National Aeronautics and Space Administration

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Mars 2020: What to do in a Launch Accident

This fact sheet provides basic information about the radioisotope power system on NASA's Mars 2020 mission, including what to do should there be a launch accident.

NASA's Mars 2020 rover mission has four primary goals: determine whether a selected area of Mars was ever hospitable to life, seek evidence of past life in this area, select and seal rock and soil samples that could be returned to Earth by a future mission, and help prepare for human exploration of the Red Planet.

WHERE AND WHEN?

NASA's Mars 2020 rover, named Perseverance, is scheduled to launch from the Cape Canaveral Air Force Station in Florida on an Atlas V launch vehicle. The launch is scheduled to occur during mid-July to early August 2020 with a landing on Mars in February 2021, where it will explore the surface for at least two Earth years. The rover's electricity is supplied by a system called a Multi-Mission Radioisotope Thermoelectric Generator, or MMRTG. This system produces electrical power from the heat given off by the natural radioactive decay of plutonium-238. This heat is converted into about 110 watts of electrical power to run the rover's on-board systems and science instruments.

WHAT IS PLUTONIUM-238 AND IS IT HAZARDOUS?

Plutonium-238 dioxide is a chemically stable form of plutonium with a high rate of radioactive decay and a relatively short "half-life" of about 88 years, meaning that it produces a significant amount of steady heat. It is different from the material used in nuclear weapons. In the unlikely event of an accident, there is potential for the release and dispersal of the radioisotope fuel into the environment, and subsequent exposure to humans or animals. It could become a significant health hazard only if inhaled or ingested as small particles. In an MMRTG, the heat source is manufactured as a ceramic form of plutonium dioxide that resists being broken into fine pieces.

WHAT DO I DO IN AN ACCIDENT?

As with any rocket accident, if there is a mishap during the early launch phase of Mars 2020, local emergency management officials in Florida will provide guidance on any protective actions, which may include asking the public to take shelter in place. A shelter-in-place announcement does not mean a release of radioactive material has occurred—it is a standard precaution to be taken until the environment is monitored and assessed.

If State or County officials ask the public in certain areas to "shelter in place," this means:

- If you are outside, go inside the nearest building. Close all doors and windows. Shut outside air vents, including fireplace dampers.
- If you are in a vehicle, close all doors and windows. You may use air conditioning if desired, but limit outside air circulation.
- Bring pets inside and keep them inside.
- If you have a child at school or daycare, or a family member in a nursing home or hospital, local officials ask that you do not try to pick them up at this time. These facilities have their own emergency procedures and plans in place.

For further information and updates:

- Local radio and TV stations should be your primary source for current information, rather than national channels, as they are more familiar with the community.
- Brevard County Emergency Management uses social media and a texting service to provide updates. Like "Brevard County Emergency Management" on Facebook, follow @BrevardEOC on Twitter, or text BREVARDEOC to 888777 to receive public safety messages via text.
- Monitor @NASA on Twitter, or check http://www.nasa.gov/ for updates.

WHAT HAPPENS IF THERE'S A LAUNCH ACCIDENT?

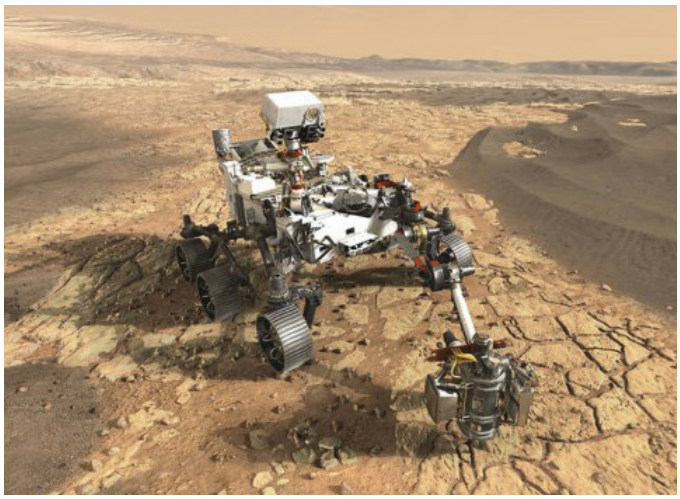
The MMRTG includes several layers of protective materials that encase its plutonium and are designed to contain its nuclear fuel in a range of potential accident conditions.

If there is an accident, the generator's built-in safety features reduce the chance that nuclear fuel could be released into the environment. If any material were released, the ceramic form of the fuel would help prevent it from moving easily through the environment and being inhaled or ingested as small particles.

In case of a mishap in the launch area, most of the material would not be a hazard to the public. Any exposures would be expected to be small. Out of an abundance of caution, monitoring teams and specialized equipment are deployed around the launch site and in the local community before launch. These teams are already in place to assess any possible radiological release, or just as important, to verify that a release has not occurred. Sampling and monitoring in the area would continue until the environment is assessed after an accident and the condition of the radioactive material in the spacecraft is known.

IS IT SAFE TO LAUNCH THIS TYPE OF GENERATOR?

Yes. Power systems similar to this one have been used safely and successfully by NASA for more than 40 years. These highly reliable generators went to the Moon with the Apollo astronauts in the 1970s to power scientific instruments on the lunar surface, and NASA spacecraft exploring Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto have used them for their electrical power.



WHAT IS THE LAUNCH HISTORY OF USING THESE GENERATORS?

The U.S. has launched 27 missions powered by such generators; each one has worked as designed and none have caused an accident. A similar generator aboard a 1968 spacecraft launch contained its fuel, as planned, when the rocket went off course and was intentionally destroyed by launch range safety personnel. The generator was recovered from the Pacific Ocean and its fuel was reused on a subsequent mission.

A reliable launch vehicle and several layers of safety features mean that a safe and successful launch of Mars 2020 is the most likely outcome. NASA, Brevard County, and the State of Florida, in cooperation with other federal agencies, are prepared to respond in the event of a launch area accident to protect the people and property of the Space Coast.

QUESTIONS?

If you have any questions or concerns, please contact:

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For more information about Mars 2020 and NASA's Mars exploration program, visit: **mars.nasa.gov/mars2020**