



ENFORCE TAC **MAGAZINE**

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INTERNATIONAL EXHIBITION & CONFERENCE

23. – 25.2.2026 Nürnberg Germany

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Ladies and Gentlemen,

Please allow me to extend a warm welcome to Enforce Tac 2026! The timing and theme of this event – “Networked Security” – could hardly be more to the point. The event’s dates, from 23 to 25 February 2026, bear symbolic weight: 24 February is the fourth anniversary of the day when Russia unleashed its war of aggression against Ukraine, in violation of international law. That was nothing less than a turning point in security policy for Ukraine, for the European framework for peace, and for Germany as well. For the first time in decades, our security has come back under direct threat. Russia is waging a brutal war of attrition that has targeted the Ukrainian civilian population in particular. At the same time, Germany too finds itself in the crosshairs of hybrid operations and cyberattacks. Attacks targeting our infrastructure and corporations are on the rise. They pose a threat to our sovereignty, our freedom, and our well-being.

The German federal government is guided by a clear principle: being able to defend ourselves so we will not have to defend ourselves. This is the core of an up-to-date deterrence through strength. Defence is a task for the state and society as a whole, and is the foundation of our country’s resilience and viable future. Ukraine is offering an impressive demonstration of that resilience, and has earned our deepest respect. We will stand steadfastly by its side as long as we are needed.

Amid that context, “Networked Security” refers to the centrepiece of a robust security architecture, involving an integrated, intimate cooperation among the Bundeswehr, police and security authorities, civil defence, and emergency preparedness – especially in cyberspace and the information sphere – as well as a strong security and defence industry. To make that architecture a reality, the German government is currently at work on fundamental prerequisites. Through reliable investments, accelerated procurement, support through industrial policy, and the promotion of research, we are not only backing our men and women in uniform, but also helping to safeguard Europe’s technology leadership and strategic autonomy.

Enforce Tac stands for this holistic, integrated approach to security. It brings together decision-makers from government, the armed forces, politics, science, and industry, within a protected space. With its focus on networked capabilities, operationally relevant innovations, and international partnerships, it impressively demonstrates how all-round defence might look in practice – from personal equipment to complex interconnections among systems. The present German government, too, is pursuing such a holistic, integrated approach to security by



CDU-Bundeskanzler Friedrich Merz
(Bundesregierung/Steffen Kugler)

establishing the National Security Council. That is why I am very pleased to be this year’s patron of this highly relevant event.

For every exhibitor and visitor, I wish you productive conversations and a successful trade fair. Let’s make the most of Enforce Tac 2026 as an invitation to shape the future of our security together – with courage, within a shared network, and in full awareness of our responsibility.

**With very kind regards,
Friedrich Merz**

Dear visitors, exhibitors, partners and colleagues, welcome to Enforce Tac 2026!

It is my great pleasure to welcome you here today. For many of us, Enforce Tac is far more than just a trade fair. It is a place of encounter, of shared learning and forward-thinking. An environment where people come together who take responsibility and who are committed to working for a secure future for Europe. This is where discussions, connections, and ideas emerge that have an impact far beyond the days of the exhibition.

At a time when threats and security policy requirements are constantly evolving and shifting, this personal exchange at the highest level is more valuable than ever. Strong networks, trust, and the courage to explore new paths form the foundation of effective security architecture today.

The fact that Chancellor Friedrich Merz is taking on the patronage of Enforce Tac this year is a strong sign of recognition for us. He puts it succinctly:

“We want to be able to defend ourselves so that we will not have to defend ourselves. Defence is whole-of-society challenge. It is also an indispensable prerequisite for the resilience and future viability of our country. Enforce Tac embodies this comprehensive approach to security.”



Jasmin Rutka
Director Enforce Tac 2026
(NürnbergMesse GmbH)

We sincerely thank him for the trust he has placed in us and for his support of Enforce Tac. His words reflect the core of this year's guiding theme: networked security means strategically integrating internal, external, and cyber security across departments. This is precisely what we strive to achieve – with formats tailored to specific target groups and real-world applications, geared toward the requirements of politics, the military, police, security agencies, and industry, in a secure and professional setting.

With the Enforce Tac Conference, we are setting a new course for the future in 2026. Under the guiding theme “Electronics Shaping the Future of Defence,” a platform is being created where the defence industry, the electronics sector, research and suppliers discuss how electronic systems are shaping today's and tomorrow's security and defence applications.

The new Armored Forces Area in Hall 11 expands our profile with an exclusive stage for large military equipment, cutting-edge vehicles, and mission-critical technologies. It offers unique insights into current developments while also providing space for exchange on innovative technical solutions.

I am also particularly pleased about our close cooperation with it-sa, Europe's leading trade fair for cybersecurity, for the first time this year. Under the joint guiding theme “Software Defined Defence,” new bridges are being built between cybersecurity, information technology and modern defence technology.

Another important highlight is the new Enforce Tac Inno Stage. More than 30 national and international start-ups will present fresh impulses, bold developments and visionary ideas, impressively showcasing how the next generation is thinking and shaping security.

Enforce Tac is a place where trust grows, where solutions and innovations emerge, and where we actively shape the security landscape of tomorrow together. Your participation, dialogue, and commitment make this exhibition a strong and vibrant community – a community that takes responsibility and protects Europe's security and values in a changing world.

Thank you for being part of Enforce Tac 2026!

Warm regards,
Jasmin Rutka
Director Enforce Tac 2026

Connecting minds. Protecting Europe.

Dear Readers,

this is the first issue of the Enforce Tac Magazine from our Mittler Report Verlag. We are very delighted to be Enforce Tac's editorial partner.

With this magazine, we would like to give all visitors to Enforce Tac an overview of the comprehensive range of products and services on offer at this leading trade fair for security and defence and introduce the topics that are driving the industry forward.

Innovative approaches from more than 1,300 national and international exhibitors in Nuremberg are giving rise to forward-looking strategies and ready-to-use solutions, and we provide editorial coverage of all relevant topics in the Enforce Tac magazine – competent and well-founded.

As Germany's largest publisher of professional defence and security media, we also feature Enforce Tac's innovative exhibitors with all our successful national and international publications, for example in our *European Security & Defence ESD*, *European Security & Technology ES&T*, *Hardthöhenkurier* or on our strong online publication *Soldat & Technik* and relevant web sides.

With our *Defence Career* job portal, we are cooperating with the Enforce Tac Jobzone. Our mission: We promote the placement of urgently needed skilled workers for the rapidly growing German security and defence industry. *Defence Career* will therefore be present both in the physical Jobzone at the exhibition centre and online. Young talents and skilled workers in the security and defence industry will have the opportunity to view the exhibitors' current job offers and make contact with potential employers directly on site.

Enforce Tac sees itself as a central platform where decision-makers, innovators and thought leaders from government, industry and society come together, united by the common goal of making Europe safer. The idea of beneficial networking between all relevant players from the defence and security industry, politics and the military has always guided us, Mittler Report Verlag, editorially. We are delighted that two strong partners with the same mindset and vision, are now joining forces here. Of course, we will not only be covering Enforce Tac editorially, but will also be present with an exhibition booth. We look forward to seeing you at booth 620 in hall 7A.

