North Korea is playing dangerous games !

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Explosive News

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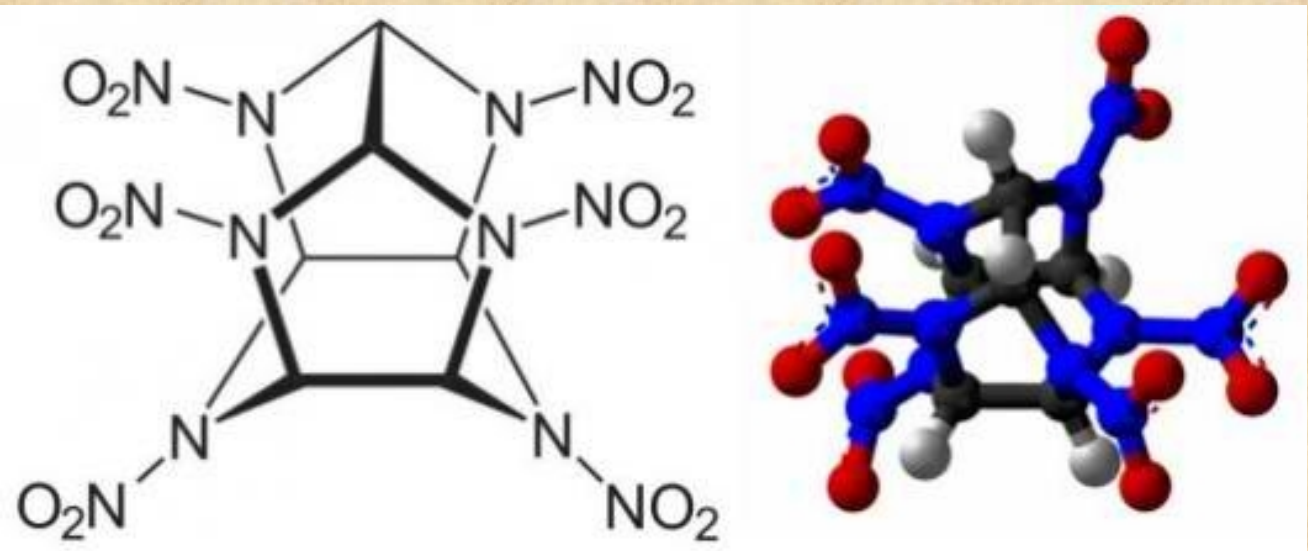
Most powerful military explosive tamed for use

Source: http://www.gizmag.com/cl-20-high-power-military-explosive/24059/

Detonation of a laser-guided warhead on an armored personnel carrier (Photo: Eglin AFB 780th Test Squadron)

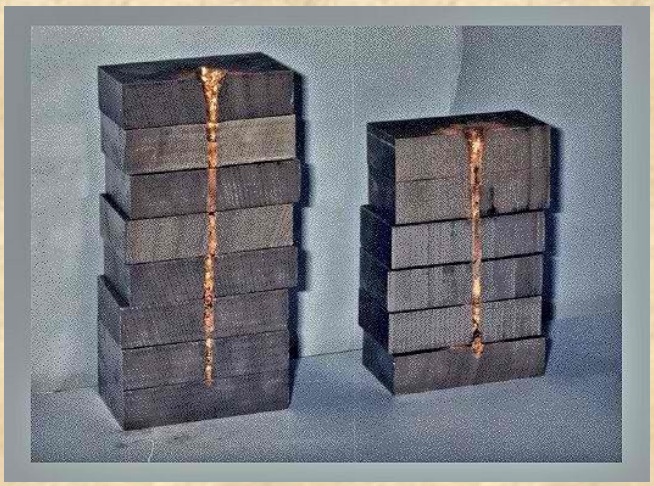
The advent of unmanned combat vehicles is generating a need for smaller weapon systems to fit their reduced dimensions. As a result, more powerful explosives are being sought to get the most performance from smaller warheads. Introduction of new explosives is a rather slow process, as premature detonation of an explosive is extremely embarrassing. The desire for higher-performance explosives persists, though, so explosive chemists get used to dancing along the edge of instability. Fortunately, new chemistry occasionally appears that pushes the edge back a bit. The recent synthesis of a stable, high-performance explosive by a research team at the University of Michigan indicates that such new chemistry is now at hand.

An ideal explosive combines the attributes of high explosive power, high stability, high density, low environmental impact, and low cost. Perhaps a dozen favored explosives, including TNT, RDX, HMX, PETN, TATB, and HNS, dominate current weaponizable explosive formulation. Improving on the favored explosives usually requires improving one attribute without significantly degrading others.



Left: Chemical schematic of CL-20. Right: Three-dimensional ball and stick model of CL-20. Black balls are carbon atoms, blue balls are nitrogen atoms, red balls are oxygen atoms, and white balls are hydrogen atoms (Image: Wikipedia)

Otherwise known as CL-20, 2,4,6,8,10,12-hexanitro-2,4,6,8,10,12-hexaazaisowurtzitane ($C_6H_6N_{12}O_{12}$) is a relatively new candidate for inclusion into the group of favored explosives. Originally synthesized in 1986 by Arnold Neilsen at the Naval Surface Weapons Center at China Lake, California (hence the CL- designator), CL-20 is the highest energy compound as well as the highest density compound known among organic chemicals. It is manufactured in the dense episilon crystal phase in batches of about 100 kg (220 lb) by Thiokol and the French SNPE. The cost in kilogram lots is quoted at over US$1300/kg, which would be expected to fall by a factor of perhaps five or ten when production is scaled up to support manufacture of active weapons.



