

Lettre du



MSIAC

Munitions Safety Information Analysis Center

Newsletter



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ADVANCED IM SEARCH (AIMS) A NEW MSIAC TOOL

MSIAC has developed over the years an Excel database suite that assembles many IM test results published in the open literature. These databases are well-known as BIRD (Bullet Impact Results Database), SYR (Sympathetic Reaction Database), FRAID (FRAGment Impact Database), DARTS (Database of Ammunition Reactions to Shaped Charge Jet) and HEAT (slow cook-off and fast cook-off test results).

Together these databases compile data from over 500 publications and comprise more than 5,500 test results. However, the growing number of test results make searching database by database more and more time-consuming and repetitive. These drawbacks highlighted the limits of an Excel-based architecture and showed the need for the development of a search engine that can look into multiple databases for the test results that match one or several criteria.

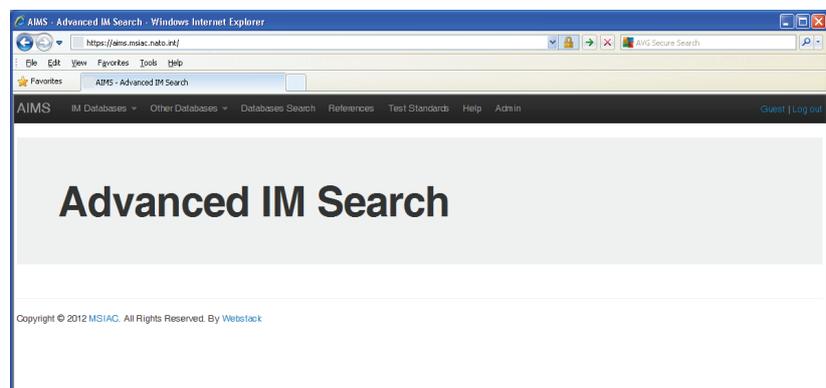


Figure 1: AIMS Website

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A first part of this ambitious task has been recently achieved with the creation of a web-based platform (figure 1) called AIMS (Advanced IM Search). This platform will be the portal to access and search through one or several IM databases.

AIMS Platform

The various functionalities of the platform are gathered in the menus located at the top of the webpage (figure 2).

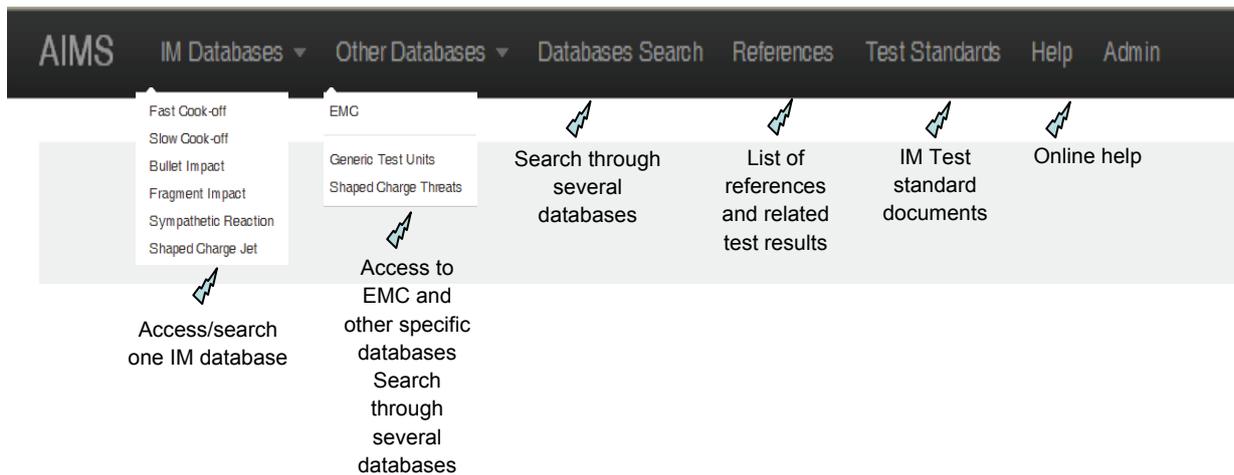


Figure 2: AIMS Platform Menus

IM Test Results Databases

The user can access a particular IM database by selecting an IM aggression in the “IM Databases” menu (figure 2). The IM test results webpages are then displayed with a layout similar to that in the Excel version as shown in figure 3 for Sympathetic Reaction (SR) database.

AIMS IM Databases Other Databases Databases Search References Test Standards Help Admin Guest | Log out

Select a criteria

Search or Clear search

Sympathetic Reaction Tests results (697) Print Export Comment

SR Test		Donor (D) and Acceptor (A) Characteristics					Mitigation		Test Setup		Results		Ref
ID	Munition (Teste d Item)	Main Energetic Material	Composition	External Diameter/ Thickness (mm)	Case Material and Thickness (mm)	Packaging	Material / Concept / Thickness (mm)	Configuration	Distance Donor to Acceptor	Initiation Mechanism	Reaction Type	Ref	
1	4.5" Mk8 IA Shell (Warhead)	Comp B	60% RDX 40% TNT	114.3	Steel 18-12-6	Packaged	GRP Tube 20.0	One on One Buffered	114.3	DDT	I	9	
2	4.5" Mk8 IA Shell (Warhead)	Rowanex-1100	88% RDX 12% HTPB	114.3	Steel 18-12-6	Packaged	GRP Tube 20.0	One on One Buffered	114.3	SDT	ND	9	
3	4.5" Mk8 IA Shell (Warhead)	Comp B	60% RDX 40% TNT	114	Steel 18-12-6	Packaged	GRP Container 6.0 Water Plate 100.0	One on One Buffered	207.0	SDT	NR	38	
4	4.5" Mk8 IA Shell (Warhead)	Comp B	60% RDX 40% TNT	114	Steel 18-12-6	Bare	None	One on Many Unbuffered	0.0 0.0 47.0	SDT SDT	I (x35 shells)	110	
5	4.5" Mk8 IA Shell (Warhead)	Comp B	60% RDX 40% TNT	114	Steel 18-12-6	Packaged	GRP Container 6.0	One on Many Unbuffered	114.3 114.3 114.3	SDT SDT	I (x15 shells) ND (x20)	110	

Figure 3: Main Webpage for Sympathetic Reaction Database

(Continued on page 3)

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The useful Excel features have been re-created. For instance, it is possible to sort results by reaction level or to see the pictures describing the test setup and results by moving the mouse over the Reaction Type value (figure 4).

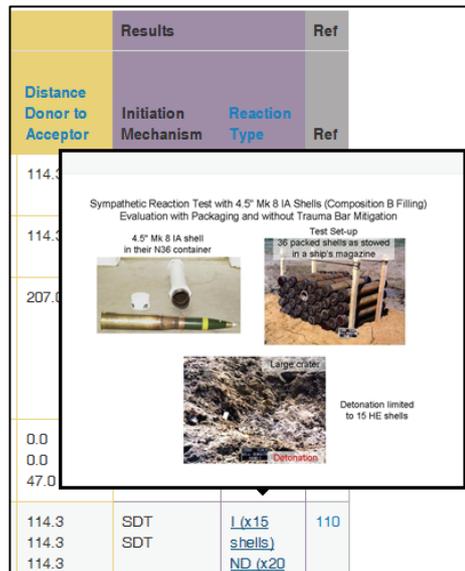


Figure 4: Picture Describing Test Setup and Results for SR Test ID 5 (Moving the Mouse over the Reaction Type Value)

This interface sums up the main available information that enables one to compare the results. A detailed view (figure 5) has also been created for each test to show information on the munition type, the initiation/ignition system, the test setup and procedure, and the pictures. This nicely displays far more information than in an Excel database.

