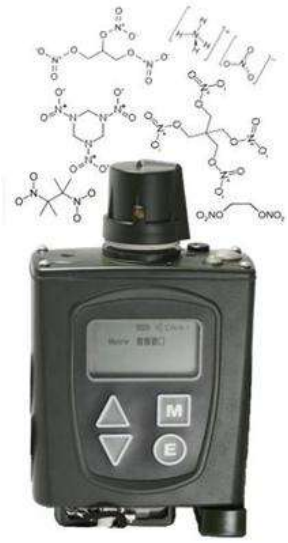
CWA Detectors for Explosives – M4A1-JCAD

Army Technology Objective (ATO) – Unknown Bulk Explosives

One purpose of the ATO is to demonstrate the detection of explosives and precursor materials in existing point and stand-off detection systems and to integrate explosives detection into the family of CBRN point and stand-off sensors. This work integrates hazard detection equipment and reduces the overall number of types of detection equipment fielded, saving purchase and maintenance cost, as well as training time.



M4A1-JCAD

The Point Detection Branch of the Edgewood Chemical Biological Center is leveraging Army-sponsored Research and Development in chemical detection for the detection and identification of unknown bulk explosives (UBE), using current chemical warfare detection instrumentation, namely the M4A1-JCAD (Joint Chemical Agent Detector). This detector is based on Ion Mobility Spectrometry (IMS) technology, which responds to chemical vapors that exist naturally or are created from low volatility chemicals in or near the inlet of the detectors.

While detectors have been developed, tested, evaluated, and field hardened for warfighter protection against chemical warfare agents (CWA), separate point detection systems were simultaneously developed for the detection of explosives. As part of the ATO, ECBC demonstrated that both CW agents and explosives can be detected using the fielded M4A1-JCAD. Dinitrotoluene (DNT), a chemical marker for TNT, was detected at less than 7 ppb and validated using a GC-MS analytical method. The detection was demonstrated on the M4A1-JCAD, without hardware modification. Based on the current signal-to-noise ratio, we expect at least another order of magnitude reduction in the limit of detection. Explosives detection was evaluated for TNT/DNT from multiple sources, RDX as C-4, DMDNB tagged C-4, PETN, ammonium nitrate (AN), calcium ammonium nitrate (CAN), urea nitrate (UN), triacetone triperoxide (TATP), EGDN.

Enhanced false alarm rejection for JCAD and all chemical detectors based on Ion Mobility Spectrometry is being pursued through development of improved detection algorithms. Using NIST-traceable parametric measurements to create order-of-magnitude more accurate IMS constants should result in improved detector resolution and improved false alarm rejection with no hardware modifications.

For more information, contact Gretchen Blethen; gretchen.e.blethen.civ@mail.mil; 410-436-6648.