Syrian CWAs – Are they under control?

Volume 45, 2012

CBRNE Newsletter Terrorism

Explosive News

www.cbrne-terrorism-newsletter.com

CBRNE Terrorism Prevention Programme

Source:http://www.interpol.int/Crime-areas/Terrorism/CBRNE-Terrorism-Prevention-Programme/Chemical-and-Explosives-Terrorism-Prevention-Unit

Terrorism that makes use of chemical, biological, radiological, nuclear and explosives (CBRNE) materials is commonly conceived as the worst case scenario of all terrorist attacks. Although CBRNE terrorism is a low incidence crime, national and global implications of a successful attack are tremendously disturbing. Not only does this type of terrorism pose a clear threat to large-scale public health and safety, but such an event would have alarming ramifications for national security and economic and political stability on a global level. Accordingly, the prevention of such incidents is of the highest priority.

The threat of CBRNE terrorism is evolving and, with it, the risk of incidents intended to maximize the number of victims on a global scale. We know that terrorist groups are working hard to acquire CBRNE materials and the expertise to use them in their operations.

At INTERPOL, our CBRNE Terrorism Prevention Programme specializes in the prevention of the different aspects of CBRNE.

Chemical and explosives terrorism

Terrorism that makes effective use of CBRNE materials is commonly considered to be the worst case scenario of all potential terrorist attacks. Given that the threat posed by chemical and explosives terrorism is a serious concern for all INTERPOL's member countries, INTERPOL has developed a specialised unit to address these issues: the Chemical and Explosives Terrorism Prevention Unit (ChemEx). As the world's only global law enforcement organisation, INTERPOL has a leading role to play in helping its member countries meet these security challenges by providing support aimed at preventing chemical and explosives terrorism.

The threat

Even though CBRN attacks are considered to be low-incidence crimes, it is worth noting that – unlike radiological, nuclear and biological agents – chemical materials can be found and acquired almost anywhere in modern societies. In today's world, it is relatively easy for terrorist groups to gain access to chemical materials in order to manufacture weapons such as Improvised Explosive Devices (IEDs) or Improvised Chemical Devices (ICDs). Incidents such as the Oklahoma bombing in 1995, the Madrid bombings in 2004, the London bombings in 2005, the Oslo bombing in 2011, as well as the sarin gas attacks in Tokyo in 1995, are all examples of horrific events where chemical or explosive materials were used to cause death and destruction at levels exceeding those of traditional criminal acts. Not only does this type of terrorism pose a clear large-scale threat to public health and safety in the immediate vicinity of a successful attack, but such an attack could also have severe ramifications for economic and political stability on a global level.

Chemical terrorism

Terrorist groups resorting to chemical weapons are prepared to inflict casualties en masse. They are also ready to experiment with somewhat risky, innovative tactics. Groups such as apocalyptic cults, radical militias or jihadist organisations without a significant support base or constituency are therefore more likely to be attracted to the idea of launching chemical attacks. Even a small-scale attack using Toxic Industrial Chemicals (TICs) can inspire extreme fear among a civilian population and have a disproportionate psychological impact. Not all terrorist groups seek to cause a high number of deaths, but rather to inflict fear by terrorising a community. To this end, it is sufficient for a terrorist group to use a chemical agent that has an incapacitating effect on victims, instead of choosing a highly lethal nerve agent. Furthermore, there

are tens of thousands of chemicals readily available as chemical weapon precursors. Whilst not all these chemicals are deadly, they can still be used to disrupt or terrorise a community.

Sabotage of Chemical Plants or Chemical Transports

Terrorist groups that lack extensive scientific expertise within their own organisations are perhaps more likely to mount a conventional attack against the transportation of hazardous chemicals or against a chemical plant. The latter would most likely include either an external attack by penetrating the plant site or an attack from the inside by a disgruntled employee. With the insider-scenario, it could be difficult to distinguish a terrorist attack from a bona-fide chemical industrial accident if no group were to claim responsibility.

In today's modern societies, chemical plants and chemical transportation are part of our industrial infrastructure. Even though law enforcement agencies in many of INTERPOL's member countries have updated contingency plans and conduct regular emergency exercises, chemical spillage from a chemical accident or attack can have far-reaching and unanticipated consequences depending on the nature of the attack, geographical position and weather conditions.

Economic globalisation has changed the threat of chemical weapons. Today many developing countries have the capability to manufacture fertilisers and pesticides. Companies are building multipurpose chemical plants in countries that lack sufficient provisions for chemical safety and security. The globalisation of the chemical industry has also created a large pool of people with expertise in chemistry and chemical engineering who could potentially be recruited by non-state actors that are seeking to acquire chemical weapons.

Improvised Explosive Devices (IEDs)

The prevalence of IEDs is increasing – both among terrorist groups and individuals with political grievances who are acting alone. When it is difficult to obtain traditional, military or commercial grade explosives, terrorist groups turn to commonly used chemicals as precursors in order to manufacture explosives. These common chemicals are easily acquired in modern societies and only the imagination of the bomb-maker limits their usage as IEDs. For example, in 2005 the London bombers manufactured their own explosives from easily sourced and perfectly legal precursor materials, with which they attacked the transportation system. Terrorist groups have a long history of favouring explosives as a popular weapon of choice to create an immediate large-scale effect with multiple casualties and thus terrorise an entire society.

Countering IEDs with Awareness Training

Law enforcement agencies worldwide are moving towards a proactive approach in combating the use of IEDs. The primary preventative step is often to deny terrorist groups access to common chemicals by removing, restricting or tracking these chemicals. However, since these chemicals are ubiquitous in our societies, it is impossible to completely restrict their usage. Therefore it is vital that police officers have a basic understanding of homemade explosives so they can identify precursor materials, offer advice on the security of such materials, and recognise activity or evidence during house searches that may mean a "bomb" factory is operating. If officers cannot identify the precursor chemicals and manufacturing items, they could well be in mortal danger. Even if the threat of IEDs cannot be removed completely, it can be mitigated by efficient prevention.