The detailed view can be accessed by clicking on the test ID or the Munition Name (indicated in the first and second columns of the main window).

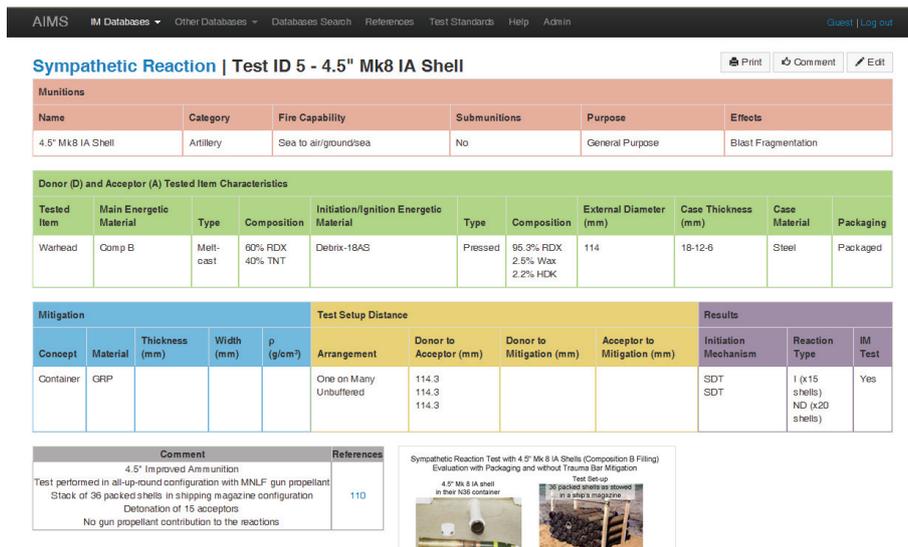


Figure 5: Detailed View for SR Test ID 5

Search One Database

A major improvement over the Excel database format is the creation of an intuitive and user-friendly search interface that enables the selection of criteria and filled search values in a few clicks. The use of this interface is illustrated in figure 6. The user just needs to click on Select Criteria in top right hand side of the webpage. A drop-

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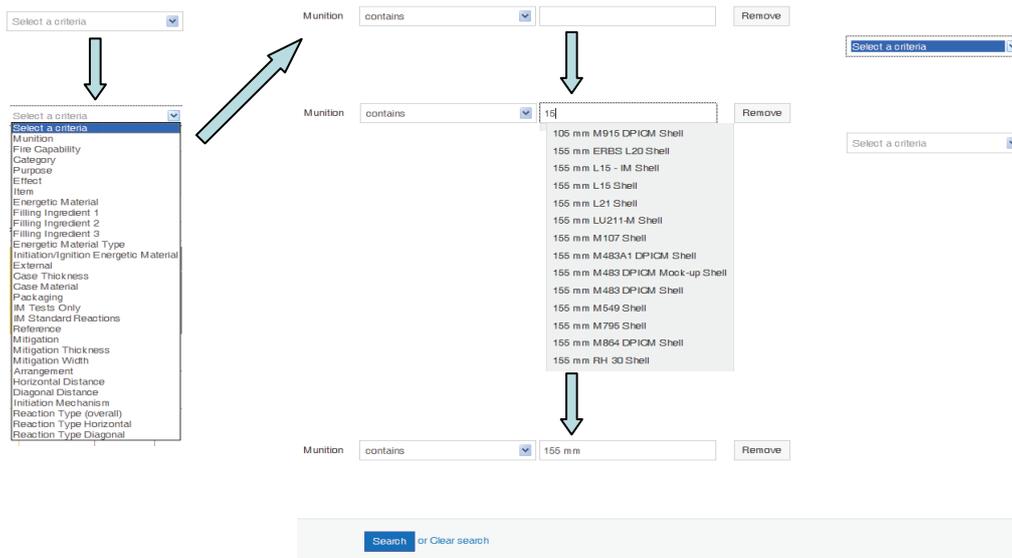


Figure 6: Search Interface in a Database

down list with the criteria appears. The selected criterion is then displayed on the left hand side and the user can fill in the value or the range for this parameter. To increase the search relevancy, the user is proposed existing values in the database that matches what he is typing (feature known as auto-complete).

The user can add as many criteria as necessary and remove them as easily.

SR Tests with 155 mm Shells Filled with NTO-based Compositions

A search example is illustrated below for sympathetic reaction test results for 155 mm shells filled with NTO-based compositions. The search scenario and the results are shown in figure 7.

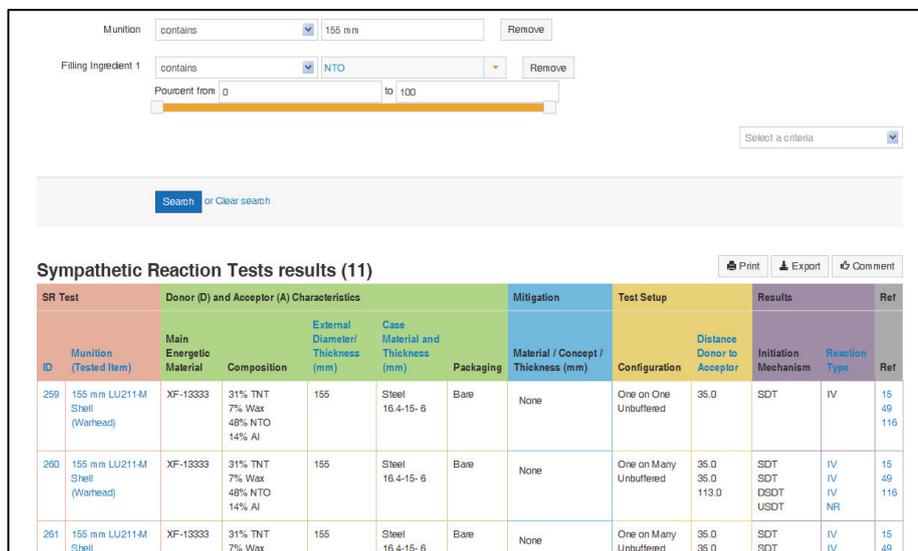


Figure 7: Search Scenario and Results for

The search in the SR tests took less than 1s and 11 results were found. The user can compare the results, access the detailed views as described previously. It is also possible to print, export the results, leave a comment to the platform administrator or refine the search.

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Search Several Databases

Another major feature of the platform is the ability to perform multi-database searches with a single common interface. For this kind of search, the user will click on the tab Databases Search (figure 2).

The search principles are exactly the same as those described for one database but this time, only the criteria common to all the databases are available (Munition type, Tested Item, Reaction Type and Reference) as shown in figure 8.

