

URBAN WARFARE 2.0

**How asymmetric threats
dominate conflicts**





COMPANY PROFILE

Dynamit Nobel Defence - 30 year partners of international armed forces

Dynamit Nobel Defence is a young company with a long tradition steeped in history. After Dynamit Nobel GmbH Explosivstoff- und Systemtechnik had been sold and reorganised in 2004, all the activities of the defence business of Dynamit Nobel Defence were relocated to Würgendorf near Siegen.

The company continues over 50 years of tradition in the development and manufacture of rocket, rocket motors, warheads, reactive armour, weapon stations and modern shoulder-launched weapons for the international infantry market.

At first, many people relate the name „Dynamit Nobel“ to the production of explosives. The company „Alfred Nobel & Co“ was founded by Alfred Nobel in 1865. That company produced the dynamite he had invented and this made his name known around the world.

This was the first milestones in the long history of Dynamit Nobel Defence, which is rich in tradition. The company has been one of the most important suppliers of different types of arms and ammunition to the Bundeswehr, German armed forces.

Dynamit Nobel Defence can look back on several decades of experience and excellent achievements in the international defence business.

The company and system house is also a supplier of the armed forces of many overseas and European countries. About 90 per cent of all its customers are located abroad. With its specialisation in high end military technology, Dynamit Nobel Defence is well prepared for the future.

Using the established performance potential in high-technology design, the company has the technological capability to supply international markets with the required high-end defence technology.

Today Dynamit Nobel Defence is the global leader in shoulder-launched anti-tank weapons for infantry use together with other military products such as specialised warheads for different applications, weapon stations and reactive armour.

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Urban Warfare 2.0

Tactical issues are becoming ever more complex for armed forces

In recent years, growing population settlements and the emergence of megacities have changed the focus of conflicts and wars. Today, an ever larger number of conflicts and wars take place in built-up areas and terrain difficult to reconnoitre. This forces well-equipped and highly trained armed forces to face scenarios which have been dominating the military approach ever more strongly for a number of years.

The military operations in Iraq and in Afghanistan have shown that fighting in built-up areas is one of the preferred tactics of the enemy forces in order to engage superior armed forces with lightly armed militia.

In military terminology, Urban Operations (UO) or Military Operations in Urban Terrain (MOUT) allow the enemy the use of the urban infrastructure, including the population, as attack and cover positions for military operations. Urban areas are the preferred locations for ambushes, sudden attacks or lightning strikes by irregular forces.

Under these conditions, assault rifles, light machine guns, armour piercing infantry weapons, self-made explosive devices, light mortar fire and land mines can inflict substantial loss even on armed forces with modern equipment and protection. This form of combat is aided and abetted by the complexity of urban areas, the attacker's detailed knowledge of the terrain and the lack of mobility of the attacked convoy or soldiers operating within restricted confines of the towns and cities.

Add to this the close combat range, which - if conditions are favourable - allows the attacker to immobilise his tar-

get by firing only a few shots from his rifle. The combat range in urban settings is normally between 15 and 100 metres. Irregular forces can advance and attack simultaneously from several positions or force the attacked party to respond in several directions thus making the attack more efficient.

Under these conditions, the attacked party is usually unable to bring its full defence capability to bear. In these situations soldiers cannot leave their armoured transport vehicles without becoming a target for the attacker.

In these situations units that come under sudden attack or ambush are forced to retreat, reorganise and then advance quickly against the attacker. This counter response allows for the safe debussing of soldiers from armoured vehicles followed by the time-consuming search for the attacker before they can be engaged successfully.

Important factors

These factors are not new to military forces engaged in international missions. The ambush tactics practiced by irregular forces with much success in many cases, followed by retreat into urban areas or the use of such areas for military operations has been the reason for many countries to change their philosophy of urban warfare scenarios.

Today, military experts of NATO assume that more than 70% of all conflicts will be urban warfare scenarios in the future. This consideration will play a very important role in providing equipment to armed forces in line with the threat faced. Today, the military demands stand-off capability and efficient infantry weapon

URBAN WARFARE: Technical superiority is useful only to a limited extent in urban fighting.



DIFFICULT TO SURVEY: Danger lurks behind every corner. MOUT scenarios require utmost concentration and combat strength of the soldier.

systems for urban warfare operations which can be used in these conditions. The new weapon systems optimised for infantry forces should not weigh more than 10kg, have combat ranges from 15 to maximum 500 metres and be able to defeat bunkers, breach cover and pierce armour.

The problem of urban warfare

MOUT scenarios are characterised by the infrastructure in which fighting takes place. If these are densely populated areas, villages or cities compare to European standard, buildings are normally in very good condition. This infrastructure is of decisive importance to attackers because it provides a base for operations and cover. Structures of high stability offer good cover against light and non-armour piercing infantry weapons, such as assault rifles and light machine guns below calibre .50. It is also easy for irregular forces to change position inside a building or to be able to attack simultaneously from several floors or from different buildings.