ChemEx: Added Value and Interagency Approach

There are a number of international agencies working in the field of chemical terrorism prevention. ChemEx provides an added value to these efforts by supporting a holistic law enforcement and partner agency-view with regard to prevention, response and investigation. This added value concerns both the threat of chemicals for malicious use and individuals with the requisite knowledge to effectively use those materials maliciously.

INTERPOL's ChemEx Unit has a well-functioning cooperation with international organisations – such as EUROPOL, the World Customs Organisation (WCO) and the Organisation for the Prohibition of Chemical Weapons (OPCW) . More specifically, ChemEx also supports the European Explosive Ordnance Disposal Network (EEODN), the International Bomb Data Centre Working Group (IBDCWG) and Project Global Shield,

which seeks to interdict the illegal trafficking of chemical precursors for the manufacturing of explosives.

ChemEx: Support to INTERPOL Member Countries

INTERPOL is uniquely positioned to provide significant support to the police services of its member countries by employing an intelligence-driven, prevention-oriented, investigative approach. To help those services meet the goals of an effective CBRNE programme, INTERPOL's ChemEx Unit provides the following support services: criminal intelligence analysis, capacity builduing and operational as well investigative support.

- **Criminal Intelligence Analysis**
  Solid criminal intelligence analysis will ensure the prevention of an attack by allowing law enforcement authorities to get on the trail of the perpetrators before they can carry out their attacks. This can be achieved by tip-offs, surveillance of suspects or by covert samplings of suspicious material by forensic experts.
- **Capacity building**
  INTERPOL also provides training for law enforcement officials and other first responders so as to ensure a comprehensive and structured approach in preventing CBRNE attacks. The approach taken by INTERPOL's ChemEx Unit promotes training and awareness enhancement, coupled with capability development.
- **Operational and investigative support**
  The criminal case begins as soon as the suspects or CBRNE materials start to move. Since materials, money, information and individuals are highly likely to cross national borders, INTERPOL will be in a unique position to interconnect national law enforcement agencies and to facilitate cross-border cooperation.

The Importance of Information-sharing

Information exchange between national agencies is of the utmost importance to prevent an attack from taking place. National agencies need to work together and assure that they can cooperate effectively. However, sharing sensitive information – and acting upon it – takes time and practice, as it also requires trust between partners and their ability to maintain confidentiality and properly utilise sensitive information. Nevertheless, in order to successfully combat chemical and explosives terrorism, it is vital that law enforcement agencies around the world work together.

Powerful new explosive could replace today's state-of-the-art military explosive

Source: http://www.homelandsecuritynewswire.com/dr20120906-powerful-new-explosive-could-replace-todays-stateoftheart-military-explosive

Borrowing a technology used to improve the effectiveness of drugs, scientists are reporting discovery of a new explosive more powerful than the current state-of-the-art explosive used by the military, and just as safe for personnel to handle. Their report appears in ACS' journal *Crystal Growth & Design*.

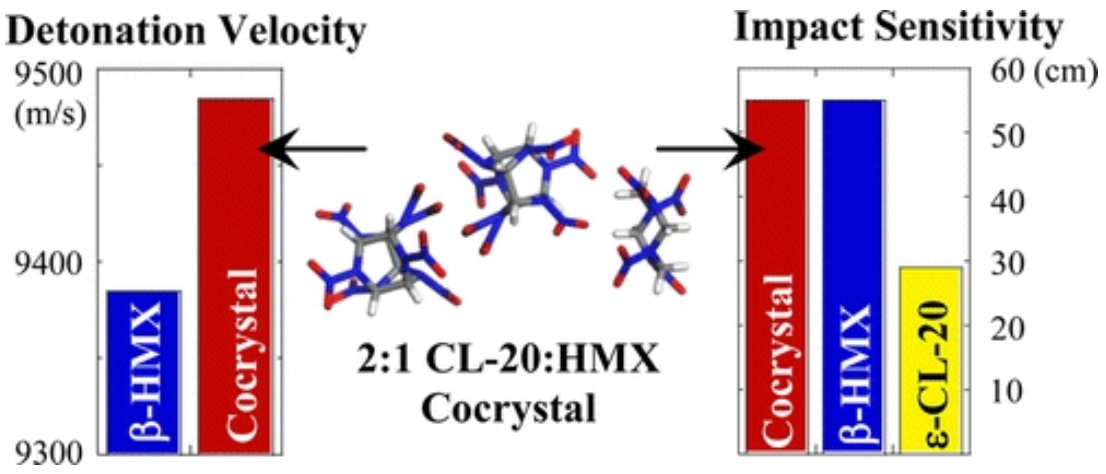
An American Chemical Society release reports that Adam J. Matzger and colleagues explain that a technique for engineering medicines and other materials, termed cocrystallization, is attracting attention as a way to make improved explosives, rocket propellants and fireworks. Most solid materials consist of crystals — with atoms and molecules arranged in a specific pattern that repeats itself time and again. Cocrystallization involves combining two materials into a new crystal architecture with the goal of producing an improved material.

They describe cocrystallization of the military's standard explosive, HMX, with a powerful explosive called CL-20, which the authors say is too prone to accidental detonation for military use. Mixing two parts CL-20 with one part HMX, however, produced a new explosive with a blast wave that would travel almost 225 miles per hour faster than that of the purest form of HMX, meaning a much more powerful blast. The new explosive, however, was as stable and resistant to accidental detonation as HMX. They suggest that it has the potential to replace HMX as the new state-of-the art military explosive.

The research was supported by the Defense Threat Reduction Agency.

