

Mission. Provides safety test data to support the Insensitive Munitions Advanced Development (IMAD) Program to ensure weapon systems deployed are safe to handle and do not react violently during a fire or other incidents involving bullet impact, fragment impact, or sympathetic detonation.

Unique Features. This is the only open-air laboratory complex that can conduct bullet impact, fragment impact, 40-foot drop, and fast and slow cookoff tests with up to 3,000 pounds of high explosive material. The CT-4 range has one of the only fragment projector guns capable of shooting the required 8,300 feet per second velocity for fragment impact testing.

Combat Support. The IMAD Program safety test requirements provide a safer weapon system for deployment of new weapons and as weapon system upgrades occur, each weapon is subjected to the safety test series to provide safety validation for our warfighters.

Cost / Time Savings. Capabilities that allow all IM and safety tests to be conducted at one location greatly reduce cost and time for customers. In addition, in-house photography and instrumentation provides for a very fast and low cost turnaround for all data acquisition regarding testing.

RDT&E. These facilities provide test data to identify potential defects in design that can cause catastrophic events, killing civilian or military personnel and destroying Government material. The current capability is used by all DoD components using China Lake for the Joint Weapon System Programs safety evaluation. Data are gathered for analysis, interpretation, and environmental consideration. The staff develops specifications and test methods using MIL-STD and NATO standardization agreements (STANAGs) to ensure warfighter safety. CT-1 and CT-4 are used exclusively for safety test events. These areas are in constant use. Every weapon system manufactured today must be approved through the IMAD insensitive munitions and safety test series.



Fast Cookoff Testing



Slow Cookoff Testing

- Major Safety Programs.** NAWCWD also coordinated and managed a number of DoD and Navy IM technology efforts, such as the NAVAIR Insensitive Munitions Technology Transition Program (IMTTP), the Navy IMAD Program, and the DoD Joint Insensitive Munitions Technology Program (JIMTP). For example, researchers and chemists used novel ingredients to formulate beyond-the-state-of-the-art energetics formulations that enhance the safety and performance of propellants and explosives. In addition, its capability to conduct multifaceted and detailed design and analysis allowed the Department to take the lead in several science and technology (S&T) efforts, such as Future Naval Capability (FNC), Joint Capabilities Technology Demonstration (JCTD), and IM projects.



Annually, hundreds of characterization and safety tests are performed. As a direct result, cutting-edge technologies were introduced to the Fleet in the form of modifications or improvements. Other work included the conception, design, and application of complex M&S hardware and software development and support, risk mitigation, and failure investigations and resolution.

- JIMTP Projects.** The JIMTP Program uses China Lake's safety test facilities for a wide array of very successful IM projects including second-generation multi-point detonating system, high-energy propellants for IM-compliant Joint Service applications, IM signature propellants for joint services IM applications, insensitive high-performance reduced-smoke propellants, emerging energetic binder systems, mitigation of sympathetic reaction in BLU-111, and bonding agents for minimum-signature propellants and extinguishable propellants.

Size / Description / Scope. The CT-1 and CT-4 safety test areas are approximately 2.1 square miles. The CT-4 site is bordered by mountains to the East and North and uninhabited desert to the South and West. The CT-1 site is surrounded by open desert. The nearest test site to the China Lake boundary is 1.5 miles and approximately 9 miles (CT-1) to 12 miles (CT-4) from the Main Site of the Base. The explosive limit for this test area is 3,000 pounds. **Year Opened:** 1984. **Annual Test Events:** 50. **Plant Value:** \$4.5M+.

Main Facilities.

Safety Test Area (“CT-1”). Conducts high-hazard safety tests for IM purposes. CT-1 has one major slow cookoff test site. Tests are operated remotely from a protected control room. Instrumentation consists of video, temperature, strain, pressure, and accelerometer data.

Safety Test Area (“CT-4”). Conducts high-hazard safety tests for IM purposes and consists of the following sites: fuel fire cookoff, bullet impact, fragment impact, and a 40-foot drop tower. Tests are operated remotely from a protected control room. Instrumentation consists of temperature, high speed video, strain, pressure, and accelerometer data.



Equipment. The 40-foot drop tower simulates an aircraft carrier's flight deck to hangar deck drop of weapons in various attitudes. There are three main-barrels for .50 caliber ammunition firing. The balance of test events is represented by the fast cookoff site that consists of an environmental bladder for the jet petroleum dump to simulate an aircraft fire.

Instrumentation. The instrumentation consists of a data acquisition system and high-speed video that provide accurate and vivid representation. Post-test mapping and fragment documentation provide the necessary data to evaluate the hazard zone for each weapon system. Instrumentation includes a 40-foot drop tower, a 40-mm fragment gun, .50 caliber and 7.62-mm gun barrels, and a permanent pit.

Interesting Facts. This test capability is the result of identifiable fleet disasters aboard the USS *Forrestal* in 1967 and the USS *Enterprise* in 1969. Aircraft sitting on the flight decks of these aircraft carriers were engulfed in flames. Warheads began detonating, which caused other weapon systems to sympathetically detonate. A total of 162 sailors died and another 505 were wounded between the two incidents. The Navy's tragedies were preceded by other similar events in Army, Air Force, and Marine Corps ammunition dumps in Vietnam in the mid to late 1960s.



The IMAD Program is the result of these events, and the China Lake investigation into the fire and ammunition response began in 1972 at the Skytop outdoor propulsion laboratory. The confined test and evaluation facility did not provide adequate or reliable data to properly identify the hazards of fire and fragment impact on explosive ordnance. The CT-4 fast cookoff facility using jet petroleum, propane, and wood fires began in approximately 1973 in open area test ranges so that more realistic patterns of fragment dispersal could be evaluated.