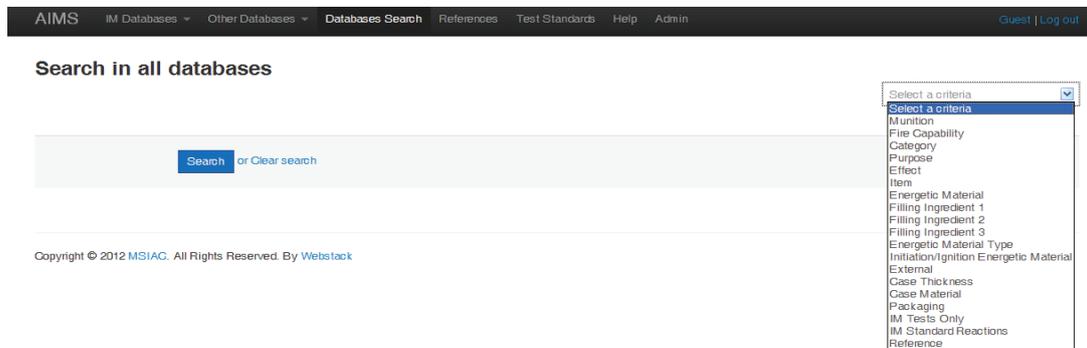


Figure 8: Multi-Databases Search Interface

As an example, the search illustrated above for sympathetic reaction can be performed again for all databases. The search criteria and the results are illustrated in figure 9.

Search in all databases

Munition contains 155 mm Remove

Filling Ingredient 1 contains NTO Remove

Percent from 0 to 100

Select a criteria

Search or Clear search

0 Fast Cook-off 0 Slow Cook-off 10 BI Tests 0 Fragment Impact 11 SR Tests 0 Shaped Charge Jet

BI Test	Tested Item Characteristics						Mitigation	Test Setup				Results		Ref
	Munition (Tested Item)	Energetic Material	Composition	External Diameter/ Thickness (mm)	Case Material and Thickness (mm)	Pack.		Material / Concept / Thickness (mm)	Bullet Type	V0 (m/s) (Firing Distance in m)	Vimpact (m/s)	Burst or Single	Aim Point	
985	155 mm HE Shell (Warhead)	TT	40% TNT 60% NTO	155	Steel	Bare	None	12.7 AP	(70)	850	Single	Center	IV (x1) V (x1)	69
988	155 mm HE Shell (Warhead)	TTR	28% RDX 50% TNT 28% NTO	155	Steel	Bare	None	12.7 API	(70)	850	Single	Center	IV	69
998	155 mm M795 Shell (Warhead)	IMX-102	50% TNT 35% NTO	155	Steel 12 (estimated)	Bare	None	12.7 AP		850	Single	Center	V	80

Figure 9: Multi-database Search Scenario and Results for

The results are provided in separate tabs, one per IM threat and the number of results is indicated in front of each threat. In the present search, there are 10 bullet impact test results and 11 SR test results (none for the other threats as the databases are still being migrated into the platform). The user can navigate without any limitation from one IM database results tab to the other, look more precisely at one test result by clicking on a Detail View, come back to the Main View, change aggression, etc.

Access to the Platform and On-going Work

At the moment, BIRD and SYR are the two first databases to be available on AIMS platform. Work is on-going to migrate the four other databases. The AIMS platform should be available on the MSIAC web server at the end of September 2012. the release will be announced on the MSIAC open web site. In the meantime, we are looking for volunteers to test the AIMS beta version (with bullet impact and sympathetic reaction threats). If you are interested please contact Pierre-François Péron, email p-f.peron@msiac.nato.int or telephone 32-2-7075426.

9TH WORKSHOP ON PYROTECHNIC COMBUSTION MECHANISMS



Group picture of the 9th WPC taken on June 9 2012 in Denver

On June 9, 2012, the 9th Workshop on Pyrotechnic Combustion Mechanisms (WPC) was held in Denver, Colorado, USA at the Westin Denver Downtown. This was the 4th time the WPC was held in the US since the beginning of the series in 2004.

The workshop is an official function of the International Pyrotechnics Society and as such was held in conjunction with the 38th International Pyrotechnics Seminar held at the same place from June 10-15 (see report below).

The main topic of this year's WPC was Advanced Energetic Materials and we were able to get 6 top international scientists to address this area of cutting-edge research.

Sebastian Knapp, diploma-physicist at the Fraunhofer ICT, Germany, presented a new approach to model granular pyrotechnic reactions with low gas production. The model in parallel solves the heat and mass transfer equation under consideration of a chemical reaction. The calculated propagation rates match pretty nicely the observed burn rates in experimental systems and show the predominant influence of particle size effects.

Karl O. Christe, professor of chemistry at the University of California, USA, talked about research on new ionic liquid high-oxygen carriers as replacements for ammonium perchlorate.

- $[\text{NH}_4][\text{B}(\text{NO}_2)_4]$ is a vibrationally stable molecule with reasonable enthalpy of formation ($\Delta_f H = -613 \text{ kJ mol}^{-1}$) and high oxygen content, $\Lambda = +33.82 \text{ wt-\%}$. However attempts to synthesize the material were yet unsuccessful.
- Bis-trinitromethylborane ammonia salt $[\text{NH}_4][\text{H}_2\text{B}_4-(\text{C}(\text{NO}_2)_3)_3]$ has attractive oxygen content $\Lambda = +17.19 \text{ wt-\%}$ and is vibrationally stable.

Santanu Chaudhry, associate professor of chemistry at the Washington State University, talked about kinetics of elementary steps of aluminized energetic materials such as:

- reactive fragments based on $\text{RM}_4(\text{Al}/\text{PTFE})$,
- agent defeat systems ($\text{Al}/\text{I}_2\text{O}_5$), and
- blast enhanced explosives (Al/RDX).

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The most reactive specie in Al-PTFE reactions are both CF₂ and COF. With current computing power it is possible to elucidate important/rate determining steps and to design new energetic material taking into account the reactivity.

Jesse Sabatini, PhD chemist at Picatinny Arsenal, gave a presentation on environmentally friendly formulations for battlefield illumination. He demonstrated the feasibility to replace obsolete potassium perchlorate by high nitrogen materials and new fuels such as boron carbide (B₄C) to replace toxic barium compounds.

Steve Son, professor in mechanical engineering at Purdue University, reported on influence of reactivity of crystalline silicon by different concentrations of both n- and p-dopants, boron and arsenic respectively. He could show that with increasing content of dopant- irrespective of its nature (either n or p) an decrease in activation energy of the oxidation of the sample is observed which nicely coincides with the observed burn rate for silicon/PTFE samples.

Lori J. Groven, associate professor in mechanical engineering at Purdue University, reported on cold welding of micronized aluminium particles with various fluoropolymers such as PTFE, PMF and THV-220. Depending on the duration and intensity of welding the samples exhibited combustion behaviour similar to nanometric aluminium samples. Thus the method proposed enable use of less reactive micronized aluminium in say blast explosives or pyrotechnics.