Penetration testing of explosives – on the right is the penetration of a 30 gram HMX shaped charge, and on the left is the penetration of a 30 gram CL-20 shaped charge (Photo: US Navy)

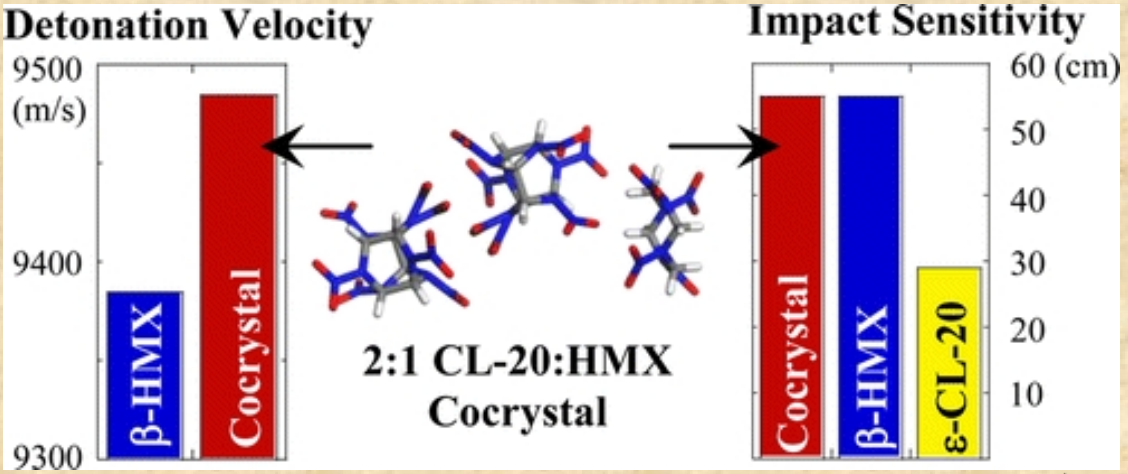
The current state-of-the-art military explosive is HMX at a cost of about US$100/kg. The photo above makes clear that CL-20 is considerably more powerful than HMX, demonstrating about 40 percent deeper penetration in steel blocks. The additional power results from the combination of faster detonation velocity (9,660 m/s compared to 9,100 m/s for HMX) and larger density (2.04 g/cc compared to 1.91 g/cc for HMX).

The increased power of CL-20 argues for its use in smaller weapon systems, such as unmanned air vehicles. However, CL-20 is rather susceptible to impact and friction, being about as sensitive as PETN, the least stable of the common military explosives. Large-scale tests have mostly used a combination of CL-20 and a plastic binder in a 90-10 ratio. While this plastic-bound explosive has achieved a higher level of stability by separating the CL-20 crystals, the power of the explosive is reduced to roughly the HMX level.

The history of CL-20 is somewhat disappointing, but there simply are not that many candidates for new explosives, so people kept experimenting with its use. Then Professor Adam Matzgar of the University of Michigan Chemistry Department set his research team on the problem.

When you can't change the chemicals, you change their environment. Cocrystallization is a method for engineering solid forms of difficult materials that has been quite successful in producing new pharmaceuticals. A normal mixture of two fine powders produces a jumbled heap of the two powders – the immediate neighborhood of each powder is the same as if it were the only powder in the mixture. As a result, explosive properties of such a mixture often lie between the properties of the two pure materials.

In cocrystallization, both materials are crystallized from the same liquid in such a manner that a molecular solid of the two materials is formed. A molecular solid is one in which the structure and order of the two components is relatively fixed. A one-to-one cocrystal of A and B will have alternating molecules of A and B throughout the cocrystal, with the relative orientation and spacing of A and B being fixed as well. This changes the local environment of each of the components in the cocrystal, which also changes its explosive properties.



Detonation properties of a 2:1 CL-20:HMX cocrystal compared to those of its components (Image: University of Michigan)

Prof. Metzgar's group succeeded in forming a cocrystal having two molecules of CL-20 to one molecule of HMX. By simple averages one would expect that the detonation velocity would be about 9,470 m/s, and the impact detonation threshold (the distance over which the fall of a standard weight will set off an explosive) would be about 38 cm. The cocrystal did indeed have a detonation velocity of 9,480 m/s, in good agreement with the expected value. However, the impact detonation threshold was 55 cm, essentially identical to that of pure HMX. In the environment of the cocrystal, the stability of the CL-20 molecule is sufficiently enhanced that the HMX becomes the more sensitive component. There is more of a power difference between HMX and the cocrystal than might be immediately apparent, as the cocrystal has larger density than does HMX, leading to a power increase of about 20 percent over pure HMX. To give this number a reference point, the cocrystal is a bigger improvement over HMX than HMX is over RDX.

The unexpected insensitivity of the cocrystal is thought to reflect the increased density of hydrogen bonds in the cocrystal relative to the crystals of pure HMX and CL-20. Intuitively, the instability of a molecule probably has something to do with chemical groups moving relative to the core of the molecule, and additional bonds serve to hold the groups in place. By being more powerful and safer to handle, the cocrystal presented is an attractive candidate to supplant the current military state-of-the-art explosive, HMX.

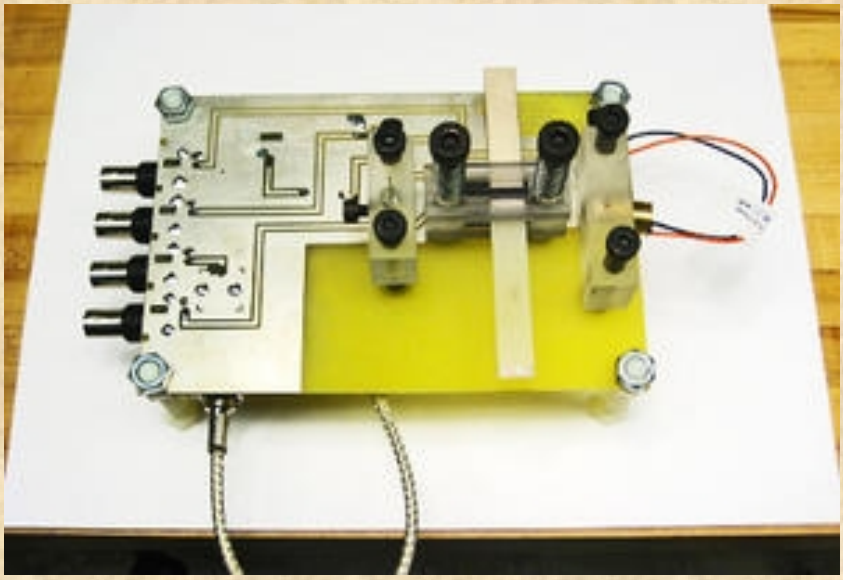
Most high-explosive anti-tank (HEAT) weapons and their relatives cost far more than their explosive charges. An example is the AGM-114 Hellfire missile, which costs about US$58,000 and has eight or nine kilograms (17 or 19 lbs) of explosive aboard. If a ten percent increase in cost provides substantially better performance, it seems likely that the military would pay the price.

