



EURONAVAL 2010

Nexter Munitions

**Recognised supplier of current generation products
and developer of future solutions**

Nexter Munitions is one of the few European companies in its sector capable of performing its role as a munitions supplier for France and for foreign armies (in the framework of an extremely secure production system) and as a developer of future solutions. A significant part of its budget (of the order of 20% of its sales) is set aside for research, preliminary studies and the development of new products. The quality and technicity of its products are sufficient for it to actively participate in many international projects, for example 155 Bonus projectile and 40 mm CTA weapons system with BAe Systems, Spacido course correction system with Junghans T2M, etc.

The existing range: from 20 mm to 155 mm / 52-caliber

Nexter Munitions is first and foremost the munitions manufacturer associated with systems developed by Nexter Systems. Munitions are designed and qualified at the same time as systems, which guarantees efficiency, reliability and safety to their users. Therefore, the range includes 155 and 105 mm munitions (and 100 mm naval) for artillery systems, 120 and 105 mm munitions for combat tanks, 90 mm munitions for armoured vehicles and 30, 25 and 20 mm munitions for lightweight vehicles and guns onboard aircraft, helicopters and ships. Most of this range respects NATO standards. Finally, Nexter Munitions is a partner recognised by European missile manufacturers in the fields of warheads, safety devices, pyrotechnic components, and IM (insensitive munitions) charges and technologies.

Its state-of-the-art products include:

- LU211, one of the few 155 mm munitions qualified in 52-caliber both in the conventional version and insensitive munitions (IM) version),
- new 120 HE explosive munition that will be fitted on tanks equipped with a 120 mm barrel, effective in deployed combat and in urban combat, with a precision of one metre at 3 km and the 120 mm practice armour piercing ammunition.



Medium caliber practice and combat munitions

The DGA (French Defence Procurement Agency) issued a new multi-annual contract in December 2009 for medium caliber munitions for use by the French Armed Forces, worth a global volume of 1 880 000 cartridges, for which deliveries will continue until 2016. This new multi-annual contract confirms the confidence of the French State (the DGA and the Armed Forces) in the capabilities of NEXTER Munitions.

Large caliber practice and combat munitions

The DGA and French Armed Forces have begun discussions with NEXTER Munitions on a multi-annual contract for the supply of large caliber practice and combat munitions for tanks (120mm and 105mm) and for CAESAR 155 / 52-caliber (long range and insensitive version) to come into

force at the beginning of 2011. This multi-annual contract will follow on from the first multi-annual contract in 2007 and the 2009 recovery plan contract. Deliveries are planned until 2018,

A qualified product range satisfying current operational needs

- **120mm HE munition** was qualified in 2009 and is in series production. This multi-purpose munition is ideal for current combat theatres. It satisfies the needs of forces in open combat against deployed troops. Furthermore, it has sufficient power to deal with medium class combat vehicles (or even first generation heavy tanks) and has shown remarkable efficiency in urban and anti-infrastructure fighting.
- **52-Caliber artillery range products** (perfectly interoperable in 45 and 39-caliber), namely propellant charges and shells, are qualified and in series production for France and for NEXTER Munitions' Export customers, for. Note that 10 000 LU 211 IM (insensitive version) shells were delivered to French Forces in 2009.

Three lines of innovation

The new operational scenarios in the framework of the projection of Forces, give priority to reducing the logistics footprint, safety of personnel and equipment, reduction of collateral damage, control of terminal effects, a graduated response and respecting environmental constraints. To satisfy these requirements, Nexter Munitions R&D has been concentrating its efforts on three main lines of improvement to its product range for several years:

- **the concept of "insensitive" munitions** (like **155 LU211-IM** and all "IM" munitions) satisfies force projection, security and logistics footprint constraints; it is tending to become generalised to all products,
- **the concept of smart munitions (BONUS, POLYNEGE and SPACIDO programs, laser guided shells and MPM with one-metre precision) gives a better cost/efficiency ratio, reduces the logistics footprint and minimises collateral damage,**
- **diversification and control of terminal effects** (for example munitions with **Airburst** fuses in 25mm and 40 CTA medium caliber and 120mm large calibre) satisfies problems of reducing collateral damage and graduated response.



"Insensitive" munitions

So-called "insensitive" munitions have many advantages; their resistance to the various types of aggression that they may encounter under operational usage conditions, ease of use, transport and storage resulting from this.

Nexter Munitions is **the first manufacturer to have qualified and started series production of insensitive 155mm artillery munitions (155 LU211-IM)**. France has already acquired LU211-IM for its CAESAR® artillery systems. LU211-IM munition also satisfies STANAG 4224

requirements and NATO and US standards for transport and storage. 155 LU211-IM has the highest insensitivity level according to tests imposed by STANAG 4439 (particularly complete insensitivity without any protection against sniper firing (14.5 mm and RPG 7) and can be demilitarised according to STANAG 4518. Obviously, 155 LU211-IM shells are compatible with all NATO standard 155mm, 39, 45 and 52-caliber guns. Furthermore and especially, its incomparable degree of insensitivity does not degrade its final performances because its terminal effect is twice as good as a classical HE type artillery shell related to a blast effect perfectly adapted to the current operational context. Nexter Munitions's skills in IM technology are found in its entire product range. Thus, Nexter Munitions is in a position to offer medium calibre munitions with IM charge.