— Read more in Onas Bolton et al., "High Power Explosive with Good Sensitivity: A 2:1 Cocrystal of CL-20:HMX," Crystal Growth & Design 12, no. 9 (7 August 2012): 4311–14

Abstract



A novel energetic cocrystal predicted to exhibit greater power and similar sensitivity to that of the current military standard explosive 1,3,5,7-tetranitro-1,3,5,7-tetrazacyclooctane (HMX) is presented. The cocrystal consists of a 2:1 molar ratio of 2,4,6,8,10,12-hexanitro-2,4,6,8,10,12-hexaazaisowurtzitane (CL-20), a powerful explosive too sensitive for military use, and HMX. A predicted detonation velocity 100 m/s higher than that of β-HMX, the most powerful pure form of HMX, was calculated for the cocrystal using Cheetah 6.0. In small-scale impact drop tests the cocrystal exhibits sensitivity indistinguishable from that of β-HMX. This surprisingly low sensitivity is hypothesized to be due to an increased degree of hydrogen bonding observed in the cocrystal structure relative to the crystals of pure HMX and CL-20. Such bonding is prevalent in this and other energetic cocrystals and may be an important consideration in the design of future materials. By being more powerful and safe to handle, the cocrystal presented is an attractive candidate to supplant the current military state-of-the-art explosive, HMX.

DRAMS

Source: http://www.kyklotron.com/millitary.html

DRAMS is an Early Warning System, based at KYKLOTRON E3 series sensors.
Kyklotron ltd developing and exclusively sails worldwide 'DRAMS'.

DRAMS offers a new operational dimension to Army, Navy, Coast Guard, Public Security Forces, Custom offices etc.

As a fully operational system, in corporation with other similar systems, could provide the ability of a faster reaction and a more accurate result to the multiple threats of the today unstable world.

Using DRAMS and KYKLOTRON E3 series sensors could detect, localize and automate record in a digital Geographical Information System Data Base :

- Guerrillas and enemies commandos;
- Any kind of explosives and ammunitions (grenades, rockets, missiles - missiles against airplanes, anti tank missiles, air to surface missiles, air to air missiles, surface to surface missiles, etc - projectiles, bombs , dispensers, mines - land and sea mines - mortar shells, torpedoes, IDE's, any kind of explosives, mixtures and traps, etc);
- Not exploded projectiles;
- Tanks, BMPs, combat vehicles of any kind and type, weapon systems, battle ships, submarines under water;
- Ammunition depots, barracks, battle positions and stations, under ground bolt holes, underground hidden ammunitions, etc.;
- Minefields (simple or electronic) in land or sea. DRAMS offers the operational ability to detect and localize a minefield from long distance (some kilometers), to detect land or sea mines spread (not laid in a tactical plan or laid method;
- DRAMS is a very good solution to the problem of long scale demining, mainly in sandy areas in the desert, where projects planned by these countries are cancelled due to the existing mines. Demining in desert is a very difficult operation for many reasons. KYKLOTRON E3 systems series are suitable for land mines detection and localization in huge areas, very fast, in 100%. Seeking a reliable and fast way for the detection and localization of laid land mines, for long scale demining purposes, mainly in sandy areas in the desert. Specially in a huge area, DRAMS system could be a very fast detection method in 100% accuracy.

- Using DRAMS Early Warning System COULD PROTECT any kind of pipelines (petroleum pipes, gas pipes, etc), industrial areas, radio, tv and in general communication stations etc detecting explosives from distances > 20,000 m;
- Cancelled projects planned by several countries due to the existing land mines now can go on. Demining in the desert can be safely done using our technology and experience. Cause the sandstorm spread and buries land mines in depths that common metal detectors can't detect, KYKLOTRON E3 tech seeking a reliable and fast way for the detection and localization of laid land mines, for long scale demining purposes, mainly in sandy areas in the desert. Especially in a huge area, DRAMS system could be a very fast detection method with 100% accuracy.

Detection capabilities of KYKLOTRON E3 FB sensors

Explosive system detection capability (Yes/No)	KYKLOTRON E3
False tuned to minerals	N
False tuned to trees & roots	N
False tuned to chalcopyrite minerals	N
False tuned to magnetic fields	N
Cell phones reflaction jamming	N
Parapets, walls, building, etc independent detection	Y
Pin point detection	Y
Localize target	Y
Localize target and represent on GIS map	Y
Is harmless to human health (x-rays , etc)	N
C4ISR capabilities	Y
Communication using Wi-Fi	Y
Communication using Bluetooth	Y
Communication using cell phone	Y
GPS embedded on search device	Y
Magnetic compass embedded	Y

Needs cards or explosive material on board	N
Needs use of electrostatic gloves	N
Needs human energy to work	N
Detects explosive from 0-5 meters	Y
Detects explosive from 0-50 meters	Y
Detects explosive from 0-100 meters	Y
Detects explosive from 5-100 meters	Y
Detects explosive from 100-1000 meters	Y
Detects explosive from 100-2000 meters	Y
Detects explosive from 0-5000 meters	Y
Detects explosive from 0-10,000 meters	Y
Detects explosive from 0-20,000 meters	Y
Detects explosive from 0 - > 20.000 meters	Y
Detects in search angle > 60 degrees	Y
Attracted from explosive that is opposite of the system	N
Can tuned in every distinguish material structure?	Y

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FSB Defuses Powerful Bomb in North Ossetia

