ENERGETICS RESEARCH FACILITY

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The Energetics Research Facility (ERF) is the only one of its kind in a university environment. The facility houses three indoor blast-containment chambers, rated for 0.2kg, 1kg, and 4kg Net Explosive Weight. These chambers serve a variety of testing applications in explosives fragmentation and penetrator formation analysis, as well as detonation product collection for materials synthesis research. In addition, the facility has the capability to make explosives and charges through melt casting, dispersion coating, and hydraulic pressing. The facility also operates an outdoor testing arena with a blast pad for open-air and structurally confined air-blast analysis, and an underground test arena. The outdoor test arena is routinely used to develop bioinformatics for traumatic brain injury and other blast-related injuries. The underground test arena is commonly used for large scale material characterization, fragmentation studies, and evaluations of explosive dust. Additionally, the facility utilizes a range of advanced blast simulation software and numerical modeling to predict and inform test design while maximizing research output, safety, and efficiency.

The ERF offers a range of instrumentation for the evaluation of energetic material performance and safety. Friction, impact, and time/pressure test apparatus allow assessment of energetic material safety prior to large scale production and use. Performance monitoring equipment includes digital high-speed video cameras such as a Vision Research Phantom V2012, capable of 22,500 frames per second at greater than megapixel resolution and up to 1 million frames per second at lower resolutions, as well as a full color rugged MREL Blasters Ranger II which records 668 frames per second at megapixel resolution and up to 26,000 at reduced resolution. Pencil probes, flush mounts, and underwater transducers make up an array of blast sensors with capabilities of measuring blast overpressures in many different scenarios. The facility also operates two aerial unmanned imaging systems, a DJI Matrice M600, with 15 kg instrumentation payload capacity, and an onboard Xenmuse X3 3-axis gimbaled 4k camera and DJI Mavic Air 2 for use in aerial blast videography and photogrammetric surface scanning. The Matrice M600 is also used for gas sensing research monitoring blast cloud emission of noxious gases from blasting. LiDAR equipment including Carlson laser face profiler, void scanner, and Cavity Auto scanning Laser System (CAL-S) run through the ERF enable pre and post blast surface scans to observe surface changes and muck-pile formation with up to centimeter spatial resolution, both above ground and in underground voids and cavities. This imaging equipment coupled with a portable Hi-Techniques Synergy P data acquisition system featuring 16 independent signal conditioned 20-volt channels sampled at 2 MHz bandwidth, and blast seismographs with 3-axis geophones and acoustic monitoring, enables broad spectrum analysis of blast overpressure, vibration, and light emission creating a comprehensive picture of extreme rate energetic events both in the lab and in the field.