WORKSHOP ON ENERGETIC MATERIALS QUALIFICATION

On June 25, 2012, the 2nd Workshop on Energetic Materials Qualification (EMQ) was held in Pfinztal, Germany at the Fraunhofer ICT. The workshop was held in conjunction with the Annual ICT Conference held in Karlsruhe starting two days later.

The workshop was organized by MSIAC to explore and discuss shortfalls in common shock and thermal testing of energetic materials.

Ruth Doherty, PhD chemist at the Indian Head NSWC, USA gave a talk in which she described the various types of shock tests applied in NATO countries. She elaborated on the rationale to do shock testing and explained the different sizes ranging from less than 10 g sample mass to about 2 kg. Furthermore, she expanded on factors affecting the test results such as –particle size distribution, critical diameter and porosity/density.

Bill Proud, professor for mechanical engineering and director of the Institute of Shock Physics, gave a presentation on current shock sensitivity testing at Imperial College. First he discussed the influence of crystal imperfections on shock sensitivity of PETN. Although internal voids are often accounted for, the overall shock sensitivity of energetic formulations he could show that this does not correlate with a number of materials. Hence, other effects such as surface porosity have to be taken into account as well. Furthermore, he discussed different mechanical failure mechanisms in PBX and propellants at both ambient and below T_g conditions.

Richard Bouma, PhD physicist at TNO Technical Sciences, discussed the Energy Fluence criterion in shock and impact testing of energetic materials. He showed that taking the pressure exclusively as a measure for shock initiation of energetic materials fails to fully describe the initiation criterion. Thus, the energy fluence, which is the integral of shock pressure times particle velocity over the considered time, is a more suitable measurable. He proposed to amend STANAG 4488 accordingly.

Manfred Bohn, PhD chemist at Fraunhofer ICT, Pfinztal, Germany, discussed the aim of thermal testing as a quantification of susceptibility of energetic materials to thermal ignition under various conditions encountered in storage and use. He stressed that both indirect ignition and self-ignition of energetic materials are relevant mechanisms of thermal ignition. He explained different thermal stability test methods such as DSC, Heat Flow Microcalorimetry (HFMC), Accelerating Rate Calorimetry (ARC) and heat storage of samples with different geometrical size. He emphasized that ARC was able to compare and assess substances with regard to thermal stability, compatibility and time-to-slow cook off event.

Gerhard Krause, PhD chemist at ISAFEM, Berlin, Germany, discussed volume-dependent effects on self-heating of energetic materials. He expressed criticism over the onset-temperature obtained from slow cook off testing according to STANAG 4382 as being far too high. He showed that true SCO-onset temperatures are far lower than obtained with this test which can have severe implications on storage recommendations in some cases.

The presentation delivered at the EMQ Workshop are available on request. Please contact Valerie Cousens at info@msiac.nato.int.

PROCUREMENT ISSUES PRESS REVIEW

If you have information you consider of relevance to this section please do not hesitate to contact MSIAC at info@msiac.nato.int

CHEMRING ORDNANCE AWARDED TWO CONTRACTS WORTH \$19.2M FOR ARTILLERY SUPPLEMENTARY CHARGES

www.chemring.co.uk – 17/07/2012)

Chemring Ordnance, Inc. ("COR"), a Chemring Group ("Chemring") company, announced today that it has been awarded by the US Army two new contracts with the combined value of \$19.2M to Load, Assemble, and Pack (LAP) artillery supplementary charges for the military services. One contract is to manufacture TNT Supplementary Charges and the other is to manufacture the new Insensitive Munition (IM) PBXN-9 (92% HMX, 6% DOA and 2% HyTemp) Supplementary Charges.

The final application has not been disclosed but such a type of supplementary charge has been evaluated in the 155 mm M795 IM shell version filled with IMX-101 (43.5% DNAN, 36.8% NQ and 19.7% NTO). This shell is close to be IM compliant and especially passes the shaped charge jet test and the sympathetic reaction test without barrier.

	FCO	SCO	BI	FI	SR	SCJ
155 MM m795 Shell (IMX-101)	V	V	IV	IV	III	III

FRANCE ORDERS 76 NAVAL AMMUNITION FROM DIEHL

www.diehl.com -04/06/2012)

Diehl Defence has received an order from France to develop and qualify modern naval ammunition. It constitutes a refinement of the 76 mm naval ammunition employed worldwide. The new ammunition is scheduled for deployment in the Oto Melara SUPER RAPIDO L-62 naval guns of the new frigates FREMM and HORIZON from 2015. The 76 mm ammunition is capable of engaging both air and sea targets as well as coastal targets.

The 76 mm shell is being filled with insensitive explosives and meets the requirements of insensitive ammunition (IM) according to STANAG. As opposed to the old variant, it prevents detonation of the ammunition in case of enemy shelling or fire on board. This contributes to the protection of the vessel's crew.

The new 76 mm naval ammunition is a joint cooperation of Diehl Defence and the French manufacturer Nexter Munitions. The company JUNGHANS T2M from La Ferté Saint-Aubin, France, supplies the fuze. The propellant charge system is delivered by the firm Nitrochemie Wimmis, Switzerland.

LOCKHEED MARTIN RECEIVES \$241 MILLION CONTRACT FOR JASSM® LOT 10 PRODUCTION

www.lockheedmartin.com – 28/06/2012)

The U.S. Air Force recently awarded Lockheed Martin a \$241.6 million contract for Lot 10 production of the Joint Air-to-Surface Standoff Missile (JASSM) and Extended Range (ER) variant.

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The JASSM Lot 10 contract is for 191 baseline missiles, 30 ER missiles, Test Instrumentation Kits and systems engineering support. While this is the tenth production lot for the JASSM baseline missile, it is only the second lot for JASSM-ER.

Armed with a dual-mode penetrator and blast fragmentation warhead, JASSM and JASSM-ER cruise autonomously day or night in all weather conditions. JASSM-ER has more than two-and-a-half times the range of baseline JASSM for greater standoff range. These 2,000-pound cruise missiles employ an infrared seeker and Global Positioning System receiver to dial into specific target aimpoints. JASSM is integrated on the U.S. Air Force's B-1, B-2, B-52, F-16 and F-15E. JASSM-ER is integrated on the B-1.

JASSM is equipped with a 1,000 pound penetrator that is filled with the Extremely Insensitive Substance (EIS) called AFX-757 (20% RDX, 30% AP, 33% Aluminium and 17% HTPB) and has a PBXN-9 booster. The warhead also includes vents in the aft closure and a Thermally Reactive Retaining ring that releases at approximately 143 °C and prevents pressure build-up when the explosive starts reacting in cook-off environments.

Thanks to these IM features, JASSM missile exhibits a very good IM signature to IM threats.

	FCO	SCO	BI	FI	SR
JASSM Missile	V	V	V	V	III*

* In logistic container



JASSM Cruise Missile in Flight

GENERAL DYNAMICS AWARDED CONTRACTS FOR 120MM TANK AND ARTILLERY AMMUNITION VALUED AT \$97 MILLION

www.generaldynamics.com – 04/06/2012)

The U.S. Army Contracting Commands, Picatinny Arsenal, N.J., and Rock Island, Ill., have awarded General Dynamics Ordnance and Tactical Systems, a business unit of General Dynamics (NYSE: GD), three contracts with a total value of \$97 million for the manufacture and delivery of 120mm M865 and M1002 tank training ammunition, 105mm M1130 high-explosive (HE) pre-formed fragmentation (PFF) cartridges and 155mm M795 HE projectile metal parts.

