



# Mars Science Laboratory

## Radiological Contingency Planning for the Launch

Like many past exploratory spacecraft such as Viking, Voyager, Galileo, Ulysses, Cassini, and New Horizons, electrical power for the Mars Science Laboratory rover and its instruments may be provided by a Radioisotope Power System (RPS). RPSs produce electricity from heat generated by the natural decay of plutonium (mostly plutonium-238, a non-weapons grade form of plutonium). Such power systems, provided to the National Aeronautics and Space Administration (NASA) by the Department of Energy, have been used reliably for over 40 years, enabling these great science missions. Multiple layers of safety features and rigorous testing has forged a robust design to contain nuclear material under accident conditions.

Assessments of potential accidents for the proposed RPS-powered Mars Science Laboratory mission indicate that the chance of an accident that could result in the release any plutonium is very small. However, to ensure public and worker safety, comprehensive contingency plans are being formulated by NASA and the Department of Energy to define and deploy a rapid and effective response capability in the event of an accident.

### Contingency Response Plans: The Basic Elements

The primary emphasis of contingency response planning is to protect the health and safety of the public and on-site personnel from potential hazards. There are several basic elements common to all such plans:

- Determine whether any radioactive materials have been released.
- Characterize the extent of any release by field measurement.
- Predict the amount and distribution of the released material.
- Formulate and recommend protective actions designed to safeguard people and property.

Once protective measures have been taken, NASA, DOE and other Federal agencies would execute recovery plans to locate and recover radioactive materials if necessary

### Response Plans for Accidents at the Launch Site

From early planning stages of any NASA mission involving a radioisotope power system, the agency coordinates with federal, state, local and launch site representatives to tailor emergency response plans to best meet mission launch risks. Prior to launch, NASA partners with emergency response agencies to participate in extensive planning efforts, including contingency planning, safety drills and training exercises, so in the unlikely event of an accident, emergency personnel are prepared to respond as part of a fully coordinated taskforce.

In the early ascent phase of the mission (about the first 30 to 45 seconds of the launch), an accident would most likely affect land areas at or adjacent to the launch pad, or areas just offshore. Specially designed, staffed (to include local, State and Federal representatives), and equipped Centers, which are located on-site at KSC and off-site in Brevard County, would coordinate and direct contingency response actions. These

emergency actions would involve, among other things, monitoring by pre-positioned field teams and fixed ground-based radiation detectors, and could include a range of recommended actions for the public, from sheltering in their home to relocation.

In the event of an accident with a confirmed release of radioactive material, measurements and characterization of the scope of the release would be made and analyzed. Based upon this analysis appropriate action would be taken to mitigate the effects of a release. If necessary, NASA and/or State of Florida officials would request the establishment of a Federal Radiological Monitoring and Assessment Center under provisions set forth in the National Response Plan. From this center, the Coordinating Agency Representative (CAR), a designated and trained NASA Federal employee, would direct and manage the Department of Energy and other Federal agencies in direct support of the State of Florida with radiological monitoring assistance and assessment expertise, as required by the National Response Plan, Nuclear/Radiological Incident Annex. With information provided from monitoring teams pre-positioned around the launch site, the State of Florida, in conjunction with local government officials, would decide upon an appropriate course of action. These actions might include mobilizing state and local emergency personnel and issuing recommendations regarding protection of the general population and/or sheltering.

### **For More Information**

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Following the immediate response to the accident, as more detailed information becomes available, decisions on the need for additional precautions would be made by state and local authorities. If required, long-term radiological monitoring and recovery measures would be the primary responsibility of the Environmental Protection Agency, other federal organizations and the State of Florida.

### **Accidental Reentry of the Spacecraft or Payload Only (No Launch Vehicle Involvement)**

In the event the spacecraft failed to deploy properly from its upper stage, it might reenter the Earth's atmosphere. The RPS and its components are designed to withstand the atmospheric heating associated with this type of reentry. They are also designed to withstand the soil, sand or water impact that they would most likely encounter after reentry. Hard surface impacts could potentially result in localized releases. Specially equipped DOE recovery teams would be dispatched to locate and recover the RPS and its components.

### **Summary**

NASA with the support of the Department of Energy, Air Force, Coast Guard, State of Florida, and Brevard County will stand ready to respond with a comprehensive assessment and response capability in the unlikely event of a launch accident involving an RPS.