This makes defining the position and fighting an attacker substantially more difficult for the party attacked. If on foot or lightly protected it forces the attacked party to enter a building for cover and continue the fight from there. This is a difficult and dangerous situation which bears a very high risk for the soldiers. The danger becomes even greater due to difficult tactical situations and the possibility of booby traps hidden inside buildings.

Even opening a locked or blocked door, clearing away artificial obstacles such as barbed wire or barricades, requires time, unnecessarily exposing soldiers and entails substantial risks as obstacles may be linked to booby traps. Blasting such obstacles to open or clear them away with special explosive charges is often too dangerous for soldiers because of the pressure generated by the explosion (blast/pressure wave) in open terrain, and much more so in an enclosed room.

Additionally hand, smoke or stun grenades cannot always be used for controlling the enemy or forcing him to leave his covered position.

An experienced user can throw a hand, smoke or stun grenade for only for 35 or 40 metres. The danger that the grenade misses the target is extremely high when considering factors such as enemy fire, poor vision and high stress. A thrown weapon which fails to hit its target can bounce back from a wall and be a danger to friendly soldiers due to explosion, fire or fragmentation within a 20 to 40 metre circumference. The soldier throwing the grenade must expose himself for several seconds, which is another source of danger for the use of hand grenades in combat.

Today's weapons

Light machine guns, assault rifles with or without 40mm grenade launcher (40mm add-on unit) and the pistol are the

weapons that are most commonly used in urban warfare today. Heavy weapon options used by infantry on a global scale include shoulder-launched anti-tank infantry weapon systems because these have a higher stand-off capability and a higher efficiency at the target. An opponent entrenched in an urban environment can be efficiently engaged with these weapons from a distance.

Complexity of the new threat

Up to and including the Cold War period, the concept of conflict was characterised by the military factor of concentration/counter-concentration of forces. Both sides tried to gain material and personnel superiority to determine the strategic and tactical approach of armed forces. This military approach has had an impact on military equipment for hundreds of years. This kind of warfare was replaced by asymmetric threats, guerrilla warfare or irregular forces (insurgents) as late as the 1970s. A technological trend started with heavy infantry weapons as a result of which these weapons can increasingly be used for a second or third function. This is particularly evident from the variety of applications shoulder-launched weapon systems are being used for, whose primary purpose was as an anti-tank weapon in the past.

After the formation of the Bundeswehr German armed forces in 1956, one task of all troop formations was „fighting armoured vehicles and tanks“. For this, the Bundeswehr had the Light Lance Panzerfaust (Panzerfaust 44) and the heavy Carl Gustaf 84mm anti-tank rifle manufactured in Sweden. These infantry weapon systems equipped with an armour piercing warhead (shaped charge) not only fought tanks but also machine gun nests, anti-tank positions, bunkers or field positions, etc. in open terrain.

The armour piercing “Panzerfaust” weapon has a combat range of about 400 metres and a variety of uses in a second role, which has not been changed since World War II. For this reason, the “Panzerfaust” is still a high efficiency “weapon system” for today’s infantry, which can also be used in urban warfare.

Requirement profile changes

The introduction of reactive and active armours on combat vehicles of the then Warsaw Pact countries started a development in the technology of the capability of the warheads, the effective range and the optical sights of Panzerfaust were improved substantially. Despite these technological improvements, the primary role of the Panzerfaust as the most effective weapon against armoured tanks at a distance of 15 metres to 600 metres remained the most important to infantrymen until the late 1990s.

The higher effective range ensured better survival for the soldier because it could be fired from a greater distance (stand-off effect) and the improved target optics and fire control systems have contributed to a higher first-shot kill probability. However, it was found very quickly that the conventional Panzerfaust or guided missile warheads which rely on shaped charge technology were not suitable for all targets being engaged in the new asymmetric combat scenarios or for urban warfare/MOUT. The effect of the shaped charge against a varying target spectrum, which today includes fortified shelters in buildings, bunkers or even

DANGEROUS: Hand grenades cannot always be used in FISH (FIGHTING IN SOMEONE ELSE'S HOUSE) scenarios.





small vehicles with makeshift armour (e.g., pick-up trucks), is rather limited. This problem was recognised by many armed forces and gave rise to their call for warheads with multi-mode effect for barrel based infantry weapon systems which can engage a wider spectrum of targets of types encountered in asymmetric conflicts or in urban warfare.

In addition, the military user demanded improved sights which made it possible to aim and hit moving or static targets at distances of up to 600 metres. Improved sights and aiming devices were to improve the first-shot kill probability and provide a high stand-off effect for a soldier. Added to this was directed military research aimed at developing cover-breaching warheads, warheads acting behind cover and anti-structure warheads that could be fired from very compact hand weapons weighing not more than 9 kilograms at distances of up to 500 metres. These new hand weapon systems had to be more compact and ergonomic so soldiers could carry them more easily in command, function and combat vehicles or aboard helicopters. These weapons should also be compatible with night vision devices or other active aiming devices.