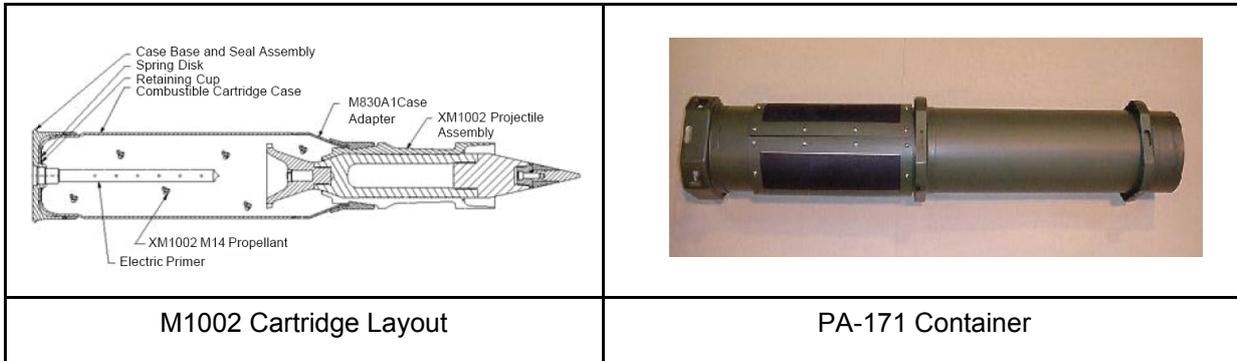
The M1002 Target Practice Multi-Purpose Tracer (TPMP-T) training cartridge provides matched exterior ballistics and time-of-flight parameters to the M830A1 High Explosive Anti-Tank Multi-Purpose Tracer (HEAT-MP-T) tactical cartridge when fired from the Abrams tank.

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The M1002 has a combustible cartridge and M14 propellant charge. The round is packed in a PA171 container. This container is made of a metal can with two single pane windows in Polyethylene Ionomer that have been designed to rupture in case of propellant combustion and prevent pressure build-up. This concept enabled to keep the container intact in IM tests and avoid container metal projections.

120 mm M1002 training ammunition is fully IM compliant and has been assigned a hazard division HD 1.3C.



	FCO	SCO	BI	FI	SR	SCJ
120mm M1002 (imx-101)	V	V	V	V	Pass	Pass

120 mm M1002 IM Signature

ATK RECEIVES \$36 MILLION ORDER FOR PRODUCTION OF 120MM TRAINING AMMUNITION

www.atk.com – 04/06/2012

ATK has received a \$36 million order from the U.S. Army to produce 120mm training ammunition for tanks. The award is for a first base-year with four, one-year evaluated option years.

The 120mm training ammunition, used by the M1A1/A2 Abrams main battle tank, includes the M865 kinetic energy and the M1002 multi-purpose anti-tank training rounds. These training rounds closely replicate tactical ammunition in appearance and ballistic performance to provide the warfighter with an affordable, yet realistic training experience.

The IM characteristics of the 120 mm M1002 are described in the article above.

LATEST PATENTS OF INTEREST



US 20120118448A1

- (19) **United States**
 (12) **Patent Application Publication** (10) **Pub. No.: US 2012/0118448 A1**
Comet et al. (43) **Pub. Date: May 17, 2012**

(54) **EXPLOSIVE COMPOSITION HAVING A
 FIRST ORGANIC MATERIAL INFILTRATED
 INTO A SECOND MICROPOROUS
 MATERIAL**

(75) Inventors: **Marc Comet**, Huningue (FR);
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 (FR)

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 FRANCO-ALLEMAND DE
 RECHERCHES DE
 SAINT-LOUIS, SAINT-LOUIS**
 (FR)

(21) Appl. No.: **12/285,463**

(22) Filed: **Oct. 6, 2008**

(30) **Foreign Application Priority Data**

Oct. 5, 2007 (FR) 07 07016

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C06B 21/00 (2006.01)
C06B 31/28 (2006.01)
C06B 31/02 (2006.01)
C06B 43/00 (2006.01)
C06B 25/00 (2006.01)
C06B 29/08 (2006.01)
- (52) **U.S. Cl.** **149/46**; 149/109.4; 149/92; 149/88;
 149/76; 149/83; 149/61; 149/108.2; 149/109.6

(57) **ABSTRACT**

An energetic composition with controlled detonation having at least a first organic material and a second material, where the second material is a porous material (micro-, meso-, or macroporous), having a pore ratio of at least 10% and preferably greater than 50%, and the first material is, at least partially, infiltrated into the pores of the second material. A mixture containing such a composition, and a method for manufacturing such a composition and such a mixture. Additionally, a method for fragmenting or expanding a microporous immaterial at nanoscale.

ACCIDENTS REPORTING

20 March - June 14, 2012

(Re-printed with the permission of ility engineering (www.saunalahti.fi/ility) from their Hazards Intelligence (Hint) Journal)

20 March - UK

120320-07 Greater London, Croydon. VINCI Construction UK. A builder injured in an explosion in a firing range inside Croydon Police Station was in a critical condition in hospital. Seven people were injured in the explosion, including one contractor who was flown by air ambulance to a specialist burns unit in Essex, where he was listed in a stable condition after suffering extensive injuries. Police said that another man was in a critical but stable condition in St George's Hospital, Tooting.



The exact circumstances of the incident are unclear, but it is believed an explosion caused a fire in the basement of the police station in Park Lane, in a former armoury which had been converted into a firing range. Five other people, including two contractors, two civilian staff and a police officer were also injured. The building had to be evacuated and operations moved to South Norwood Police Station following the explosion at 11:28.

Earlier in the day, Chief Inspector Caroline Trevithick indicated the explosion occurred in a de-commissioned armoury now used as a firing range, and that the area contained no weapons or munitions. Chief Superintendent Musker, however, denied his officer had ever identified what the area was being used for, adding: "She never said that. We neither confirm nor deny what we have in police stations". The Metropolitan Police later confirmed, however, that the explosion occurred in a firing range which was being refurbished before being re-opened in May.



Everyone else who was in the building at the time was accounted for, including 14 prisoners who were relocated to South Norwood Police Station. The fire was brought under control by 13:38. The builders involved in the explosion worked for VINCI Construction UK, which expressed gravely concerns about the welfare of its staff. A spokesman said: "VINCI Construction UK has been working with all emergency services throughout the day to secure the scene of the incident. We are working with the HSE in their ongoing investigation to understand the cause of the explosion".



22 March - USA

120322-12 VA, Zuni. An 06:30 explosion, which did \$75,000 damage to a home, occurred in a room that the tenant used for reloading ammunition. Isle of Wight County Sheriff's Capt. Rick Gaddis said on March 23 that while the cause of the explosion remained under investigation, it may never be determined. Gaddis said: "The state police has to finish their investigation and lab tests. The reality is the lab tests will show why the black powder exploded. There's gotta be a spark. We could sit here and speculate for 100 years. I just don't know". The explosion, which did not result in any injuries to the four residents, destroyed the room and damaged the ranch home's rafters.

