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## **Test demonstrates weapon in-flight performance system**

Lab researchers, in collaboration with researchers from the Department of Energy's Kansas City Plant, Lawrence Livermore National Laboratory and Sandia National Laboratories, recently demonstrated an instrument system that can transmit mock nuclear weapon performance data until the point of detonation.

The researchers have performed ground and flight tests on the telemetry system, which eventually will aid in the assessment of the engineering and physics performance of nuclear warheads during flight conditions. Such assessments are necessary because researchers previously have demonstrated that even the most thorough ground testing and simulation of a missile can fail to detect in-flight conditions that might adversely affect the performance of the warhead after launch.

The heart of these systems is the High-Explosive Radio Telemetry System, which transmits a variety of data during the missile's flight as well as performance data from the weapon's high-explosive component as it detonates. Such data can help those monitoring the weapon from a control center determine whether systems inside the weapon are functioning properly, and detect changes in vibration, temperature, acceleration and other variables during flight.

Los Alamos is focusing on HERT instrumentation for the W76 submarine-launched missile system. Researchers from Los Alamos, Lawrence Livermore, Kansas City and Sandia also will use HERT on other weapons systems in the stockpile.

The researchers are collaborating on a new-generation HERT system that can transmit data in high-shock and low-shock environments, improving the reliability and reporting capability of the system. Researchers are using advanced manufacturing techniques and cutting-edge components to ensure that the next-generation HERT system, called HERT Mark II, is smaller and lighter weight than the previous system.

Earlier this month, a research team from Los Alamos, Lawrence Livermore, Sandia and Kansas City tested the HERT-Mark II-based system in a Lawrence Livermore re-entry vehicle flown from Vandenberg Air Force Base in California to Kwajalein island in the South Pacific. The team successfully collected data during the test and was pleased with the results.

This test was a true team effort on the part of all involved," said Miles Baron of Primary Design and Assessment (X-4), who is the Joint Test Assembly Coordinator. "This successful flight test not only proved the utility of this remarkable technology, but it also showed that the weapons complex can, and does, come together effectively in a team environment. The HERT team is to be commended for its effort."

Before the flight test, researchers had tested HERT systems in an explosive environment. The team was able to collect and analyze data successfully from a series of explosive tests, lending further credibility to the systems' utility and potential.

HERT units will become an essential tool for evaluating the performance of the nation's stockpile using mock nuclear components in actual flight conditions, Baron said. This testing will help ensure the safety, reliability and performance of United States nuclear weapons.