Portable X-ray source offers a mobile terrorism prevention tool

Source: http://www.homelandsecuritynewswire.com/dr20130108-portable-xray-source-offers-a-mobile-terrorism-prevention-tool

Pulsed-power scanner developed by University of Missouri team // Source: aau.edu

The hand-held scanners, or tricorders, of the Star Trek movies and television series are one step closer to reality now that a University of Missouri engineering team has invented a compact source of X-rays and other forms of radiation. The radiation source, which is the size of a stick of gum, could be used to create inexpensive and portable X-ray scanners for use by doctors, as well as to fight terrorism and aid exploration on this planet and others.



"Currently, X-ray machines are huge and require tremendous amounts of electricity," said Scott Kovaleski, associate professor of electrical and computer engineering at MU. "In approximately three years, we could have a prototype hand-held X-ray scanner using our invention. The cell-phone-sized device could improve medical services in remote and impoverished regions and reduce health care expenses everywhere."

A University of Missouri, Colombia release reports that Kovaleski suggested other uses for the device. In dentists' offices, the tiny X-ray generators could be used to take images from the inside of the mouth shooting the rays outward, reducing radiation exposure to the rest of the patients' heads. At ports and border crossings, portable scanners could search cargoes for contraband, which would both reduce costs and improve security. Interplanetary probes, like the Curiosity rover, could be equipped with the compact sensors, which otherwise would require too much energy.

The accelerator developed by Kovaleski's team could be used to create other forms of radiation in addition to X-rays. For example, the invention could replace the radioactive materials, called radioisotopes, used in drilling for oil as well as other industrial and scientific operations. Kovaleski's invention could replace radioisotopes with a safer source of radiation that could be turned off in case of emergency.

"Our device is perfectly harmless until energized, and even then it causes relatively low exposures to radiation," said Kovaleski. "We have never really had the ability to design devices around a radioisotope with an on-off switch. The potential for innovation is very exciting."

The device uses a crystal to produce more than 100,000 volts of electricity from only ten volts of electrical input with low power consumption. Having such a low need for power could allow the crystal to be fueled by batteries. The crystal, made from a material called lithium niobate, uses the piezoelectric effect to amplify the input voltage. Piezoelectricity is the phenomenon whereby certain materials produce an electric charge when the material is under stress.

— Read more in Kovaleski's team published "Investigation of the Piezoelectric Effect as a Means to Generate X-Rays," IEEE Transaction on Plasma Science 41, no. 1 (January 2013): 106-11

A dandelion-shaped device to help in demining operations

Source: http://www.homelandsecuritynewswire.com/dr20130108-a-dandelionshaped-device-to-help-in-demining-operations

Decades of war have left land mines buried all over the Afghan countryside. They continue to go off, killing and maiming hundreds of innocent people every year.

Last year alone, more than 812 people were wounded or killed in Afghanistan because of mines left behind after the armies retreated.

Now, Massoud Hassani has come up with a new, innovativesolution which can set some of these mines off, thus clearing large tracts of land, in the process saving the lives of kids and adults alike.

AFP reports that the gadget, which Hassani calls a "**mine kafon**," resembles a dandelion: 150 bamboo legs are screwed into a central metal ball. At the end of each leg is a round white plastic disc attached to a black rubber car part for drive shafts, called a CV-joint boot.

The name Kafon is short for "kafondan," which means "something that explodes" in Dari, Hassani's native tongue. According to Hassani, the design for the invention came from his childhood.

"The idea comes from our childhood toys which we once played with as kids on the outskirts of Kabul," Hassani told AFP as he rolled out the device for a demonstration.

The Kafon is designed to be moved hither and yon with the wind, setting off anti-personnel mines as it rolls around on the ground. The Kafon can be easily repaired becasue the legs are made out of readily available bamboo. The metal ball contains a GPS device to pilot the path as its rolls through an area that contains mines.

Hassani and his brother Mahmud are now searching for sponsors. The brothers hope to raise $160,000 in donations by next month to continue development and to take the device to Afghanistan later this year for more trials.

Afghanistan has made progress in cleaning up hidden mines in recent years, but it is still one of the most heavily mined countries in the world. According to the UN, as of June 2012 there were still 5,233 "danger zones" covering 527 miles, putting 750,000 people at risk.

Since 1989, 650,000 anti-personnel mines and 27,000 anti-tank mines have been collected, according to the UN-funded Mine Action Coordination Centre of Afghanistan (MACCA).

"People are killed almost daily in my home country — and tragically it's often kids, like what happened on Monday," Hassani told AFP.

Hassani was referring to a day in early December, when ten Afghan girls collecting firewood were blown apart after one accidentally struck a mine with an axe.

The brothers say the Kafon is still in the testing phases, and that they are now working on making sure that there is constantly 100 percent contact

between the feet of the Kafon and the ground, so no mines are missed.
Initial trails with the Kafon, using explosives from the Dutch Defense Force as well as an in-the-field rolling test in Morocco, showed positive results.