The tenant had just walked out of the room when the explosion occurred. He said he had no idea what caused it. Gaddis said that no one was in the room when the powder ignited, except for an opossum that the tenant's wife believes the dog may have chased into the home. They were attempting to get the opossum out of the home at the time of the explosion. The opossum was killed. During the investigation, a small amount of suspected marijuana and smoking devices allegedly were found. Charges are pending, Gaddis said.

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March 30 - Canada

120330-11 British Columbia, Kelowna. A loud explosion was heard around 11:30 near the Kelowna Airport. Kelowna RCMP Sgt. Greg Woodcox said the explosion was the work of police: "We had members from our Explosives Disposal Unit up here because a couple of days ago someone found some gunpowder in his residence. They were just at a field close by the airport and were burning it when it detonated". Woodcox added it was a controlled situation and no one was at risk during the procedure. The person who reported the find to police was cleaning out a house in Kelowna when they discovered about 40 pounds of gunpowder.

3 April - Switzerland

120403-04 Canton Graubünden, Chur. A worker in a cottage that had previously stored black powder, was injured on the hands and face by an explosion. The victim and another worker of a flooring company were grinding the wood floor in the old powder house on Pulvermühlestrasse [Powder-mill Street]. According to initial findings of the police, was ignited explosively by a spark of the angle grinder. The sparks were also thought to have ignited powder residue behind the wall, which according to the Graubünden canton police, led to two other explosions. The worker who performed the grinding work was brought by the rescue to the hospital with injuries to the hands and face. The second worker was outside the cottage at the time of the explosion and was uninjured.

It always pays to inquire into the history of the site. For example, that bargain property in Pestfriedhof [plague burial ground] might not be the best place for your block of luxury condos.

19 April - UK

120419-02 Oxfordshire, Banbury, Grimsbury area. Police and fire-fighters were called at about 12:40 to a building site in Grimsbury, in Banbury. Contractors uncovered an item which let off chemical fumes when disturbed. Army bomb disposal officers found three World War II phosphorus grenades. Fire station manager Mick Clarke said a controlled explosion was later carried out. He said fire crews and the Royal Logistics Corps would return on April 20 to excavate further to establish if there were any more grenades at the site. Mr Clarke said phosphorus grenades were usually stored "in groups of twenty" so they were likely to find more.



Mr Clarke said the grenades looked like "milk bottles three quarters of the way full with milk", adding: "But when phosphorus comes into contact with air it bursts into flames, so they [the contractors] did the right thing in calling us. Nobody has been hurt. However three members of the public, who were working on the site, and three of the initial attendance fire crews were taken to hospital for a precautionary check-up because they were breathing the smoke in the early stages.

They have all been released and are fine with no lasting effects".

This has many of the signs of a WWII cache of phosphorous grenades hidden by the Home Guard in the early 1940s. References to a munitions factory in the area in 1919 were a red herring.

On April 24, it was reported that the EOD squad carried out a controlled explosion after more grenades were found at an Oxfordshire building site.

21 April - Cameroon/Cameroun

120421-03 Yaoundé, Camp Yeyap. An explosion may have occurred in a munitions bunker of the Secretariat of State for Defence, Camp Yeyap, panicking the residents of the neighbouring districts of Melen, Mokolo, and Elig-Effa. Many feared a repeat of the April 6, 1984 attempted coup d'état. According to a statement by the Deputy Minister of Defence:

"In the night of 20 to 21 April, 2012, at 00:15, a fire outbreak was declared inside a compartment of the small calibre munitions bunker in the Elig Effa barracks. The sentry on duty, having noticed smoke, immediately alerted his superiors. The special services of the national fire-fighters and of the Inter-service Munitions immediately came to the scene. The situation was quickly brought under control. It was a relief to note that the bunker in question is constructed to the state-of-the-art and is underground and dug-in. However, for reasons of security, the local inhabitants were kept away from the incident until the securing of the site was complete".



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22 April - Albania

120422-03 Skrapar, 150 km (90 miles) south of the capital, Tirana. On April 23, Albania's defence ministry reported that a man had died in an explosion at a munitions disposal site. The ministry said the man died when an artillery shell exploded at a "blast range" [Firing range? Testing range? Ed.].

A different report said the person was killed in an explosion at an ammunition depot.

24 April - India

120424-09 Tamil Nadu, Chinnadarapuram police station limits, Anaipalayam. An explosives storage facility was destroyed when detonators and gelatin sticks stored there exploded shortly after midnight. One person was injured in the explosion. People in the vicinity of the magazine, a warehouse where explosives are usually stored, located in a remote part of Anaipalayam in Chinnadarapuram police station limits, heard a huge explosion amidst thunder and lightning that accompanied heavy summer rain that lashed the area. The reinforced magazine, belonging to M. Ramakrishnan of Kongu Nagar, was blown up. Sources said that around 45,000 ordinary and electric detonators and 120 gelatin sticks were stored in the magazine. The watchman, who was injured, was rushed to a hospital in Karur.

18 May - Russia

120518-03-A Primorskiy kray, 300 km northeast of Vladivostok, town of Sungach. A fire at an ammunition warehouse northeast of Vladivostok set off a series of explosions, injuring a soldier and prompting the evacuation of area residents. Trains and aircraft mobilized to put out the fire could not attack it that afternoon, since the fire had grown as ammunition continued to detonate inside the military facility. A Primorye region law enforcement source said: "The intensity of the ammunition explosions are rather high, so, considering the situation, it is currently impossible to put out the fire. The fire-fighters on the scene are waiting for the blaze to become less intense and for ammunition to stop exploding".



Around 700 residents of the town of Sungach, where the depot is located, and of the nearby town of Dukhovskoye were

evacuated from the area. Sungach is located 280 km northeast of Vladivostok in the Far East, near the border with China. It mainly stored artillery shells.

Interfax reported that there had been more than ten explosions at ammunition warehouses in Russia in the last three years, resulting in hundreds of injuries and more than a dozen deaths.

19 May - China

120519-03-B Hunan province, Zhuzhou city, Yanling county. At least twenty persons were killed by an explosion in the Bamianshan tunnel, which is being built for the Yanling-Rucheng expressway, in Yanling county of Zhuzhou city. A total of 24 people were working in the tunnel when the explosion occurred. The Hunan provincial transport department said in a statement that four of them were rescued, including one in critical conditions, and another slightly injured. The two injured were hospitalized. Rescuers conducted life detections six times at the site, with no sign of life detected, according to Yang Jun with the fire brigade of Yanling county.

The explosion happened at about 08:30 when a vehicle carrying explosives was unloading in the 2,355 metre-long tunnel. The explosives were contained in 12 cases, each with a weight of 24 kilograms, according to the contractor of the tunnel project.

On May 22, Fan Jinsheng, director of the State Administration of Work Safety's emergency rescue centre, said initial investigations showed that the truck had been carrying explosives and detonators, despite regulations stating that they must be transported separately. How the detonator was ignited remains unknown, he said, adding that a team of experts was still analyzing the cause of the accident.