We hope you enjoy reading and wish you a successful fair!

With very kind regards,
yours Peter Tamm
Publisher and CEO Mittler Report Verlag



Peter Tamm
Publisher and CEO Mittler Report Verlag

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23.-25.02.2026

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The views expressed are not necessarily those of the publisher.

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Cover Photo: Rheinmetall



(Rheinmetall)

A systematic Approach

EQUIPMENT FOR POLICE AND MILITARY IN TIMES OF HYBRID THREATS

Armed forces, as well as police and security agencies, consist of specially equipped, trained and (albeit to varying degrees) armed individuals. They reflect the society they serve.

For the individual warfighter, what the Prussian general and military philosopher Carl von Clausewitz wrote in his work "On War" in the 1820s still applies today: "The soldier is recruited, clothed, armed, trained, he sleeps, eats, drinks and marches, all for the sole purpose of fighting in the right place at the right time." In a figurative sense, this can also be applied to law enforcement officers. This quote therefore provides the key points for the topic of this special issue. The soldier system (and also the "police officer system") comprises all the components that the individual user needs to fulfil their military or police mission. They select from these components to configure themselves optimally for their respective task.

The current conflict landscape – from hybrid threats to hyperwar

Before deploying armed forces, one must know what for and against what. Russia's war of aggression against Ukraine in February 2022 marked the beginning of a "turning point" ("Zeitenwende") in Germany's security policy – actually a good eight years late, as the annexation of Crimea in spring 2014, which violated international law, marked the beginning of the Russian-Ukrainian war. In any case, Western societies must currently prepare themselves for a wide range of threats. "We are not at war, but we are no longer at peace either", is how the Chancellor of the Federal Republic of Germany, Friedrich Merz, described the current situation.

In view of the current conflict situation, the Bundeswehr and its soldiers face two major challenges. On the one hand, the troops must prepare themselves to wage high-intensity combat against an equally equipped and capable adversary on NATO's new eastern flank as part of national and alliance defence. The permanent stationing of the new Panzerbrigade 45 "Litauen" in the Baltic States, created from reorganised formations and units, marks a turning point, as does the newly established wheeled "Medium Forces" category of the German Army. "Medium forces travel and fight on wheels," says



Bundeswehr soldiers looking at the digital situation map (Bundeswehr)



In times of hybrid warfare, but also in host nation support, allied forces, the German Armed Forces and German police authorities cooperate closely with one another. (Bundeswehr)



“We want to be able to defend ourselves so that we do not have to defend ourselves. Our goal is a country, a Germany and a Europe that are so strong together that we will never have to use our weapons.”

Friedrich Merz, Chancellor of the Federal Republic of Germany

the German Army. They are to be deployable quickly and without long preparation times throughout NATO's European area of operations with wheeled, highly mobile units. For the first formation of the Medium Forces, the Dragonerbrigade 21 "Lipperland" from Augustdorf, this means reaching an area of operations some 1,500 kilometres away in the Baltic States within a few days and, if necessary, engaging in combat there immediately. Germany itself is no longer a frontline state as it was during the Cold War, but rather a staging and transit area. Among other things, the leading role in the Reinforcement and Sustainment Network (RSN) requires comprehensive security for critical infrastructure. To this end, the concept of "territorial defence forces," which was dissolved in the early 2000s, has been rediscovered and modified.

Hybrid warfare continues to pose new challenges for the police and other security agencies. Is damage to critical infrastructure merely criminal activity, sabotage, or already asymmetric warfare? Which domestic networks can enemy intelligence services and other asymmetric forces rely on? What potential threat can be activated, for example, through targeted fake news and propaganda? Is the IT infrastructure sufficiently protected against cyber attacks? These are just a few examples. Furthermore, the healthcare system would face major challenges in the event of a large-scale attack on NATO territory. Military healthcare facilities and hospitals would largely be unable to provide civilian care, as they would have to treat large numbers of wounded personnel. In addition, staff shortages can also be expected in civilian facilities, as medical personnel with reserve status could be called up.

Recruitment – the aspiration and reality of German security policy

Where and how do you recruit individual soldiers in order to establish armed forces and make them capable of growth and endurance through reserves? Armed forces, police forces and security agencies usually recruit from the same pool of applicants. This has been a challenge in terms of personnel recruitment in recent decades, even though the need for strong standing armies was no longer seen after the Cold War. Even professional armed forces barely reached their target strength, which was far below the presence strength of conscript armies. Due to the need for armed forces to be able to grow and sustain themselves after the 'turning point',

the toughest nuts to crack remain in recruitment, especially in the German political and social dimension. The current German political and military leadership, namely Federal Minister of Defence Boris Pistorius (SPD) and Inspector General Carsten Breuer, are calling for society to be "fit for war" – a demand that has gone largely unchallenged by society. Ultimately, the aim is to reverse the threefold demobilisation of Germany that has taken place since 1990 – structural, material and intellectual. In material terms, some things can be solved with money. To this end, the federal governments have made large "special funds" available since the "turning point". Structurally, mobilisation is proving more difficult. Currently, the Bundeswehr leadership estimates that over 460,000 soldiers are needed to defend Germany. By way of comparison, during the Cold War, the West German Bundeswehr alone had a presence of around 490,000 and a defence capacity of 1.3 million men. The current target strength of the Bundeswehr is around 200,000 active military posts, which are not even fully staffed. In addition, there are 60,000 reservists on basic duty. In addition to these 260,000 soldiers, there is currently a general reserve of around 100,000 men. This leaves a gap of 100,000 soldiers. The aim is to close this gap in the coming years, primarily through a new voluntary military service. The Bundeswehr



Individual equipment, including that used by the police, is tailored to the respective purpose. (Bundespolizei)

will only be able to make a decisive contribution to the "war readiness" and security culture of the Federal Republic of Germany by returning to a conscript army that is designed in a way that makes sense in terms of security policy and military strategy. Conscription would also help to combat intellectual demobilisation, strengthen the bond between the armed forces and society, and actively contribute to resilience and, better still, resistance (defence capability).

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Night combat capability is standard for modern armed forces. (U.S. Army)



Cyborg cockroach with mini sensor package – a concept by German company SWARM Biotactics (SWARM Biotactics)

Armament – the central subsystem of the soldier system

But let us now move from matters of political philosophy to more tangible issues. Once a soldier has been recruited, he is armed. The individual small arm forms the central subsystem of the soldier system. For police officers, however, the weapon is a last resort. Nevertheless, a well-thought-out concept and comprehensive training are required.

The infantry toolbox enables soldiers to combat individual enemies, but also their weapons, vehicles, other large equipment or positions. This takes place at distances from zero to around 2000 metres. The spectrum of numerous weapons ranges from combat knives to shoulder-launched munitions (SLM).

