

# Army Guide monthly



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## Term of the day

## Mortar



A mortar is a muzzle-loading indirect fire weapon that fires shells at low velocities, short ranges, and high-arching ballistic trajectories. It typically has a barrel length less than 15 times its caliber.

A mortar is relatively simple and easy to operate. A modern mortar consists of a tube which gunners drop a shell into. A firing pin at the base of the tube detonates the propellant and fires the shell.

These attributes contrast with the mortar's larger siblings, howitzers and field guns, which fire at higher velocities, longer ranges, flatter arcs, and sometimes, direct fire.

In the 19th and early 20th centuries very heavy immobile siege mortars were used, of up to one metre calibre.

A mortar can also be a launcher for fireworks, a hand-held or vehicle-mounted projector for smoke shells or flares, or a large grenade launcher.

Light and medium mortars are portable, and usually used by infantry units. The chief advantage a mortar section has over an artillery battery is its small numbers, mobility and the ability to engage targets in the defilade with plunging fires. It is able to fire from the protection of a trench or defilade. In these aspects the mortar is an excellent infantry support weapon, as it can be transported over any terrain and is not burdened by the logistical support needed for artillery.

There are also heavy mortars of 120mm to 300mm caliber. These weapons are usually towed or vehicle-mounted, sometimes breech-loaded, and normally employed by infantry units attached to battalion through division level. Even at this size, mortars are simpler and less expensive than comparable howitzers or field guns.

A mortar can be carried by one or more men (larger mortars can usually be broken down into components), or transported in a vehicle. An infantry mortar can usually also be mounted and fired from a mortar-carrier, a purpose-built or modified armoured vehicle with a large roof hatch.

A heavy mortar can be mounted on a towed carriage, or permanently vehicle-mounted as a self-propelled mortar. Twin-barreled self-loading mortars — such as the Patria AMOS PT1 — are the latest evolution of these heavy mortars and are mounted on platforms such as armoured personnel carriers, tank chassis, and coastal patrol boats.

Most modern mortar systems consist of three main components: a barrel, a base plate, and a bipod.

Modern mortars normally range in calibre from 60mm

(2.36 inches) to 120mm (4.72 inches). However, mortars both larger and smaller than these specifications have been produced. An example of the smaller scale is the British 51mm light mortar which is carried by an individual and consists of only a tube and a base plate. Conversely, a large example is the Soviet 2S4 M1975 "Tyulpan" (tulip tree) 240mm self-propelled mortar.

Smaller mortars (up to 81mm) are commonly used and transported by infantry based mortar sections as a substitute for, or in addition to, artillery.

Ammunition for mortars generally come in two main varieties: fin-stabilised and spin-stabilised. The former have short fins on their posterior portion which control the path of the shell in flight. Spin-stabilized mortars rotate as they travel along and leave the mortar tube. This action stabilizes them in much the same way that a rifle bullet is, or that the American football is stabilized when thrown in a "spiral." Both types of rounds can be either illumination (infrared or visible illumination), smoke, or high explosive.

Spin-stabilised rounds require a rifled barrel. Since mortars generally are muzzle loaded, the mortar shell has a pre-engraved band, called an obturator, that engages with the rifling of the barrel. The increase in accuracy is at a cost in loading time and having to account for drift, a peculiarity of rifled systems that causes the round to "drift" perpendicular to the spin axis; this Magnus effect is common to any spinning projectile, and is, for example, what makes it possible for pitchers to throw curve balls.

Mortars come in a variety of calibres. The French 81mm mortar became standard for many countries. The Soviets took tactical advantage of this. They standardised an 82mm mortar for their armies. Hence, troops using Soviet mortars could use mortar ammunition of other countries found on the battlefield, albeit with less accuracy, while their own would be too large for their opponents. This advantage was used during the Vietnam War and at other times.

## Contracts

### RUAG Awarded Contract to Supply 48 Crew Training Simulators for French Army VBCI

Bern, -- RUAG, in collaboration with its local partner, GAVAP, has been awarded a contract by the French MoD for the delivery of a total of 48 tactical simulators for the new VBCI (Vehicule Blinde de Combat d'Infanterie) Infantry Fighting Vehicle.

This major contract, worth over 30 million Euro, solidly places RUAG in the French market, which it first entered two years ago with a successful bid for the delivery of 4300 weapon infantry laser tactical effects simulation systems.

RUAG and GAVAP beat strong international competition to win the contract, competition which included the traditional simulation suppliers to the

French Army. The project, called STES (Simulateurs de Tir d'Equipage et de Section) includes the development and production of 48 simulators with instructor stations, as well as the maintenance and construction of ten standard buildings in which the simulators are to be installed. The contract runs into 2015, with deliveries of the first simulators due in 15 months.

### Defence Industry

## BAE Systems Launches New V-22 Defensive Weapon System, Begins On-the-Move Testing



BAE Systems unveiled its new remotely operated turreted weapon system, the Remote Guardian™ System (RGS), designed to provide 360 degrees of suppressive fire for the Marine Corps V-22 tilt-rotor aircraft.

In recent stability testing at Camp Ripley, Minnesota, the RGS, with a GAU-17, 7.62 mm mini-gun, was mounted on a moving land vehicle test platform. The testers demonstrated the weapon's accuracy, based on the three-axis stability and control that is the foundation of the RGS and a core capability of BAE Systems.

"RGS performed admirably in the tests, demonstrating accurate fire on-the-move," Clark Freise, vice president of defense avionics for BAE Systems, said in introducing the system at the Modern Day Marine Expo in Quantico, Virginia. "Due to the support and feedback we received from the Marine Corps' requirements and user communities, we are now launching this as a mature system."

BAE Systems, which has been working with the user community to develop and demonstrate this capability since mid-2005, is planning to make the system available for installation beginning in the third quarter of 2008.

RGS, designed to be belly-mounted on the V-22, is the first remote weapon system capable of delivering accurate, sustained fire throughout the aircraft's entire flight envelope. It features a compact, retractable design that saves valuable aircraft cabin space and was designed to be completely compatible with the V-22's avionics suite.

RGS incorporates proven elements of already-fielded systems, drawing on BAE Systems' more than 50 years of experience in the precision control of airborne weapons systems. In addition to meeting specific V-22 requirements, BAE Systems' modular, retractable design

is able to support different weapons and is compatible with different sensors, giving it potential applications on other airborne and ground vehicles.

### Term of the day

## Bombard



A bombard is a type of medieval cannon or mortar, used chiefly in sieges for throwing heavy stone balls. The modern term bombardment derives from this.

A notable example of a bombard is the large Mons Meg weapon, built around 1449 and used by King James II of Scotland. Mons Meg was capable of firing 180 kg (396 lb) shots and was one of the largest bombards ever built. It is now housed on public display at Edinburgh Castle.

This weapon was usually used during sieges to hurl various forms of missile into enemy fortifications, such as stone or metal ball and burning materials, or a weighted cloth soaked in quicklime or greek fire.

In the popular PC game Medieval II Total War certain factions are granted access to bombards to use on their enemies. However, the largest in the game, the "Monster Bombard" which is only available to the Turk and Timurid factions is much larger than Mons Meg weapon. In the game, it is mentioned that the Monster Bombard can fire shots well over half a ton. The barrel is supported by large chains and held on a large wooden frame. However, the crew is able to move it as quickly as a ballista, the smallest siege weapon. The player is never shown how you reload the massive gun due to the obvious near impossibility but is told it takes an "eternity". This is a huge exaggeration of Mons Meg but put in the game to add challenge and uniqueness by a large degree.

The name derives through medieval Latin and French forms from a Greek word expressing the making of a humming noise.

### Defence Industry

## Unique Cooling System Port-A-Cool Replaces Airconditioning

The summers get every year warmer and wamer. Airconditioning is now not anymore the only option for a pleasant climate, the company LC-Europe introduced this year the Port-A-Cool evaporator in Europe.

The Port-A-Cool is a mobile evaporator which reduces the temperature between the 7 and 25 degrees and consumes little electricity. Also in the Army the Port-A-Cool can guarantee a fresh breeze.



**Heat**



Who does not remember the heat of the last summers, the temperatures rose more than once over the 30 degrees. When we may believe the weather experts we can expect in the future longer and hotter summers. Purchasing cooling equipment therefore is very advisable.

**Cooling**



Airconditioning is not anymore the only option to cool down a space. The Port-A-Cool has now been introduced into Europe by LC-Europe. The working is very easy, the machine works on water and electricity. Due to evaporation of the water (the machine has panels of compressed paper which are constantly kept wet) a fresh breeze leaves the machine, resulting in a decrease of temperature of between the 7 and 25 degrees.