"We know this is a working prototype and that we need to do lots of testing still," Hassani said, noting that the Kafon would not be deployed in the field until it was 100-percent proven.

Bomb found in body of jawan killed in encounter with Maoists in Jharkhand

Source: http://timesofindia.indiatimes.com/india/Bomb-found-in-body-of-jawan-killed-in-encounter-with-Maoists-in-Jharkhand/articleshow/17967183.cms

Jharkhand: Bodies of 10 CRPF jawans recovered in Latehar

Naxalites had surgically inserted an improvised explosive device (IED) in the body of a Central Reserve Police Force (CRPF) jawan who was killed three days back in an ambush in Jharkhand's Latehar district.
Doctors conducting the autopsy of the CRPF troopers at a government hospital in Ranchi were shocked when they found a 1.5 kg unexploded bomb stitched inside the abdomen of 29-year -old Constable Babulal Patel who was among those killed in the encounter with Naxals.
Jharkhand DGP G S Rath said the body of Patel with the IED implanted in it was recovered by patrol squads yesterday evening from near the encounter site and the postmortem was scheduled for today morning. "The doctors became suspicious when they saw the body of the CRPF jawan. The bomb disposal squad was then called and the body was placed in an open field," Rath told.
Later, the IED was defused by the bomb squad, a senior CRPF official said.
"The IED was a pressure bomb prototype which explodes on being disturbed," he said.
Thirteen people--nine CRPF personnel, one personnel from the state's special anti-Naxal force 'Jharkhand Jaguars' and three civilians--were killed in the encounter that occurred on January 7.

Earlier, Naxalites in Latehar district of Jharkhand put the body of a critically injured and incapacitated jawan over a landmine following a fierce battle between the Maoists and Central Reserve Police Force (CRPF) on Monday morning, in an action reminiscent of a scene from Oscar-winning Bosnian war film "No Man's Land". On Tuesday evening, security forces along with local villagers found the jawan's body deep in Karmatiya jungles. However, as soon as the body was picked up, the mine exploded, killing three villagers and blasting the jawan to smithereens.
The film No Man's Land had ended with an injured Bosnian soldier lying on the mine while still alive with no hope of rescue. Bosnian Serbs had put his body over a landmine while he was unconscious.
Sources said, in all probability the jawan bled to death while lying on the mine adding that even if he had gained consciousness and tried to move, he would have died. Following the blasts, the forces retreated on Tuesday night and the combing operation was restarted with reinforcements on Wednesday.
On the trail of senior CPI (Maoist) leader Arvindji, around 300 soldiers from CRPF and Jharkhand Jaguars were combing Karmatiya forests when they were ambushed by a contingent of around 200 Maoists - led by a woman - who were firing at them from hill top. The forces had taken the only narrow path that cut through the jungle and then opened into a plain with hills surrounding it. That the Maoists were in Army fatigues confounded matters. About 600 Maoists are suspected to be hiding in the jungles moving between Bihar and Jharkhand.

Defeating the Improvised Threat

By John Avolio

Source: http://news.cbrnresourcenetwork.com/newsDetail.cfm?id=138

Homemade Explosives (HMEs) can be as simple as black powder or as complex as the "plastic" type explosives. Plastic explosives could be PETN, also known as "det" cord, RDX

also known as C-4, or the mixture of these two known as SEMTEX and that's not a complete list. Fertilizer containing nitrates is an often seen HME, but there are many others.

The evolution of explosive threats is ever changing. Hundreds of years ago, alchemists first played with many a witches brew in an effort to make both explosives and flash powders, amongst other things. Black powder was one of the first explosives discovered in this manner. This work, as illustrated by many of the paintings from that period, show this work being done within the confines of one's own home. Typically, this work was conducted in the kitchen area where it was in close proximity to an open fire and flame. With little or no knowledge of the inherent dangers, this led to many mishaps including fires and explosions.

World of Complex Threats

The world we live in is one of suicide bombers wearing vests, shoes and underwear all fabricated into improvised explosive devices. This fact makes it imperative to use lessons learned from the war on terror at home to further aid those dedicated within the field of homeland security. Vehicle/vessel borne IEDs (VBIEDs) and the classic pipe bombs are ever present too. At this time, the threat list is not limited to the type of explosives used or the manner in which they are similarly delivered.

As persons frequently involved with force protection, IED defeat, and homeland security, it is so important to share the intelligence and information gathered. We also need to exploit these lessons learned to improve our chances of future success. It is important to point out that Homemade Explosives (HMEs) can also be a key component of an improvised Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) device. This illustrates the all-important point that detecting explosives is and will continue to remain a top priority.

A Homegrown Past

Historically, the initial work and practice of explosives creation and testing was then taken from the home and into the appropriate laboratory setting. The type of compounds chemists made ranged from pyrotechnics and propellants to explosives. These new explosives included those of commercial and military value. Nitroglycerin, dynamite and TNT are just a few of the explosives worthy of mentioning. Being in a laboratory environment did not make them immune to the mishaps of both fire and explosions, or stop them from occurring.

There is and always will be a common denominator regarding explosives creation. That common denominator is that any and all explosives can be homemade by terrorists. Therefore, we have actually come full circle going from

home to lab and back to home in the present day. Many of these homemade explosives are presently made at home and still yield both fires and explosions.

This has led to the interdiction of a number of international bomb-making facilities over the years. The type or complexity of the homemade explosive one wants to make actually does not matter. All that is required is the desire, some chemicals, equipment, and little or no technical expertise along with time, money and effort. Many of the chemicals needed are readily available from an assortment of legitimate sources. The number and variety of homemade explosives available to terrorists is far greater today than it has ever been. Since we are now living in an Internet-based information age, obtaining knowledge is not difficult.

The Terrorist Dilemma

Unfortunately, some explosives handlers with bad intentions are not amateurs at all and indeed highly accurate. This poses a very significant threat and persistent problem for the military with respect to the challenges of Counter-Improvised Explosive Device (C-IED) ops as and for counter-terrorism, security and law enforcement professionals worldwide.

