NASA Plans Test of 'Electronic Nose' on International Space Station

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NASA astronauts on space shuttle Endeavour's STS-126 mission will install an instrument on the International Space Station that can "smell" dangerous chemicals in the air. Designed to help protect crew members' health and safety, the experimental "ENose" will monitor the space station's environment for harmful chemicals such as ammonia, mercury, methanol and formaldehyde.

The ENose fills the long-standing gap between onboard alarms and complex analytical instruments. Air-quality problems have occurred before on the International Space Station, space shuttle and Russian Space Station Mir. In most cases, the chemicals were identified only after the crew had been exposed to them, if at all. The ENose, which will run continuously and autonomously, is the first instrument on the station that will detect and quantify chemical leaks or spills as they happen.

"The ENose is a 'first-responder' that will alert crew members of possible contaminants in the air and also analyze and quantify targeted changes in the cabin environment," said Margaret A. Ryan, the principal investigator of the ENose project at NASA's Jet Propulsion Laboratory, or JPL, in Pasadena, Calif. JPL built and manages the device.

Station crew members will unpack the ENose on Dec. 9 to begin the instrument's six-month demonstration in the crew cabin. If the experiment is successful, the ENose might be used in future space missions as part of an automated system to monitor and control astronauts' in-space environments.

"This ENose is a very capable instrument that will increase crew awareness of the state of their air quality," said Carl Walz, an astronaut and director of NASA's Advanced Capabilities Division, part of the Exploration System Mission Directorate, which funds the ENose. "Having experienced an air-quality issue during my Expedition 4 mission on the space station, I wish I had the information that this ENose will provide future crews. This technology demonstration will provide important information for environmental control and life-support system designers for the future lunar outpost."

Specifically, the shoebox-sized ENose contains an array of 32 sensors that can identify and quantify several organic and inorganic chemicals, including organic solvents and marker chemicals that signal the start of electrical fires. The ENose sensors are polymer films that change their electrical conductivity in response to different chemicals. The pattern of the sensor array's response depends on the particular chemical types present in the air.

The instrument can analyze volatile aerosols and vapors, help monitor cleanup of chemical spills or leaks, and enable more intensive chemical analysis by collecting raw data and streaming it to a computer at JPL's ENose laboratory. The instrument has a wide range of chemical sensitivity, from fractional parts per million to 10,000 parts per million. For all of its capabilities, the ENose weighs less than nine pounds and requires only 20 watts of power.

The ENose is now in its third generation. The first ENose was tested during a six-day demonstration on the STS-95 shuttle mission in 1998. That prototype could detect 10 compounds, but could not analyze data immediately. The second-generation ENose could detect, identify and quantify 21 different chemicals. It was extensively ground-tested. The third-generation ENose includes data-analysis software to identify and quantify the release of chemicals within 40 minutes of detection. While

it will look for 10 chemical types in this six-month experiment, the new ENose can be trained to detect many others.

For more information about the ENose and the Advanced Environmental Monitoring and Control Project, visit: aemc.jpl.nasa.gov/instruments/enose.cfm

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