This military requirement resulted in industry responding with the development of new heavy infantry weapon systems. For example, Dynamit Nobel Defence limited the total length of its hand weapons to one metre. The warhead was integrated in the barrel and does not project from it like in the case of the Panzerfaust 3 family or the Bunkerfaust. The diameter of the new warhead was reduced from 110mm to 90mm to save weight. This technical redesign was triggered by the fact that a soldier often carries up to 30kg of equipment and the weight load should be reduced.

Most of the weight a soldier carries is for ballistic protection, weapons and ammunition. The heavier the equipment, the bigger the problem for the soldier to move quickly over debris, through destroyed buildings, etc. in an urban warfare scenario. This is the case, in particular, when the soldier is exposed to extreme climate such as cold, heat or dust, in addition to other battlefield conditions.



Different targets spectrums and warhead functions

Recent experience, in particular, of armed forces in the West, has shown how important it is, in military terms, to have the use of modern multi-functional hand weapons that are cover-breaching, armour penetrating and anti-structure. The international trend in military equipment today is to provide soldiers with multifunctional hand weapon systems to enable them to fight different targets in the field using only one system.

A technical aspect that was considered in the development of the new hand weapons by industry is the ability of more effective breaching of artificial and natural covers or strong walls/steel-reinforced concrete and to include a behind target effect.

In an urban warfare or MOUT setting, targets difficult to defeat include reinforced sand bag bunkers, hardened shelters or concrete bunkers, fortified shelters in basements and firing positions built in houses which due to their efficient camouflage are difficult to spot and defeat.

To be able to defeat these targets better in future, light-weight, stand-off and cover-breaching infantry weapons are required whose warheads are selectable manually to at least two different functions (armour piercing or cover breaching). This multimode capability should enable the soldier to fight armoured or fortified/hardened urban targets with the same weapon.

In most cases, the function of a shaped charge warhead that can be used as high explosive squash head (HESH) or HEAT (high explosive anti tank) warhead is sufficient. However, the action of such a warhead is not optimum against all building structures. An alternative to these special warhead solutions is an anti-structure warhead which the soldier can set manually to two different functions offering a "Mouse hole" mode and a "Blast" mode.

Blast mode is utilised to destroy very heavily fortified positions and building structures, warhead developments are required which can breach cover and provide a behind the cover effect, i.e., in the rooms behind. For this, anti-structure warhead design is needed that penetrates a strong building structure, by making the manual setting which de-

GLOBAL: The changed geopolitical situation and the lessons learnt from past missions have shown that fighting, in three out of four cases, will take place in urban areas in future.



COLLATERAL DAMAGE:
Insurgents use urban structures
for retreat.

lays the time at which the main charge functions, these anti-structure warheads detonate after penetrating through the wall or hardened target. There, the main charge of the warhead acts as a strong blast charge within the room or enclosure behind the cover.

warheads for many years and are among the best-known products DND manufactures.

Exist Warheads Technology

Utilising established and new warhead technologies based on the barrel-based infantry weapons RGW 60 and RGW 90 (recoilless grenade weapons) from Dynamit Nobel Defence (DND), infantrymen today can already effectively engage all kinds of building structures, such as concrete, masonry or mud bricks, and a whole spectrum of military cover, including fortified shelters, field positions and bunkers.

DND has for years been facing the technological challenge of developing and manufacturing new infantry weapon systems for specific military requirements. The company is a leader in shoulder-launched, cover-breaching and armour-piercing infantry hand weapons.

The Panzerfaust 3 infantry weapon family, the Bunkerfaust bunker buster, the RGW 90 family and the light RGW 60 family have been fitted with different

RLEM – the soldier door breaching weapon system



In combat MOUT operations, doors must often be opened quickly and by force to restrain or pursue an opponent into a building without endangering civilians in the building. In the past, either small explosive charges or pump guns were used for this. The disadvantage is that the soldier has to be in close proximity to the door and cannot operate from a distance or utilise available cover.

This is extremely dangerous in an urban battle and to improve this DND offers a door breaching system, RLEM (Rifle Launched Entry Muniton). RLEM is a rifle grenade which breaches conventional doors from distances of between 15 and 50 metres. The RLEM rifle grenade, which is 73.2 cm long, can be fired from all common assault rifles such as the German G36, the U.S. M16 or the French FA-MAS. RLEM contains a spike about 50 cm long which ensures that the warhead weighing 120 grams and of flat shape explodes at the optimum distance from the target.

The action is similar to that of an HESH charge whose blast acts on the target object. When the RLEM hits a door, the detonation of the explosive charge pushes the door into the entrance of the building. The danger area behind the target object is not more than 2 metres. The soldier should maintain a minimum distance of 6 metres from the target to be safe from the explosion. Stability of the ballistic flight is provided by a tail unit in which the fuze of the explosive charge is integrated. To fire the RLEM grenade, which weighs 620 grams and has 10 cm diameter, it is placed over the end of the rifle and fired. The RLEM grenade moves along a flat ballistic curve and explodes on impact with the target. RLEM is available with warheads of different performance.