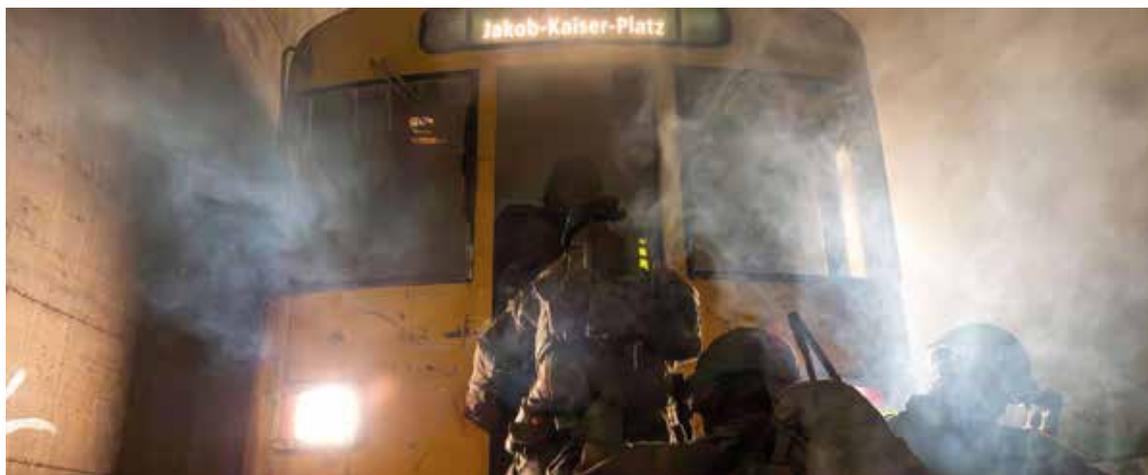
The armed conflicts in Ukraine, the Gaza Strip and Lebanon have also added various unmanned systems (UxS = Uncrewed/older: Unmanned Systems; the x is replaced by the domain) and other airborne weapons ("Loitering Munition", LM) to the infantry toolbox. Crew-served weapons primarily include heavy machine guns, grenade machine guns, anti-tank guided missiles for longer ranges, and mortars. With all these tools, the infantry and other branches of the armed forces can operate at ranges well over 2,000 metres.

Across the entire infantry toolbox, recent modernisations have focused on greater modularity, weight reduction and connectivity – as well as supply, interoperability and availability. In the field of small arms, at least within NATO, relatively conventional designs in proven calibres will remain the standard for the next few years – even though there are now moves on both sides of the Atlantic to modernise ammunition. In the area of support weapons, multi-role capability and the range of ammunition will be further expanded. Larger and faster development steps are more likely to occur in the areas of optics, optronics, C4I and networking. Similarly, the topics of artificial intelligence, automation and robotics are continuing to gain momentum, for example in the form of walking robots or unmanned ground vehicles as force multipliers.

Fighting in the right place at the right time – C4I, networking and digitalisation

Most of today's multidimensional warfare concepts are similar. According to these concepts, networked combat units consisting of individual soldiers, their land, air, sea, cyber and space platforms, as well as robots, drones and other unmanned systems, work together to master operations that sometimes run parallel to each other in

Combat in urban terrain is no longer the exception, but the rule. (Bundeswehr)





Unmanned ground vehicles can assist with transport, air defence, casualty evacuation and even fire support. (U.S. Army)

different intensity spectra in all domains. All actors on the digitalised battlefield regularly feed information into the shared network, so that everyone always has an up-to-date picture of the situation. This shortens the sensor-to-effector chains (or, horrible dictu, "kill chains"): enemy forces can be detected and engaged more quickly. Soldier systems and radio equipment form the interfaces for individual soldiers for digital operations. Artificial intelligence (AI) supports the commanders in evaluating

the flood of information and preparing decisions. Even if they are "digital natives", individual soldiers will still be faced with mundane questions: How and with what equipment do I interact with the network and the command system? Can I concentrate on my tactical behaviour and the use of weapons, or am I overwhelmed by the mere operation of the equipment or the flood of information? How do I recognise enemy attacks on the network? And what do I do when I run out of power?

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The 8x8 Boxer vehicle – shown here in the "heavy infantry weapon carrier" version – forms the backbone of the medium forces. (Bundeswehr)



"My intention is that by the end of this decade, Germany will have a deployable, sustainable and digitally networked armed forces that meet NATO capability targets, fulfil the Operationsplan Deutschland for

territorial defence and provide a visible and effective deterrent on the eastern flank. [...] I want our children and grandchildren to be able to grow up in safety. And I want us all to look at a Bundeswehr in ten years' time that is proud of itself – because it is ready to defend what makes up our lives: peace, freedom and democracy"

Boris Pistorius, German Federal Minister of Defence

Clothing, sleeping, eating, drinking, marching – the other subsystems and components

"No food, no fight!" Anyone who reads the numerous eyewitness accounts from all sides of the great wars of the last century knows how much of an impact food has on combat readiness and morale. Curiously, field catering equipment has hardly changed in recent decades. The pocket stoves or mess kits still look much the same as they did in the trenches before Verdun. The situation is quite different when it comes to clothing and personal equipment: here, modern materials, designs and cuts provide significantly greater protection and comfort. Modern clothing and personal equipment ultimately also express the appreciation and status that individual soldiers enjoy among their employers, superiors and in society.

Practice and fencing – mental tools, mindset and training

War is dangerous. In order to survive, it requires not only weapons and equipment but also mental fortitude. Carl von Clausewitz: "If we now take a comprehensive look at the four components that make up the atmosphere in which war takes place, namely danger, physical exertion, uncertainty and chance, it is easy to understand that great strength of mind and intellect is required to advance with certainty and success in this difficult environment, a strength which, according to the various modifications it undergoes depending on the circumstances, we find in the mouths of narrators and reporters of warlike events as energy, firmness, steadfastness and strength of character."

Loyal readers of my publications can recite the familiar *Ceterum Censeo* by heart: Using the infantry toolbox requires solid technical skills. Continuous training, further education and the principle of "practice as you fight" are essential prerequisites for this. Good training lays the foundation for operational readiness and combat readiness. Combat readiness does not mean blind obedience, of course! Nor does it mean blind hatred of the enemy. "The true soldier fights not because he hates what is in front of him, but because he loves what is behind him," as the British writer Gilbert Keith Chesterton (1874-1936) once aptly put it.

Training must take current operational experience into account. For example, the rescue chain, which begins with individual first aid and combat casualty care, and the entire medical care system are facing radical change. In national and alliance defence scenarios in particular, an enormous number of casualties can be expected on a regular basis – especially from artillery and indirect fire. In addition, the patterns of injury differ from those caused by improvised explosive devices in combat against irregular forces. Since evacuation by air transport is often not possible, the "golden hour" rule no longer applies. New or rediscovered procedures are therefore needed. Other topics worth mentioning here include the battle for barriers, breaching, entrenching and building field fortifications, all arms air and drone defence, fighting in urban areas, sewers and tunnel systems, the use of and defence against drones and loitering munitions, and electronic warfare. With regard to the battlefields of the future, it is necessary to rediscover or further develop tactics, techniques and procedures.

