

New Mexico Tech

ENERGETIC MATERIALS RESEARCH AND TESTING CENTER

801 Leroy Place Socorro, NM 87801

Phone: (505) 835-5312 Fax: (505) 835-5630 <http://www.emrtc.nmt.edu>

The Energetic Materials Research and Testing Center (EMRTC), a research division of the New Mexico Institute of Mining and Technology (NM Tech), in Socorro, New Mexico, provides a comprehensive, state-of-the-art working laboratory for conducting research, development, test and evaluation (RDT&E) of ordnance, explosives and energetic materials; their enabling componentry; their delivery systems and methodologies; and their associated technologies to obtain high quality, technically sound data for dissemination to government, academic, and commercial sponsors and customers. This includes the development and conduct of training courses in areas such as, but not limited to, explosives handling and safety, emergency response, terrorist incident responses, and anti-terrorist methods.

Throughout its 50+ years' history, EMRTC has a well-earned reputation for responsive, cost-effective, and technically reliable work. Its highly experienced, technically proficient team of more than 100 multi-talented professionals perform in-depth scientific investigations and studies in a number of technology areas in conjunction with/or for the Departments of Homeland Security, State, Defense, Justice, Energy, and Transportation; the Environmental Protection Agency; Los Alamos, Sandia, and Lawrence Livermore National Laboratories; many other academic institutions; and various commercial/industrial concerns.

TRAINING PROGRAMS

EMRTC plays a lead role in the development and conduct of training of federal, state, tribal, local and allied government personnel, both in the classroom and at its field laboratory sites and facilities.



EMRTC/NM Tech serves as an active member of the National Domestic Preparedness Consortium (NDPC), a partnership of public universities and the Departments of Homeland Security, Justice and Energy. The NDPC supports the efforts of Homeland Security's Office of Domestic Preparedness by providing emergency response training. EMRTC is the lead NDPC partner

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

for explosives and firearms, live explosives, and incendiary devices training.

Through its Domestic Counter-Terrorism Training Program, EMRTC has developed and is currently conducting *Incident*

Response to Terrorist Bombings courses to provide both technical and operational awareness training for emergency responders such as firefighters, law enforcement officers, and other emergency response personnel who have a significant responsibility for responding to incidents involving explosives and incendiary materials and other weapons of mass destruction (WMD).

EMRTC's *Explosive Firing Site and Laboratory Safety Course* offers training in the safe handling and use of explosives during research and testing activities. Topics include basic properties of explosives, required safety procedures for testing explosives, characterization testing methods, instrumentation

techniques, and procedures for safe storage, handling, and transportation.

EMRTC also offers specialized training in emergency planning for handling bomb, mail, and telephone threats.

As part of the Department of State's Anti-Terrorism Assistance Program (ATAP), EMRTC has been providing training in *Rural Border Patrol Operations* and *Hostage Negotiations* to enhance the anti-terrorism skills and capabilities of friendly foreign governments and to increase respect for human rights.

FIELD TEST FACILITIES

EMRTC's 40 square mile field testing and training laboratory, located in the mountains adjacent to the New Mexico Tech campus, offers more than 30 separate test sites, gun/missile ranges, and research facilities, along with an explosives storage capability of over 500,000 pounds. EMRTC performs 200-300 field tests per year.

Rocket Propulsion Systems Test Facility

The Rocket Propulsion Systems Test Facility (RPSTF) supports RDT&E of full-scale, liquid-fueled rocket engines and associated equipment that use "green" fuels.



The RPSTF includes two horizontal thrust structures, one rated at 8K pounds (lbs) of thrust and the other at 80K lbs of thrust. Planning is currently underway to expand the capability of the RPSTF to support testing of hydrogen

peroxide fueled rocket engines in addition to liquid oxygen and liquid nitrogen fueled engines.

Countermine Test Facility

The Countermine Test Facility, developed to test and evaluate technologies for detecting and disarming anti-tank and anti-personnel mines and unexploded ordnance (UXO), has recently been expanded to include more test tracks and an unimproved field area.

Gun Ranges

The EMRTC field laboratory contains a number of gun ranges enabling firings from point blank to 5,000 meters (16,400 feet).