Breaching doors is not the only use of the rifle grenade. Strong window systems can also be pushed in. In this application RLEM is equipped with a shorter spike, carries 100 grams of explosive and is made of plastic to reduce secondary effects to a minimum. RLEM was also developed as static system to be applied to a door by a soldier. This system can also be used by police forces and anti-terror police. The maximum explosive charge so far integrated into the RLEM is about 150 grams. This is enough to breach strong windows with bullet-proof or shatter-proof panes. The RLEM system has so far been supplied to the Israeli armed forces, the US Delta Force, the US Army, the French SWAT teams and the British Army.

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New Infantry Weapons

Light-weight, compact and efficient

Dynamit Nobel Defence (DND) offers new infantry weapon systems specifically optimised for infantry fighters in urban environments to both its national and international markets.

This is the company's response to the international military demand for the supply of a high-efficiency infantry weapon for current military scenarios, which provide the soldier with more directed firepower to improve his effectiveness on the battlefield. The new DND products include infantry weapon systems which can defeat armoured targets, bunkers or shelters at distances up to 500m, burst open doors or tear holes in solid brick walls to enter a building.

All these new infantry weapons are of light weight and intuitive to use, have high warhead efficiency and a wide combat range. All infantry weapons made by DND can be fired from enclosed rooms because they use the "Davis Gun principle".

This principle also results in a low firing signature, typical of all weapons of the Panzerfaust 3, RGW 60 and RGW 90-families; when fired, they produce little smoke and only medium blast noise. All weapon systems made by DND are simple to use even by soldiers in a high stress combat environment; this is mainly due to the balanced ergonomic design of these weapons. All weapon systems have a high-quality optical sight to ensure the soldier achieves a high first-hit rate and therefore a high "kill" level in combat. The infantry weapons of the new RGW 60 and RGW 90 families are designed as disposable weapon systems and the tubes are thrown away after being fired. This enables the soldier, having

fired, to change position and move more quickly in the field.

Panzerfaust 3 family from DND – Optimised not only as anti-tank weapon

Despite the change of military scenarios anti-tank weapons are still important equipment for the infantryman of today because of their second role as a weapon against urban targets.

This also includes Panzerfaust 3 family (Pzf 3) from DND with three major performance parameters for engaging battle tanks and armoured personnel carriers, bunkers, hardened fortifications or sniper positions. The 110mm diameter warhead of Panzerfaust 3 with its high explosive charge of 1.5kg and the high formed charge performance can be used against different target spectrums giving the soldier on the modern battlefield-combat fire power.

The Panzerfaust 3 weapon family belongs to the most powerful anti-tank infantry weapon with which the modern soldier of today can obtain.

Panzerfaust 3 is a recoilless shoulder-launched anti-tank weapon that is carried and can be used by one soldier.

It can be fired from an enclosed room and its single-purpose warhead with a shaped charge (DM12A1) of calibre 110mm pierces steel armour of up to approximately 800mm thickness. The high penetration performance of the Panzerfaust 3 is due to the shaped charge principle and the quick response of the percussion fuze; the effect on the target does not depend on the impact velocity.

ASSERTIVE: The Panzerfaust 3 has been an essential anti-tank weapon for a long time. Also by other armies.

If an armoured vehicle, hardened or other target is penetrated by the warhead with a shaped charge, several secondary effects, from fragmentation to fire, are produced behind the cover.

Panzerfaust 3, which is 12.9kg is on the heavy side but can be fired from enclosed rooms because the Davis Gun principle does not require a high propellant charge. The weapon also has an extremely low recoil. When the projectile with the shaped charge leaves the barrel, it is propelled to approximately 250 m/s by a sustainer rocket motor.

The ergonomic design of all controls such as handles, launcher, barrel shape and optical sight, is optimum for the user. All controls are easy to handle by the soldier in all shooting positions (lying, kneeling or standing). After the weapon is fired, the firing mechanism with the at-

tached optical sight is removed and the barrel thrown away, the firing mechanism is reusable. The effective combat range of Panzerfaust 3 is between 15 and 300 metres against moving and 400 metres against static targets. An optical sight with line pattern fixed to the reusable firing mechanism enables the soldier to aim at and engage moving or static targets. To ensure night combat capability, a night-vision device or residual light amplifier can be set up in front of the optical sight.

Improvement to Panzerfaust 3-T anti-tank weapon

Panzerfaust 3 which has a the single warhead with a shaped charge was improved by DND to Panzerfaust 3-T (T for tandem shaped-charge warhead), a more powerful version which uses the same 110mm diameter warhead. The warhead with the tandem shaped charge can pierce all reactive protection and add-on armours. The dual warhead has a small first charge and a main shaped charge. The first charge penetrates the reactive add-on armour on the combat vehicle without initiating the charge inside it to ensure it does not compromise or prevent the armour-piercing action of the main shaped charge.

