



# EMRTC

**ENERGETIC MATERIALS RESEARCH AND TESTING CENTER**

Workers from Sandia National Laboratories and the Energetic Materials Research & Testing Center (EMRTC) at New Mexico Tech. *Photo by Randy Montoya*



*The Energetic Materials Research and Training Center (EMRTC), a research division of New Mexico Tech, performs Research, Development, Testing, and Experimentation (RDT&E) of all types of energetic materials from improvised explosive devices to Military munitions. It also offers courses for emergency responders in response to terrorist bombings. The 40-square-mile (100 km<sup>2</sup>) field testing and training areas are located west of the town of Socorro, New Mexico, in Socorro County as well as in Playas, New Mexico, in Hidalgo County.*

# EMRTC

WORKING TO KEEP PEOPLE SAFE SINCE 1947



## A HISTORY OF SUCCESS

The New Mexico Institute of Mining and Technology's (NMT) Energetic Materials Research and Testing Center (EMRTC) has a well-earned reputation for high quality, responsive, cost effective, technically reliable work. EMRTC has its roots in the very important, successful activities of Dr. E. J. Workman and his team in the development of the Variable Timing (VT) fuze—commonly known as the proximity fuze—during World War II.

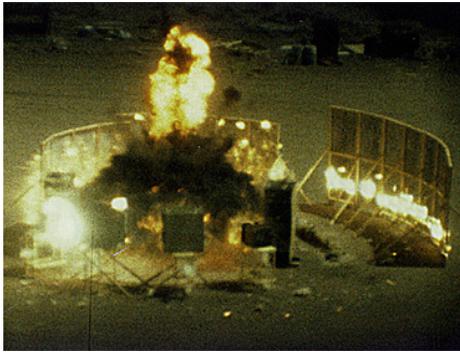
In 1946, Dr. Workman relocated his team from what was then known as the New Mexico Experimental Range in Albuquerque to form the Research and Development Division

at the New Mexico School of Mines in Socorro, now the New Mexico Institute of Mining and Technology (New Mexico Tech).

To evaluate the effectiveness and proper functioning of the proximity fuze, Dr. Workman's team also had to investigate related areas such as stress loads, blast damage effects, and fragmentation patterns. They were then able to fully examine the nature of various explosive effects. So began the science of energetic materials testing.

This fuze system had to be ruggedized to withstand the acceleration forces associated with launch and flight. Essentially the proximity fuze was a radar system

that transmitted and received reflected electromagnetic energy from potential targets.



Arena test

It is typical of EMRTC to start with a specific problem, identify and explore difficult areas of the problem, identify solutions and investigate and share potential impacts to other technologies. This approach has led to numerous inventions and many patents.

During its 71-year history, EMRTC has evolved, in part, as the result of mergers with other related organizations at New Mexico Tech, and the incorporation of their missions, highly skilled science and engineering staff, and their technological capabilities.

As a major component within the overall complex of research, development, test, and evaluation (RDT&E) activities at New Mexico Tech, EMRTC draws upon the assets and capabilities of the other RDT&E activities, as well as those of the various academic departments,



to complement and enhance its technical base, providing valuable synergy of the technical community as a whole.

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*EMRTC is a world-class RDT&E complex of more than 30 test facilities located within its 40 square mile field research laboratory.*

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C4 shot

## **BUILDING ON THAT SUCCESS**

EMRTC today is a world-class RDT&E complex of more than 30 test facilities located within its 40 square mile field research complex. A close-knit team of more than 100 highly experienced, technically proficient, multi-talented professionals perform

in-depth science and engineering investigations and studies in a number of technological areas in conjunction with:

- Departments of Defense, State, Justice, and Transportation
- Los Alamos National Laboratory
- Sandia National Laboratory
- Lawrence Livermore National Laboratory
- Other academic institutions, such as Louisiana State University, Texas A&M University, Georgia Institute of Technology, New Mexico State University, and the University of New Mexico
- Various commercial entities such as Aerojet Rocketdyne, Orbital ATK, ARA, Honeywell, Lockheed-Martin, Raytheon, along with others.

## **APPLIED TECHNOLOGY DIVISION**

The Applied Technology Division (ATD) performs research, design, engineering, analysis, fabrication, and experiment supervision. Our engineers and scientists have more than 150 years of experience performing energetic materials research and experiments in interior and exterior ballistics, projectile and sabot design, warhead design and fabrication, structural and non-structural building component construction and testing, anti-terrorism research, hydrocode modeling, explosives testing, sled track design and testing, rocket engine testing, data reduction and analysis, and professional report preparation.



