NASAfacts

Mars Science Laboratory Launch Contingency Planning

In late 2011, NASA plans to launch the Mars Science Laboratory on a mission to enable scientists to assess whether an intriguing area of Mars has preserved evidence of environmental conditions favorable for microbial life. Due for liftoff from Cape Canaveral Air Force Station in Florida aboard a United Launch Alliance Atlas V launch vehicle in late November or December, the Mars Science Laboratory will be the largest, most technologically advanced rover ever sent to another planet.

The rover, named "Curiosity," is outfitted with a sophisticated suite of instruments to study the rocks, soil, and atmosphere of Mars. The electrical power source for the rover and its scientific equipment is a Multi-Mission Radioisotope Thermoelectric Generator (MMRTG). Essentially a nuclear battery, the MMRTG contains 10.6 pounds (4.8 kilograms) of plutonium dioxide as a heat source used to produce the rover's onboard power and to warm its internal systems during the frigid Martian night.

The MMRTG is an evolutionary design of the power sources that have been launched safely and successfully by NASA on a wide variety of planetary exploration missions for more than 40 years. As with the previous seven generations of such devices, the MMRTG is designed, built and tested by the U.S. Department of Energy (DOE) to contain its nuclear material in a variety of potential accident scenarios using several layers of protective materials. In addition, the plutonium dioxide fuel is manufactured in a ceramic form, which is insoluble in water, fractures in largely non-inhalable chunks, and is not easily vaporized.

These features of the fuel reduce the potential for it to be transported in the environment or vaporized into small particles, which represent a human health hazard when inhaled or ingested. The MMRTG design has several layers of safety features that further minimize this possibility. NASA and DOE have demonstrated that potential mission risks are very small, as documented in the Final Environmental Impact Statement for the mission.

NASA prepares and rehearses contingency response plans for every launch that it conducts. Ensuring the safety of launch-site workers and the general public in the communities surrounding the launch area is the primary consideration in this planning. No member of the public has ever been injured during a NASA launch.

The team preparing to respond to any launch accident involving the nuclear material aboard Mars Science Laboratory includes a variety of experts from federal, state and local agencies.

This contingency planning task takes on an added dimension when the payload being launched into space carries nuclear material. The primary goals of radiological contingency planning are to assess whether a release of radioactive material has occurred due to a launch-area accident, to quantify the magnitude and nature of any material released, to predict where the material is likely to be dispersed (if at all), and to formulate guidance on any appropriate protective actions to be taken. This guidance covers both on-site actions and those that are recommended for any off-site response.

This planning is based on the fundamental principles of advance preparation (including rehearsals of simulated launch accident responses), the timely availability of technically accurate and reliable information, and prompt external communication with the media and general public.

The Radiological Control Center (RADCC) at Kennedy Space Center (KSC) is the primary facility used to coordinate all radiological contingency planning activities. NASA has modernized and expanded the RADCC to accommodate all of the participants in

the radiation monitoring and assessment team in a single facility. This allows for a more efficient and coordinated approach to collection, analysis and delivery of the most up-to-date information in the event of an accident.

The RADCC will house the NASA federal Coordinating Agency Representative (CAR), and representatives from the Brevard County Department of Emergency Management and the State of Florida's Department of Emergency Management. Key federal participants include experts from the U.S. Air Force, DOE, the Federal Emergency Management Agency, the Department of Homeland Security, and the Environmental Protection Agency. The center will also be in live contact with both the county and the state's Emergency Operations Centers, and other federal emergency operations centers as may be necessary.

The associated Joint Information Center will receive regular updates on potential accident conditions from the RADCC, and will be responsible for communicating information concerning any protective-action recommendations for the surrounding communities deemed prudent by the assessment team, and approved by the CAR and the management group that supports him. The Joint Information Center will distribute ongoing status messages to the NASA launch commentator, the NASA KSC news center, and the state and local emergency operations teams regarding any accident situation. Related information will be available directly to the public via the Web, text messaging, and social media feeds, which will be widely advertised before launch.

The RADCC will receive its primary status information from a network of 30 remote devices called Environmental Continuous Air Monitors (ECAMs). Each ECAM features a specialized sensor at the average height of a human being that is capable of selecting for airborne particles that could be potentially hazardous to human health. These data are reported automatically by each ECAM via satellite communications links to the control center.

The ECAMs being deployed for the launch of Curiosity are substantially more sensitive than the previous generation of such detection systems. These ECAMs will be distributed strategically around the launch area, with 19 of the 30 placed in off-site areas surrounding KSC. The ECAMs will be installed and operating about six weeks prior to launch of Curiosity in locations selected using information on prevailing local meteorological conditions. Four of the ECAMs will be deployed to locations selected just prior to the launch to maximize the effective coverage area of the overall network, based on the weather forecast and precise lift-off time window for that day.

Thirty of these advanced environmental monitors (center) will be deployed in the surrounding area in advance of the Mars Science Laboratory launch.

Sixteen mobile field-monitoring teams will be deployed during launch to provide additional ground measurement data and, in the event of an accident, to respond to and validate any positive signal from one or more of the ECAMs. These teams include experts in industrial safety and health physics, in addition to the fire safety and emergency medical teams that are on alert for every launch.

NASA, DOE and local and state emergency managers do not expect public health and safety to be significantly affected even in the unlikely event of a launch accident. If an accident does occur, public information alerts could include precautionary guidance to shelter indoors for a limited period. There are no credible accident scenarios for the launch of Mars Science Laboratory that would require evacuation of the surrounding area.

Advance briefings will be provided to civic organizations, local schools, and hospitals to avert any unnecessary emergency response. In all cases, accurate and prompt information on the status of the Curiosity launch and any actions recommended for the public will be communicated widely and openly to the news media and to people in the surrounding communities.

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For further information, contact:
David Lavery
Science Mission Directorate
NASA Headquarters
Washington, DC 20546
(202) 358-4684
david.lavery@hq.nasa.gov

National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

www.nasa.gov

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