As the only facility of its kind in the world, the High Explosives Applications Facility (HEAF) has a distinguished 25-year history of providing vital contributions to national security. Accomplishments include:

Stockpile Stewardship

- Demonstrated through years of material science R&D that the explosives used in Lawrence Livermore National Laboratory (LLNL) nuclear weapons have no significant aging problems, and therefore do not limit the lifetime of the LLNL designs in the national nuclear stockpile.
- Developed age-aware explosive performance models supported by high-fidelity experiments that have been applied to nuclear stockpile questions of national importance.
- Developed and implemented detonation performance tests and models (such as the modified James Criterion) to establish performance margins for the initiation systems in stockpile systems.
- Developed and implemented hazards response experiments (such as the Scaled Thermal Explosion Experiment, and Flash Radiography of Thermal Explosions) to develop, parameterize and validate hazards response models used for stockpile safety assessments.
- All of the above activities support the annual assessment to the U.S. President regarding the reliability of the nuclear stockpile.

Advanced Modeling and Simulation

- The Cheetah code was developed to predict explosive detonation performance based on thermochemistry and detonation physics, and is used by about four hundred scientists and engineers nationwide in support of national defense.
- The concept of coupling thermal transport, slow mechanical motion and chemistry into a hydrocode was an idea with HEAF as its center of mass. This has matured into ALE3D, which is used today at LLNL and elsewhere to solve problems for the National Nuclear Security Administration (NNSA), Department of Defense (DOD), National Aeronautics and Space Administration (NASA) and other agencies.

Diagnostics

- Implementation of 3D Computed Tomography instrument for explosives for full-scale nuclear weapon parts and homemade explosives. This is the only such instrument in the Department of Energy (DOE)/NNSA complex and has been heavily used for homeland security as well as stockpile stewardship.
- Refinement of Fabry-Perot interferometry, including dual speed Fabry-Perot, to provide previously unavailable information on dynamics of materials driven by explosives.
- Invention of Photon Doppler Velocimetry, which has become adopted world-wide as a high-fidelity and easy-to-deploy and use dynamic diagnostic.

New Energetic Materials

- LLM-105, now being finalized as LX-21 for improved booster for LEPs and as LX-22 for possible use as main charges.
- Invention of dozens of new energetic materials of interest to NNSA and the Department of Defense. LLM-105 emerged from this program.
- First formulation and large-scale testing of CL-20 as LX-19 (high explosive invented at China Lake).
- High-precision high-power injection moldable explosive, LX-20, used in large shaped charges (270-500 mm diameter).

Support of Energetic Material Community

- Developed the LLNL Explosives Reference Guide, an online reference source with a wide range of scientific information on energetic material; frequent updates with new information. Used by more than 1,000 scientists and engineers in support of national defense.
- U.S. editor of international journal *Propellants, Explosives, and Pyrotechnics*; co-sponsor of International Detonation Symposium series.

Operational Excellence

- Long-standing focus on safety, as implemented through a functional Facility Safety Plan that is used as a reference and through the explosive Peer Review process, with result of no explosive-related accidents or injuries in HEAF since its opening.

- A true sense of community.