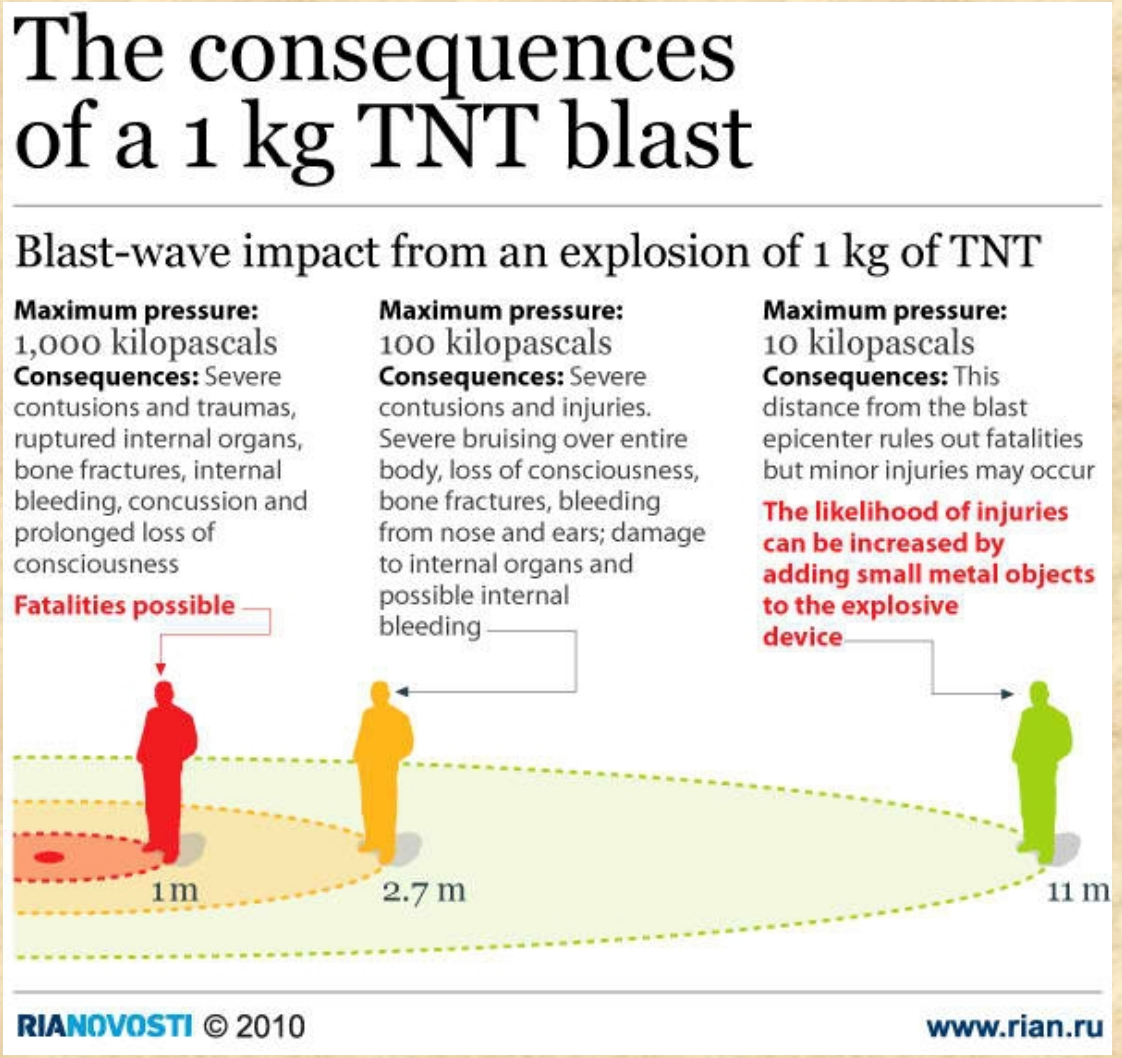
Source: http://en.rian.ru/russia/20120916/175994855.html

Bomb experts of the Russian Federal Security Service (FSB) defused a homemade explosive device equivalent to **80 kilograms of TNT** in North Ossetia, a spokesman for the local FSB department said on Saturday.

The bomb was found 10 meters away from a highway near the border with Ingushetia, the spokesman said.

The bomb consisted of a metal (other reporting says plastic) container filled with an explosive liquid and ball bearing shrapnel. A mobil phone and two portable radio communicators were attached to detonate the device. A live artillery shell was also in the container.

The explosive device was supposed to be used for a terrorist attack on Russian servicemen, moving along this highway, he said.



EDITOR'S COMMENT: 80kg barrel and nobody noticed anything?

Explosives dumped into Gulf of Mexico pose big problems

Source:http://www.homelandsecuritynewswire.com/dr20121001-explosives-dumped-into-gulf-of-mexico-pose-big-problems

Millions of pounds of unexploded bombs and other military ordnance that were dumped decades ago in the Gulf of Mexico, as well as off the coasts of both the Atlantic and Pacific oceans, could now pose serious threats to shipping lanes and the 4,000 oil and gas rigs in the Gulf, warns two oceanographers.

A Texas A&M release reports that William Bryant and Neil Slowey, professors of oceanography who have more than ninety years of combined research experience in all of the Earth's oceans, along with fellow researcher Mike Kemp of Washington, D.C., say millions of pounds of bombs are scattered over the Gulf of Mexico and also off the coasts of at least sixteen states, from New Jersey to Hawaii.

Bryant says the discarded bombs are hardly a secret. "This has been well known for decades by many people in marine science and oceanography," he explains.

He is giving a presentation in San Juan, Puerto Rico today (Monday, 1 October) about the bombs to a group of oceanographers and marine scientists in a conference titled International Dialogue on Underwater Munitions.

"This subject has been very well documented through the years," Bryant explains. "My first thought when I saw the news reports of the Deepwater Horizon explosion in the Gulf two years ago were, 'Oh my gosh, I wonder if some of the bombs down there are to blame.'"

Military dumping of unused bombs into the Gulf and other sites started in 1946 and continued until 1970, when it was finally banned.

Millions of pounds — no one, including the military, knows how many — were sent to the ocean floor as numerous bases tried to lessen the amount of ordnance at their respective locations.

"The best guess is that at least 31 million pounds of bombs were dumped, but that could be a very conservative estimate," Bryant notes.

"And these were all kinds of bombs, from land mines to the standard military bombs, also several types of chemical weapons. Our military also dumped bombs offshore that they got from Nazi Germany right after World War II. No one seems to know where all of them are and what condition they are in today."

Photos show that some of the chemical weapons canisters, such as those that carried mustard gas, appear to be leaking materials and are damaged.

"Is there an environmental risk? We don't know, and that in itself is reason to worry," explains Bryant. "We just don't know much at all about these bombs, and it's been 40 to 60 years that they've been down there."

With the ship traffic needed to support the 4,000 energy rigs, not to mention commercial fishing, cruise lines and other activities, the Gulf can be a sort of marine interstate highway system of its own. There are an estimated 30,000 workers on the oil and gas rigs at any given moment.

