



# Hydrodynamic Testing

## What is hydrodynamic testing?

Hydrodynamic testing (hydrotesting) is the execution of high-explosive-driven experiments to assess the performance and safety of nuclear weapons. Under test conditions the behavior of solid materials is similar to liquids, hence the term “hydrodynamic.” These large scale hydrodynamic experiments utilize test assemblies that are representative of nuclear weapons but with the fissile material in an actual weapon altered or replaced with surrogates. A suite of high performance diagnostics (including high speed cameras, high energy radiography, and fiber optic and electrical-based measurements) are used to understand the hydrodynamic behavior of a simulated nuclear weapon primary implosion.

## Why is hydrodynamic testing needed?

Hydrodynamic testing is a central component in maintaining nuclear weapon design and assessment capability. Hydrotesting, coupled with high performance computer modeling and simulation, is now used to certify the safety, reliability, and performance of the nuclear physics package of weapons without underground nuclear testing. Radiographic images and other data from hydrotesting help ensure continued confidence in NNSA’s assessments of nuclear weapons by:

- Providing data for representative nuclear weapons geometries
- Fine tuning computer modeling of nuclear weapons performance and behavior
- Evaluating effects of aging on materials
- Evaluating performance of remanufactured or new materials and components

## Where does NNSA currently conduct hydrodynamic testing?

The majority of stockpile stewardship hydrotesting is conducted at Lawrence Livermore National Laboratory (LLNL) in the Contained Firing Facility (CFF) at Site 300 and at Los Alamos National Laboratory (LANL) at the Dual Axis Radiographic Hydrodynamic Test Facility (DARHT). Small scale hydrodynamic tests are also conducted at LANL, LLNL, Pantex, Sandia National Laboratories (SNL), and Nevada Test Site (NTS) to support surveillance, production, and other specialized needs.



## What are the alternatives NNSA is evaluating for hydrodynamic testing?

The No Action Alternative evaluates continued operations at the existing hydrotesting facilities. The Reduce-in-Place Alternative evaluates consolidation of hydrotesting at LLNL, LANL, and NTS; hydrotesting would be discontinued at Pantex and SNL/NM. The Consolidation at LANL Alternative evaluates the integration of the hydrotesting program at LANL; construction of a new CFF-like facility at LANL; discontinuation of hydrotesting at LLNL, Pantex, and SNL/NM; and maintaining the Big Explosive Experimental Facility (BEEF) at NTS. The Consolidate at NTS Alternative evaluates consolidation of the hydrotesting program at NTS; construction of new DARHT-like and CFF-like facilities at NTS; and the discontinuation of hydrotesting at LLNL, LANL, Pantex, and SNL/NM. NNSA’s preferred alternative is to consolidate/reduce operations in place, close the CFF in approximately 2015, and plan for consolidation at NTS when the DARHT facility approaches end of life in approximately 2025.

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