After three days of recovery efforts, the death toll remained uncertain. Fan said: "The blast from 240 kilograms of

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explosives was so powerful that most of the bodies might have been vaporized in the explosion. It was so tragic that the rescuers could not even find a sole from a disaster victim". According to Fan, the construction company responsible for building the tunnel is a subsidiary of China Railway Construction Corp.

23 May - France

120523-07 Vaucluse (84), Oppède. A charge exploded around 11:30 in a quarry at Oppède while two experts from the Direction Générale de la Sécurité Civile et de la Gestion des Crises [DGSCGC – General Direction of Civil Safety and Crisis Management] were preparing to destroy various explosives and detonators. Severely injured, the two men were evacuated by helicopter to two hospitals in Marseille. Workers at the quarry alerted the emergency services.

24 May - Turkey

120524-12 Sivas province, Sivas city. There was an unconfirmed report from an Iranian source that people around the central Turkish city of Sivas had suffered from toxic gases, released following the detonation of leftover ammunition by Turkish military forces. Turkey's gendarmerie forces exploded hundreds of unused hand grenades and munitions near Sivas to clear out the explosives left behind from a military manoeuvre, without first acquiring information on weather conditions. Strong winds picked the hazardous gases and pollutants, and spread them throughout areas near the city, leaving many vulnerable to contamination. More than a dozen locals were hospitalized after inhaling the poisonous gases, prompting the Turkish police forces to hand out gas masks to residents.



25 May - Brazil

120525-08 Rio Grande do Sul, Caxias do Sul. A worker died after suffering an accident at work in Caxias do Sul, in the mountains. According to the Regional Police Command, he was the victim of a dynamite explosion that could have been triggered by a cell phone call. The man was taken to hospital, but succumbed to his injuries. According to Captain Felipe Santos Rocha, of the EOD squad of the Special Tactics Group Actions, the explosion was caused by the ringing of the phone, claiming: "The dynamite is an explosive quite stable. For the detonation to occur, you must have a system of initiation. So, it is practically impossible to happen".

The explosion was reported to Military Police shortly before 13:30. According to the police report, the worker was inside a backhoe, carrying a stick of dynamite to be used in the work when the explosion occurred. Pieces of glass and vehicle parts were thrown several metres away.

Helped by a Samu ambulance, the victim was hospitalized in Pompeii Hospital, where he underwent surgery to amputate a leg. The man also suffered serious injuries to the face and abdomen. By late afternoon, the hospital confirmed the death of the worker due to the severity of injuries.

26 May - India

120526-05 Rajasthan state, Banswara district, Kushalpura village. A watchman at a licensed explosive magazine, a centre where explosives used for mining purposes are stored, was killed when an explosion occurred in his house in Rajasthan's Banswara district. Police said: "Nanu had stored some explosives in his house, located 300 m from the magazine in an isolated area in Kushalpura village". A police official said there was an explosion in his house, and he died on the spot, but the store was safe.



28 May - Russia

120528-07 Trans-Baikal Region, Tsugol range. A spokesman for Russia's Eastern Military District confirmed that there had been an ammunition explosion at the Tsugol range in the Trans-Baikal Region on May 28. Defence Ministry spokesman, Lt. Col. Alexander Gordeyev said that the driver of a vehicle carrying munitions discovered a fire coming from under the bonnet/hood of the truck. He then stopped the

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truck and ran to a safe distance. Gordeev said: "As a result of the fire, an explosion of ammunition that was in the back of the vehicle took place, there was no destruction or injuries". The scene of the explosion was quickly cordoned off, and is more than 20 km from the nearest settlement. Gordeev added: "At the moment the fire is localized, and an investigation is underway".



29 May - USA

<http://abclocal.go.com/wls/story?section=news/local&id=8681315>

120529-05-A IL, Villa Park. Veterans of Foreign Wars (VFW). Ten people were taken to hospital following a fire and explosion at a VFW hall. The fire broke out about 19:00, in a gun range located in the basement of the building.



According to investigators, the injured were workers doing repairs to the gun range. Two were in critical condition.

Ronald J. Rakosnik, Lombard fire battalion chief said: "Over the years, all the gunpowder probably built up. They ignited the gunpowder, it appears, we are going to do an investigation right now. A fire occurred and when it got to the stairs ... an explosion occurred". The hall will be closed while fire-fighters complete their investigation.

The rifle range was constructed in 1955 in a reinforced concrete room that had been a bomb shelter, constructed in the 1940s. Post Commander Dennis Geiseman said the range was only used by members of the post for recreational shooting. Sid Bergh, 86, a World

War II veteran who is the post's vice commander, said: "That's the first accident we've had down there, and it happened to be bad one".

However, Lt. Mike Barton of the Villa Park Fire Department, said the fire spread rapidly when a welder ignited a spray-on foam material used for minimizing sound on the back of the metal wall. Barton reportedly said that when workers repairing the gun range left: "They closed the door, and a backdraft was created in the concrete room. It erupted through the weakest point, which was the door". He said the fire was not caused or fed by firearms, ammunition, or gunpowder residue, adding: "All their guns and ammunition were stowed in appropriate gun lockers and vaults".



Barton said welders were repairing welts, caused by armour-piercing ammunition, in a metal backstop at the end of the basement gun range. Barton said the post members repairing the wall [Emphasis added, Ed.] likely did not know the walls and ceiling of the range were insulated using an egg crate acoustical foam that is highly flammable.

Barton said the fire department does not regularly inspect the gun range. Monique Bond, a spokes-woman for the Illinois State Police, said it is not their responsibility. Chris McCloud, a spokesman for the Illinois Department of Natural Resources, said he was not aware of any state agency that inspects gun ranges.

6 June - India

120604-02 State of Tamil Nadu, Coimbatore city, Palladam. Ganesh Explosive Manufacturing Unit. A warehouse that stocked explosives at M Uthukuli near Palladam was destroyed when 100 kg of the material went off. Explosive materials and concrete particles were scattered around a radius of 20 metres, but there was no human casualty.

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Police said Ganesh Explosive Manufacturing Unit had 22 warehouses in the premises. The unit supplies gunpowder and other explosive materials to defence units and firecracker factories in Sivakasi. Police suspect that safety measures were compromised in the warehouse that stocked the explosive materials. Over 900,000 rupees worth of valuables were damaged in the incident.

Unit manager Sounder Rajan lodged a complaint with Kamaickenpalayam police on Sunday. The police have registered a case and the investigation is on. According to police, as many as 80 labourers were employed in the plant and they were working in other warehouses when the incident occurred.

5 June - Bulgaria

120605-01-D Eastern Bulgaria, city of Sliven, village of Lozenets. Bereta Trading. A series of explosions occurred at a privately-owned arms depot in south-eastern Bulgaria, injuring seven people and triggered the evacuation of about 600 people from a nearby village. Three workers were missing.



The explosions began around 14:40, starting a fire at the depot near the village of Lozenets, some 330 km (200 miles) east of Sofia. It was not immediately clear what triggered the explosions. Seven workers at the disposal depot, owned by a private Bulgarian company Bereta Trading, were rushed to hospital. Two were in a serious condition. Tests on emissions were being carried out, but civil defence officials said initial results showed human health was not endangered.