The bombs are no stranger to Bryant and Slowey, who have come across them numerous times while conducting various research projects in the Gulf, and they have photographed many of them sitting on the Gulf floor like so many bowling pins, some in areas cleared for oil and gas platform installation.

"We surveyed some of them on trips to the Gulf within the past few years," he notes. "Ten are about 60 miles out and others are about 100 miles out. The next closest dump site to Texas is in Louisiana, not far from where the Mississippi River delta area is in the Gulf. Some shrimpers have recovered bombs and drums of mustard gas in their fishing nets."

The release notes that bombs used in the military in the 1940s through the 1970s ranged from 250- to 500- and even 1,000-pound explosives, some of them the size of file cabinets. The military has a term for such unused bombs: UXO, or unexploded ordnance.

"Record keeping of these dump sites seems to be sketchy and incomplete at best. Even the military people don't know where all of them are, and if they don't know, that means no one really knows," Bryant adds. He believes that some munitions were "short dumped," meaning they were discarded outside designated dumping areas.

The subject of the disposal of munitions at sea has been discussed at several offshore technology conferences in recent years, and it was a topic at an international conference several years ago in Poland, Bryant says.

"The bottom line is that these bombs are a threat today and no one knows how to deal with the situation," Bryant says. "If chemical agents are leaking from some of them, that's a real problem.

If many of them are still capable of exploding, this is another big problem. "There is a real need to research the locations of these bombs and to determine if any are leaking materials that could be harmful to marine life and humans," Bryant says.

Why common explosive sometimes fails

Source: http://www.homelandsecuritynewswire.com/dr20120926-why-common-explosive-sometimes-fails

The explosive PETN has been around for a century and is used by everyone from miners to the military, but it took new research by Sandia National Laboratories to begin to discover key mechanisms behind what causes it to fail at small scales.

"Despite the fact explosives are in widespread use, there's still a lot to learn about how detonation begins and what properties of the explosive define the key detonation phenomena," said

Alex Tappan of Sandia's Explosives Technology Group.

Explosives are typically studied by pressing powders into pellets; tests are then done to determine bulk properties. A Sandia Lab

release reports that to create precise samples to characterize PETN at the mesoscale, the researchers developed a novel technique based on physical vapor deposition to create samples with varying thicknesses. That allowed them to study detonation behavior at the sub-millimeter scale and to determine that PETN detonation fails at a thickness roughly the width of a human hair. This provided a clue into what physical processes at the sub-millimeter level might dominate the performance of PETN (pentaerythritol tetranitrate).

Years of work went into the process, Tappan said.

The idea is that by understanding the fundamental physical behavior of an explosive and the detonation process, researchers will improve predictive models of how explosives will behave under a variety of conditions.

Right now, "if we want to model the performance of an explosive, it requires parameters determined from experiments under a particular set of test conditions. If you change any of the conditions, those models we have for predictions don't hold up any more," said Rob Knepper of Sandia's Energetic Materials Dynamic and Reactive Sciences organization.

Physical vapor deposition works like this: Researchers put PETN powder in a crucible inside a vacuum chamber and heat it so the PETN evaporates. Above the crucible is a flat substrate of plastic, ceramic or metal, and the PETN vapor deposits on that, producing explosive films.

Such pristine samples allow the team to study the initiation and detonation behavior of explosives, Tappan said.

"By varying deposition conditions, we're starting to get a handle on how the deposition conditions affect the microstructure and how microstructure affects detonation behavior," Knepper added.

The tests use less explosive than what's inside a .22-caliber bullet, and researchers wearing safety glasses and ear protection can stand next to the experiment in a protective enclosure, Tappan said.

"A typical experiment weighs about a tenth of an aspirin tablet," he said. "If that tablet is 325 milligrams, we're shooting about 32.5 milligrams. These are not huge."

The team did multiple shots to determine at what point detonation fails.

"As size (thickness) decreases further and further, at some point the detonation will slow down and eventually fail," Tappan said.

Tappan, Knepper, and co-authors Ryan R. Wixom, Jill C. Miller, Michael P. Marquez, and J. Patrick Ball presented a paper at the 14th International Detonation Symposium in Coeur d'Alene, Idaho, in 2010. In the paper, "Critical Thickness Measurements in Vapor-Deposited Pentaerythritol Tetranitrate Films," they wrote that the work represented the first highly resolved measurements of detonation failure in high-density PETN.

It adds new information for a very old explosive.

"What we brought to the table is a new experiment that allowed samples to be made that are small enough to measure this critical thickness property," Tappan said. "Other research been done on PETN in a different form or when it had a binder added to it. This is the first time these data have been done on the critical detonation geometry for pure, high-density PETN."

In the past, diameter information was obtained through experiments using high-aspect-ratio cylinders of pressed pellets of differing diameters. But it's difficult to press pellets with diameters smaller than 1 to 2 mm with precise density.