**Advantages**

The Port-A-Cool has several advantages compared with the traditional airconditioning. First of all the machine works in places where an airconditioning cannot be used or is too expensive. With the Port-A-Cool it is not necessary to close the doors or windows. The energy consumption is ten times as low as the normal

airconditioning.



But there is more; the machines are very maintenance friendly, you just have to oil the motor once a year and clean the panels once a month. Furthermore the machine is very easy to deal with, everybody can work with the Port-A-Cool.

**Applications**



The Port-A-Cool is available in four different dimensions, the smallest machine can cool up to 75m<sup>2</sup> and the biggest machines cools up to 325m<sup>2</sup>. All the models are foreseen of an integrated water tank for using the machines some hours without refilling. Preferably the machine is connected to the watersupply. All the machines have wheels, thanks to this mobility the machine can be put where the machine is needed. The machines are installation free, you just have to connect the machine to the electricity and provide water and within 2 machines they are cooling your environment.

The application possibilities are very wide, it is ideal for workplaces, the productivity of the employees increases by the pleasant environment they work in. The Port-A-Cools are often used in kitchens, marquees, hangars and workplaces.

**Afghanistan**



The Port-A-Cool is used a lot by the US-Army and other armies, the machines are used as cooling in tents, kitchens and garages. The machines can also be used in decreasing the energy consumption or supporting the

airconditioning, when the airconditioning has insufficient capacity. The machine can also be used in outdoor. The machines can be foreseen of filters for dusty environments. In countries like Afghanistan the Port-A-Cool can reduce the temperature up to 26 degrees due to the lower humidity level. To summarize:

**with Port-A-Cool you can easily beat the heat.**



## Contracts

### 140 Mastiff Vehicles for Iraq and Afghanistan



The Prime Minister announced to Parliament today plans to buy 140 additional Mastiff vehicles to enhance the mobility and protection afforded to our troops on operations in Iraq and Afghanistan.

MoD intends to finalise the deal for 140 of these battle-proven and highly popular vehicles in the next few weeks.

Secretary of State for Defence Des Browne said:

"Mastiff has proved its value on operations offering high levels of protection against mines and roadside bombs. Today I am pleased to announce our intention to purchase 140 extra Mastiffs.

"It's my job to make sure we are delivering the best equipment we can for our Armed Forces. The extra Mastiffs will give us a real increase in capability for our troops."

The MoD is currently in discussions with the US Government to agree the export from Force Protection Inc.

Mastiff is just one of a whole range of protected vehicles being used on operations including Challenger 2, Viking, Bulldog, Warrior, Vector, and Snatch.



## Defence Industry

### U.S. Army Adds Sniper-Detection Capability to Land Warrior System

Scottsdale, Ariz. -- General Dynamics C4 Systems has received a task order from the U.S. Army to integrate BBN Technologies' "Boomerang" sniper-detection system with the Land Warrior system, enabling Land Warrior-equipped soldiers to identify and respond to a sniper's shot within seconds.

The new capability, requested by Land

Warrior-equipped troops serving in Iraq, improves soldiers' ability to detect and respond to enemy sniper fire.

The \$250,000 task order funds integration and delivery of six sniper-detection systems to a Stryker Brigade Combat Team which is currently serving in Iraq. Initial deliveries are scheduled for the fourth quarter of 2007. The task order is a modification to the Land Warrior contract awarded in 2003.

Land Warrior is an integrated ensemble worn by dismounted soldiers that greatly enhances their warfighting combat efficiency and reduces risk of fratricide.

Developed by Cambridge, Mass.-based BBN Technologies and integrated at the General Dynamics-sponsored EDGE(tm) Warrior Innovation Center in Scottsdale, the Boomerang system comprises a group of small microphones and a digital display. The system detects and analyzes the muzzle blast and shock wave from a speeding round to display the precise distance and direction of the sniper. Once delivered, Land Warrior soldiers will automatically receive sensor input in their digital displays.

Work is also ongoing in the EDGE Warrior Innovation Center to make size, weight and power improvements to the next generation system based on feedback from soldiers.

"This is what the EDGE Warrior Innovation Center is all about - delivering new technology to soldiers quickly," said Richard Coupland, director of the EDGE(tm) Innovation Network. "In our first eight months of operation, the EDGE Warrior Team has developed and integrated multiple components and capabilities with the next generation of Land Warrior, reducing the system's weight to less than 7.3 pounds."

Mark Sherman, vice president, BBN Technologies, said, "BBN is pleased to support General Dynamics' initiative to integrate the latest life-saving technology into Land Warrior to enhance troop protection in the urban battlefields where snipers pose a constant threat. The ease of integration translates into rapid deployment and the ability to save more lives in urban operations."



## Defence Industry

### Force Protection, Inc. Awarded Additional ILAV Vehicle Contract



LADSON, S.C. -- Leading armored vehicle manufacturer Force Protection, Inc. announced that it has received a purchase order from BAE Systems for an additional 45 Iraq Light Armored Vehicles

(ILAV).

In addition to Iraq, approximately 18 of these vehicles are bound for Yemen. The order is worth an estimated \$3.5 million and will be completed by February 2008.

The combined enterprise of Force Protection and BAE Systems previously received awards totaling \$180 million in 2006 to build 398 4x4 ILAVs, based on the proven design of the Cougar vehicle. In total, the contract authorizes production of up to 1,050 Cougar ILAVs. BAE Systems is prime contractor on the ILAV program, with Force Protection as subcontractor.

“We are pleased to continue to provide our life-saving blast protection technology in support of U.S. armed forces and their coalition partners,” said Force Protection COO Raymond Pollard. “This new contract is further evidence of the many applications of our proven Cougar solution for American forces and their allies in the global war on terror.”

Force Protection’s Cougar and Buffalo vehicles have an unmatched record of performance in Iraq and Afghanistan. They are the gold standard in troop safety and have protected thousands of troops during highly dangerous route clearance and explosive ordnance disposal operations since 2003.



## Exhibitions

### Russia Presents Special Equipment At Milipol 2007

From 9 to 12 October 2007 Paris, France, will host the 15th Worldwide Exhibition of Internal State Security Milipol Paris 2007 held under the aegis of the French Ministry of the Interior, Gendarmerie Nationale, 3 Commissariats (Land, Air, Sea), French Customs, Ministry of Justice and Prison Department, and Ministry of Transport.

For the first time this great event will take place at the exhibition center “Paris Expo Porte de Versailles”.

“Milipol Paris 2007” is the world’s major showcase demonstrating various items of special equipment and weaponry. In the recent years the exhibition has won the reputation of the most prestigious international forum for exchange of experience in the development and upgrading of techniques and weapons to fight terrorism, illegal drug trafficking, smuggling, and hostage taking. Along with security professionals, the exhibition is visited by the representatives of state political structures, business elite, and other organizations interested in providing reliable public security in their countries. For instance, “Milipol Paris 2005” attracted 812 exhibitors from 41 countries. It is expected that this year the exposition will feature a much broader range of exhibits, particularly a variety of new generation special weapons and facilities.

Over the recent decade Russia, like several other countries, has faced terrorist threats and realized attacks and so it could not but respond to the challenge of countering terrorism facing the world community. In this connection the deliveries of special weapons and special

facilities are becoming increasingly important for the Rosoboronexport State Corporation (hereafter referred to as Enterprise), the single Russian enterprise authorized to export and import the whole range of armaments and military equipment. For this reason, a separate division was set up within its organizational structure in 2001 to cope with equipping foreign law-enforcement bodies and counterterrorist groups with special devices.

Within the united Russian exposition, organized by the Rosoboronexport State Corporation, domestic manufacturers of special equipment and weaponry will present a wide spectrum of their exhibits.

Being involved in forming a legal civilized market for security and counter-terrorism facilities, the Enterprise has established interaction and information sharing with the UN Security Council Counter-Terrorism Committee and the CIS Counter-Terrorist Center. The Corporation actively interacts with the Federal Security Service (FSB) of Russia, whose delegation also participates in the exhibition, and the united Russian exposition will include its special equipment, telephone and microphone tapping equipment, search, protection and security, covert surveillance, photography and TV facilities, criminalistical equipment as well as counter explosive device equipment. The visitors will see an electronic presentation of a unit designed to remotely destroy explosive devices using hydro-brasive cutting. Among the exhibits will be also the Turaya personal satellite communications system tapping equipment and mobile communications subscriber station tapping hardware.

Visiting the Russian exposition, the participants and guests of the show will be able to get familiar with a special weapons for equipping counterterrorist groups: the 9 mm PP-000 machine pistol, 9 mm AS special assault rifle, 9 mm VSK-4 sniper rifle, other models of small arms and ammunition to them as well as a variety of night vision sights and body armor. Russian silenced small arms like the PSS pistol, sniper rifles, and the unique 5.66 mm APS underwater assault rifle, which is manufactured in any other country of the world, will expectedly be of great interest.

