonradiological and radiological consequences (for any MEP missions that may utilize radioisotope devices) of mission accidents. Regarding such possible radiological impacts, the development of a mission-specific risk assessment provides the opportunity to generate feedback into the mission design to possibly reduce the impact of these factors. NASA will continue to use this process to assess and manage potential radiological risks associated with any MEP mission that proposes to use RPSs or RHUs. Each mission risk assessment would build upon the information and insights developed in earlier assessments of all types of launches and tailor the assessment to the specific mission parameters. It is reasonable to expect that risk and safety assessments performed for future MEP missions may result in mission modifications intended to address mission-specific risk factors.

Furthermore, NASA, with expert technical assistance from DOE, the EPA, the U.S. Department of Homeland Security, the U.S. Department of Defense, and other Federal agencies, and in cooperation with State and local authorities, would develop a federal radiological contingency response plan for each MEP mission utilizing radioisotope devices. Key elements of monitoring and data analysis equipment would be pre-deployed to enable rapid response in the event of a launch anomaly. The plan for each such MEP mission, to be documented elsewhere, would define the roles of the agencies involved and would address short-term monitoring and mitigation activities associated with each launch. Post-accident mitigation activities, if required, would be based upon detailed monitoring information and assessment.

Decision

Based upon all of the foregoing, it is my decision to select the MEP as defined in the Proposed Action (Alternative 1).

A.V. Diaz
Associate Administrator for Science

June 20, 2005
Date