Panzerfaust 3-T, which weighs 13.3kg, is as easy to use as Panzerfaust 3. The optical sight and the mounting firing mechanism have not been changed so the 30-T can be retrofitted with the other models. The new warhead can pierce steel armour of approximately 800mm thickness behind reactive protection. Static and moving targets can be defeated effectively at distances between 18 and 400 metres.

More powerful again – Panzerfaust 3-IT

Not satisfied with warhead performance another increase of performance was achieved with Panzerfaust 3-IT, improved tandem warhead (IT), which pierces even the latest reactive armour on combat vehicles. Panzerfaust 3-IT has on improved tandem shaped-charge warhead weighing approximately 14.3kg. The 110mm diameter warhead is designed to penetrate approximately 900mm solid armour with

Background information, requirements for new infantry weapons

To prevail in asymmetric and urban warfare scenarios, new warheads types for infantry weapons with breaching capability are indispensable. The technical requirements involved can only be met by a few producers. Despite this, evaluations of military operations have shown the importance of a family of new infantry weapons with optimised effect against different threats utilising a compact and easy to handle design. The concept of a family of infantry weapon systems, such as the Panzerfaust 3 family and the developments of RGW 60 and RGW 90, prove that the design of this concept, demanded by the international armed forces for some time, is the correct one. In the last few years, Dynamit Nobel Defence has responded to this market by launching new, weapons of lighter weight and higher performance and developed new infantry weapon systems for the new military requirements. The target of these developments was to combine different technical characteristics of infantry weapon systems and their warheads and bring them together into a new family of weapon systems. In conjunction with this are the characteristics of the new RGW 60 and RGW 90 weapon system families, whose dimensions are substantially more compact, which are designed as disposable weapons and weigh less than 10 kg. These technical features enable the soldier to carry less weight, to be less stressed by the fighting and be more agile but still carry the same or greater fire power. A substantial point in favour of most of these weapons is their multipurpose capability so that the soldier can react to different threats using the same weapon. This basic concept of multipurpose capability of the same weapon system family has also been applied to RGW 90 LRMP, the latest developments from DND. Here, an extended range of more than 1000 metres is combined with a computerised warhead effect (airburst, HESH effect and delayed detonation) to provide an extremely effective and unique weapon system.



reactive protection elements. The first shaped charge of the warhead destroys the reactive protection and removes the add-on armour before the main charge detonates. After this, the main shaped charge can engage unprotected armour. The stand-off of Panzerfaust 3-IT with its removable optical sight is 400 metres. Panzerfaust 3-IT, like the other models of the Panzerfaust 3 family, can be used for night fighting by the addition of a night-vision device (e.g., NSA80 from Zeiss). The NSA system is part of the standard equipment of the "Infantryman of the Future" (IdZ) and "Infantryman of the Future - Extended System" (IdZ ES) concepts. All three versions of Panzerfaust 3 can engage heavily armoured combat vehicles, urban structures, concrete walls and fortified positions. Like the other models, Panzerfaust 3-IT can be fired from enclosed rooms and has a very low firing signature. In international comparison, the Panzerfaust 3 family with its different variants is still among the most powerful anti-tank weapons in its class. Since the 1990s, all Panzerfaust 3 versions have proved to be reliable infantry weapon systems for soldiers and still form the backbone of shoulder-launched anti-tank weaponry of many countries.

DYNARANGE

The effective range of all Panzerfaust 3 versions can be increased up to 600 metres by the DYNARANGE electronic fire control unit. This highly effective rang-

ing device is a substantial improvement to the stand-off and defend capability against moving targets such as combat vehicles and also static objects.

The 3.5x magnification provided by the DYNARANGE optical sight with the computerised fire control and laser range finder quickly determines distance, which is displayed in the optical sight. When activated, the fire control computer automatically computes the point at which a static or moving target should be aimed at and displays the target as a red dot in the optical sight.

The only thing for the soldier to do to hit the target is train his Panzerfaust 3 on the target and fire the shot. If a laser signature must be avoided, the distance to the target can also be entered manually.

DYNARANGE is an inherent part of the replaceable firing mechanism of the Panzerfaust 3 family. Allowing for all weather conditions, the computerised targeting system ensures very high first-hit probability at distances of between 300 to 600 metres. The high hit probability was confirmed by Dutch soldiers as part of the ISAF mission in Afghanistan. DYNARANGE even helped hit static targets at distances up to 1,000 metres. The DYNARANGE sight and active aiming device can be used on all versions of Panzerfaust 3.

ANTI TANK: The Pzf 3 has been a reliable and effective weapon system since 1992 not only for the Bundeswehr, German armed forces.



EFFECTIVE: Weapons from system house Dynamit Nobel Defence work under extreme climatic conditions.