The exposition also displays Russian assault weapons that are popular abroad as well. Among the most powerful weapons worldwide in its class is the 9 mm SR-

Gyurza self-loading pistol. A bullet of the SP-0 cartridge penetrates splinterproof armor vests and steel army helmets at distances of up to 100 m. The 9 mm SR-2 machine pistol also offers unique capabilities. The SV-1324 unit intended to disintegrate mines and demolition bombs used by terrorists for explosive attacks in populated areas will surely be a highlight of the exposition.

Most of the special weapons offered to foreign customers meet the urban warfare requirements to the maximum: restricted destruction radius and high grouping of shots in single and automatic fire reducing the probability of casualties among civilians, hostages and special police officers and minimizing destruction of physical objects.

The specialists attending the exhibition will surely take an interest in national security systems used to provide protection of administration buildings and rooms. Some of the systems have proved their effectiveness in protection of such worldrenown historic and cultural centers as the State Hermitage in St. Petersburg and the State Historical Museum in Moscow. These include the Rastr electrooptical detector and Rebus passive security detector. The operating principle of these devices is based on recording a change in the coordinates of a light spot created by a built-in active emitter that illuminates the protected object and on analyzing electromagnetic disturbances generated by moving objects.

The exhibits displayed at the stand are only a pittance of the equipment that is now in demand both in the domestic Russian market for security facilities and in dedicated segments of the global market. If required, the specialists will provide complete information concerning both specifications and use of the special equipment exported by the Rosoboronexport State Corporation and experience in its deliveries abroad.

Welcome to the exposition of the Rosoboronexport State Corporation at "Milipol 2007", where you can see the reliability and high quality of the Russian special export products. The Russian stands are located in Hall 7.3, 3J85.

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### Defence Industry

## Qualification of the NEXTER Battle Management System SIT V1 for the French Army



The French Defence Procurement Agency (DGA) formally qualified the NEXTER Battle Management System SIT V1 on 31st August 2007.

This qualification is the result of the successful operational trials, conducted with a squadron of the 1st Foreign Legion Cavalry Regiment, on upgraded AMX 10 RC, VB2L and VBL (armoured cars).

The overseas operations of this regiment in Ivory Coast also confirmed the outstanding performance of the SIT V1 BMS, notably its easy operation and the operational advantage it provides. The contract signed with the DGA covers the equipping of 650 French Army combat or command vehicles with the SIT V1.

As of today, more than 150 systems are already in

service, on the Leclerc MBT, the AMX10RC, the VBL and the VB2L. The qualification of the SIT V1 BMS and its integration into the overall command chain has transformed battlefield digitisation into reality.

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### Defence Industry

## BAE Systems, U.S. Army Sign Public-Private Partnership For M109 Family Of Vehicles

WASHINGTON - BAE Systems and the U.S. Army have signed a memorandum of understanding that will establish a Public-Private Partnership (P3) to develop and sustain the Army's M109 Family of Vehicles throughout their lifecycle.

Parties to the memorandum signing include BAE Systems leaders, the U.S. Army Tank Automotive & Armaments Command (TACOM), the Program Executive Office for Ground Combat Systems, the U.S. Army's Project Manager - Heavy Brigade Combat Team (PM-HBCT), and the Anniston Army Depot (ANAD). The memorandum was signed during the Annual Meeting and Exposition for the Association of the U.S. Army in Washington, D.C.

The establishment of a P3 will capitalize on the strengths and capabilities of each organization to ensure the cost-effective and on-time reset of the current fleet of M109A6 Paladin self-propelled howitzers and M992A2 Field Artillery Ammunition Supply Vehicles (FAASV), as well as the planned production of the M109A6/M992A2 Paladin Integrated Management (PIM) program unveiled earlier this week.

"This partnership was established for the benefit of the American soldier," said COL. Paul Lepine, Army PM-HBCT. "The M109 family plays a critical role in the success of the HBCT and we are pleased to partner with BAE Systems and ANAD to ensure these systems continue to provide the performance our Soldiers need to be successful on the battlefield today and into the future."

The M109 reset activities will be managed by the PM-HBCT, with the goal of creating an integrated, seamless partnership to bring the best value to the soldier, while maintaining necessary skills and competencies in the public and private industrial base.

Through the P3, ANAD will retain labor and lead the majority of the program, with BAE Systems responsible for materials management.

"ANAD has proven time and again to be a dedicated workforce focused on meeting the needs of our soldiers through effective combat vehicle reset programs," said Raj Rajagopal, president, Ground Systems, BAE Systems. "We're proud to partner with ANAD and the PM-HBCT to leverage our efficient materials management processes to make M109 FOV reset even more effective, and to work closely as a team to rapidly provide the M109A6-PIM to our soldiers."

The M109A6-PIM production process will also be led by the PM-HBCT with a direct contract to BAE Systems,

who will oversee system design, development and production. ANAD will be integrated into the PIM Integrated Product Development Teams (IPDTs) structure during the design phase and will support the manufacture of the prototype vehicles which will be delivered to the Army for test and evaluation in 2009. Following test and evaluation, ANAD will overhaul the prototype vehicles to ensure the depot has the demonstrated capability to meet their M109A6/M992A2-PIM mission requirements. ANAD will be a partner in PIM production, responsible for induction of vehicles, overhaul of critical components such as the main armament, as well as modification & upgrade of the cab structure. The partially assembled cabs, along with overhauled components, will be provided to BAE Systems for integration with the PIM chassis - designed and built around commonality with the Bradley family of vehicles.

### Contracts

#### BAE Systems Receives U.S. Army Contract For M326 120-MM Mortar Stowage System

MINNEAPOLIS - BAE Systems has received a \$13.9 million contract from the U.S. Army to procure 588 of the M326 120mm Mortar Stowage Systems. The contract calls for BAE Systems to begin low-rate initial production (LRIP) immediately and deliver the first 52 M326 systems to the Army by October 2008.

"Time is critical when our light maneuver forces are in combat, and the Mortar Stowage System makes it easier for Soldiers to quickly set-up and take down the M120 120-mm Mortar on the battlefield," said LTC John Lewis, the product manager - Mortar Systems (PM-MS). "Due to its weight, the 120-mm mortar tube takes considerable physical effort to put it in place, fire and quickly move to avoid enemy counterfire. The M326 will increase survivability by significantly speeding the time it takes to set up and take down a mortar system."

The company will deliver an additional 536 systems through full-rate production, which will begin immediately following LRIP completion. All of systems will be assembled at the Louisville, Kentucky, facility and will be delivered by early 2010. The contract also includes options for funding the delivery of up to 100 additional systems, as well as new equipment training, installation, warehousing and spares. If all options are exercised, the contract could grow to \$20.6 million.

"With the M326, a 120-mm mortar crew can set-up, fire and be on the move again in three minutes without having to lift the heavy tube," said Jim Unterseher, vice president of Army Programs, BAE Systems. "Like so many of BAE Systems' technologies, the M326 helps to take the burden off the soldier and allows an innovative technology to do the work."

The M326 was developed by BAE Systems and is a simple and rugged device that can be easily attached to the M1101 Trailer, the M998 High-Mobility

Multipurpose Wheeled Vehicle or a variety of other vehicles that serve as a prime mover for 120-mm mortar systems. It significantly reduces mortar crew workload by using a hydraulic system to hoist the fully assembled M120 Mortar, which weighs more than 300 pounds, into and out of the trailer or vehicle used to haul the weapon.

The assembled mortar base plate, tube and bipod are held together as a unit by a steel strut that connects the mortar to the M326 lift arm. The hydraulic lifting enables rapid weapon set-up and removal. During tests, mount and dismount of a fully assembled M120 Mortar have been achieved in less than 20 seconds.

### Robots

#### New 'Transformer-like' Robotic Platform Unveiled



WASHINGTON, DC -- QinetiQ North America announced today that its Foster-Miller, Inc. subsidiary is introducing a totally new, 'transformer-like' robotic platform at AUSA, the US Army's annual meeting and exhibition (October 8-10, Washington DC, Booth No. 3443).

The company's latest innovation in robotics introduces a new modular design to its popular line of TALON and SWORDS robots for military and first responders.

The current TALON robot is designed with a manipulator arm and gripper for identification and neutralization of roadside bombs and related tasks. Similarly the SWORDS robot is fitted with an M249 Squad Automatic Weapon for use by infantry forces to secure checkpoints and to conduct armed reconnaissance.

Now Foster Miller's newest military robot, named MAARS (Modular Advanced Armed Robotic System), is modular in design, uses the more powerful M240B Medium Machine Gun and has significant improvements in command and control, situational awareness, maneuverability, mobility, lethality and safety compared to its SWORDS predecessor.