With such a vast array of options to choose from today, a terrorist poses a significant problem for those persons looking to detect and mitigate them in an effort to stop them prior to reaching their target and accomplishing their mission. Keeping up with the latest methods and developments is a daunting task. From tracking precursor chemicals and gathering field intelligence to detecting HMEs both in a pre and post blast environment this job is a very difficult one indeed. To improve the effectiveness of defeating the IED and HME threat several new technologies and techniques have been developed, implemented and operationally deployed. These range from low tech methods like the "off leash" canine program and having many more realistic training aids now available for IED recognition courses. A few high tech solutions like stand-off explosive and precursor detection systems to rapid on-site HME field test kits have also recently been researched, developed and utilized. In concert with these new and old tools in the toolbox terrorist networks, bomb makers, transporters and IED's are being defeated more often.

Countering the Threat

A few years ago, when the liquid explosives plot was first uncovered and then foiled in the UK, there were a number of key factors for success. It was the gathering of intelligence and surveillance along with the well-coordinated efforts of many in concert with good investigative techniques which yielded a successful result. With those lessons learned and shared, there were many new policies, procedures and technologies quickly implemented worldwide to counter this new threat vector. Testing and evaluating both bulk and trace explosive detection technologies and techniques as applied to homemade, commercial and military explosives is critical in bringing new knowledge to those who need it.

In 2011, the U.S. Department of Defense Joint Improvised Explosive Device Defeat Organization (JIEDDO) reported that in spite of spending billions of tax dollars to combat road side bombs, the number of IED attacks on U.S. troops in Afghanistan nearly tripled between 2009 and 2010. JIEDDO further reported enough legal fertilizer is being smuggled from Pakistan to Afghanistan to build 40,000 homemade bombs (see chart).

Homemade explosives are a significant problem and a key ingredient in the terrorists Improvised Explosive Device (IED) arsenal. HMEs can be as simple as black powder or as complex as the "plastic" type explosives. Plastic explosives could be PETN, also known as "det" cord, RDX also known as C-4, or the mixture of these two known as SEMTEX and that's not a complete list. Fertilizer containing nitrates is an often seen HME, but there are many others including Chlorates, Perchlorates, Nitro-aromatics and Peroxides to name only a few. It should be noted that some HMEs especially the Peroxides can be solids or liquids. This wide array of choices includes both primary as well as secondary explosives. In other words HMEs can be the type of explosives that could be used as an initiator and detonator in addition to those used as a main charge. A few of the HMEs actually are dual use and can be used as both.

Now and Looking Ahead

These days, HMEs are widespread throughout the world. This fact makes it imperative to take the lessons learned from the war on terror and

IEDs in theater like Iraq and Afghanistan back home to further aid those dedicated here within the field of homeland security. Sadly they will remain a serious problem for a long time. The world we presently live in is one of suicide bombers wearing vests, shoes and underwear all fabricated into IEDs. Vehicle/vessel borne IEDs (VBIEDs) and the classic pipe bombs continue to remain a threat because they are easy to make, conceal and use. At this time the threat list is not limited to the type of explosives themselves or the manner in which they are similarly delivered. The network of bomb makers and their facilitators are considered by some experts to be the greatest threat to security and order.

Just as the military relies heavily on intelligence to plan and execute missions safely, first responders involved in force protection, IED defeat, and homeland security must share and have access to vital intelligence information from multiple sources. We also need to exploit these lessons learned to improve training programs and our chances of future success through tactics, techniques and procedures that keep pace with a changing threat. It is important to point out that HME's can also be a key component of an improvised Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) device. This underscores the all-important point that detecting explosives is and will continue to remain a top priority for explosive ordinance disposal (EOD), security and first responder professionals.

When threats change - and they will with certainty do so - it is necessary to look toward a fully integrated and efficient solution. The intelligence and scientific communities will need to address them as quickly and effectively as possible. This cycle has been ongoing for many years without abatement. One may ask the question: "What can be done?" As such, the answer is quite simple: "Remain vigilant and aware." While working together in a cohesive manner defeats the enemy, complacency and personal ambition remain only allies of the enemy.

John Avolio *is presently a technical and business consultant. He serves as a science and security advisor in the area of CBRNE and drug detection to both industry and Government. His primary focus is the development of new and novel technologies and methods as applied to counter-terrorism and counter-drug programs. Cyber security is also an area of expertise, interest, and great concern.*

DART for Peroxide and Tetrazine Explosives Detection

By James A. Laramee, H. Dupont Durst, Theresa R. Connell, and J. Michael Nilles

Source: http://news.cbrnresourcenetwork.com/newsDetail.cfm?id=129

Peroxide-based explosives are once again of interest to the United States Government because of their use on the world stage. Peroxide explosives were first explored early in the last century by the U.S. Army as a field-producible explosive that could be prepared using dual-use starting materials. These explosives have the favorable characteristics that they are inexpensive to make, straightforward to synthesize in one-pot reactions,(1)(2) and relatively insensitive to shock. But they also possess the undesirable traits of a significant vapor pressure and decomposition upon storage, which renders them unsuitable in military application.

On the other hand, an insalubrious application of peroxide-based explosives has emerged in contemporary world events. Triacetone triperoxide (TATP), hexamethylene triperoxide diamine (HMTD), and other analogs are known to have been used by terrorists.

The detection of these explosives is an awkward analytical challenge for currently fielded detection systems. These systems require that the analyte explosive contain nitro groups or chromophores, possess optical properties such as fluorescence, and be stable during assay. While peroxide detection is realizable using certain detection systems, their slow response or low analytical sensitivity is a fundamental difficulty.

Clearly a need exists for an instrumental method of analysis that quickly detects explosives in situ, without time-consuming sample preparation, and with high sensitivity and selectivity. The DART™/AccuTOF(3) (JEOL USA, Inc., Peabody, MA) analytical

instrument is such a system. It has been tested and developed in a U.S. Army program since 2002, and it is now timely to present some of the authors' historical results. No damage to the sample surface occurs because the working reagent in DART is a gentle stream of helium gas.