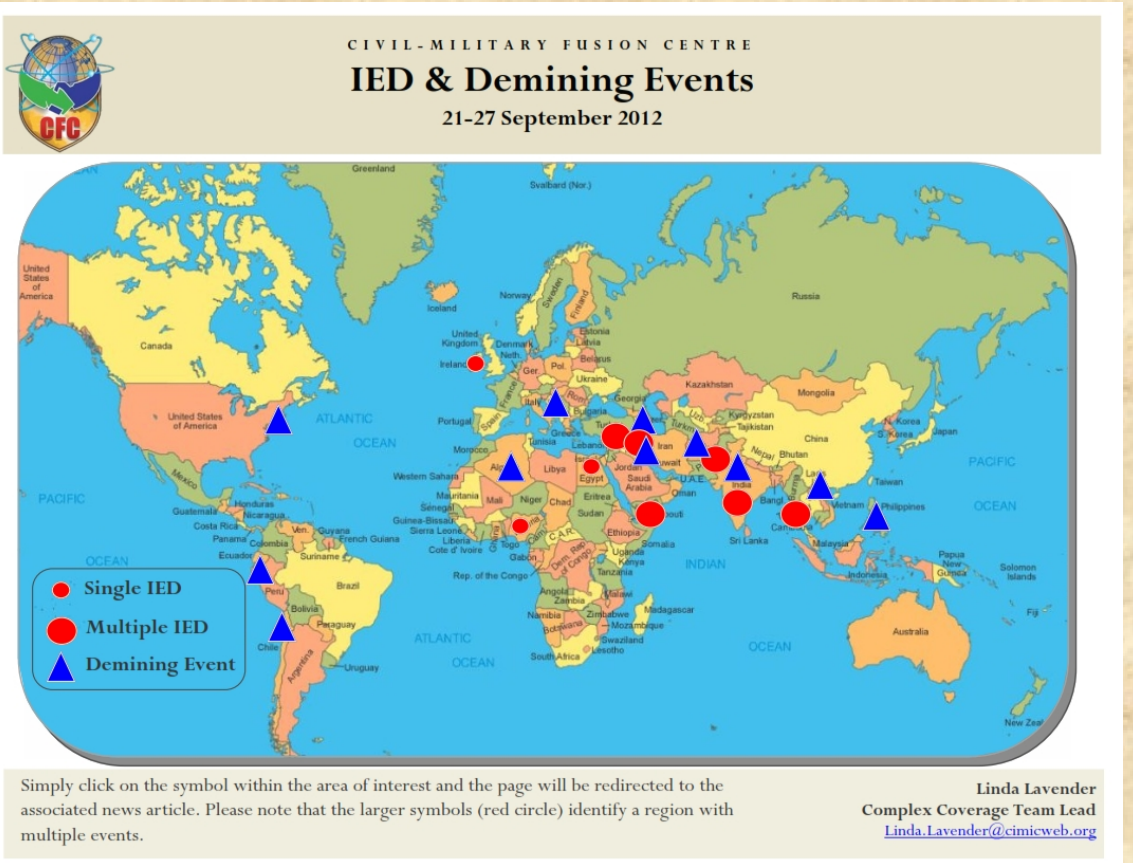
The work began under a 3-year Laboratory Directed Research and Development grant that ended in 2001. It is now funded through a combination of internal and external programs. The release notes that the research falls under the umbrella of Sandia's Microenergetics Program, which Tappan said uses novel techniques to produce small-scale explosive samples to study ignition, combustion, and detonation phenomena. It began as a collaboration among researchers in Sandia's Explosives Technology Group, Manufacturing Process Science and Technology Group, Engineering Sciences Center and Microsystems Science and Technology and Components Center.

IED and demining

Source: https://www.cimicweb.org/sites/C-IED/Pages/default.aspx

Between 80 to 110 million landmines are deployed in 64 countries around the world. Landmines wound and kill over 20,000 people each year. According to the UN, the most heavily mine-affected countries in

the world are: Afghanistan, Angola, Bosnia-Herzegovina, Cambodia, Croatia, Eritrea, Iraq, Mozambique, Namibia, Somalia, Nicaragua and Sudan. These 12 countries together account for nearly 50 percent of the landmines currently deployed in the world and also suffer the highest number of landmines casualties. IEDs contribute to most military casualties in recent conflicts while causing psychological and physical harm on civilian populations.



Interactive map

Source: https://www.cimicweb.org/sites/C-IED/Documents/CFC%20C-IED%20products/%2828-Sep-12%29%20CFC%20IED-Demining%20Weekly%20Events.pdf

Boarding gate with built-in explosives detection speeds up airport security checks

Source: http://www.homelandsecuritynewswire.com/boarding-gate-built-explosives-detection-speeds-airport-security-checks

Hitachi, in collaboration with the Nippon Signal Co., Ltd. and the University of Yamanashi, have successfully prototyped a boarding gate with built-in explosives detection equipment as part of efforts to increase safety in public facilities such as airports. Hitachi says the prototype boarding gate collects minute particles which have affixed themselves to IC cards or portable devices used as boarding passes, and can detect within one or two seconds the presence of explosive compounds using internalized equipment. With this method, it is possible to inspect 1,200 passengers per hour. The technology is expected to contribute to the prevention and containment of carry-on explosives as it inspects immediately prior to boarding without disrupting the flow of passengers, and provides increased security without affecting convenience.

This research and development was supported by the Strategic Funds for the Promotion of Science and Technology of the Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT).

Hitachi says that to ensure safety and security in transport services, there is a need increase security to discourage and prevent the carrying-on of explosives into to transports such as airplanes. For example, flight safety would be significantly increased if it were possible to inspect passengers for explosives at the boarding gate, the last point of inspection before boarding the flight; however, as

several hundreds of passengers need to pass through the gate at once, the time taken by conventional metal detectors and X-ray inspections is an issue.

Prototype boarding gate with built-in explosives detection equipment

The prototype boarding gate employs mass spectrometry technology. The device can be adapted to entrance security equipment for train stations, stadiums, event halls, etc.

Hitachi highlights these features of the prototype boarding gate:

- High-speed collection of minute particles adhering to IC cards or portable devices while reading the device. A technology utilizing high speed air current to collect minute particles attached to IC cards or portable devices used as boarding passes, while reading the card or device, was developed. The efficient extraction and collection of the minute particles within a short period of time was achieved by optimizing the timing to generate the air flow, positioning of the pass, and air current speed.
- High-speed concentration of the collected particles and high-sensitivity mass spectrometry analysis. In order to achieve high-sensitivity mass spectrometry, it was necessary to release the unnecessary gas to outside the equipment and increase the concentration of the particles since the particles are collected within a large volume of air, cyclone method centrifugal technology was employed to efficiently and quickly separate and collect only the particles from the gas, enabling the particles to be introduced into the mass spectrometer to be collected and concentrated in a short time, thus achieving high sensitivity mass spectrometry.
- Internalized compact high-sensitivity mass spectrometer. A linear ion trap type (which traps ionized sample compounds in a linear region within a vacuum before conducting analysis) high sensitivity mass spectrometer which can continuously detect explosive compounds in real-time was employed, and by innovating the assembly of the power and control systems, the size of the equipment was reduced even further to achieve internalization within a boarding gate.