The purpose-built MAARS chassis provides a uni-body frame with easier battery and electronics accessibility. Other features include a larger payload bay, higher torque, creating faster ground speeds and improved braking. The new Digital Control Unit significantly improves command and control and situational awareness for the operator resulting in greater safety margins. The complete system weighs about 350 pounds. The weaponized version of the MAARS robot is on display this week at the AUSA annual meeting.



MAARS will also come with a new manipulator arm having a nominal 100 lb lift capability. The arm can quickly replace the turret mounted M240B weapon, literally transforming it from a remote weapons platform for force protection to an Improvised Explosive Device (IED) identification and neutralization tool. The MAARS robot will not only permit units to employ multiple mission payloads but production of common chassis and Digital Control Units will also lead to economies of scale resulting in lowered customer costs.

“Foster-Miller is proud to introduce the new MAARS robot to the US Military personnel who risk their lives every day defending our freedom” said Dr. William Ribich, President of QinetiQ North America’s Technology Solutions Group. “The challenge before us now isn’t technological in nature but rather the widespread training of our forces to use this greatly enhanced robotic capability.”



### Contracts

#### **Patria AMV 8x8 vehicle agreement signed with the Croatian Ministry of Defence**



Patria and Duro Dakovic Special Vehicles as Consortium partners and the Croatian Ministry of Defence have today signed an agreement covering 84 Patria AMV 8x8 vehicles to the Croatian Army.

The vehicles will be manufactured in Finland and Croatia. The value of the agreement is approximately EUR 112 million. Deliveries are scheduled to start before the end of 2008 and all deliveries to be completed by the end of 2012.

Mr Jorma Wiitakorpi, CEO and President of Patria stated: “We note with great satisfaction that our AMV vehicle has taken another important step towards becoming the preferred choice of the armies of the region. The newest 4th generation Patria AMVs have already shown in real-life crisis management missions that they honour the promises: excellent protection and performance. Through the offset included Patria offers potential to the Croatian economy as a whole. The vehicles will be produced through direct participation of local cooperation partners.”

Mr Bartol Jerkovic, President of Duro Dakovic Special Vehicles (DDSV) said: “DDSV’s experience and know-how in main battle tank (MBT) production and modernisation has been recognised by the Croatian Government and our strategic partner Patria as a good basis for establishing of Croatian competence centre for AMV 8x8 vehicle production. Using Patria Technology

Transfer, the vehicles will be manufactured by the Consortium DDSV-Patria. Additionally, DDSV will be responsible for specific mission equipment production and final integration as well as after-sales activities.”

Patria is a defence and aerospace group with international operations delivering its customers competitive solutions based on own specialist know-how and partnerships. Patria is owned by the State of Finland and the European Aeronautic Defence and Space Company EADS N.V.



### Defence Industry

#### **GD Chemical Detection Technology Selected by U.S. DoD for Evaluation**

General Dynamics Armament and Technical Products has been selected by the U.S. Department of Defense to participate in the first major phase of Increment 2 of the Joint Chemical Agent Detector (JCAD) Program.

General Dynamics' handheld chemical agent detector, JUNO(TM), incorporates next-generation differential mobility spectrometry (DMS) technology, providing better detection, sensitivity and selectivity compared with that of traditional, handheld ion mobility spectrometry (IMS)-based chemical agent detectors.

The goal of the JCAD program is to improve protection for the warfighter by making it possible for users to confidently, quickly and easily monitor exposure levels to multiple chemical warfare agents, toxic industrial chemicals and nontraditional agents simultaneously, and confirm decontamination effectiveness.

"Our JUNO(TM) technology represents the next generation in handheld chemical threat detection systems," said Bill Gural, vice president and general manager of Detection Systems at General Dynamics Armament and Technical Products. "This achievement is the result of our continued commitment to innovate through independent research and development and our ability to leverage our expertise in detection technologies."

JUNO(TM) features a simple, cell phone-style interface and is capable of detecting, identifying, quantifying and alerting individual warfighters to the presence of chemical agent vapors. In addition, as new chemical threats emerge, JUNO(TM)'s software can be upgraded and its detection library capacity can be expanded. It can be used in handheld, fixed-site, ground vehicle, shipboard and aircraft interior applications.



### Exhibitions

#### **Rheinmetall unveils new low-signature weapon system Fly-K at Milipol in Paris**

Today's armed forces increasingly find themselves deployed in out-of-area missions. In scenarios like these, troops are exposed to a multitude of different threats.

Keeping a low profile can help, and not just during commando-type operations. Being able to engage the enemy without revealing one's own position can give friendly troops a vital edge.



Rheinmetall Defence has concluded a licensing agreement with the Swiss firm Cathyor Engineering S.A. for Fly-K, an innovative low-signature weapon that Rheinmetall will be showcasing at MILIPOL 2007 for the first time. This carefully targeted expansion of the Group's product portfolio is set to give Rheinmetall customers the critical advantage of being all but undetectable on the battlefield.

Globally unique, Fly-K consists of a tried-and-tested family of ammunition already used by a number of armies as well as the accompanying launcher.

A wide variety of different ammunition types are already available, including high explosive, white phosphorous smoke/obscurant, and practice rounds. The Fly-K family of ammunition also features an illumination round for the visual and infrared spectrum; others contain grappling hooks and anti-frogman warheads.

An HE round with a proximity fuse is planned, as are several variants with non-lethal payloads (red phosphorous smoke/obscurant, CS and OC gas, flash & bang stun ammunition) and marking rounds (coloured smoke and chemo-luminescent markers).

The weapon is designed for use in a wide variety of tactical scenarios:

- **Single-shot launcher:** Intended for use by individual infantrymen, this variant is ultra-light and very safe to handle. The single-shot launcher is also highly reliable, even in rugged operating environments.
- **Multi-shot launcher:** An electronically controlled weapon system with several different types of ammunition fired at a controllable launch speed in variable salvos. Light and robust, it can be readily mounted on tactical vehicles. To cite just one example, the concept enables lightly armoured vehicles or boats to respond to an attack without revealing their position.

This revolutionary principle revolves around the unique interaction of the weapon and ammunition. As soon as the weapon transmits the ignition impulse to the ammunition, an enclosed internal propelling system launches the round. Among other things, this approach offers the following advantages:

Low signature during launch:

- Noiseless: < 52 dB at 100m distance
- No heat signature: Undetectable by IR sensors
- No smoke: Cannot be visually detected in daylight
- No muzzle flash: Cannot be visually detected at night

Efficient, versatile, safe:

- Low weight means being able to carry more ammunition per unit
- No possibility of double feeding due to internal propelling system
- Possibility of constant fire; no overheating of the weapon
- A wide variety of ammunition types enables a multitude of missions



## Future Technologies

### Ansaldo Fuel Cells signs agreement in the energy sector with L-3 Communications Combat Propulsion Systems

Ansaldo Fuel Cells (AFCo), a Finmeccanica company coordinated by Ansaldo Energia, and L-3 Communications Combat Propulsion Systems (L-3 CPS) have signed a Memorandum of Agreement to develop and market fuel cell energy generation systems.

Under the agreement, the two companies will co-operate on marketing activities in the US and on product development in the military sector. The agreement also envisages a possible joint venture that would offer services and products to the US government.

Ansaldo Fuel Cells is one of the few players involved in developing high-temperature fuel cells (molten carbonate technology MCFC, Molten Carbonate Fuel Cells) worldwide, and the only company in Europe that has invested heavily in the development of fuel cells (MCFC). The cells generate electric and thermal energy at significantly higher efficiencies than conventional power generation technologies. The company operates on the distribution market, supplying a highly efficient and environmentally-attractive product, thanks to negligible emissions and very low noise.

Ansaldo Fuel Cells is a Finmeccanica Company that manages all activities relating to the generation of energy using fuel cells, with the aim of completing the development and manufacture of the product and launching it on the market, in line with the group's growth strategies. The company is headquartered in Genoa, where the laboratories and development engineering division is based. In Terni, since 2004, they produce cell components used to build the demonstration plants so far created.

L-3 CPS develops, manufactures, integrates and supports propulsion and mobility systems that include engines, transmissions, turret drives and suspensions for military combat platforms worldwide. As an experienced heavy manufacturer with a detailed knowledge of converting commercial systems to military applications, L-3 CPS will be the U.S. manufacturing & integration source for the fuel cell systems.

L-3 CPS is an established alternative energy provider, already having asserted itself in the development of small, light weight fuel efficient engines for power generation; auxiliary power units; and hybrid electric vehicle technologies. L-3 CPS is based in Muskegon, Michigan.