TNT shot



Sled Tra

The ATD works closely with the other divisions at EMRTC providing customers with world-class research and experimentation programs.

### FIELD LABORATORY FACILITIES

EMRTC's 40 square mile field testing laboratory is located in the mountains adjacent to the New Mexico Tech campus. All-weather roads provide access, with the most remote site located only 25 minutes from the main offices. The semi-arid climate allows year-round use, with very few inclement weather days. The mountainous terrain provides security and natural backstops for containing/shielding the effects of



5,000 lb shot

diverse sources such as explosives, propellants, electromagnetic radiation, directed energy, etc.

EMRTC can store more than 500,000 pounds of explosives on site. Appropriate federal and state permits, as well as approved monitoring systems, are in place for conducting investigations involving high explosives munitions, flash x-ray systems, and both conventional and hypervelocity gun systems.

### HIGH PERFORMANCE MAGAZINE

The High Performance Magazine Site, developed for scaled structure experiments that require a large recovery area, has been used for NATO testing of quarter scale aircraft shelters, and for evaluating the survivability/vulnerability of magazine structures. This site has been used for large detonation overpressure tests involving in excess of 20,000 pounds of explosives.



d Track

## **COOK-OFF SITE**

Cook-Off Site was recently constructed for dedicated use in Insensitive Munitions (IM) test programs. Fast and slow cook-off experiments on large and small items can be conducted.

## **SLED TRACK**

The 1,000-foot monorail track is used for dynamic testing of warheads, penetrators, and shape charges. It provides a dynamic method of precision impact control for target penetration studies, development of hard target penetrators, and proof of concept testing. Velocities up to 1,800 feet per second are achievable.

## **GUN RANGES**

The EMRTC field laboratory contains a number of gun ranges providing firing ranges from point blank to more than 5,000 meters. Several of the ranges support large- and small-scale

explosive experiments, fragment projector experiments, warhead characterization tests, large and small caliber gun firings, fuze evaluations, IM testing, target response to single and multiple impacts, vulnerability assessment experiments, fragment or debris distribution studies, tactical rocket firings, and vehicle and running engine experiments.

## **STANDARD AND HYPERVELOCITY GUN SYSTEMS**



20,000 lb shot

EMRTC's diverse inventory of gun systems—and its ability to modify these systems to meet ballistic

experimental requirements—is a major asset. U.S. Army and Navy standard gun systems (5.56 NATO to 8-inch Howitzer) are available on site. EMRTC has designed and modified a large range of gun systems that are used to fire specialized/prototype projectiles and fragments at more than 6,500 feet per second. EMRTC also owns a two-stage light gas gun with a 1.5-inch diameter launch tube that can fire projectiles at velocities greater than 21,000 feet per second.

### **COUNTERMINE TEST FACILITY**

The Countermine Test Facility, developed to test and evaluate technologies for detecting and

disarming anti-tank mines, anti-personnel mines, and unexploded ordnance (UXO), has recently been expanded to include more test tracks and an unimproved field area.

### **RESEARCH & DEVELOPMENT**

EMRTC's numerous field test sites and laboratory facilities offer a unique complex for conducting research and development (R&D) in areas such as process safety, chemical analysis, explosives processing, formulation and characterization, computer modeling and simulation, and counter-terrorism.

### **ENERGETIC MATERIALS**

EMRTC researchers can conduct



Large ANFO shot

analyses of anything from low-level explosives contamination, to post-blast residue. The lab also houses an array of small-scale thermal analysis equipment as well as small scale safety testing equipment. Active research programs are ongoing in explosives detection, compatibility, forensics, thermal hazards, aging, and mechanistic decomposition. Additional capabilities include a 2-ton pilot plant processing bunker, remote building and extensive wet-lab facilities can be used to prepare a large assortment of energetic materials, including common pyrotechnics, isotopically labeled explosives, and a wide variety of improvised explosives.

One highly unique feature of EMRTC is the Torres Laboratory complex. Its dedicated melt-cast and pour building, 2-ton pilot plant processing structure, remote mix building and extensive wet-lab facilities can be used to fabricate a large assortment of energetic materials, ranging from common pyrotechnics and isotopically labeled explosives, to a wide variety of improvised explosives (replicating materials used in actual terrorist attacks). Test charges have ranged from milligrams to tons.