Experimental

The experimental apparatus(4) consisted of a modified DART ion source (model 001-JL1) and a modified JEOL AccuTOF mass spectrometer (model JMS-100TLC). The working reagents in the DART ion source, metastable excited-state ions, and neutrals, are patent protected. The DART operating principle was publicly disclosed on April 14, 2003, in two patent applications5 as the first ambient mass spectrometric method.

Analytical standards of TATP and HMTD (AccuStandard, New Haven, CT) at a concentration of 100 µg/mL in acetonitrile were used as purchased. Two microliters of TATP (or 1 µL of HMTD) standard were deposited on an aluminum weighing boat and the solvent evaporated. A volunteer was checked for the absence of explosive residue and then the volunteer dabbed his finger into the weighting boat and inserted it into the DART beam. Grimy steel of Army materiel was acquired at Aberdeen Proving Ground (Edgewood, MD). An old and impure sample of 3,3'-azo-bis-(6-amino-1,2,4,5-tetrazine) (DAAT) was purified by filtering and washing in 2-propanol and then hot water.

Results

A human volunteer's finger was analyzed by DART after rubbing a metal surface spiked with 200 ng of TATP. The explosive residue is clearly seen as the ammonia adduct of the protonated neutral molecule $(MH+NH3)^+$. This adduct occurs because the human body exudes ammonia as a metabolic byproduct, and its large proton affinity facilitates adduct formation. The measured mass of the explosive was found to be 240.1444 Da, which is in excellent agreement with its theoretical mass of 240.1447 Da. Its signal-to-noise ratio (S/N) was 1300.

Another human volunteer's finger was analyzed after rubbing a metal surface spiked with 100 ng of HMTD. The ammonia adduct of the protonated neutral molecule and the protonated neutral, MH^+, are easily identified in the spectrum. The MH^+ ion's measured mass of 209.0771 Da was in excellent agreement with its theoretical mass of 209.0774 Da. The S/N was 3200.

Next, the analytical selectivity of the AccuTOF mass spectrometer was challenged with severely grimy steel of Army materiel awash in lubricating oils. Two hundred nanograms of TATP were applied to the steel where it dissolved into the oil-coated surface. The $(MH+NH3)^+$ cation of TATP was seen with an S/N of 200. One hundred nanograms of HMTD was then applied to the grimy steel and inserted into the DART beam for analysis. The MH^+ ion is clearly seen above the background noise with an S/N of 560. The MH^+ cation was found at 209.0768 Da, which compares well with its theoretical mass of 209.0774 Da despite the low S/N of the peak. Other ambient surfaces (airline tickets, glass, and plastic containers) gave equal success.

Concrete is a highly absorptive surface that provides a forensic advantage for ascertaining peroxide explosives synthesis and use. To simulate an unintentional splatter that might well occur during manufacture, 1 µg of TATP was deposited unto a chunk of concrete where it was absorbed. The concrete chunk was placed into the DART beam, and the intensity of the $(MH+NH3)^+$ species at mass 240.145 Da was recorded. The concrete chunk was inserted six times into the DART beam; consequently six response peaks were observed with a maximum intensity of 300,000 counts and an S/N of consistently 23,000. Repeated analysis of the same sample demonstrates the forensic advantage that DART does not damage the sample surface substrate.

The quality of the spectra produced by DART and desorption electrospray ionization (DESI) defines the detection sensitivity of each technique. DESI is another ambient mass spectrometric method introduced in 2005 after DART(6) Spectra of 10 ng TATP were examined under equivalent experimental conditions and compared. The DART/AccuTOF system gave an intense ammonia adduct cation with an absolute intensity of 91,000 counts and S/N of 17,000. On the other hand, the DESI/ion trap gave a weak $(TATP+NH4)^+$ cation of 700 absolute counts with an S/N of $=20^4$.

Another compound class of novel explosives are tetrazines. Tetrazines

are the nitrogen analog of the peroxide explosives. Tetrazines derive most of their detonation energy from their very high positive heats of formation (10.7 eV) rather than from oxidation of the carbon backbone. A clean mass spectrum of DAAT was obtained with the measured mass of the protonated neutral agreeing nicely with its theoretical mass, 221.0763 Da versus 221.0760 Da. Its S/N was 2300. An ammonia adduct is also seen because of the proximity of the human body to the DART beam. Electrospray ionization failed to ionize this sample.

The chemical structure of HMTD is widely misrepresented(7) in the open literature despite the availability of X-ray crystallographic data(8) as well as corroborating density functional calculations.(9) Its geometry is unusual about the two nitrogen atoms. The nitrogen and carbon atoms are exactly planar and are composed of short 1.42-A C–N bonds with a 120° C–N–C bond angle. This strained sp2-orbital hybridization of the nitrogen atoms results in a cryptand structure. The 106° C–O–O bond angles are normal and expected. It is noteworthy that the explosion of TATP is not a thermodynamically favored process, having a relative reaction energy of 0.01 eV. Instead, the explosion is an entropy burst, with one mole of TATP converting into four moles of gaseous products with an overpressure of approximately 100 atmospheres. It is likely that the explosion of other peroxide-based explosives is also an entropic burst instead of an exothermic process.(10)

Exact mass measurements are more informative than nominal mass measurements because their information content is larger. Their inherent advantage is that they reduce the likelihood of a false alarm (false positive type 1 error) by increasing the number of resolution elements into which useful analyte signal and useless interferent noise can be distributed. False alarms are nervewracking in general and downright distressing when they occur during the combined detection of chemical warfare agents and explosives. This chemical combination occurs during certain types of Stockpile demilitarization operations. The 6000 mass resolution and better than 1 ppm mass accuracy of the AccuTOF mass spectrometer is sufficient to separate target analyte from interferent noise in the mass range relevant to explosives detection. The Edgewood Chemical Biological Center (ECBC) laboratory has analyzed thousands of real-world samples without yet finding a false positive test result.