Headquartered in New York City, L-3 Communications employs over 63,000 people worldwide and is a prime system contractor in aircraft modernization and maintenance, C3ISR (Command, Control, Communications, Intelligence, Surveillance and Reconnaissance) systems and government services. L-3 is also a leading provider of high technology products, systems and subsystems. The company reported 2006 sales of \$12.5 billion.



### Defence Industry

#### Thales and Boeing downselected for FRES SOSI role

The UK MoD has announced that Thales UK in partnership with Boeing through its Boeing Defence UK subsidiary have been selected as the preferred bidder for the role of System of Systems Integrator (SOSI) for the Future Rapid Effect System (FRES) programme.

Commenting on MoD announcement Alex Dorrian, CEO Thales UK, said:

"This is the most excellent news. Thales and our partner Boeing are absolutely committed to helping the MoD achieve success in FRES, which is the UK Army's highest priority equipment programme. We are ready to build upon the rapid decision made by the MoD to drive forward with pace to the successful delivery of the programme.

Our FRES team builds upon the proven track record of both companies in the successful delivery of complex programmes, including those at the system of systems level. Underpinning expertise includes capability-based acquisition, commercial innovation, the management of complex supply chains and world-class systems integration skills. The team also has excellent domain knowledge of the UK defence acquisition process and of the land environment, including armoured fighting vehicles."

Dennis Muilenburg, Vice President and General Manager, Boeing Combat Systems said:

"Today's announcement is a positive reflection of the world-class capabilities that Boeing and Thales are bringing to bear to successfully execute this important programme and our commitment to fully support the intent of the UK Defence Industrial Strategy. We have developed a strong and collaborative relationship within our integrated team, a characteristic which we will bring to our relationship with the MoD for the System of Systems Integrator for FRES."



### Defence Industry

#### Acro Signs Non-Binding Letter of Intent to Acquire RAY Detection Technology Group

New York, NY -- Acro, Inc., a developer of explosive detection solutions, today announced it has signed a non-binding letter of intent to acquire RAY Detection Technology Group (RAY) in an all-stock transaction.

RAY develops and provides advanced inspection and detection systems. The parties agreed that upon the execution of a definitive agreement, Acro will provide RAY an interim financing, in accordance with an agreed working plan.

Completion of the proposed acquisition is subject to a number of conditions, including completion of definitive documentation on terms satisfactory to the parties, due diligence, and the approval of the proposed acquisition by both companies' boards of directors.

RAY's products are based on a proprietary technology, Discovery CERT, enabling trace automated sampling of bulk goods and cargo for the detection of explosive, chemical, and biological threats. Discovery CERT streamlines high-volume screening in airports, seaports, rail stations, border crossings, and government buildings, among others, allowing rapid inspection of goods, ranging from a single bag to an entire cargo pallet. RAY's systems have performed successfully during real-time airport testing, conducted by aviation, airport security, and anti-terror authorities of the US and Israel governments, with collaborative participation by European security agencies.

Acro's current flagship product is ACRO-P.E.T., a pen-like peroxide explosive tester for the detection of improvised explosives. The company recently signed an agreement with LSRI – Life Science Research Israel Ltd., a subsidiary of IIBR – Israel Institute for Biological Research, to incorporate IIBR's long-proven technology into Acro's pen-like device, allowing the detection of commercial and military explosives.

#### About RAY Detection Technology Group

RAY Detection Technology Group is an Israel-based company, developing and providing advanced technology solutions for screening cargo, mail and luggage. RAY's innovative solutions enable automated sampling of bulk goods and cargo, detecting explosive, chemical, and biological threats.

#### About Acro, Inc.

Acro, Inc. develops explosives detection technologies. The company has developed a unique patented technology for identifying peroxide-based explosives, such as TATP. Acro's Advisory Board includes Prof. K. Barry Sharpless, winner of the 2001 Nobel Prize for Chemistry, and Prof. Richard A. Lerner, President and CEO of The Scripps Research Institute, considered one of the world's most influential scientific institutes. For more information about Acro, visit [www.acrosec.com](http://www.acrosec.com).



## Robots

### iRobot Awarded \$8.8 Million U.S. Military Order for PackBot Robots



BURLINGTON, Mass., Oct. 16, 2007 – iRobot Corp. announced it received a delivery order totaling \$8.8 million from the U.S. Army Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI), on behalf of the Robotic Systems Joint Project Office at Redstone Arsenal, Ala.

This order for 40 iRobot® PackBot® robots, plus spare parts and equipment, brings total orders to date from PEO STRI to \$45 million. iRobot expects to complete delivery by the end of June 2008.

PEO STRI placed this order for a range of iRobot systems, including PackBot with ICx Fido Kit as well as the Army's first orders for the PackBot 510 robot and more than 300 new high-performance radios that will be retrofitted onto existing iRobot PackBots in theater. These radios increase the operational range and flexibility of the PackBot systems to achieve mission success in a wider range of tactical environments than previously possible. The robots will ship with iRobot's new game-style hand controllers for faster training and easier operation in the field.

Under the terms of the existing Indefinite-Delivery/Indefinite-Quantity (IDIQ) contract, PEO STRI could order up to the full \$64.3 million value in robots, spare parts, training and repair services.

To date, iRobot has delivered more than 1,000 PackBot robots to a broad range of military and civilian customers worldwide.



## Term of the day

### Grenade launcher



A grenade launcher is a weapon that launches a grenade greater distances,

more accurately, and faster than a soldier could throw by hand.

The man-portable grenade launcher can either come in the form of a standalone

weapon (either single-shot or repeating weapons), or mounted under the

barrel of a rifle. Alternatively, many rifles have been designed to fire

grenades from their muzzle.

Most grenade launchers are man-portable, shoulder-fired weapons, usually

mounted on a rifle such as the AK-47 or M16.

However, many can be used

independently, such as the M79 and AG36. These are almost always single

shot, manually reloaded weapons firing 30–40 millimeter caliber grenades

which rarely resemble hand grenades, but look more like miniature

artillery shells. The most standard grenade round today is the 40mm

grenade, which has a wide variety of applications in man-portable and

vehicle mounted weapons systems. With this standardization, there are many

new 'specialty' grenades available, from rounds that can be used as a

flare, infrared flare, or even a video camera that surveys the battlefield

from a bird's eye view. There are also heavier examples, including

automatic grenade launchers for ground and vehicle use, such as the

American Mk 19. Capable of a relatively high rate of fire, these automatic

grenade launchers are used for suppressive fire and to destroy or disable

light vehicles and buildings. Some armored fighting vehicles also mount

grenade launchers as a means of defense, usually firing smoke grenades to

conceal the vehicle behind a smoke screen, though can also be loaded with

chaff, flares, or anti-personnel grenades to repel infantry attacks.

The man-portable grenade launcher can either come in the form of a

standalone weapon (either single-shot or repeating weapons, the latter

resembling a large revolver); or an underbarrel weapon which is

permanently mounted to the rifle. Alternatively, many rifles have been

designed to fire grenades from their muzzle, using either a special blank

propellant cartridge or a central hole through the grenade allowing the

bullet to pass through. This system has two key advantages: the grenade

can generally be made larger and more powerful as

compared to underbarrel or standalone weapons, and the rifle's weight and handling characteristics are not affected as with underbarrel systems. The disadvantage of this method is that when a soldier wants to launch a grenade he must unload the weapon and then load the propellant cartridge and grenade. If he is surprised by a close-range threat while preparing to fire the grenade, he has to reverse the above procedure and cannot immediately react with rifle fire. In underbarrel systems, the rifle portion and launching portion of the weapon can both be carried loaded and ready to fire. Underbarrel tubes generally have their own trigger and use the rifle's magazine as a grip for the firing hand. To fire, one simply changes grips, disengages the safety and pulls the trigger. In most systems the barrel either slides forward or pivots to the side to allow reloading. For aiming, the M203 mounts either a flip-up rear sight, which is notched for different ranges and utilizes the rifle's existing front sight, or a "quadrant" sight which mounts to the side of the carrying handle. Recoil from such weapons is significant, comparable to a high-power shotgun. Examples of modern man-portable grenade launchers are the M203 and GP-30, which mount to service rifles. Another type of man-portable grenade launcher is the M32 'six shooter' grenade launcher and its cousins, which is able to fire six grenades in quick succession from a cylindrical chamber, this classification of firearm is often referred to as a Multi Shot Grenade Launcher, or MSGL. Automatic launchers include the Mk 19, AGS-17, and the HK GMG, which all fire at a higher velocity than related shoulder-fired grenades. Modern developments tend toward smaller, faster, and massed grenade fire. The XM25 is a shoulder-fired, magazine-fed semi-automatic launcher firing 25 mm projectiles. It was originally a component of the XM29 OICW program, but modified to a larger caliber. Its heavy equivalent is the XM307 ACSW automatic grenade launcher that is easily convertible between the 25 mm grenade ammunition and standard .50 BMG cartridges. Both are intended to fire programmable "smart" grenades

capable of being set to explode at a certain distance from launch or at a certain height above the ground. This gives the ability to hit targets inside of rooms or behind hard cover that would normally not be reachable by small arms fire.