The prototype equipment developed will be on display at the Special Equipment Exhibition & Conference for Anti-Terrorism (SEECAT' 12) which will be held from 17-19 October 2012 at the Tokyo Big Sight in Tokyo, Japan.

Hitachi says that further pilot tests at public transport facilities are also planned in the next financial year.

DARPA seeking tools for identifying hidden explosives at standoff

Source: http://www.homelandsecuritynewswire.com/darpa-seeking-tools-identifying-hidden-explosives-standoff

The threat to U.S. soldiers from improvised explosive devices (IEDs) is as varied as the makers of IEDs are resourceful in how they design and conceal the explosives. The Department of Defense has developed and deployed detection and counter-measures for many types of IEDs, but as the threat evolves, new defenses are required to keep soldiers safe. DARPA says it has created the Methods of Explosives Detection at Standoff (MEDS) program to confront a specific class of IEDs: those deeply embedded in substances such as mud, meat, or animal carcasses – that is, opaque substances with high water content that cannot be safely and effectively probed with current technology.

DARPA says that through MEDS, it seeks proof-of-concept demonstrations of technologies and techniques that can rapidly and accurately detect the presence of bulk explosives in such substances using non-contact methods, meaning there can be no physical contact with the host substance. The technology would have to detect, but not necessarily image, explosives embedded at a depth of five centimeters or greater. To protect the health of the operators and people nearby, the tools developed may not use ionizing radiation, with the possible exception of X-ray backscatter. DARPA will evaluate proposed techniques on the anticipated tradeoff between image fidelity and radiation output.

Because of the constraints on using radiation, DARPA expects that new, interdisciplinary areas of research will be required to develop an effective solution. For that reason, universities, including the medical community, are encouraged to collaborate and propose innovative solutions along with commercial industry.

"MEDS technologies may require new engineering and physics. DARPA does not believe that incremental enhancements to existing imaging technologies will be adequate to meet the program objectives. However, the building blocks for a solution are in place, as we've seen in several recent scientific breakthroughs," said Dr. Judah Goldwasser, DARPA program manager for this effort.

Some potentially relevant research areas include ultra-wide-band thermo-acoustic imaging, phase-contrast methods, non-linear acoustics and mixed modality mechanisms.

"This program may represent a bit of a change for past DARPA university performers. We require proof-of-concept demonstrations of technologies and techniques, as opposed to just basic research," Goldwasser said. "Researchers' expertise, though, will be fundamental to a solution."

To allow for broad participation, proposers may propose appropriate surrogates for explosives to be used in testing; DARPA will specify common packaging substances at the program kickoff.

The anticipated period of performance for MEDS will not exceed 18 months, including a 12-month base period for research, development, and demonstration of a capability, and a six-month option for follow-up reproduction and testing of successful capabilities at U.S. government laboratories.

Different technologies aim to replace dogs as explosives detectors

Source: http://www.homelandsecuritynewswire.com/dr20121017-different-technologies-aim-to-replace-dogs-as-explosives-detectors

Bomb-sniffing dogs are the best and most popular way for airport security quickly to detect anyone planning to bring explosives to an airport. Denis Spitzer is trying to change that.

Dr. Spitzer and his colleagues are working on a sensor that will detect vapors of TNT and other explosives in very faint amounts. The device Spitzer is trying to create would replace dogs as the top bomb detecting method in the field.

The *New York Times* reports that inventing a machine to replace dogs will not be easy, however. A bomb-sniffing device must be extremely sensitive, able to develop a signal from a relative handful of molecules. It must also be highly selective, able to distinguish an explosive from the "noise" of other compounds.
At this time there are some vapor detectors on the market, but dogs are still the best when it comes to bomb detection.
"Dogs are awesome," Aimee Rose, a product sales director at the sensor manufacturer Flir Systems, which markets a line of explosives detectors called Fido, told the *New York Times*. "They have by far the most developed ability to detect concealed threats," she said.

An Amtrak officer, Michael Szczawinski, and Billy on routine patrol at South Station in Boston for an Acela train bound for Washington in February.

When it comes to using dogs in the field, there are some drawbacks. Dogs can get distracted, they cannot work around the clock, and they require expensive and extensive training and handling.
Flir's bomb detectors are lightweight, compact, and considered to be on par with dogs. The military is currently using Flir's devices, which are capable of detecting TNT at a few parts per quadrillion. Rose does not consider the devices an alternative to dogs, but instead "we see our technology as complementary to dogs."
The devices use a fluorescent polymer technology developed by Timothy Swager, a chemist at MIT, under whom Rose studied. Thin films of the polymers emit visible light when exposed to ultraviolet rays, but molecules of TNT stop the fluorescence. A single TNT molecule can quench many thousands of fluorescence reactions, greatly increasing sensitivity.
The *Times* notes that Spitzer has a different approach with his sensors. The slivers of silicon are fixed at one end of the device and are made to vibrate. As molecules of explosives are captured by the cantilever, the added mass changes the vibration rate, which can be measured by a laser.
Microcantilevers are used in many sensor applications today, but are not sensitive enough to detect explosives, so they are used in conjunction with nanotubes — hollow cylinders of titanium oxide which allow more molecules to be captured.
The sensitivity of an explosive detector is critical because many explosive compounds, such as RDX and PETN, are not very volatile at normal temperatures, so very few particles vaporize. As a result, bomb detection is now focused more on finding explosive particles on

surfaces of one's clothing or luggage than on detecting molecules in the air.

David Atkinson, chief scientist for explosives research at the Pacific Northwest Laboratory in Richland, Washington, knows this method is the best way to detect explosives. "We've had a particle-based detection paradigm for the past two decades." Even today, when a laptop or other object is deemed suspicious after being X-rayed, an agent wipes the surface and puts the wipe in a spectrometer that ionizes any explosive compounds present, allowing them to be quickly identified.

"The key is you've got to get that particle," Atkinson told the *Times*. "The whole ability to detect explosives is whether the operator correctly samples."