Effects behind cover - the Bunkerfaust

Until a few years ago, the Panzerfaust was the only weapon for fighting bunkers or heavily fortified shelters (sand bag shelters, hardened shelters). Even if the effect of a warhead with a shaping charge was highly effective against concrete and fortified shelters, it was not always optimum because the secondary effect obtained within the target was weak.

For this reason, the Bundeswehr, German armed forces contracted DND, together with the company Diehl VA Systeme, to develop the Bunkerfaust bunker buster to fill a military capability gap. For many years, Bunkerfaust has been the only infantry weapon system to effectively combat the inner space of a fortified bunker or hardened target within the framework of MOUT combat scenarios.

The Bunkerfaust concept relies on components from the Panzerfaust 3 family. The launching tube with propulsion, the recoil stabiliser and the firing mechanism with the sight from the Panzerfaust 3 family were adopted for the Bunkerfaust. These components made it possible to fire the 110mm calibre warhead without recoil and with a high accuracy at targets up to 400 metres away.

Special warhead

The warhead of the Bunkerfaust was developed jointly by Diehl and DND. The warhead effect is a 2-stage solution consisting of a penetration charge with percussion fuze and a follow-through grenade with a delayed fuze. A shaped charge initiated by a stand-off rod and percussion fuze serves as the penetration charge. Masonry, brickwork, limestone or reinforced concrete up to 25cm thick, aerated concrete up to 30cm thick, sand bag walls up to 100cm thick and 12mm armour steel can all be penetrated by shaped charge of the Bunkerfaust.

The design of the shaped charge is such that the penetration crater in the target is large enough for the 47mm calibre fragmentation follow-through grenade to penetrate. The velocity at which the follow-through grenade enters the space through the penetration hole is almost that of the projectile velocity and it detonates 1.2 to 2.7 metres behind the front wall, delayed electronically by a fuze. The detonation of the follow-through charge causes about 1200 fragments and 900 ball-type fragments to be ejected with over 80 Joules energy each, distributed evenly within the room. The fuzes used for the penetration charge and the follow-through charge are Swiss-made and were modified for their new application in the Bunkerfaust.



ENHANCED COMBAT VALUE:
Increased effective range and
higher first-hit probability with
the DYNARANGE fire control
system.

The Bunkerfaust has the same external ballistic characteristics as the Panzerfaust 3 family. It can be used safely and with devastating effect on targets at a distance from 11 m to 400 m; the typical hit pattern of the Panzerfaust 3 family is obtained even for the longest firing ranges.

The Bunkerfaust can be air-lifted and dropped by parachute in its delivery packaging. The development of this weapon type was the first infantry weapon in the German armed forces whose performance parameters met the requirements of asymmetric and urban warfare scenarios.

Important characteristics of infantry weapon systems

- Today, armour-piercing infantry weapons can have several warhead functions making the weapon suitable for different tasks.
- Modern armour-piercing and structure-breaching infantry weapons should have effective ranges between 400 and 500 metres to ensure good stand-off.
- Fixed optical sights for high first-hit probability during day and night are necessary equipment of infantry weapons.
- Firing from enclosed rooms must be possible.
- Low firing signature and low launch noise of the weapon system are essential.
- Mounting options for additional aiming devices, such as fire control computer and night vision devices, must be provided.
- Modern infantry weapon systems are designed as one-shot weapons (disposable weapons) to reduce weight.
- For entering buildings, stand-off weapon systems must be able to fire at the target from a safe distance.
- Door opening systems also facilitate fighting in built-up areas or terrain.
- All new weapon systems must be of light weight, compact design and easy to handle in high stress combat situations.
- It should be possible to integrate infantry weapon systems into a weapon station individually or in a multiple launcher.
- The future development of infantry weapon warheads detonating in airburst to engage an opponent behind cover in the open.



Cover-breaching infantry weapons

The Recoilless Grenade Weapon family

The development and manufacture of a recoilless grenade weapon family (RGW 60) required a number of technical changes to make infantry weapons of calibre more compact.

By reducing the weight of the weapon and integrating the warhead into the launching tube, a new and easy to handle weapon system family was created which better meets the soldier's requirements for low weight, optimum ergonomics and ease of handling. An important point during the development of these weapons was that the handling and the safety features of the proven Panzerfaust 3 were retained. The development and manufacture of the compact RGW60 disposable weapon marked the advent of a new generation of light-weight, shoulder-launched infantry weapon systems covering a wide military spectrum because DND makes this system with three different warheads.

RGW 60 weighs 5.8kg, is 850mm long and has a 1.5x magnification optical sight. The entire ergonomic design of the RGW 60 ensures a very high first-hit probability. This is a decisive advantage for the soldier in combat. The ease of handling of the weapon's controls in all firing positions provides additional confidence. The RGW 60 is available in three different versions which makes this compact infantry weapon suitable for use against different targets.