## Defence Industry

### Lockheed Martin and Patria join forces for Marine Personnel Carrier Offering



Owego, NY and Helsinki, Finland -- Lockheed Martin and Patria have teamed to compete for the U.S. Marine Corps' Marine Personnel Carrier (MPC).

The MPC will be the Marines' next generation medium armored vehicle. The service is expected to release a request for proposals during the second quarter of 2008.

Under the agreement between the two companies, Lockheed Martin Systems Integration in Owego, NY will act as prime contractor for the MPC effort, providing systems integration, survivability enhancements, U.S. production and net-centric and logistics capabilities for Patria's proven AMV 8x8 multi-role vehicle.

"The Lockheed Martin/Patria team will offer the U.S. Marine Corps a superior personnel carrier that enhances force protection while still providing the mobility necessary to execute expeditionary missions," said Lou DeSantis, Vice President and General Manager of Systems Solutions at Lockheed Martin Systems Integration-Owego. "Our MPC is a combat-proven solution that supports the Marine Corps' current mission with room for future capability enhancement."

The Lockheed Martin/Patria MPC will meet the U.S. Marine Corps' anticipated performance, protection and payload requirements as a versatile armored personnel carrier. It will be optimized for unconventional warfare, but effective across the full range of military operations. The MPC is designed to fill the medium-armor ground vehicle gap, while also providing capability to "swim" through water.

"This teaming agreement with Lockheed Martin is in step with Patria's strategy to team up with strong partners with whom it offers competitive tailor made solutions to customers," said Jorma Wiitakorpi, President and CEO of Patria. "The Patria AMV 8x8 is a combat proven solution fielded internationally and receiving great feedback from users in theaters of operations."



## Defence Industry

### Rheinmetall wins major orders for NBC reconnaissance equipment and electronics totalling over 80 million euro



The defence technology arm of Rheinmetall AG of Düsseldorf has recently booked orders worth over 80 million euro for military vehicle electronics and NBC reconnaissance equipment.

Of this amount, some €60 million relates to orders for electronic assemblies for the German-Dutch Boxer. Thus, as part of the consortium tasked with producing this new all-wheel-drive wheeled armoured vehicle, Rheinmetall now also assumes responsibility for manufacturing and supplying the electronics for all variants of the vehicle. The order encompasses the complete controller area network (CAN) bus system as well as other high-end components.

In the realm of NBC reconnaissance technology, the US, Switzerland and Germany have recently contracted with Rheinmetall to supply highly mobile systems for detecting nuclear, biological and chemical agents and other hazardous substances. Worth around €25 million in total, these orders reinforce Rheinmetall's status as the global leader in NBC detection and reconnaissance, both civil and military.

The US military has awarded Rheinmetall a contract for modernizing an initial 18 of its 123-strong fleet of Fox NBC-RS reconnaissance vehicles, which will bring them up to the latest technical standard. In Germany, too, 37 Fuchs/Fox NBC reconnaissance vehicles are now earmarked for modernization.

A new era in NBC reconnaissance will open for the Bundeswehr when advanced bio detection technology is integrated into Rheinmetall's Yak armoured transport vehicle, making it possible to detect weaponized biological agents and similar hazards for the first time. The Bundeswehr has now contracted with Rheinmetall to build a demonstrator version.

Existing NBC reconnaissance systems have hitherto possessed only a very limited biological detection capability. Developed by Rheinmetall, the new Bio version of the Fuchs/Fox NBC armoured reconnaissance is set to change all that. Starting in 2008, the company will begin supplying these state-of-the-art systems to the United Arab Emirates. The technology can be integrated into an extremely wide variety of carrier vehicles. Taking an important initial step, the Swiss Army has ordered a prototype version of a mobile NBC field laboratory that includes bio detection components, the first of an anticipated total of twelve.

The company expects the aforementioned countries to place follow-up orders worth a total of around 50 million

euro.



## Defence Industry

### MDH Defense Lands M113 Upgrade Work

MDH Defense has been awarded a major contract by FNSS Savunma Sistemleri to supply 300 CBRN filtration systems and airconditioning as part of the M113 upgrade package for Saudi Arabia.

The work will be carried out in country, with the first vehicles expected to be returned to service during 2008.

The CBRN filtration unit and the air-conditioning system will utilise an integrated multi-function control panel which will be the new MDH Defense digital unit that incorporates membrane panel switching with a Vacuum Fluorescent Display (VFD).

The complete system has the following features:

- Combined CBRN and AC digital control box with VFD data display
- CBRN filtration to NATO standard AC/225 (Panel VII) D251
- Vehicle over pressure or face mask system CBRN filtration capability
- 9kW of spot cooling from the airconditioning system
- Air-conditioning volume flow rate nominally 1200m<sup>3</sup>/hr

Although this contract covers around 300 vehicles, it is understood that follow-on contracts could lead to the upgrade of the entire fleet, which is rumoured to number in excess of 2000 vehicles.



## Term of the day

### Faustpatrone



The Faustpatrone (literally 'fist cartridge') was a German anti-tank weapon of early World War II and a forerunner of the later Panzerfaust.

Much smaller in physical appearance, the Faustpatrone was actually heavier than the better known Panzerfaust. Development of the Faustpatrone started in the summer of 1942 at the German company HASAG with the

development of the smaller forerunner-prototype called "Gretchen" ("Little Gretel") by a team headed by Dr. Heinrich Langweiler in Leipzig. The basic concept was that of a recoilless gun; neither the Faustpatrone nor its successor the Panzerfaust were rockets.

The following first weapon model of the Panzerfaust-family, the so-called Faustpatrone klein, 30m ("Small Fist-Cartridge") had a total weight of 3.2 kg (7.1 lb) and a total length of 98.5 cm (38.8 in); its projectile had a length of 36 cm (14.2 in) and a warhead diameter of 10 cm (4 in); it carried a shaped charge of 400 g (14 oz) of a 50:50 mix of TNT and tri-hexogen. The propellant consisted of 54 g (1.9 oz or 830 grains) of black powder, the metal launch tube had a length of 80 cm (31.5 in) and a diameter of 3.3 cm (1.3 in) (early models reportedly 2.8 cm (1.1 in)). Fitted to the warhead was a wooden shaft with folded stabilizing fins (made of 0.25 mm (0.01 in) thick spring metal). These bent blades straightened into position by themselves as soon as they left the launch tube. The warhead was accelerated to a speed of 28 m/s (92 ft/s), had a range of about 30 m (100 ft) and an armor penetration of up to 140 mm (5.5 in) of plain steel. Soon a crude aiming device similar to the one used by the Panzerfaust was added to the design; it was fixed at a range of 30 m (100 ft).

Other designations of this weapon were Faustpatrone 1 or Panzerfaust 30 klein; however, it was common to refer to this weapon simply as the Faustpatrone. Twenty thousand were ordered and the first 500 Faustpatronen were delivered by the manufacturer, HASAG Hugo Schneider AG, Werk Schlieben, in August 1943. Two main problems had already surfaced much earlier in the weapon's trials. First, the original model did not have a sighting device. Second, due to the odd shape of the warhead (see pictures) it tended to ricochet off or explode with less effect on sloped armor, especially on the Russian T-34. Since these problems surfaced already early in testing, the development and production of its successor, the Panzerfaust 30, had already begun by the time of the first deliveries. Still, the small and simple Faustpatrone klein was kept in production well into 1945.



## Defence Industry

### Plasan Introduces Its Latest Ballistic Armour Solutions At LWC 2007

Company showcases exceptional flexibility in vehicle design and armour solutions for a wide range of today's unique requirements.

Plasan, a world leader in the design, development and manufacture of combat-proven ballistic armour solutions, will showcase its latest solutions at LWC 2007, which will take place October 23-26, 2007, Adelaide, Australia. The Company showcases examples of its exceptional flexibility in vehicle design and armour solutions for a wide range of today's unique requirements. The

SandCat, an armoured DAF truck, and two 8x8 armoured platforms will be on display at the company's Stand, B3 in the main hall.

Designed to answer the complex challenges of today's modern battlefields, the company's applications are fully optimised for protection, weight, and cost. Plasan's solutions - based on its technological expertise, unique capabilities, and field experience - have been integrated by the Israeli Defence Forces and by customers around the world, for whom the name Plasan has become synonymous with armour.