Jan-Phillipp Weisswange

OBSERVE, ORIENT, DECIDE, ACT:

AIR BASE DEFENCE IN THE DRONE ERA

Air bases have long been a valuable target, where our most potent assets are static, concentrated, and at their most vulnerable. Europe's commitment to invest €800 billion by 2030 under the ReArm Europe Plan / Readiness 2030 initiative reflects not only a historic modernisation effort, but also a recognition of the rapidly evolving threat environment. Recent reporting suggests that a significant share of this investment will address the growing risk posed by unmanned systems to military installations, where the speed and accessibility of drones have reshaped both the threat landscape and the defensive requirements of air power.

DroneShield's experience in Ukraine, where over hundreds of our systems are deployed, shows an emerging and increasing threat. Both Russians and Ukrainians have attacked air bases with unmanned aerial systems (UAS) – or drones, and their success shows the need to respond to this growing challenge.

Operation Spiderweb, a highly successful Ukrainian campaign that successfully destroyed \$1 billion worth of Russia's military aircraft on the ground, demonstrated how coordinated UAS strikes can exploit gaps in perimeter security and target parked aircraft, fuel and support infrastructure at scale. The operation underscored that UAS are not only tools for espionage and surveillance, but precision strike assets that can deliver operational and strategic effects at relatively low cost. For bases hosting advanced platforms such as the F 35 Joint Strike Fighter, this creates an unfavourable cost exchange where billions in combat power can be placed at risk by inexpensive systems. This is a challenge European air forces cannot ignore.

To effectively address this evolving threat, DroneShield advocates a C2 Mission System that follows US Air Force Colonel John Boyd's OODA (Observe, Orient, Decide, Act) loop - a proven decision-making cycle that underpins critical defence operations. DroneShield's DroneSentry-C2 Mission System provides a modular open systems architecture that enables effective countering of small UAS (sUAS) at the speed of relevance and the speed of evolving threat.

Observe: Multi-Sensor Detection for Early Threat Recognition

Early warning of approaching UAS, in the vicinity of 4-10km from key assets, gives the optimum time to assess threats and make proactive decisions. DroneShield's platforms allow alert zones to be set, providing automated notifications as threats approach key assets like aircraft or fuel installations. Friendly UAS activity can be tagged to reduce confusion and improve operational clarity.

Orientate: Sensor Fusion and Optical Identification

Understanding drone behaviour is becoming just as important as detecting their presence. DroneShield's platforms use advanced artificial intelligence and machine learning to analyse patterns in drone activity, including flight paths, loiter times, and swarm behaviour, to enhance early threat recognition and prediction. This allows operators to move beyond reactive defence and start shaping proactive, intelligence-led responses. AI-enhanced behaviour profiling helps distinguish between friendly or hostile UAS, sharpening the effectiveness of both soft and hard-kill responses while reducing false alarms.

Decide: AI-Powered Decision Superiority

A layered approach to base defence provides the best chances of success. With technology developing so rapidly, no system is 100 per cent effective against 100 per cent of UAS threats. To help combat this, much like a physical security system of fences, guards and cameras, a layered approach offers the best chance for success. Alongside interoperable sensors, DroneShield's C2 enables decision makers to identify and respond to threats. This picture should be held at the appropriate classification – in Base Operations Centres – to allow decision making and threat assessment to be synchronised with activities like air traffic control and help maintain a common operating picture for the entire air base.

Act: Layered Defence through Soft and Hard-Kill Options

A choice of soft and hard-kill responses such as radio frequency jamming and high-powered microwave directed energy, provide flexibility and gives the best chance of success. Responses need to consider return-on-investment and collateral damage, particularly at bases in close proximity to civilian populations.

As one of the world's leading counter-drone technology companies, DroneShield provides a fully integrated counter-drone capability tailored to protect airbases against the growing sUAS threat. By enabling rapid decision-making, enhanced situational awareness, and flexible response options, DroneShield supports various militaries globally in maintaining operational freedom and airbase resilience in an increasingly contested and complex battlespace.

Oleg Vornik, CEO and Managing Director of DroneShield (ASX:DRO)



DroneSentry is a modular installation that provides operators with a comprehensive counter-drone solution that meets their mission requirements. (DroneShield)



DroneSentry-C2 Tactical is a portable Command-and-Control solution that provides operators with real-time C-UAS situational awareness. (DroneShield)

INCREASED INDIVIDUAL FIREPOWER

Assault rifles, pistols and (general purpose) machine guns are the central elements of cross-sectional individual firepower. Significant developments are currently underway in all areas.



Several thousand IWI ARAD rifles were issued recently to rapid response teams of the IDF (IWI)

On 4 December 2025, the soldiers of the Bundeswehr's Panzergrenadierbattalion 122 (mechanized infantry) received the first 300 units of the new Bundeswehr G95A1 and G95KA1 assault rifles. This marks the start of the operational phase of the "System Sturmgewehr Bundeswehr (Bundeswehr Assault Rifle System)". The project, which has also attracted a lot of public attention, began with the corresponding tender in April 2017. The selection decision was delayed by public procurement procedures. Ultimately, the HK416 prevailed in the A8 configuration. At the end of 2022, the Bundestag's budget committee released the funds. On 23 January 2023, the Federal Office for Equipment, Information Technology and In-Service Support of the German Armed Forces (BAAINBw) concluded a framework agreement with Heckler&Koch for 118,718 assault rifles. Other components of the system, in particular the optics (Elcan Specter 1-4, reportedly supplemented by an Aimpoint Acro P2 for better night combat capability) and laser light module (Rheinmetall LLM Vario-Ray), are covered by separate contracts. This was followed by integrated verification, including testing in different climate zones. The final design for the weapon was finalised at the end of 2024. Changes were made to the colour scheme (RAL8000 olive brown instead of sand), the grip, the shoulder stock and the handguard. Basically, two variants of the HK416A8 are to be introduced into the German armed forces: the G95A1 (long barrel version with 16.5" barrel) and the G95kA1 ("short barrel" with 14.5" barrel). The originally estimated quantities can now be significantly increased, as the German Armed Forces are set to grow considerably.