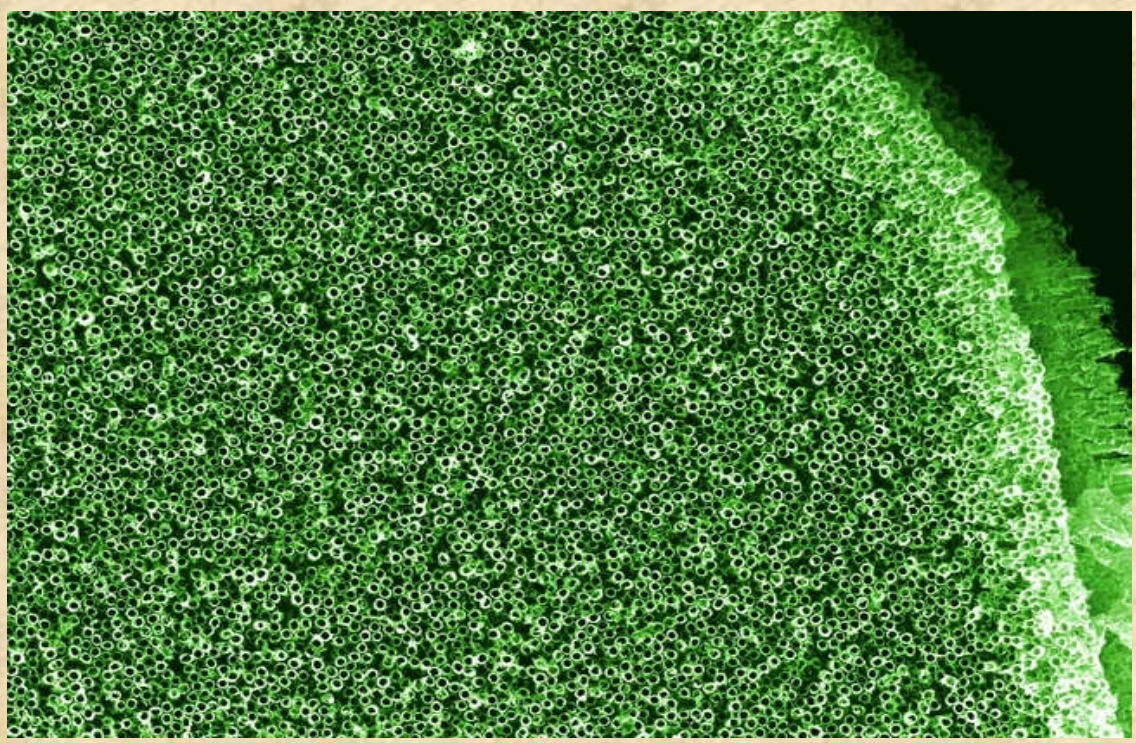
No one knows exactly why dogs are so good at detecting explosive material. Dogs have roughly thirty times as many olfactory cells as people, and the brain region devoted to smell is proportionally much larger, but size does not explain the entire situation.

"The black box that is a dog that we don't really understand makes a lot of scientists uneasy," Paul Waggoner, senior scientist at the canine detection research institute at Auburn University told the *Times*.

Spitzer is still working on making his machines more sensitive to explosive materials. Right now, the experiments his staff is conducting suggest they can detect TNT at concentrations at less than one part per trillion, which is still not as good as dogs.

The next step for his team is to determine ways to make the nanotubes used in their devices more selective so the sensors do not pick up on water or other molecules which could affect the measurements.

Eventually, Spitzer will test the sensors in simulated airport rooms, and under other conditions that simulate an active airport. "When you have real conditions, sometimes you can have surprises," Spitzer said.



A sliver of silicon is covered with titanium nanotubes to better detect explosives molecules.

Did you know this?

RDX

Cyclotrimethylenetrinitramine (RDX) has caused convulsions in military field personnel ingesting it and in munition workers inhaling its dust during manufacture. The substance's toxicity has been studied for many years.[1] At least one fatality was attributed to RDX toxicity in a European munitions manufacturing plant.[2] The substance is low to moderately toxic with a possible human carcinogen classification.[3] However further research is ongoing and this classification may be revised by the EPA.[4][5] Remediating RDX contaminated water supplies has proven to be successful.[6]

1 http://www.epa.gov/ncea/iris/pdfs/Litsearch_RDX.pdf
2 Schneider, N. R.; Bradley, S. L.; Andersen, M. E. (July 1976), *Toxicology of cyclotrimethylenetrinitramine (RDX): Distribution and metabolism in the rat and the miniature swine*, Scientific Report, DTIC, SR76-34; also in Toxicology and Applied Pharmacology 39(3) March 1977, doi:10.1016/0041-008X(77)90144-2
3 http://cira.ornl.gov/documents/RDX.pdf
4 http://www.mass.gov/dep/cleanup/compliance/rdxwhite.pdf
5 http://www.epa.gov/iris/subst/0313.htm
6 www.serdp.org/content/download/4725/68763/file/ER-0426-FR.pdf

PETN

Like nitroglycerin (glyceryl trinitrate) and other nitrates, PETN is also used medically as a vasodilator in the treatment of heart conditions. These drugs work by releasing the signaling gas nitric oxide in the body. The heart medicine *Lentonitrat* is nearly pure PETN.[1] Monitoring of oral usage of the drug by patients has been performed by determination of plasma levels of several of its hydrolysis products, pentaerythritol dinitrate, pentaerythritol mononitrate and pentaerythritol, in plasma using gas chromatography-mass spectrometry.[2]

1 Russek H. I. (1966). "The therapeutic role of coronary vasodilators: glyceryl trinitrate, isosorbide dinitrate, and pentaerythritol tetranitrate.". *American Journal of Medical Science* **252** (1): 9–20. doi:10.1097/00000441-196607000-00002. PMID 4957459.
2 R. Baselt, *Disposition of Toxic Drugs and Chemicals in Man*, 8th edition, Biomedical Publications, Foster City, CA, 2008, pp. 1201–1203.