In Australia, Plasan showcases the range of its capabilities - from design and innovation through manufacturing to the delivery of customized armour solutions for military survivability applications, tactical personnel vehicles, and aircraft.

Plasan offers its successful track record in the international defence market to Australia.

"Australia is very important to Plasan", says Mr. Dani Ziv, Plasan's CEO. "We believe that we have a great deal to offer specifically in the areas that dovetail our products and expertise with national and local Australian needs and capabilities. Our focus on providing solutions through the marriage of Plasan's methods, products and know-how with those of local companies is particularly suitable to the Australian market because of the high level of professionalism, thoroughness, and quality for which Australian defence products is known".

These cooperative ventures will form the foundation for the company's increasing contribution to this important market.

#### MRAP - Mine-Resistant Ambush Protected Project

As sub-contractor for ITEC, Plasan is supplying the US Marines with battle-proven ballistic armoured protection for 1200 MRAP (Mine-Resistant Ambush Protected) vehicles, designed to safeguard military personnel and property from the threats of IEDs (Improvised Explosive Devices), RPGs (Rocket Propelled Grenades) and SAFs (Small Arms Fire). Supporting multiple mission types, the MRAPs will be delivered by the end of February, 2008, in a contract valued at over \$200m.

#### Advanced Armour Solutions for Today's Complex Needs

Based on today's most advanced technologies, Plasan develops armour solutions for a wide range of applications and platforms - including light patrol vehicles, HMMWVs, trucks, and APCs. Modular and lightweight, these solutions enhance crew survivability, improve multi-hit performance, and enable increased mobility.

Leveraging the company's exceptional capabilities, Plasan's global projects cover a wide spectrum of solutions of varying complexity: (1) Add-On Armour, in which kits are provided for operational vehicles that require urgent armour upgrades in the field; (2) Chassis-Up, in which the company receives the chassis and builds the armour to complete the vehicle; (3) Built-to-Print, in which the company receives the

complete platform design and builds the entire armoured vehicle; and, (4) Complete Hull Design, in which the company receives the hull and designs and builds the vehicle from the hull - up.

In every project, Plasán's team is involved in all stages of the customisation process, from design and development - through post-delivery services. The company takes pride in its high level of customer service, and the quality of its solutions, which meet the strictest international standards, including those of NATO and the USA.

Unique in the industry, the Company's expertise covers four of today's major ballistic technologies - Metal Composite, Composite Ceramic Armour, SMART Technology Armour, and high performance Polyethylene Armour. The sophisticated utilisation of these cutting-edge technologies - combined with exceptional engineering, as well as modularity and flexibility built into every solution - enable the company to quickly respond to evolving requirements, supplying fully integrated, end-to-end solutions to meet the specific needs of every manufacturer, including kits that can be rapidly assembled and maintained in the field.

#### **Close Cooperation with Leading Platform Manufacturers**

Plasán Sasa is one of the few companies approved by the U.S. Department of Defence to supply advanced add-on armour for lightweight military vehicles and trucks. The company's solutions are used in a wide range of military truck fleets, including Oshkosh Medium Tactical Vehicle Replacement (MTVR), M915, DAF and Volvo, as well as Oshkosh vehicles for the US Navy.

### **Defence Industry**

#### **BAE Systems to Supply Thermal Sights for U.S. Army Weapon Program**

BAE Systems has received a \$15 million contract to provide thermal imaging sights for the U.S. Army's Common Remotely Operated Weapon Station II (CROWS) program.

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Under the five-year contract, which has a potential value of up to \$200 million, BAE Systems will manufacture and deliver up to 6,500 TIM1500 thermal sights to Kongsberg Defence and Aerospace AS, supplier of the CROWS II system. The CROWS II program has a maximum order quantity of 6,500 remote weapon stations. Production deliveries will begin in early 2008.

"TIM1500 provides a critical infrared imaging capability to the U.S. Army's weapon station of choice for ground vehicles," said Michael Mawn, deputy program director for BAE Systems' TIM1500 program.

"The TIM1500 gives the warfighter a significant battlefield advantage."

The TIM1500 improves situational awareness and gives the ability to carry out target acquisition and surveillance at extended ranges. It can be installed on any U.S. Army ground vehicle.

### **Defence Industry**

#### **QinetiQ Successfully Fires Composite 155mm Artillery Munition**

QinetiQ, as the lead contractor in Team ImpaQt, has successfully fired the first metre long fully composite 'strength of design' projectile at the MOD Eskmeals, Cumbria firing range.

Part of an MOD-wide initiative to ensure modern fighting forces are suitably equipped and have maximum mobility to operate on tomorrow's urban battlefields, this is a key stage in the UK MOD Lightweight Advanced Munition (LWAM), part of the Advanced Ordnance Demonstrator (AOD) programme.

The AOD programme is investigating the ability to provide mobile forces with a lightweight rapid response capability with at least the same performance as today's conventional heavyweight systems like the MLRS or AS90. The current work on 'strength of design' will demonstrate the design performance and capability of the LWAM and a further ballistic firing is anticipated for March 2008.

LWAM is a 30kg, 155mm munition, able to carry a variety of payloads including high explosive, smoke or illuminating canisters. Its structural airframe components are manufactured almost entirely from composites which, in comparison with existing conventional 40+kg, 155mm ammunition, enables range, lethality and accuracy at least as good as current in-service conventional munitions together with a large reduction in weight consistent with achieving a Rapid Reaction capability. Precision targeting will be achieved by using a gun-hardened guidance, navigation and control system.

When fired from a conventional 39 calibre 155mm ordnance system preliminary results indicate that the composite munition withstood the demanding loading conditions in-bore and operated correctly during subsequent flight.

### **Defence Industry**

#### **Lockheed Martin and Patria join forces for Marine Personnel Carrier Offering**

Lockheed Martin and Patria have teamed to compete for the U.S. Marine Corps' Marine Personnel Carrier (MPC). The MPC will be the Marines' next generation medium armored vehicle.

The service is expected to release a request for proposals during the second quarter of 2008.

Under the agreement between the two companies, Lockheed Martin Systems Integration in Owego, NY will



act as prime contractor for the MPC effort, providing systems integration, survivability enhancements, U.S. production and net-centric and logistics capabilities for Patria's proven AMV 8x8 multi-role vehicle.

"The Lockheed Martin/Patria team will offer the U.S. Marine Corps a superior personnel carrier that enhances force protection while still providing the mobility necessary to execute expeditionary missions," said Lou DeSantis, Vice President and General Manager of Systems Solutions at Lockheed Martin Systems Integration-Owego. "Our MPC is a combat-proven solution that supports the Marine Corps' current mission with room for future capability enhancement."

The Lockheed Martin/Patria MPC will meet the U.S. Marine Corps' anticipated performance, protection and payload requirements as a versatile armored personnel carrier. It will be optimized for unconventional warfare, but effective across the full range of military operations. The MPC is designed to fill the medium-armor ground vehicle gap, while also providing capability to "swim" through water.

"This teaming agreement with Lockheed Martin is in step with Patria's strategy to team up with strong partners with whom it offers competitive tailor made solutions to customers," said Jorma Wiitakorpi, President and CEO of Patria. "The Patria AMV 8x8 is a combat proven solution fielded internationally and receiving great feedback from users in theaters of operations."

Lockheed Martin's previous experience with military vehicles for the U.S. Marine Corps include the Light Armored Vehicle Command and Control (LAV-C2) and Light-weight Prime Mover.

The Patria AMV 8x8 multi-role vehicle was launched in 2001, with the first vehicles delivered to the Polish army in 2004 as the serial production started. The advanced modular vehicle is already the choice of the Polish, Finnish, Slovenian, South African and Croatian armies. It has also participated in tough field tests in a number of Arab, Asian and South American countries, with excellent results.

Patria is an international defense and aerospace group. Its key business areas include armored wheeled vehicles, mortar systems and ammunition as well as their life cycle support. Patria is owned by the State of Finland and the European Aeronautic Defence and Space Company EADS.

Headquartered in Bethesda, Md., Lockheed Martin employs about 140,000 people worldwide and is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services.

Dynamics Land Systems, a business unit of General Dynamics, have signed a memorandum of agreement to work collaboratively in support of the U. S. Army's Heavy Brigade Combat Team modernization plan, which will upgrade, modernize and achieve commonality on BAE Systems' family of Bradley fighting vehicles and General Dynamics M1 Abrams tanks, the primary combat vehicles of the Army's Heavy Brigades.

The agreement, developed with the Army's encouragement, defines how both companies will work with the Army's Project Manager for Heavy Brigade Combat Team, and the Abrams and Bradley Product Managers, to jointly translate warfighter requirements into capabilities through collaborative design and development of common solutions. The agreement also establishes the basic process for collaborative specification and product development and provisions for the common procurement of material to support system evolution on both companies' combat vehicles.