Conclusion

The above findings show that the DART/AccuTOF system is a safe, sensitive, and selective method for detecting trace-level quantities of peroxide-based explosives on human fingers and other ambient surfaces. Clutter-free spectra are produced without the environmental burden of toxic solvent sprays. Sample surfaces remain intact, unmarred, and uncontaminated because they are not spray-washed with solvents. The fact that DART/AccuTOF requires no sample preparation along with its ease-of-use and high speed makes for an attractive high-throughput screening prospect.

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Greece – IED exploded in Athens' shopping mall

Source: The Editor

Sunday, Jan 20, 2013 – An IED was detonated at 10:45 in the parking area of the shopping mall "The Mall Athens" in Maroussi, Athens. Two security employees were transferred to KAT Hospital with minor injuries. At 09:55 and 09:59 unknown person telephoned to "Eleftherorypia" newspaper and zougla.gr

website (news) stating that an explosive device has been placed in the mall and expected to explode in 48 minutes. According to released information, the IED has been placed near a National Bank's ATM machine next to escalators leading from basement parking area to first floor. The mall is open during Sundays and more than 200 people were there.

***Comment 1:** One more proof that the unexpected always happens! Terrorists could skip the warning and kill people; or could place a more powerful IED in place. One more proof that malls are soft targets indeed and that security was a joke! One more proof about the rotten environment Greece and Greeks are experiencing the last 30 years…*
***Comment 2:** On Jan 24th, a new (?) group identified as "Wild Freedom" ("Agria Eleftheria") assumed (in written) responsibility for the bombing.*

Reducing the impact of a terrorist attack on trains and metros

Source: http://www.ncl.ac.uk/press.office/press.release/item/reducing-the-impact-of-a-terrorist-attack-on-our-trains-and-metros#.UQDPovKkrzI

Developing a range of blast-proof technologies and systems, the EU-funded SecureMetro project team – led by Newcastle University, UK, and involving experts from across Europe – has designed a new generation of train and metro vehicles to reduce the impact of a possible bomb attack on our railways.

Led by Mr Conor O'Neill in the NewRail research centre at Newcastle University, the project has focussed on two key areas; containing the impact of the blast and reducing debris – the main cause of death and injury in an explosion and the key obstacle for emergency services trying to gain access to injured passengers.

Analysing the carriages involved in the London Underground bombings, the team have now re-designed current vehicles and have just completed a full-scale test on the prototype.

The aim is for the new technology to be incorporated into European and national standards and regulations.

Mr O'Neill, based in the School of Mechanical and Systems Engineering at Newcastle University, explained: "The Madrid bombings in 2004 and the 7/7 attack in London the year after highlighted how vulnerable our trains are to attack – particularly busy metro and commuter trains.

"At the same time we have to be realistic – completely replacing existing vehicles just isn't an option. Instead, we have developed and incorporated new technology and materials into existing carriages to improve performance.

"And what we've shown is that companies could make some relatively cost-effective and simple modifications that would significantly improve the outcome of an attack."

In a controlled, full-scale explosion on a decommissioned metro carriage, the NewRail team began the process of assessing the impact that a terrorist attack can have on the vehicle structure. Understanding the progression of the blast wave as it travels the length of the coach was key to understanding how the interior furnishings reacted to the blast force.

Filming the explosion – which takes less than a second – the team used high-speed cameras to slow down the blast footage in order to understand the mechanics of the explosion.

Learning lessons from this experiment, a similar test was carried out on a prototype, designed and built specifically with blast resilience in mind.

Tethering down heavy equipment such as ceiling panels and equipment using retention wire, plastic coatings on windows and the replacement of heavier structures with lighter-weight and energy-absorbing materials were some of the key modifications made to the prototype.

"Preventing flying objects is the key," explains Mr O'Neill. "Tethering ceiling panels reduced the risk of fatalities and injury from flying shrapnel and also meant the gangways were kept relatively clear of debris, allowing emergency staff quick access to the injured.

"The window coating we developed was also incredibly effective. Without it the windows are blown outwards – putting anyone outside, such as those standing on a platform, at risk from flying glass. With the plastic coating you see a clear rippling effect as the blast moves through the train but every window remains intact apart from the safety windows which are designed to be easily knocked out."

The team have also investigated the benefits of dividing up the carriages

using energy-absorbing materials that reduce the impact of the blast.

As a result of the research and testing conducted the SecureMetro project is now in a position to advise the rail industry on which design approach will improve the resilience of rail vehicles in the event of a blast.

Mr O'Neill adds: "A bomb on a train is always going to be devastating but what we are trying to do is find a way in which the vehicle itself can help to mitigate the impact of an attack.

"These are all low-cost, simple solutions that can be put on existing trains which could not only save lives but also reduce the attractiveness of our railways for potential terrorist attacks."

The Syrian "barrel bomb" - a terror weapon

Source: http://francona.blogspot.gr/2012/10/the-syrian-barrel-bomb-terror-weapon.html

Barrel bombs aboard an Mi-8 helicopter

Syrian air force crewman ignites barrel bomb fuse with a cigarette

The Syrian air force has developed a crude, but effective air-delivered munition referred to by the Syrian people who it is dropped on as *al-barmil* (the barrel), or *al-barmil TNT*. It is mostly delivered by helicopter, usually the Mi-8 (HIP C) and Mi-17 (HIP H). The sound of helicopter rotor blades causes panic and terror.

There are several versions of the barrel bomb, probably depending on which air base prepares them. They all include the same basic components. Start with a cylindrical object, be it a large-diameter pipe, a used artillery shell, or the basic oil drum. Fill the object with TNT or other explosive, some oil and shrapnel. The shrapnel used includes pieces of rebar, nuts and bolts, nails and ball bearings. The explosion causes great damage to soft structures - houses, apartment buildings, commercial areas - in addition to the extreme human casualties.

