Subcritical experiment plays crucial role in Stockpile Stewardship

by Ron Gibson

The unicorn was considered a harbinger of good fortune and a prophet of great things to come in ancient Asia, and while the Los Alamos National Laboratory's (LANL) subcritical experiment of the same name, and its sister experiment, Krakatau, are anything but mythical, LANL expects as much from these experiments as perhaps, the Asians did from their fabled creature.

The fortune Assistant Manager for National Security **Deborah Monette** expects from these experiments is rooted in what she describes as their "the multi-faceted value."

"Krakatau and Unicorn will provide the critical, real-time performance data the national laboratory's 3-D computer codes need to certify our nation's nuclear deterrent," explained Monette. "Add to that the ability to exercise the skills and equipment to prepare, execute and capture data with 21st century diagnostics and you have what I believe to be the best environment to attract our nation's 'brain trust' of scientists, engineers and managers through meaningful experiments."

Among the "brain trust" charged with the success of the upcoming subcritical experiments is **Robert Braddy**, assistant general manager for stockpile stewardship, who echoed Monette's sentiment.

"Since the advent of the 1992 moratorium on underground testing, subcritical experiments, beginning in 1997, have become a crucial part in our mission to maintain the safety and reliability of our nuclear weapons stockpile," said **Braddy**. "They also help us maintain the requisite skills employees at the Nevada Test Site and nuclear weapons laboratories need to properly execute tests and obtain useful data."

Kismet, the first dynamic experiment conducted in U1a in 1995, showed the difference between laboratory and field experiments.

"It was a disaster," Braddy said. "We lost data because we skipped some of the steps we would have normally taken during an actual underground test." Braddy said the national laboratories have since learned from Kismet, conducting subcritical experiments in much the same way as a live, underground test -- barring the nuclear explosion, of course.

"Chemical high explosives are used to generate high pressures applied to nuclear weapons materials," explained Braddy. "Since the configuration and quantities of the explosives are insufficient to cause a self-sustaining nuclear fission chain reaction, the experiments are called subcritical."

All of this takes place far below the Earth's surface - approximately 1000 feet in the case of Krakatau, a subcritical experiment planned for sometime within the first three months of 2006. According to Dr. Nick King, LANL Senior Fellow and diagnostic manager for Krakatau, it is the most complex subcritical experiment to date.

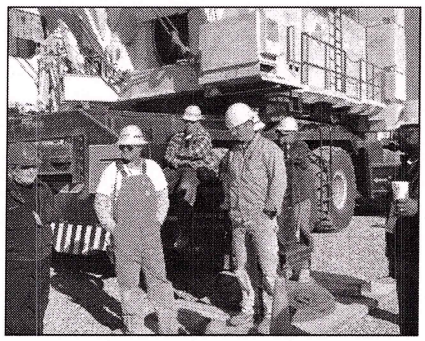
"We'll be utilizing a racklet concept in which the experiment and diagnostic probes are placed in a hole 30 feet deep in a tunnel floor 1,000 feet below the surface," explained King. "Data capture will be in a reusable recording room complex both above and below ground."

King said that configuration is cost effective because it permits a reuse of the facility, adding that analysis and use of the key data gleaned from Krakatau will happen for years following the experiment.

The Unicorn experiment is buried a bit shallower at 624 feet, with an 88-inch diameter steel surface casing for the first 117 feet. Unicorn's vertical emplacement utilizes technology that has gone unused for many years. According to LANL Program Manager Dennis Barker, the reconstitution of equipment and personnel skills began in late 2002. Unicorn is the culmination of the Stallion series of subcritical experiments.

"The U6c site designated for Unicorn was originally developed for the Fortune nuclear test scheduled in the 1990s." Barker said. "Following Unicorn, simpler tests are planned for 2007 in U1a that are expected to take far less time to execute because they will take advantage of existing infrastructure at the Nevada Test Site."

Both experiments take less than a fraction of second, but will yield valuable data regarding the key components of nuclear weapons materials, namely plutonium, and how it reacts under high pressure.



***Kathy Carlson** talks with craft workers as they disassemble the tower assembly for Centaur, the confirmatory shot prior to conducting the Unicorn experiment. From l. to r., **"Bud" Warren, Jeremy Bentz, Danny Kranjcevich, Danny Ellis,** and **Cle Threats**.*

Braddy said nuclear weapons designs were empirically tested at the Nevada Test Site. This testing left large gaps in what is known about plutonium and how it reacts under different pressure regimes. These subcritical experiments are one method available to support the national laboratories and the National Nuclear Security Administration's (NNSA) assessment of the nuclear stockpile, which contains some weapons as old as 40 years.

Braddy compares maintaining our nuclear stockpile to a classic car's upkeep.

"An old car is only as good as the maintenance it gets, and you could say the same about our nuclear stockpile," Braddy said.

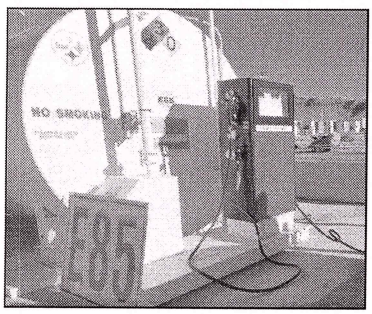
Of course, certifying the reliability of the U.S. nuclear arsenal entails more than looking under the proverbial hood. The $200 million stockpile stewardship program, with more than $60 million allocated for subcritical experiments, is a congressionally-mandated requirement. The NNSA, national laboratories, and Bechtel Nevada managers, scientists, technicians and support staff constantly seek more effective, efficient, and responsive ways to evaluate the readiness of the US nuclear arsenal.

"Certification of the enduring stockpile, without nuclear testing, will continue to be the driving force behind maximizing the value of these subcritical experiments," Braddy said. "We'll continue to improve our processes and work smarter and harder to get the most 'bang for our buck.'"

E-85 makes "cents"

by Ron Gibson

"A single vehicle reduces the consumption of gas by 85 percent alone, and we don't sacrifice a shred of performance with that reduction."



The Southwest view of the E-85 station and credit card reader.

Activation of the latest E-85 fueling station Sept. 29, 2005, in Mercury, has everyone at the Nevada Test Site (NTS) breathing a little bit easier these days.

The ethanol-based E-85 fuel featured at the station reduces smog pollutants by one- quarter and greenhouse emissions by as much as 40 percent in Alternate Fuel Vehicles, contributing to cleaner, more breathable air.

The collective sigh of relief and satisfaction merely begins with the environmental accomplishment, however, according to Assistant General Manager for NTS Operations **John Howanitz**.

He was even more impressed with the mere weeks it took from final procurement to activation.

"We wanted the station ready no later than the end of the fiscal year [2005], and we got the job done with the help of our procurement, maintenance, and construction professionals with a day to spare," explained Howanitz. "I'm pleased with the work that was done, and I'm pretty sure our customers are satisfied."

The station is only the third of its kind on the entire Department of Energy complex and will help the NTS meet Presidential Executive Order 13149, which calls for a 20 percent reduction of petroleum fuel usage in the federal vehicle fleet. Absent a presidential directive, the station still would make sense in a time with ever-increasing gas prices, said Howanitz. E-85 costs less per gallon than unleaded fuel, which offsets the lower vehicle miles per gallon efficiency.

"A single vehicle reduces the consumption of gas by 85 percent alone, and we don't sacrifice a shred of performance with that reduction," said Howanitz. "Considering the amount of time our workers can spend commuting as part of their duties, this station was, quite simply, a great idea."