The G95A1 and G95KA1 (carrying the Hensoldt Z04x30i/RSA combination here) were officially introduced to the troops on 4 December 2025 (Bundeswehr)



The SIG 56X is available with different barrel lengths. Using an adapter, the weapon can also use the older Sturmgewehr 90 magazines, as shown below. (Jan-P. Weisswange)



SIG Sauer's 6.8 x 51 mm hybrid ammunition penetrates steel plates at 114.3 metres (125 yards), while the 7.62 M80A1 cartridge fails at 45.7 metres (50 yards) and the 5.56 M855A1 cartridge fails at 25 yards (22.86 m). (Jan-P. Weisswange)

International assault rifle projects

The German Armed Forces are not alone in their assault rifle procurement. Regardless of all the changes over time, soldiers on the battlefields of today and tomorrow primarily deploy their individual firepower with assault rifles. They learn how to operate, maintain and use this cross-sectional primary weapon through drill training at the beginning of their basic training. Depending on the barrel length and calibre, the combat range of an assault rifle is ideally up to 500 metres – the infantry half-kilometre (Thomas P. Ehrhart). However, it can be used effectively up to 300 metres in any case. In Germany, training at this distance is possible at most standard shooting ranges, which should be done regularly as part of comprehensive firearms training. Several armed forces have recently modernised or are currently modernising their assault rifle arsenals. Some armies are adapting existing stocks in line with their system philosophy, such as the Austrian and Finnish armed forces. The Finns adapted their AK derivative RK62 to

the M2 and M3 variants in 2015. The Austrian Armed Forces have modernised their Sturmgewehr 77, alias Steyr Arms AUG, several times. The last major measures began in 2022 and resulted in the 77A1 MOD variant. This features Mil-Std-1913 rails on the receiver and on the 3x magnification sight, an Aimpoint Mirco T-2 on the sight, an improved cocking handle and a case deflector on the ejection port. In April 2025, the first of 4,000 "77A1 MOD Nightfighter" models followed, which are additionally characterised by a special night vision camouflage surface coating and a laser light module attached on the right. The procurement of new systems offers another approach – this is the approach taken by the armed forces of France, Luxembourg, Germany (variants of the HK416 in each case), Estonia (LMT Rahe R-20), Hungary, Czechia (both CZ Bren 2), Portugal (FN SCAR), Israel (Tavor X95 and Arad), Japan (Howa Type 20), China (QBZ-191) and Sweden (Automatkarbin AK24, an AR system from Sako). At the end of 2025, the Chief of the Italian Army announced that the NARP assault rifle debuted by



(Heckler&Koch)

Semi automatic Patrol Rifles start to replace the submachine guns in many police forces. The HK437 fielded by the Schleswig-Holstein State Police was also procured by the Bundeswehr as the G39 semi-automatic sound suppressed special purpose rifle. (Polizei Schleswig-Holstein)



(Bundeswehr/BMVg)

“We need to rethink national defence and alliance defence. (...) The mindset of military readiness forms the basis for resolutely confronting the simultaneity of warfare in this era of change with combat-ready armed forces. However, its core requirement for resilience also includes society, politics and industry. We are all born defenders of our country.”

General Carsten Breuer, Chief Of Defence Germany

Beretta in 2023 would initially be introduced to special forces and then across all troops. Furthermore, newly introduced weapons are already being modernised again based on operational experience. For example, the Russian Kalashnikov Group has revised the AK-12 assault rifle several times. The Polish small arms manufacturer FB Radom has also improved its GROT modular assault rifle system several times.

A third approach is to combine modernisation with new procurement. The United Kingdom, for example, is currently modernising its L85 bullpup rifles to the A3 version and supplementing them with additional weapons for individual units. The Royal Marines recently procured the SIG Sauer MCX assault rifle as part of Project Hay. With Project Hunter, they introduced the Knights Armament Stoner KS-1 as the L403A1 in 2023 through the British government supplier Edgar Brothers. For the rest of the armed forces, Project Grayburn will soon begin as the successor to the L85A3. In

the United Kingdom, there has also been recent movement in the law enforcement sector. Both FN UK, with its FN 15 Advanced Semi-Automatic Rifle, and Glock, with its GR-115 model, offer semi-automatic long guns (“patrol rifles”) for police forces.

In 2020, the Canadian Armed Forces (CAF) launched their Canada Modular Assault Rifle (CMAR) project to procure a two-stage fleet of modular weapons. The Tier 1 CMAR Full Spectrum (CMAR-FS) is intended to be used in open and urban terrain in particular. In contrast, the Tier 2 CMAR-GS (General Service) would be intended for combat support and as a personal defence weapon. Colt Canada – a subsidiary of the Colt CZ Group – has introduced a new variant of the C8 carbine. The C8A4 is considered a possible future assault rifle configuration for the Canadian Armed Forces in the CMAR project. The new weapon has clearly attracted the interest from other C7/C8 users. In August 2025, Denmark ordered 13,000 C8 MRRs in black and earth brown. The Danish designation is Gevaer M/25. Deliveries are scheduled to be completed in 2026.

Modernisation is also on the horizon in Switzerland. Here, the US-based Lewis Machine and Tool Company (LMT Defence) and Swiss supplier Swissloxx AG were awarded the contract for the new Sturmgewehr 25 assault rifle for special forces and military police. The weapon is based on the LMT Modular Ambidextrous Rifle System-Light (MARS-L), is designed for the 5.56 mm x 45 cartridge, operates as a gas piston system and comes in barrel lengths of 16" and 12". In Europe, it had previously enjoyed greater success in Estonia. The Balts introduced the weapon as the Rahe R-20. In Switzerland, however, there are currently no plans to replace the Sturmgewehr 90 assault rifle. The Swiss army assumes at the moment that the current standard weapon will remain in use for at least another ten years. The Swiss SIG Sauer subsidiary based in Neuhausen has presented its new SIG 56X assault rifle. This can be manufactured from scratch, but older SIG assault rifles from the 550 series, which also includes the Sturmgewehr 90, can also be modernised to this design standard.

Next Generation Squad Weapon of the US Army

Mixed inventories are more the norm than the exception in the US armed forces, as the different branches procure their equipment separately. In any case, the US Army's Next Generation Squad Weapon (NGSW) project attracted worldwide attention – especially as it followed the system concept comprehensively. The NGSW comprises an assault rifle (NGSW-R), a light machine gun (NGSW-AR for "automatic rifle"), the associated 6.8 mm x 51 hybrid metal cartridge ammunition and the XM157 fire control sight. The weapons and ammunition are supplied by SIG Sauer, while the fire control sight is supplied by Vortex. The XM7 was introduced as the NGSW-R. With its official launch on 20 May 2025, it is now designated the M7, while the NGSW-AR XM250 is known as the M250. The M7 is based on the SIG MCX SPEAR. It follows the AR operating philosophy but has a folding shoulder stock. The weapon has a 20-round magazine, is equipped with the XM157, which is essentially a patrol scope with an adapted fire control computer and laser rangefinder, and has a silencer. When ready for use, this system falls more into the category of a semi and full-auto sniper rifle.

The new NGSW ammunition is now also to be standardised by NATO. SIG Sauer intends to continue offering its hybrid metal casing technology for other NATO calibres in order to improve the range of existing small arms fleets. However, it should be noted that this ammunition would first have to be qualified according to NATO STANAGs.

Trends in assault rifles

Time will show to what extent the NGSW project will affect the anticipated assault rifle projects in the United Kingdom, the Netherlands and Switzerland. Regardless, some general trends can already be identified.

It is not a trend, but rather standard practice that assault rifles (like the other elements of the infantry toolbox) are considered a system. Optical sights, laser light modules and, increasingly, silencers complement the system. In addition, there is of course the ammunition, as well as other attachments and interfaces to soldier systems. The German Armed Forces also adopted this approach in its Functional Capability Requirements (FFF) for the "German Armed Forces Assault Rifle System" (Sys StG Bw) project.