The bombs, in reality improvised explosive devices, are fitted with a fuse that appears to be nothing more than detonator cord, and is ignited with a match, lighter or cigarette (as seen in video below). After the fuse is lit, the device is pushed out the back of the helicopter. From the videos I have seen, there does not appear to be much aiming - the crewmen push the barrel out over a city or village. The helicopters remain fairly high - I estimate the altitude of the video below at about 10,000 feet - to remain above the effective altitude of the anti-aircraft artillery and shoulder-fired surface-to-air missiles in the hands of the Free Syrian Army.

This is what a barrel looks like after it has hit the ground, but not detonated. Note the shrapnel in the lower frame.

Carrying barrel bombs inside a helicopter is risky business, especially if the helicopter is flying within the effective range of antiaircraft weapons. I believe this helicopter may have been carrying these TNT-laden barrel bombs when it was hit by ground
fire.

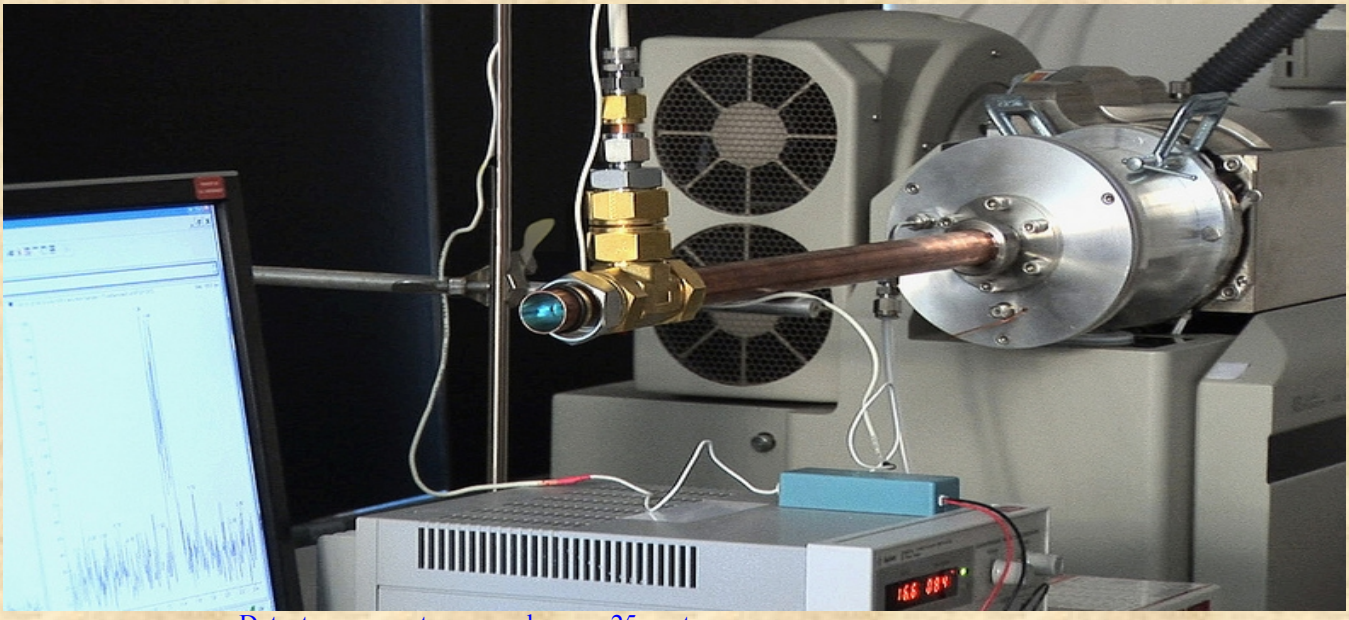
The Syrians have developed what appears to be an effective weapon that incites panic and

fear on its intended targets. We must not forget that these random bombings are directed at their own people.

New explosives vapor detection technology

Source: http://www.homelandsecuritynewswire.com/dr20130222-new-explosives-vapor-detection-technology

Novel explosives detection method focuses on direct, real-time vapor detection rather than collection of explosives particles. It could change paradigm for explosives screening.



Detector senses traces as low as 25 parts per quadrillion // Source: pnnl.gov

A quick, accurate, and highly sensitive process reliably to detect minute traces of explosives on luggage, cargo, or travelling passengers has been demonstrated by scientists at the Department of Energy's Pacific Northwest National Laboratory (PNNL). The vapor detection technology accurately detects and identifies the vapors of even very low-volatility explosives in real time at ambient temperature and without sample pre-concentration.

Details are outlined in a recent issue of *Analytical Chemistry*.

A PNNL release reports that rather than searching for particle residue using a typical method like surface swipes or using pulses of air to dislodge particles for analysis, the system "sniffs" directly for explosives vapors, much the way bomb-sniffing canines do.

"We have demonstrated direct, real-time vapor detection for the low-volatility explosive compound RDX, which is used in many types of explosives," said David Atkinson, senior research scientist at PNNL. Low-volatility compounds are those which release very small amounts of the explosive vapor typically at parts per trillion levels or lower, making it extremely difficult to detect. The PNNL system easily detects vapors from a fingerprint-sized sample of RDX at levels below 25 parts per quadrillion.

"The system correctly identified the RDX vapor using selective atmospheric pressure chemical ionization with mass spectrometry," explained Atkinson. The approach involves pulling an air sample stream and ionizing it within a reaction region in an atmospheric flow tube. The ionized sample moves to a mass spectrometer for ion detection and identification. These air samples need no heating or pre-concentrating. Analysis happens in about one second.

— Read more in Robert G. Ewing et al., "Direct Real-Time Detection of RDX Vapors Under Ambient Conditions," Analytical Chemistry 85, no. 1 (7 December 2012): 389–97