Several of the ranges also support large- and small-scale explosive experiments, fragment projector experiments, warhead characterization tests, large and small caliber gun firings, fuse evaluations, insensitive munitions 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.

Shock Tube

EMRTC has a 6 meters in diameter by 30.5 meters long (20 feet by 100 feet) shock tube that allows the blast and shock effects of a nuclear explosion to be simulated using conventional explosives.

The Shock Tube provides over-pressure pulses up to 50 pounds per

square inch for periods up to 50 milliseconds. The tube is equipped with multiple instrumentation and camera ports.

Sled Track

This 300-meter (1,000 foot) monorail track is used for dynamic testing of warheads, penetrators, and shape charges. It provides a dynamic means of precision impact control for target penetration studies, development of hard target penetrators, and proof of concept testing. Velocities up to 550 meters/second (1,800 feet/second) are achievable (based on payload).

High Performance Magazine

The High Performance Magazine Site, developed for scaled structure experiments requiring 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 is also used for large detonation over-pressure tests involving in excess of 9,090 kilograms (20,000 pounds) of explosives.

Cook-Off Site

At the Cook-Off Site, recently constructed for dedicated use in insensitive munitions test programs, both fast and slow cook-off experiments on large and small items can be conducted according to MIL-STD-2105B.

RESEARCH AND DEVELOPMENT

Process Safety

The EMRTC Process Safety Group has investigated a wide range of industrial accidents and has examined a diverse group of issues ranging from thermal hazards to chemical incompatibilities. Several test sites at EMRTC—such as the Little Eagle Firing Chamber—are

used to reproduce chemical processing conditions.

Chemical Analysis

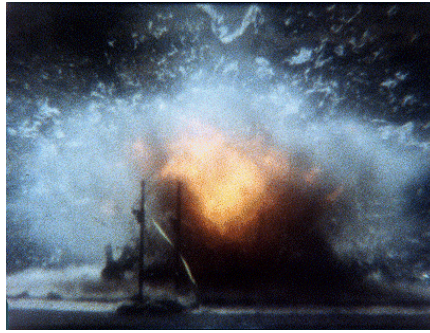
With its new state-of-the-art chromatography lab, EMRTC researchers can conduct analyses of anything from low-level explosives contamination to post-blast residue. The lab also houses an array of small-scale thermal analysis equipment. Active research programs in explosives detection, compatibility, forensics, thermal hazards, aging, and mechanistic decomposition are ongoing.

Explosives R&D



EMRTC scientists are pursuing active research programs designed to understand and better model the energy release of a variety of non-traditional, non-ideal explosives. Tests range from simple air-blast analyses to complex cylinder expansion tests.

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, to isotopically labeled explosives, to a wide variety of improvised explosives (to replicate 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, reactive chemicals, and other exotic formulations not traditionally studied by standard explosive research programs.

Insensitive Munitions Testing

EMRTC performs all types of Insensitive Munitions (IM) research and testing. While most of the IM testing is performed using Mil-Std-2105B guidelines, EMRTC has also used international specifications. The usual experiments include bullet impact, single and multiple fragment impact (gun-launched), slow and fast cook-off, shaped charge jet impact, sympathetic detonation, 12-meter drop test and spall impact tests. EMRTC also provides small-scale safety tests for sensitive materials and DOT classification.

Computer Modeling and Hydrocodes

EMRTC's Smoothed Particle Hydrodynamics (SPH)—a computational technique with unique capabilities for problem solving—is at the forefront of computer modeling of energetic materials. EMRTC's computational group built the first SPH code suitable for modeling the dynamic response of solids, extending the technique

from astrophysical gas dynamics into new areas of computational continuum mechanics of condensed matter.

Blast Mitigation and Explosive Effects

EMRTC performs multiple research programs for both government and private agencies involving structures, load bearing and non-load bearing walls, windows, curtain walls, vehicles and temporary shelters. With more than 30 different test areas available for testing, EMRTC is able to provide multiple tests, at reasonable costs, on schedule. Typical measurements include pressure, acceleration, vibration, strain and temperature.