Denislav Delev, manager of Bereta Trading, told national radio that the depot did not store any dangerous chemical or biological substances, and was only used to dismantle obsolete munitions of the Bulgarian army. Bereta Trading, whose depot spreads across an area of 6,000 square metres, has a permit to store 1,200 tonnes of explosives, according to its website. NATO member Bulgaria plans to destroy about 11,000 tonnes of obsolete munitions this year, the defence ministry said.

On June 6, Bulgaria's Interior Ministry warned that munitions and fragments of munitions had been scattered in the surrounding region. Those who spot munitions or fragments of them are urged to call the 112 emergency phone number. The information will be then transferred to the experts that are currently gathering loose munitions.

Explosions since 2000 at Bulgarian munitions facilities (owned by either the Defence Ministry, or private firms):

- 2011, November 12. Explosions at former military storage facilities near the village of Lovnidol; the 3,000 shells contained no chemical or radioactive substances, and nobody was injured. [HInt 11-11a, 111112-05.]
- 2010, February 3. Midzhur factory, which produces explosives, located in the village of Gorni Lom, Chuprene Municipality, north-western Bulgaria, caught fire. The ensuing explosion injured four employees, with two of them suffering serious injuries. [HInt 10-02a, 100203-02.]
- 2008, August 10. Grenade storage facility at the Arsenal military plant in Kazanlak, central Bulgaria, caught fire, leading to explosions; nobody injured. [HInt 08-08a, 080810-03.]
- 2008, July 3. Military storage site near the village of Chelopechene, suburban Sofia, exploded, with blasts lingering for days. The explosions engulfed explosive processing facilities with 2,500 tonnes of conventional munitions and 20 tonnes of TNT. Nobody injured but the residents of the villages of Chelopech and Chepintsi were evacuated. [HInt 08-07a, 080703-01.]
- 2000, July 9. Fire near several villages in the south-eastern Haskovo District reached a munitions storage depot near the village of Ivanovo, and led to explosions.

On June 6, a Defence Ministry official claimed that human error was the most likely reason for the incident. Deputy Defence Minister Valentin Radev told Bulgarian National Radio that some safety regulations had been violated in the facility: in particular, a robot camera showed what appeared to be two cell phones at the scene of the accident, one of them badly burned. He said that cell phones are forbidden in such facilities. The Deputy Defence Minister also said that a spark from a match may have caused the accident.

Within hours, the tabloid Standart News had translated this into the headline: "Mobile Phone and Cigarette Blow up Ammunition Depot". It claimed that an old mobile phone, "left on vibration", went off and caused the detonation of a shell in workhouse number one. It said that "experts were shocked to see not one, but two mobiles in the storehouses". Standart News also claimed that investigators found that the employees used mobile phones and smoked in the workshop.

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On June 8, Kalin Georgiev, Head Secretary of the Interior Ministry, said the three employees missing after the ammunition depot exploded were dead. Georgiev stated that the explosion left a four-metre deep crater, adding: "The people inside stood no chances of surviving. Human remnants and biological material were found during the investigation, which means the outcome was fatal". He said that DNA tests will reveal the identity of the casualties.

On June 12, it was reported that Bereta Trading, owner of the munitions plant, was beginning to repair explosion-damaged residential and public buildings. The company signed a contract for repair works with a construction company to replace broken windows, doors, ceilings, and other damages. The mayors of the villages of Lozenets and Gorno Alexandrovo were notified about the impending construction activities.

The Mayor of the municipality of Stradlza, Mitko Andonov, demanded urgent state help for the areas affected by the explosions, which damaged 178 residential buildings, 32 public ones, 68 stores and other commercial space, 5 industrial shops, the water pump providing water for the town of Stradlza, and three nearby villages. The damage at the Lyulyak mountain cabin was yet to be assessed since the building remained inaccessible.

11 June - Russia

http://www.dailymotion.com/video/xrh8nj_raw-video-blasts-rock-arms-depot-in-central-russia_news

120611-08 Orenburg region, Orenburg city. One person was injured and two were missing after a military depot near the Urals city of Orenburg caught on fire, triggering a series of explosions. According to official reports, the fire at the depot, owned by the Defence Ministry, occurred at 15:15 Moscow time [11:15 GMT], triggering numerous explosions. A press service of the regional government said that a total of 26 people, the depot's personnel, had been evacuated. Residents of several villages adjoining the depot were also evacuated.



The chief spokesman for the Volga Regional Centre of the Emergencies Ministry, Oleg Zügeyev, said the operation to extinguish the fire involved 355 people and 68 pieces of machinery of the Emergencies Ministry "All 81 children and adults evacuated from the children's camp in Partizansky have already been accommodated and provided with hot meals".

Two aircraft of the Emergencies Ministry arrived at the scene of the incident to help fight the fire. They can dump 42 and 12 tonnes of water at a time respectively. A third aircraft with five psychologists, 28 specialists from the Lider centre, and four rescuers aboard was flown out of Ramenskoye outside Moscow.

14 June - USA

120614-07 CO, El Paso County. Dragonman's. The wife of the owner of a shooting range in El Paso County, east of Colorado Springs, died during a special effects explosion while a film was being made on the range. Dragonman's owner Mel Bernstein, said to be better known as the "Dragonman" himself, said his wife was hit by "a smoke bomb device that went off like a rocket unexpectedly".

The range was being used to film a television show, and the production team was filming the last 30 seconds of the show after a week of 8-9 hour days. The scene involved cast members walking through smoke with guns in the air. Bernstein said one of the smoke bombs shot off like a rocket, going right through his wife's chest. The 51-year-old woman died instantly. Bernstein said he felt the rocket whiz within four inches of him before turning to see his wife fall to the ground.

Dragonman's is a shooting range, paintball park and museum. On June 13, a woman was burned during the filming, though she was quickly treated and released from a hospital. El Paso County Sheriff's deputies are investigating the incidents.

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2012 MUNITIONS SAFETY AWARDS

AT THE IMEMTS

Las Vegas, May 2012



155mm Artillery Shells Award



Gary Wittmer (in the middle)



Career Achievement Award to Alice Attwood

The MS Award for Technical Achievement, which recognizes for significant technical contributions in research and/or engineering related to Munitions Safety, went to the US Army PM-CAS, the US Army ARDEC and the US Army ARL teams, and BAE Systems for the Implementation of Reduced Sensitivity Explosive IMX-101 to Replace TNT in 155mm Artillery Shells.

The MS Award for Career Achievement recognizing dedication and outstanding contribution to the cause of Munitions Safety for the Benefit of the International Munitions community was awarded to Alice Attwood.

Gary Wittmer, the IMEMTS Committee Chairman received on the same occasion, the NDIA gold medal for distinguished service for his association over the past 30 years with ADPA and NDIA.

Congratulations to all.

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- O149 Superiour Infrared Flare Compositions Based on Magnesium Diboride (MgB₂) and Dimagnesium Silicide (Mg₂Si)/Polytetrafluoroethylene/Viton™ Infrared Decoy Flare by Dr Ernst-Christian Koch, Arno Hahma, Volker Weiser, Evelin Roth and Sebastian Knapp, July 2012