

Successful Hydrotests Completed at DARHT

Dynamic Experimentation (DX) Division scientists at the Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility successfully completed two essential hydrotests in 2005. Hydroshots 3625 and 3612 were part of a test series designed to gather data on the LANL-developed W76 warhead, which is carried on Trident submarine-launched ballistic missiles.

Hydrotest 3625 was conducted April 1, 2005, and hydrotest 3612 was conducted 3 months later on July 1, 2005. Results from these two hydrotests allow researchers to compare data with hydrocode predictions that eventually will be factored into refurbishment requirements for final certification of NNSA's W76 Mod 1 Life Extension Program (LEP).

DARHT is a LANL high-explosives (HE) firing site that has hydrodynamic experiment capabilities; i.e., measurements are made at the extreme temperatures and pressures generated by the detonating HE, wherein the tested metals flow like fluids. Scientists use DARHT's flash x-ray machine and cameras to study the implosion characteristics—recording interior images during implosion—of nonnuclear mock-ups of nuclear weapon components.

Hydrotests fall into one of two categories: joint radiograph and implosion pin (JOPIN) tests and gas cavity tests. Although DARHT can accommodate both types of hydrotests, it is the world's most capable gas-cavity test facility. LANL has conducted numerous gas cavity tests, including 3605 and 3623 (in 2004 for the W76 Mod 0 LEP) and 3625 (in 2005 for the W76 Mod 1 LEP). Recent JOPIN



Containment foam. Before the tests, technicians filled a tent-like structure with an aqueous foam to limit dispersal of materials such as beryllium, depleted uranium, and lead into the environment. Although hydrotest 3625 was a gas cavity test and hydrotest 3612 was a JOPIN test, they used similar foam containment systems to avoid contaminating the environment.

tests at DARHT include 3596 (in 2004 for the W76 Mod 0 LEP) and 3612 (in 2005 for the W76 Mod 1 LEP).

Gas cavity hydrotests

- have a small field of view,
- require a compact setup geometry,
- can “see through” very opaque object features that are difficult to radiograph, and
- use the gamma-ray camera (GRC) as a principal diagnostic tool.

JOPIN shots, which do not require the full radiographic intensity of DARHT,

- have a very large field of view,
- can “see through” transparent object features that are easily radiographed,
- are concerned with case and other device components,
- diagnose early-time implosion with pins, and
- use many different diagnostics.

The manufacture of some W76 replacement components, scheduled to begin in late 2006, will be based in part on the results of the DARHT W76 test series. Before manufacturing begins, LANL will conduct confirmatory experiments to ensure that the new components perform as well as those built