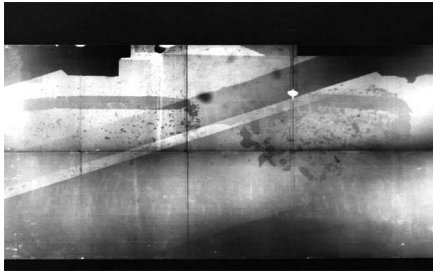
SUPPORT SERVICES

In addition to specialized modeling and simulation capabilities, fully equipped chemical and materials analysis laboratories, and advanced computer processing systems, EMRTC field investigations and R&D programs are supported by state-of-the-art data collection and processing systems; high-speed film, still photography, video, and radiographic collection and processing systems; comprehensive machine shop equipment and fabrication facilities; and a wide variety of heavy equipment that allows for rapid preparation/restoration of test sites, as well as for the construction of standard/non-standard structures for testing the ability of building materials and methods to resist the effects of energetic materials.

Instrumentation

EMRTC has more than 30 channels of orthogonal flash x-ray available for use in testing, including 150 and 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. A complete electronics calibration laboratory is used to calibrate digital and analog data collection devices to meet National Institute of Standards and Technology criteria.

Photography

Ultra high-speed, high-speed, and still photography in both color and black and white, 16 millimeter and 35 millimeter formats at speeds up to 40,000 frames per second are available for test support. Image motion compensation photography in these formats is also available, as are still photography and video Tape (SVHS and VHS). EMRTC processes all film (including x-ray film) in-house. High-speed movie film can be processed and available for study within 1 hour (overnight processing is standard). Film can also be transferred to video tape for editing and analysis.

NEW INITIATIVES

Microelectronics Programs

The effects of man-made or natural radiation can cause catastrophic damage to unprotected military, space, and commercial microelectronic components, thereby negating their proper performance. To deal with this problem, Congress, through the Defense Authorization Bill for

Fiscal Year 2003, awarded EMRTC \$8.2M to establish the MicroElectronics Testing and Technology Obsolescence Program (METTOP). In this program EMRTC tests, evaluates, and assesses the wide range of micro-electronic components used in military, space, and commercial applications. Under METTOP, EMRTC also procures and stores radiation tolerant electronic components and develops engineering solutions for microelectronic components that are obsolete and/or no longer available.

Playas RDT&E & Training Site



NM Tech is currently negotiating to acquire the entire town of Playas, NM, as a new RDT&E and training complex for Homeland Security, Homeland Defense, and related programs.

To Obtain Additional Information on EMRTC Capabilities, Facilities, Programs, and Training Courses and Schedules, Visit the EMRTC Website or Contact

Dr. John L. Meason,
Director
EMRTC
801 Leroy Place
Socorro, NM 87801

Office: (505) 835-5312
Fax: (505) 835-5630

meason@emrtc.nmt.edu

The Playas site—with its municipal facilities, community infrastructure, residential neighborhoods, helipad and air strip—will afford many opportunities for conducting RDT&E and training in areas such as

- ❖ First Responder Training
- ❖ Bio-security Research
- ❖ Ecosystem/Environmental Experiments
- ❖ Urban Warfare Exercises (including simunitions)
- ❖ Hostage Negotiation Training
- ❖ Urban Customs and Border Security Exercises
- ❖ Emergency Preparedness Drills
- ❖ Simulated NBC (including WMD)
- ❖ Deterrent Exercises
- ❖ Guerilla Warfare Tactics (including simunitions)
- ❖ Antiterrorism Assistance Training Programs
- ❖ Special (covert) Intelligence Operations/Tactics/Training
- ❖ Red Team/Blue Team Operations to Infiltrate or Attack Defensive Forces or Measures in Place at Playas to Validate Scenarios Developed by Various Antiterrorism Analysis Centers

OUR PHILOSOPHY

At EMRTC we start with a specific problem; identify and explore that problem and its related areas of investigation; find a solution to the immediate problem; and then investigate and share potential impacts for other technologies and practical applications.

“EMRTC—Where we Find Solutions to Technology Challenges, Share our Results, and Teach Safe, Practical and Effective Applications to Others.”