"As the Army adds capability to the Heavy Brigade Combat Teams, they desire common solutions to reduce logistics burdens, to lower development costs, and to make Soldier training easier," said Mark Roualet, senior vice president and chief operating officer General Dynamics Land Systems. "BAE Systems and General Dynamics have responded with an agreement that harnesses the expertise of the world's premier combat-vehicle developers to provide our customers the technology and capability they require in the 21st century."

"This agreement is the natural conclusion of initiatives started under the leadership of Kevin Fahey, the Army's Program Executive Officer, Ground Combat Systems to achieve greater commonality within the Heavy Brigade," said Raj Rajagopal, president of BAE Systems' Ground Systems business. "It is a win-win for the U.S. Army, BAE Systems and General Dynamics, and illustrates how our partnership with the Army continues to evolve and apply best industry practices to the benefit of our customer and the American taxpayer."

BAE Systems and General Dynamics Land Systems are also One Team partners for the Future Combat Systems program, primarily responsible for ground combat systems development. This agreement will allow BAE Systems and General Dynamics Land Systems to leverage the work they are doing on the FCS program for application to current force vehicles.

#### **About BAE Systems**

BAE Systems is the premier global defense and aerospace company delivering a full range of products and services for air, land and naval forces, as well as advanced electronics, information technology solutions and customer support services. BAE Systems, with 96,000 employees worldwide, had 2006 sales that exceeded \$27 billion on a pro forma basis, assuming BAE Systems had owned Armor Holdings, Inc. for the whole of 2006.

#### **About General Dynamics**

General Dynamics, headquartered in Falls Church, Va., employs approximately 83,000 people worldwide

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### **Defence Industry**

## **BAE Systems And General Dynamics Sign Collaborative Agreement To Support Modernization Of U.S. Army Heavy Combat Vehicles**

WARREN, Michigan – BAE Systems and General

and anticipates 2007 revenues of approximately \$27 billion. The company has leading market positions in mission critical information systems and technologies, land and amphibious combat systems, shipbuilding and marine systems, and business aviation.



### Term of the day

## Shaped Charge



A shaped charge is an explosive charge shaped to focus the effect of the explosive's energy. Various types are used to cut and form metal, initiate nuclear weapons, and penetrate armour.

A typical modern lined shaped charge can penetrate armour steel to a depth of 7 or more times the diameter of the charge's cone (cone diameters, CD), though greater depths of 10 CD and above are now feasible.

Shaped charges are frequently used as warheads in anti-tank missiles (guided and unguided) and also gun-fired projectiles (spun and unspun), rifle grenades, mines, bomblets, torpedoes and various types of air/land/sea-launched guided missiles. They are also used to demolish large obsolete structures by precisely placed and progressively timed cutting charges with the intent of causing an inward collapse that confines the debris to the structure's footprint. Shaped charges find their most numerous application in the petroleum industry, in particular in the completion of oil wells, in which they are used to perforate the metal casing of the well at intervals to admit the influx of oil.

A typical device consists of a solid cylinder of explosive with a metal-lined conical hollow in one end and a central detonator, array of detonators, or detonation wave guide at the other end. The enormous pressure generated by the detonation of the explosive drives the liner contained within the hollow cavity inward to collapse upon its central axis. The resulting collision forms and projects a high-velocity jet of metal forward along the axis. Most of the jet material originates from the innermost layer of the liner, about 10% to 20% of its thickness. The remaining liner material forms a slower-moving slug of material, which is sometimes called a "carrot."

Because of variations along the liner in its collapse velocity, the jet so formed has a varying velocity along its length, decreasing from the front. This variation in velocity stretches the jet and eventually leads to its break-up into particles. In time, the particles tend to lose their alignment, which reduces the depth of penetration at long standoffs.

Also, at the apex of the cone, which forms the very front of the jet, the liner does not have time to be fully accelerated before it forms its part of the jet. This results in its small part of jet being projected at a lower velocity than jet formed later behind it. As a result, the initial

parts of the jet coalesce to form a pronounced wider tip portion.

Most of the jet formed moves at hypersonic speed, the tip at 7 to 14 km/s, the jet tail at a lower velocity (1 to 3 km/s), and the slug at a still lower velocity (less than 1 km/s). The exact velocities are dependent on the charge's configuration and confinement, explosive type, materials used, and the explosive-initiation mode. At typical velocities, the penetration process generates such enormous pressures that it may be considered hydrodynamic; to a good approximation, the jet and armor may be treated as incompressible fluids, with their material strengths ignored.

The shape most commonly used for the liner is a cone, with an internal apex angle of 40 to 90 degrees. Different apex angles yield different distributions of jet mass and velocity. Small apex angles can result in jet bifurcation, or even in the failure of the jet to form at all; this is attributed to the collapse velocity being above a certain threshold, normally slightly higher than the liner material's bulk sound speed. Other widely used shapes include hemispheres, tulips, trumpets, ellipses, and bi-conics; the various shapes yield jets with different velocity and mass distributions.

Liners have been made from many materials, including glass and various metals. The deepest penetrations are achieved with a dense, ductile metal, and a very common choice has been copper. For some modern anti-armor weapons, molybdenum and pseudo-alloys of tungsten filler and copper binder (9:1 thus density is  $\sim 18\text{t/m}^3$ ) have been adopted. Just about every common metallic element has been tried, including aluminium, tungsten, tantalum, depleted uranium, lead, tin, cadmium, cobalt, magnesium, titanium, zinc, zirconium, molybdenum, beryllium, nickel, silver, and even gold and platinum. The selection of the material depends on the target to be penetrated; for example, aluminium has been found advantageous for concrete targets.

For the deepest penetrations, pure metals yield the best results, because they display the greatest ductility, hence postponing the breakup of the stretching jet into particles. In charges for oil-well completion, however, it is essential that a solid slug or "carrot" not be formed, since it would plug the hole just penetrated and interfere with the influx of oil. In the petroleum industry, therefore, liners are generally fabricated by powder metallurgy, often of pseudo-alloys, which if un-sintered, yield jets that are composed mainly of dispersed fine metal particles.

During World War II, liners were made of copper or steel, though other materials were tried or researched. The precision of the charge's construction and its detonation mode were both inferior to modern warheads. This lower precision caused the jet to curve and to break up at an earlier time and hence at a shorter distance. The resulting dispersion decreased the penetration depth for a given cone diameter and also shortened the optimum standoff distance. Since the charges were less effective at larger standoffs, side and turret skirts (known as

Schürzen) were fitted to some German tanks to give the jet room to disperse and hence reduce its penetrating ability. The plates may also have been used to destabilise small calibre armour piercing (AP) projectiles, and/or strip the penetration cap from larger calibre APC (armour piercing capped) and APCBC (armour piercing capped ballistic capped) projectiles.

The use of skirts today may increase the penetration of some warheads. Due to constraints in the length of the projectile/missile, the built in stand-off on many warheads is not the optimum distance. The skirting effectively increases the distance between the armour and the target, providing the warhead with a more optimum standoff and greater penetration if the optimum stand-off is not drastically exceeded. Skirting should not be confused with bar/slat/chain armour which is used to damage the fuze system of RPG-7 projectiles. The armour works by deforming the inner and outer ogives and shorting the firing circuit between the rocket's piezoelectric nose probe and rear fuze assembly. If the nose probe strikes the armour, the warhead will function as normal.

The spacing between the shaped charge and its target is critical, as there is an optimum standoff distance to achieve the deepest penetration. At short standoffs, the jet does not have room to stretch out, and at long standoffs, it eventually breaks into particles, which then tend to drift off the line of axis and to tumble, so that the successive particles tend to widen rather than deepen the hole. At very long standoffs, velocity is lost to air drag, degrading penetration further.

For optimum penetration, a high explosive having a high detonation velocity and pressure is normally chosen. The most common explosive used in high performance anti-armour warheads is HMX (octogen), though it is never used on its own, as it would be too sensitive. It is normally compounded with a few percent of some type of plastic binder, such as in the plastic bonded explosive (PBX) LX-14, or with another less-sensitive explosive, such as TNT, with which it forms Octol. Other common explosives are RDX-based compositions, again either as PBXs or mixtures with TNT (to form Composition B and the Cyclotols) or wax (Cyclonites). Some explosives incorporate powdered aluminium to increase their blast and detonation temperature, but this addition generally results in decreased performance of the shaped charge. There has been research into using the very-high-performance but sensitive explosive CL-20 in shaped-charge warheads, but, at present, due to its sensitivity, this has been in the form of the PBX composite LX-19 (CL-20 and Estane binder).

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