Silencers are increasingly being added to assault rifle systems. These reduce muzzle signatures, making it more

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A variant of the SIG LMG-6.8 is being introduced to the U.S. Army as the M250 Next Generation Squad Weapon-Automatic Rifle (NGSW-AR). Here it is undergoing Arctic testing. (U.S. Army/PEO Soldier)

difficult to detect the shooter's location – an advantage that is currently evident on urban battlefields and in the trench warfare in Ukraine. Muzzle signature reducers also facilitate communication, protect the shooter's hearing and increase accuracy.

For the time being – probably at least for the next decade – the calibre mix of 5.56 mm x 45 and 7.62 mm x 51 will remain standard for assault rifles used by Western armed forces. The Russian armed forces continue to rely on 5.45 mm x 39 and 7.62 mm x 39. At least on the battlefields of Ukraine, there are no widespread complaints about the lack of effectiveness of assault rifle ammunition. With regard to national and alliance defence, the focus is more on standardisation, compatibility, interoperability and interchangeability – and availability! The latter includes the issue of reserves. Therefore, new procurements do not mean a complete departure from the existing arsenals. For example, the German Armed Forces want to keep the once much-maligned G36 in reserve alongside their G95 family. The same applies to the Swedish armed forces, which want to retain a certain proportion of their AK-4 (G3) and AK-5 (FNC) rifles. In the West, AR architecture continues to gain ground – albeit increasingly with the short-stroke gas piston system. There is also a renewed trend towards longer barrels or a mixed armament of short and long versions. At least in the West, assault rifles are also increasingly equipped with powerful optics with four or even six, eight and ten times magnification. Disruptive steps in the assault rifle system are more likely to be expected in the foreseeable

Assault rifles I

	Colt Canada C8A4 MRR	G39 (HK437)	G95 family (HK416A7/A8)	M7 (SIG Sauer MCX)
Photos f.l.: Colt Canada, Heckler & Koch (2), SIG Sauer				
Operating principle	Gas-operated rotating bolt	Short stroke gas piston system, rotating bolt	Short stroke gas piston system, rotating bolt	Short stroke gas piston system, rotating bolt
Caliber	5.56 x 45 mm	.300 BLK 7.62 mm x 35	5.56 mm x 45 mm	6.8 mm x 51 Hybrid
Magazine capacity	30, AR-compatible	30 cartridges	30 cartridges, AR-compatible	Magazine with 20 or 25 cartridges
Length (min./max.)	760 mm/840 mm	537 mm / 795 mm (without silencer)	G95KA1 (14"): 800 mm / 882 mm G95A1: (16.5"): 848 mm / 944 mm G95K: (14.5"): 808 mm / 890 mm	914 mm
Barrel length	295 mm	229 mm (9")	G95KA1 (14"): 356 mm G95A1: (16.5"): 419 mm G95K: (14.5"): 368 mm	330 mm (13")
Firing modes	0-1-F	0-1	0-1-F	0-1-F
Weight (empty)	2900 g	3140 g	G95KA1: 3490 g G95A1: 3560 g G95K: 3730 g	3800 g

Assault rifles II

	Beretta NARP	IWI ARAD	Steyr Arms AUG/STG77
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Photos f.l.: BDT, IWI, Jan-P. Weisswange



Operating principle	gas-operated short stroke piston with rotating bolt	Short stroke gas piston with rotating bolt	Short stroke gas piston with rotating bolt
Caliber	5.56 mm, x 45	5.56 x 45 mm (also .300 BLK)	5.56 mm, x 45 (also .300 BLK)
Magazine capacity	30 rounds, AR-compatible	30 rounds, AR-compatible	30 rounds
Length (min./max.)	806/888 mm (14.5" barrel)	755/855 mm (14.5" barrel)	715 mm (16" barrel) 802 mm (20" barrel)
barrel length	16": 407 mm 14.5": 365 mm 11.5": 292 mm	16": 407 mm 14.5": 365 mm 11.5": 292 mm	16": 407 mm 20": 508 mm 14.5": 365 mm
Firing modes	0-1-F	0-1-F	0-1-F
Weight (empty)	3300 g (14.5" barrel)	2950 g	3.390 g

future in the areas of optics, optronics, fire control and networking. Weapon management systems with integrated shot counters can also facilitate maintenance and logistics.

The pistol

The pistol is the police officer's primary weapon and the soldier's secondary weapon. The aim is to be able to deploy the weapon system in a matter of seconds – for example, if a sudden threat arises or the primary weapon fails due to a malfunction. In some environments, a long gun is too bulky: for example, in buildings, bunker systems, trenches, on ships or when it is necessary to fight a sudden enemy attack from a vehicle at close range. Special forces, on the other hand, use special pistol models – such as silenced variants.

The resurgence of the pistol in the military is reflected in many current procurement projects that have been underway in recent years or are still pending. It is striking that some of the modern secondary weapon systems are replacing ancient predecessor generations. In France, for example, the MAC-50 was in service for seven decades before being replaced in 2020 by the Pistolet Semi-Automatique (PSA), also known as the Glock 17 Gen 5 FS. In Australia the SIG P320 replaced the Browning High Power Mk3 in 2022, which had been in service Down Under since the Second World War. In 2019, the Danes began replacing the M/49, alias SIG 210-DK, introduced 70 years earlier, with the SIG P320 X-Carry. In Switzerland, in the 50th year of service of the Pistol 75, known as the SIG220 on the commercial market, the decision was made to replace this model with a P320 variant. This is to be manufactured locally in Switzerland.



The Bundeswehr selected the CZ P10-C OR as the new P13 Standard Pistol (Colt CZ/POL-TEC)

The comparatively gigantic Modular Handgun System (MHS) project of the US armed forces serves as an example that it can also be done more quickly. In 2017, the decision was made in favour of the SIG P320 MHS, which is available as the M17 in the full-size version and as the M18 in the compact version. It replaced the relatively new M9, also known as the Beretta 92FS, which was introduced in 1985. The P8 and P8A1 pistols currently used by the German Armed Forces were introduced to the troops at the end of 1997 along with the G36 – just over 28 years ago. Currently, the P14/P14k "System Pistole Spezialkräfte" (Special Forces Pistol System), based on the Carl Walther PDP, is replacing the P8A1C, P9 A1 (Glock 17 Gen 4), P12 (a version of the HK USP Tactical in .45ACP) and P30. In December 2025, it was announced that the German Armed Forces intended to procure a variant of the P10-C OR from the Colt CZ Group as the new 'Pistole Querschnittlich' P13. The project is being managed by the German government supplier POL-TEC.