The HESH (High Explosive Squash Head) version is optimised as a cover-breaching weapon. Infantrymen, paratroopers or soldiers of special units can use it for breaching walls and entering through the hole created. The RGW warhead can pen-

etrate 240mm of masonry or reinforced concrete. It can also pierce armour steel up to 20mm thickness. The RGW 60 HESH is used against pick-up trucks or light armoured vehicles which irregular fighters use as weapon launchers in MOU scenarios.

Shelters reinforced or makeshift fortifications/bunkers with steel plates can also be engaged very efficiently with the RGW 60. The maximum effective range is 300 metres.

HEAT warhead

The RGW 60 is supplied with a HEAT (High Explosive Anti Tank/shaped charge) warhead from DND. This warhead is optimised for penetrating homogeneous steel armour of the type used for personnel carriers or light combat tanks. This makes the weapon ideal for task forces and special forces who may expect encounters with armoured vehicles, also for special police forces because consideration has been given to the secondary effects (fragmentation). DND also supplied the RGW 60 with a HEAT-MP (High Explosive Anti Tank-Multi Purpose) warhead. This warhead can penetrate 100mm of homogeneous steel armour with a secondary effect within the target.

These versions of the RGW 60 were developed for fighting part-hardened shelters and positions hidden behind masonry. A decisive technical advantage of the RGW family is that these weapons can be fired from an enclosed room of 15 s.qm. size.

The low firing signature of the RGW 60 avoids exposure of the firing soldier po-

MULTIFUNCTIONAL: Weapons from the RGW family can be used against armoured vehicles as well as urban structures.



sition in the field and makes reconnaissance by the opponent more difficult. The RGW 60 is ready for firing quickly and is easy to handle in high-stress situations.

The RGW 60 family is a disposable weapon system, the tube is thrown away after firing.

The small size makes the RGW 60 weapon system ideal for task forces, paratroopers or armoured infantrymen operating in built-up terrain.

They can be carried by the soldier and do not hamper his movement in heavy

terrain or inside buildings. Training in the use of RGW 60 is neither time-consuming nor cost-intensive for the user. The system is designed to need no maintenance.

RGW 90 - a family of hand weapons for universal use

The target of the development of RGW 90, which started at DND several years ago, was to have a high-precision, compact and high-efficiency dual mode infantry weapon whose maximum weight was less than 10kg. RGW 90 was equipped with a 90mm diameter warhead to ensure sufficient armour steel piercing perform-

Suitable weapon systems for MOUT

The experience of British, US and Israeli forces having remote-control weapon carrier systems on armoured vehicles shows that such technologies are indispensable for MOUT scenarios. 40 mm grenade launchers with effective range up to 2,000 metres have proved to be very successful.

The optical sight of the grenade launcher enables engagement of a window as far as 800 to 1,000 metres away. In Afghanistan, the 40 mm grenade launcher from Heckler & Koch has been successful in fighting enemy forces. The effect of the explosion and fragmentation of a 40 mm grenade is about that of a light hand grenade. The high firing rate makes the 40 mm launcher highly effective against surface and point targets.

In addition to the 40 mm grenade launchers, 12.7 mm calibre (.50 cal.) heavy machine guns are increasingly used in weapon stations. The effective range of the 12.7 mm ammunition is well over 1,200 metres. Armour plate, walls, sand bag barriers or light bunkers can be pierced using 12.7 mm AP cartridges even from such a distance. The high firing rate makes the heavy machine gun a very effective weapon against a wide range of targets which can be expected in asymmetric conflicts.



ance while saving weight. This infantry weapon, which is only one metre long, has the same 1.5x magnification optical sight and firing mechanism as the smaller RGW 60. RGW 90 is also designed as a disposable weapon, has been made for effective ranges up to 400 metres and has a special warhead, a combination of the HESH and the HEAT warhead.

This combination makes the RGW 90 an ideal weapon system for infantry and special units in MOU or asymmetric warfare scenarios. The RGW 90 can engage hardened targets such as field shelters, sand bag bunkers, sniper positions or anti-tank positions successfully.

It can also fire through concrete or brick walls and fortifications behind which the opponent is seeking shelter.

This is achieved with a 90mm warhead which the soldier can easily set to HESH or HEAT mode before firing. If for engaging a target the soldier requires an armour piercing effect, he simply pulls out a spike from the front of the RGW 90 warhead.

The extended spike ensures sufficient stand-off for the shaped-charge warhead when it hits the target so that the shaped charge can have the full armour-piercing effect.

The single-purpose shaped-charge warhead of the RGW 90 penetrates 500mm armour steel. This makes the RGW 90 suitable for lateral fighting. The warhead

weighing 2.5kg is also suitable for efficient combat against fortified shelters, entrances to basements or machine gun positions.

To activate the HESH warhead of the RGW 90 the spike remains in the warhead and is not extended. If HESH mode is active, concrete or brick walls can be penetrated or holes opened in them. Sand bag bunkers, hardened field positions or man-made covers against which the RGW 90 is fired suffer sustained damage.

The performance of the weapon makes the RGW 90 a very effective weapon system commensurate with the threat in local and urban warfare and asymmetric threats of all kinds.