"Smart" munitions

Contracts for **BONUS** smart anti-tank munition were completed in 2007 after being started in the 1990s in cooperation with its Swedish partner, BAE Systems Bofors. 6 000 shells have been manufactured so far.

155 BONUS MKII munition produced by Nexter Munitions and BAE Systems Bofors combines a multi-spectral infrared detection device with a laser range finder in order to detect the temperature signature of the target and its 3-dimensional signature at the same time. Thus, BONUS munition that can counter armoured vehicles with a precision of one metre satisfies many of the above-mentioned requirements.



SPACIDO system improves the precision of artillery munitions and considerably reduces risks of collateral damage. SPACIDO is made in partnership with the Junghans T2M and IN-SNEC companies, and is based on a system comprising a multi-function electronic fuse provided with an aerodynamic brake, a means of programming and muzzle radar. The precision has been improved by a factor of more than 4 at long range, and without using GPS.

The **Metre Precision Munition (MPM) contract** was notified to Nexter Munitions and TDA by the DGA (French Defence Procurement Agency) in 2008. The objective is to demonstrate that the main applicable technologies (laser guidance) are mature for 155mm artillery and 120mm Tank (NEXTER Munitions) and 120mm Mortar and 68mm Rocket (TDA) metre precision munitions, at "Munitions" costs, taking account of the very good intrinsic precision of the basic products. This program is the logical follow up to the POLYNEGE contract issued in 2002, which was to be applied to 120mm NATO tank guns.

Control of terminal effects

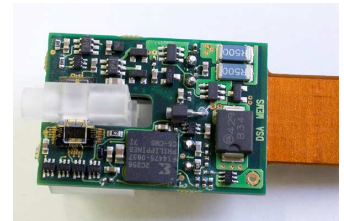
During 2005, the DGA notified NEXTER Munitions about two contracts designed to improve the performances of medium and large caliber munitions. "**Airbursting system**" theme was one of the major topics in both of these design contracts. It was a system capable of initiating the terminal effect of a projectile on a trajectory at a controlled range. In this framework, the innovative technologies applied formed a significant technological break from products in the range in service.

The first full scale validation tests in 25x137 caliber (firing programmed 25M811 munitions namely VBCI weapons) gave results conforming with operational needs. Integral configuration tests will take place from a VBCI at the end of 2010. Similarly, Nexter Munitions is carrying out study and design work on a CTA 40-caliber and tank 120mm caliber airburst munition.

ACCEPTING FUTURE TECHNOLOGICAL CHALLENGES

Search: Combining electronics and pyrotechnics

Nexter Munitions teams have succeeded in developing a new device for interrupting the pyrotechnic system that up to now required large and expensive mechanical means. In the future, a reliable and secure micro-mechanism etched in a silicon chip will be sufficient. This technological progress (MEMS technology) can improve performances for multiple applications at low costs.



Nexter Munitions delivered a batch of demonstrators to the DGA in 2007 related to a new generation DSA (Armament Safety Device), after a 30-month design phase. The technical challenge was to guarantee the safety of a pyrotechnic mechanism integrating micro-electromechanical systems (MEMS).

The DSA is one of the key components of all munitions, necessary to guarantee safety of the ammunition throughout its life, and obviously triggers the warhead under optimum conditions (this device also ignites missile propulsion units).

The purpose of the design phase was to satisfy strict miniaturisation and price requirements. Nexter Munitions successfully completed the design and validation of a miniaturised pyrotechnic system during this design phase, based on an electromechanical system etched on a silicon chip. In a conventional DSA, the pyrotechnic system is normally controlled by a larger and more expensive mechanism. Furthermore, this new type of DSA can trigger an Extremely Low Sensitivity Detonating Material (MDEPS) which now has to be implemented for the insensitive munitions (IM) technology.

This progress is the result of an iterative approach in the framework of a development carried out jointly with the MEMSCAP Company that specialises in the MEMS technology. The mechanical architecture and pyrotechnic components were developed in parallel to offer a reliable DSA satisfying the strictest international standards.

Combining pyrotechnics with the MEMS technology originating from the electronic industry allows Nexter Munitions to offer a new generation of DSAs for a wide range of applications (missiles, torpedoes and gun munitions, and even aeronautical and space applications), making use of the degrees of miniaturisation, cost and performance achieved.

The maturity of this new DSA concept will be rewarded by the Chansson Prize on June 16 2010.