The increased importance of the pistol as a cross-sectional secondary weapon is clearly reflected in the higher numbers of today's procurement projects. The



In December 2025 Glock presented the 6th generation of its pistol family (Glock)

Current Pistol Trends

Several observations can also be drawn from current pistol procurement projects. The system concept has also become established. The system primarily includes modern holsters, but also optics, laser light modules and weapon lights, optics, silencers and other peripheral equipment. Procurement authorities are increasingly ordering optics-ready variants that have interfaces for mounting optics. Optical sights can be used effectively in conjunction with night vision goggles. Just as red dot sights once improved shooting results with rifles, they could soon do the same for pistols. Experienced pistol shooters, on the other hand, can still gain a few fractions of a second in speed with optics and practice to win the firefight. The standard of modularity applies not only to the interfaces for peripheral devices, but also to the concept of families. Most pistol manufacturers offer their models as a whole family, including full-size, compact, subcompact and micro sizes. In addition, there are hybrid models known as "crossovers", which combine a compact slide with a full-size frame and vice versa.

fact that as many soldiers as possible receive one is also because the procurement costs for the pistol itself are lower. Of course, those responsible for meeting demand must consider not only the price of the weapons, but also the additional costs for peripheral equipment, training, regulations, storage, etc. The secure supply of the system over its service life and thus also the manufacturer's system capability must also be taken into account.

Pistols					
	CZ P-10 CZ P-10 C	Carl Walther PDP (P14)	Glock 17 Gen 5 (PSA)	HK SFP9	SIG Sauer M17 und M18
Photos f.l.: Colt CZ Group, Carl Walther, Glock, Heckler & Koch, SIG Sauer					
Caliber	9 mm x 19	9 mm x 19	9 mm x 19	9 mm x 19	9 mm x 19
Magazine capacity	19 15	Compact: 15 Full Size: 18	17	15/17/20 cartridges 12/15/17 (SK)	21/17
Dimensions (L x W x H; mm)	150 x 32 x 203 187 x 32 x 132	C 4": 184 x 34 x 135 C 5": 210 x 34 x 135 FS 4": 184 x 34 x 143 FS 4.5": 198 x 34 x 143 FS 5": 210 x 34 x 143	202 x 34 x 139	186 x 33 x 138 202 x 33 x 138 (SD OR) 168 x 33 x 116 (SK)	M17: 203 x 35,5 x 140 M18: 183 x 35,5 x 140
Barrel length	114 mm 102 mm	102 (4"), 114 (4.5") or 127 (5") mm	114 mm	162 145 mm (SK) 162 mm (SD OR)	M17: 120 mm M18: 98 mm
Sight radius	175 mm 163 mm	163 (4"), 176 (4.5") or 188 (5") mm	164 mm	162 mm 145 mm (SK) 162 mm (SD OR)	M17: 168 mm M18: 147 mm
Weight (with empty magazine)	810 g 760 g	C 4": 690 g C 5": 740 g FS 4": 695 g FS 4.5": 715 g FS 5": 745 g	708 g	738 g 692 g (SK) 748 g (SD OR)	M17: 834 g M18: 737 g
Function	Striker fired	Striker fired, safe action trigger	Striker fired, safe action trigger	Fully pre-cocked striker fired	Striker fired

From a weapons technology perspective, new materials and manufacturing processes make it possible to reduce weight and complexity and increase modularity. Plastic frames with customisable grips are now standard. Furthermore, the striker-fired systems are gaining ground over the hammer fired. The former now offers almost the same ignition reliability and also allows for flatter sight lines – and it offers good handling safety.

The 9 mm x 19 Luger or Parabellum cartridge, originally developed by Austrian weapons designer Georg Luger at Deutsche Waffen- und Munitionsfabriken (DWM), remains the standard in Western countries. Even more than 100 years after its development, this cartridge remains the most widely used military pistol and submachine gun (SMG) ammunition. The German Armed Forces use the DM11 and DM51 loads with a bullet weight of 8.0 g, which achieve a v10 of 395 m/s. In addition, there is the DM91 hard-core cartridge with a 10.0 g bullet weight and a v10 of 480 m/s. The US armed forces introduced the M1152 Ball (115 gr full metal jacket) and M1153 Special Purpose (147 gr jacketed hollow point) cartridges with the Modular Handgun System. The "other field post number" did not remain idle either. The Russian armed forces developed the strongly loaded 9 x 19 mm armour-piercing 7N21 and 7N31 cartridges. With the CF-98, the Chinese Norinco Group

has produced a nine-Luger export version of its QSZ-92 service pistol, which is chambered for 5.8 mm x 21 mm and manufactured for the People's Liberation Army.

Modernisation in the pistol sector continues. At the end of 2025, Glock introduced the sixth generation of its proven striker-fired pistol. Similar to assault rifles, the greatest growth potential lies primarily in peripheral devices. In military terms, for example, the question arises of integrating handguns into soldier systems that link individual combatants on the digitalised battlefield with higher levels of command.

Submachine guns and PDWs

Only briefly will we touch on the submachine gun. From 1918 onwards, the submachine gun, first introduced on a large scale by the Imperial German Army, became another element in the infantry's toolbox. The compact long gun in pistol-calibre ammunition has since closed the gap between the pistol and the rifle. The same applies to the "Personal Defence Weapons (PDWs)" that emerged in the 1980s, or close-range defence weapons with their specially developed rapid calibres. Their purpose was to be able to engage enemy forces equipped with personal ballistic armour – at ranges of up to 200 metres. For decades, the high-velocity PDW calibres were dominated

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Light and ultra-light machine guns

	FN Herstal Evolys 762	Heckler & Koch HK421	IWI Negev-7 ULG	SIG Sauer M250	Kalashnikov RPL-7
Photos f.l.: FN Herstal, Jan-P. Weisswange, IWI, SIG Sauer, Konzern Kalaschnikow					
Caliber/Cartridge	7.62 mm x 51	7.62 mm x 51	7.62 mm x 51	6.8 mm x 51	7.62 mm x 39
Ammunition feed	Disintegrating belt; Belt pouches with 50 rounds	Disintegrating belt	Disintegrating belt	Disintegrating belt	Belt, belt pouch with 80 cartridges
Length (min/max)	925 mm/1025 mm	330 mm/13": 810 mm/958 mm 419 mm/16.5": 895 mm/1043 mm	1000 mm max.	1,063 mm max.	1100 mm (long barrel) 950 mm (short barrel)
Barrel length	406 mm (16")	330 mm (13") 419 mm (16.5")	420 mm	444 mm	590 oder 415 mm
Weight	6200 g	330 mm: 8300 g/ 8500 g 419 mm: 8500 g/ 8700 g (Para-/Slim-Line shoulder stock)	6600 g	5900 g	5500 g
Firing modes/ Rate of fire	Semi automatic and fully automatic fire; 750 rounds/minute	Fully automatic fire: 670 or 700 rounds/ minute (gas adjustment)	Semi automatic and fully automatic fire; 600–750 rounds/ minute	Semi automatic and fully automatic fire; 800 rounds/minute	Fully automatic fire; 800 rounds/minute
Effective Range	Approx. 1,000 m	Approx. 600 m; precise suppressive fire up to approx. 1,000 m	600 m	600-800 m	400-600 m
Operating principle	Gas-operated, open bolt, short-stroke gas piston system with rotating bolt	Indirect gas-operated, open bolt, locked rotating bolt head	Gas-operated, open bolt, rotating bolt	Gas-operated, open bolt, rotating bolt	Gas-operated, long stroke piston and rotating bolt head

by a race between two bottle-neck cartridges, namely 5.7 mm x 29 from FN Herstal and the 4.6 mm x 30 from Heckler&Koch/Royal Ordnance/Radway Green within NATO. In December 2020, NATO finally standardised both calibres. The 5.7 mm x 29 is now covered by the STANAG 4509 standardisation agreement. The 4.6 mm x 30 is covered by STANAG 4820. The standardisation agreements define the performance criteria and technical specifications that the ammunition types must meet in terms of interchangeability within the Atlantic Alliance – an important criterion for alliance defence. In the meantime, ultra-compact assault rifles are increasingly replacing submachine guns in the military sector. In the police sector, this is being done by often semi-automatic patrol rifles (in the German Law Enforcement sector this weapon category is dubbed as "Mitteldistanzwaffen"/medium-range weapons). Nevertheless, MPs and PDWs remain the weapon of choice, especially for vehicle crews or equipment operators.