Fixed to the RGW 90 is an optical sight to ensure a high first-hit probability. Laser aids or a residual light amplifier can be attached to the optical sight.

The flight time of the wing-stabilised and sustained warhead is only 1.2 seconds over a distance of 300 metres to hit moving targets reliably. The weapon can be fired from enclosed rooms due to the Davis canon gun principle utilised. The maximum effective range of the weapons, which weighs only 8.9kg, is 400 metres.

The RGW 90 is one metre long, easy to handle and has low-key firing signature to prevent spotting the soldier easily due to smoke or blast noise.

NO CHANCE: The high-speed exposures show that fortified urban structures can be engaged so that they do not provide cover for asymmetric forces.



DUAL MODE: Ease of handling and scalable effect were the focus for the development of the RGW weapons family.

Anti-structure munition for breakthrough

Another aspect which military forces demand for urban warfare or MOU missions over and over again is the availability of anti-structure munition (ASM) for engaging smaller buildings in urban spaces or hardened sand bag bunkers. Thus far, this has only be achievable with an artillery-type barrel weapon systems. Artillery strikes in built-up areas are restricted due to the substantial collateral damage it would entail.

Dynamit Nobel Defence looked at the problem and developed a 90mm calibre high-efficiency anti-structure munition to defeat the defined urban targets, based on the RGW 90 infantry weapon. The new infantry weapon was code-named RGW 90-AS (Anti Structure) and was designed as a disposable weapon for fighting hardened and urban targets. The target spectrum for which the RGW 90-AS was designed includes buildings or built-up spaces held by snipers or anti-tank soldiers.

The RGW 90-AS has been developed as an anti-structure weapon with a special dual purpose warhead and a functional principle similar to that of the Bunkerfaust. The user of the RGW 90-AS has the choice of two different warhead modes: blast or mouse hole effect. Either a large hole can be penetrated in a wall through which the building can be entered or a blast mode can be selected to defeat the protective value of the structure. The

required mode is activated by turning a switch integrated into the front of the warhead. The warhead has two charges; the follow-through charge is initiated by a delay fuze that is set by turning the switch. The delay with which the follow-through charge detonates, after the penetration charge, can be short or long. In the first mode, the follow-through charge fuze is initiated shortly after the penetration charge has penetrated inside the target structure. In the second mode, the follow-through charge initiates as it penetrates the outer structure. The force of the explosion is so large that the blast rips a large hole (mouse hole) in the target structure. In the first mode, the user has selected the longer delay ensuring that the follow-through charge is not initiated unless it has penetrated the hole left by the penetration charge and entered the room of the structure. The cover-breaching effect makes this weapon suitable for fighting all urban structures and heavily fortified positions, even bunkers. If the target is hidden behind a protecting brick wall, the blast and the associated secondary action have additional effects on the target.

The effect of the explosion is so strong that it extends to adjacent rooms in which the opponent may be seeking shelter. The difference between this weapon and the Bunkerfaust is in the distinctly lighter weight and more compact design, the dual effect (cover breaching and effect behind cover) and the stronger blast of the follow-through charge in comparison with the fragmentation of the Bun-

kerfaust. The cover-breaching action rips large holes in reinforced concrete, penetrates armour and the projectile penetrates mud walls up to 80cm thick.

The RGW 90-WB

Quite often, troops in urban warfare situations are forced to enter buildings without having the use of doors or windows. For this purpose, small explosive charges used to be attached to the walls of the building and initiated. This was a dangerous undertaking for the soldiers because they often had to attach the charges under combat conditions, including exposure to fire or in view of the enemy. Now the RGW 90-WB (Wall Breaching) from DND makes it possible to blast a large hole or a breakthrough in a wall of the building from a safe distance and then enter the building. The warhead of the RGW 90-WB generates holes in structures (masonry, brick wall, mud wall) through which a soldier carrying full combat equipment can enter. The explosive force of the 174mm diameter warhead of the RGW 90-WB is such that it penetrates walls of this thickness without damaging the building structure.

The warhead is integrated externally in front of the launch tube in a way similar to Panzerfaust 3. The cone-shaped warhead has a long and a short spike to ensure the optimum distance to the target at the time of initiation.

The explosion of the warhead produces an annular effect on the target structure. Holes up to 80cm in diameter are made, sufficient in size for a soldier to enter. Secondary effects behind the target hit are enormous and include fragmentation of the structure material and heat effects. Even conventional steel plates can be pierced by RGW 90-WB projectiles. The weapon is of the disposable design and can be used at a range of 15 to 100 metres. The weight of the RGW 90-WB is 13kg, it is only one metre long and can be fired from enclosed rooms. The optical sighting device and the firing mechanism are the same as those of the RGW 90 family. The compact dimensions make this weapon system suitable for special units or military operations in built-up terrain. The RGW 90-WB can also be used by anti-terror units or special police units.

Dynamit Nobel Defence

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