A strong contract base in the commercial sector has resulted in an expanding expertise in ammonium nitrate explosives, pyrotechnic mixtures, air-bag propellants,



Playas Operation Angle Thunder

reactive chemicals, and other exotic formulations not traditionally studied by standard explosive research programs.

## **FORMULATION AND SYNTHESIS**

A strong contract base in the commercial sector has developed extensive expertise formulating Fuel/Oxidizer energetics including: AN/Chlorates/Peroxides/Etc., ammonium nitrate explosives, pyrotechnic mixtures, air-bag propellants, reactive chemicals, and other exotic formulations not traditionally studied by standard explosive research programs.

## **COUNTER-TERRORISM**

With the increase of terrorism worldwide, the need for blast resistant buildings are increasingly more important and is in high demand. EMRTC is working with our customers to develop technologies for protecting our nation from terrorist attacks.

## STRUCTURAL AND NON-STRUCTURAL TESTING

EMRTC is currently performing multiple R&D efforts investigating the effects of blast overpressure on building materials and both structural and non-structural components. This includes items such as I-beams, columns, windows, doors, infill walls, and facades. Tests on infrastructure such as bridges, tunnels, and other components, are also conducted.



Small arms firing

## SMALL ARMS RANGES

EMRTC has multiple areas where small arms can be fired at extreme ranges both flat and high-angle. This capability can be supported with Doppler radar, Schlieren or Shadowgraph imaging diagnostics for bullet design and development.

## SUPPORT SERVICES

EMRTC field investigations and R&D programs are supported by state-of-the-art data collection and processing systems, comprehensive machine shop and fabrication facilities, including a wide variety

of heavy equipment that allows for rapid preparation and restoration of test sites, as well as construction of test structures.

## INSTRUMENTATION

EMRTC has more than 20 channels of orthogonal flash x-ray available for use in testing, including 150 kilovolt, 450 kilovolt, and 1 megavolt systems. EMRTC also has a wide range of fixed and portable electronic digitizers that cover needs from very slow digitizer rates up to 1 nanosecond per point. Numerous computer controlled data collection systems are available for enhancing ballistic analyses.

## IMAGING

EMRTC owns and operates multiple Phantom and Photron digital High-speed video cameras, with up to 2 million frames per second frame rates available.



Training at PTRC

## TRAINING PROGRAMS

EMRTC provides DHS/FEMA



### Helicopter Rescue

certified training courses for local, county, and State First Responders. These courses are listed on the EMRTC website and include both on and off-site training. Over 525,000 First Responders have been trained by EMRTC, both in Socorro and off-site. Graduates of these programs are uniquely qualified to assist their communities in preparation for and response to bombing incidents, which includes critical response operations. EMRTC also conducts an Explosive Firing Site and Laboratory Safety Course for other agencies and contractors.

### **PLAYAS TRAINING AND RESEARCH CENTER (PTRC)**

EMRTC also owns a complete town in Southwestern New Mexico that is used as a research facility/training center for urban operations and has several outlying villages that are used for training that simulates other parts of the world. PTRC serves

government and industry clients, nationally and internationally, that require controlled environment, reality-based testing and training venues in any aspect of physical security provides a unique, adaptive, controlled, and comprehensive range platform to advance the effectiveness and appropriateness of client tactics, techniques, and procedures.

### **UNMANNED AERIAL SYSTEMS (UAS)**

The EMRTC facilities in Socorro and Playas are both within an FAA approved Flight Test Center Airspace operated by New Mexico State University (NMSU). NMT and NMSU work closely together to fly UAS's for testing/training. Flights may occur in over 15,000 square miles of coordinated airspace featuring a very low volume of aviation traffic and overlies mostly undeveloped Government owned land.

## EXPANDING TECHNICAL HORIZONS

As it was, more than 50 years ago, with the development of the proximity fuze and all of the technologies and applications that resulted, EMRTC stands poised to extend its military, space, and commercial systems capabilities to better meet the diverse and complex challenges of its wide and varied customer base. EMRTC is an extremely capable and unique facility from the 40 square mile test range, to the New Mexico Tech faculty and students that participate in the research and testing programs.



*For additional information regarding  
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and training schedules, please contact:*

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