NASA Radiological Control Center

Cape Canaveral, Florida

Government

Photo Credit: November 2011, Mode:Green, Inc.

Display Technology Taken to New Heights at NASA

Radiological Control Center renovation just in time for Mars Science Lab launch

Background

If the most critical part of your mission lasts only 50 seconds, the right technology can make the difference. When NASA launches a vehicle that includes a radioisotope power source, the first crucial seconds of the launch must be monitored by the NASA Radiological Control Center (RADCC), which is responsible for monitoring, and coordinating protective actions in the unlikely event of a launch accident that releases radioactive material in the launch area.

The job of RADCC scientists became a lot easier in November when the Mars Science Lab lifted off from the Kennedy Space Center. This was the first mission using a newly redesigned and reconfigured RADCC, with a complicated array of new technology made simple and seamless thanks to the Crestron control system.

Mission critical

NASA does not launch payloads with radioisotope power sources every day, but their importance to a mission's success is well recognized.

"The 2003 Mars Rovers had eight radioisotope heat sources, each about the size of a 35 mm roll of film," says Randall Scott, Radiological Control Director for NASA. "The heat they produced kept critical components from freezing at night on the Martian surface and helped the rovers, designed to last 90 days, remain functional for over six years."

The Mars Science Lab, with the rover "Curiosity" tucked in its belly, launched with a nuclear battery containing plutonium dioxide. Even though the likelihood of a release of radioactive material was low because the fuel was in ceramic form and encased in strong metal alloy with three layers of a heat resistant carbon fiber material, it was still necessary to establish an assessment capability should a launch mishap occur. Scott wanted the newly designed RADCC ready for that launch.

The RADCC existed in some form for nearly 40 years but was overdue for renovation. Scott and his team began by gutting

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and enlarging the room, then dividing it into two areas of operation: technology and management.

During a launch, representatives from a variety of government agencies sit on the management side, including FEMA, the Departments of Defense and Homeland Security, the EPA and emergency management agencies from Brevard County and the state of Florida. NASA scientists and technical support personnel from the Department of Energy and other federal and state organizations sit in the slightly larger technical area, most at workstations positioned in a U shape to offer more efficient exchange of data. Each workstation has a custom-built console that allows RADCC personnel to plug in their laptops and provide up-to-the-minute information during launch. Operators display output from these laptops on nine plasma monitors ranging from 42 to 58 inches, plus four digital projectors with drop-down wall screens. In addition, scientists can view live video of the launch from 11 cable boxes and recorded video from two DVD players. They also have video conferencing capabilities in both areas. Multiple ceiling speakers provide zoned audio to three different areas of the room.

Team scientists use their laptops to receive data from a variety of sources including 30 Environmental Continuous Air Monitors (ECAM) spread in and around the Kennedy Space Center to monitor air quality for the presence of any radioactive material. They also view information from 16 field teams mobilized to monitor the ground and respond in the case of a positive reading from an ECAM following any launch accident. The team also receives constant updates on wind direction and velocity, weather changes, telemetry data, and animated scenarios of possible event results.

Controlling the control room

Bill Lally, president of Orlando-based independent programming company Mode:Green programmed the Crestron control system. “We needed a simple way to handle the large number of sources coming in and make them switch easily and quickly, so we created an on-screen image of the layout of the room itself with the sources and monitors included. All an operator has to do is touch the image of the console they want to display and then touch the monitor they want to send it to.”

When the RADCC is in launch mode, all component controls are accessible from a trio of Crestron touch screens, which


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have identical interfaces. While one remains in the equipment rack, two operators under Scott's direction are seated at the other two, executing his orders as to what data to display on which monitor. Crestron provides an intuitive and consistent experience across all touch screens, plus the director's PC (running XPanel software) and the Apple® iPad® (running the Mobile Pro® G app). The interface is so simple that there's little chance of a mistake in an emergency situation.

Of course, emergencies are rare. In four decades of radiological launches there have only been three accidents. In 1964, the nuclear power source of a navigational satellite reentering the atmosphere burned up in the upper atmosphere, as it was designed to do. Four years later a rocket took off from California but landed in the Pacific. The power source was undamaged, salvaged and used in another vehicle.

"And then there was Apollo 13 where they had an accident on the way to the moon," says Scott. "They had to use the Lunar Lander as their lifeboat back to earth. Since they never made it to the moon, the nuclear power source was still attached to the Lander. Ultimately the astronauts transferred back into the capsule for landing, and that power source went in to the Pacific Ocean's Tonga Trench, which is several thousand feet down."

The RADCC stands ready to fully support any NASA launch requiring a radioisotope power source. "We rehearse constantly before a mission," Scott says. If there ever is a release of any radioactive material, personnel would kick in to high gear, getting the word out immediately to the public and their respective agencies through several pathways including the videoconferencing systems installed in the RADCC.

"One of the last phases of the project was to build a secondary room to facilitate information release to the media," says Lally. "Besides public affairs representatives from several federal & state agencies, NASA added a Twitter® station and a Facebook® station and were actually blogging the whole launch procedure for the Mars mission. We were sending them feeds, which the Crestron system handled as well, and it managed the video conferencing in the event something happened."

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> **Bill Lally,** President, Mode:Green

The launch of the Mars Science Lab went off without a hitch. The team spent their 50 seconds intensely monitoring the vehicle and the environment, but there was no need to deal with an emergency. There may not be another radioactive launch until 2016, but the RADCC will be available for other launches as well, acting as backup to the Kennedy Space Center's Emergency Operations Center, a job it is now fully equipped to handle.

In the end, Scott got what he asked for: a simple and seamless system. "The technology needs to stay out of the way," says Lally. "And it needs to be seamless for the user, because if an emergency occurs, they won't have time to think about how to use it."