Machine guns

The machine gun (MG), on the other hand, has a much more diverse user base. To this day, many armed forces still adhere to the philosophy of the general purpose or

universal machine gun. This is suitable for many applications, from the primary weapon of infantry or dismounted operating sections to vehicle armament, and can be operated by any soldier. However, as appealing as this idea may be, there have been numerous new developments and refinements in recent decades. The focus has been and continues to be on lighter weight and more powerful calibres.

A current trend is towards lightweight, compact machine guns in more powerful calibres. Prominent recent developments include the M60E6, the Russian RPL-7, the HK421, the IWI Negev-7 and the latest MK3 variant of the FN Minimi 762. FN has even created an ultra-lightweight machine gun category with its Evolys family. This even dispenses with the quick-change barrel function to save weight. Moreover, attention inevitably turns to the US Army's NGSW programme. In 2025, it officially introduced the SIG LMG-6.8 as the M250 in the equally new 6.8 mm x 51 calibre. This weapon weighs a good kilo and a half less than its predecessor, the M249 (aka FN Minimi), and increases its penetrating power due to the velocity of the calibre. The Army also launched the Future Medium Machine Gun (FMMG) project. This is intended to replace the M240 universal machine gun, also known as the FN Browning MAG. The US SOCOM is currently looking for a mediumweight

large-calibre machine gun. The project is called Lightweight Machine Gun Medium (LMG-M) and is intended to close the gap between 7.62 NATO and .50 BMG. The cross-sectional long guns currently used by armed forces worldwide – including most machine guns – still mainly fire six types of ammunition: 7.62 mm x 51 NATO, 5.56 mm x 45 NATO, 7.62 mm x 54 R, 7.62 mm x 39, 5.45 mm x 39 and – largely overlooked in Europe – 5.8 mm x 42, the standard ammunition of the Chinese People's Liberation Army. In recent years, the range of ammunition for machine guns has expanded significantly. Naturally, attempts were made to develop promising cartridges from the rifle sector – especially intermediate calibre cartridges. However, most of these attempts remained at the prototype or demonstrator stage. The situation was different – similar to that in the field of sniper rifles – with new, more powerful loads. These include the aforementioned NGSW ammunition family with hybrid cases, which the U.S. Army is currently introducing in the form of the 6.8 mm x 51. As already mentioned, the Army is also initiating its NATO standardisation. The developer of the hybrid case ammunition, SIG Sauer, also wants to offer this technology for other NATO cartridges. This should increase velocity, range and thus firepower without changing calibre. There is also a lot happening above the 7.62 calibre category. The .338 Norma Magnum (8.6 mm x 63) is currently establishing itself in the new mediumweight large-calibre MG category – at least Ohio Ordnance with the REAPR, SIG Sauer with the SIG MG338 and True Velocity with the RM338 are competing for the LMG-M. On this side of the Atlantic, Czech manufacturer FK Brno also presented a mediumweight large-calibre machine gun in this calibre with the BKS.



Live firing the FN Evolys (Jan-P. Weisswange)

The aspect of air defence regained importance with the return of conventional warfare, as it now also includes the defence against widespread drones. In this context, the proven Dillon M134D multi-barrel gatling gun received further attention as a medium machine gun with a high rate of fire. The U.S. Army equipped it on a trial basis as an anti-aircraft machine gun on the M1 Abrams main battle tank – complete with a 3,000-round canister. At Enforce Tac 2025, Dillon Europe, in collaboration with D.E.S. Defence and I-E-A MilOptic, presented the compact Manul cUAV drone defence vehicle. The all-terrain vehicle carries a silenced M134D, which can fire RWS's new Urban Drone Defence ammunition. It also carries MBDA's Enforcer light anti-tank guided missiles.

Mediumweight Large-Calibre Machine Guns

	SIG Sauer SIG-MG338	Ohio Ordnance REAPR	FK BRNO BKS338
Photos f.l.: SIG Sauer, Ohio Ordnance, FK BRNO			
Caliber	.338 Norma Magnum (8.6 mm x 63); also 7.62 mm x 51, 6.8 mm x 51 and SIG .338 Norma Magnum high-pressure ammunition	.338 Norma Magnum (8.6 mm x 63); also 7.62 mm x 51	.338 Norma Magnum (8.6 mm x 63)
Ammunition feed	Disintegrating belt	Disintegrating belt	Belt
Length	1,300 mm	1,384 mm max.	1,275 mm max.
Barrel length	610 mm (shorter lengths available)	624 mm	N/A
Weight	9700 g	12,156 g	11,000 g
Firing modes/Rate of fire	Semi automatic and fully automatic fire;	Fully automatic fire; 500 - 650 rounds/minute	Fully automatic fire; 550 rounds/minute
Effective range	Up to 1900 m	Over 1500 m	Up to 1700 m
Operating principle	Gas-operated with recoil reduction system	Recoil-operated with roller delayed operating system	Gas-operated with recoil reduction system



The Rheinmetall SW40 (Jan-P. Weisswange)

Taking into account the latest developments, namely FN Evolys, the U.S. Army's NGSW project and the US SOCOM's Lightweight Machine Gun Medium Project, six categories of machine guns can now be roughly distinguished:

- Medium machine guns are mostly classic standard and universal machine guns in calibres from 7 mm to 8 mm inclusive and weigh between 8 and 12 kg. They can be operated by one or two soldiers.
- Light machine guns weigh between 6.5 kg and 9 kg and can usually be carried and operated by a single soldier. They have a calibre of 5 mm to 8 mm inclusive.

- Ultra-light machine guns weigh less than 6.5 kg, mostly thanks to new manufacturing processes or the omission of classic design features such as quick barrel changes. They also have a calibre of 5 mm to 8 mm inclusive.
- Mediumweight large-calibre machine guns are the second new category after ultra-light machine guns. They fire ammunition with a calibre of over 8 mm to 10 mm and weigh over nine kilograms.
- Heavy and super-heavy machine guns have a calibre of over 10 mm to under 20 mm, making them the last category before machine cannons and grenade machine guns. These are usually crew-served weapons. This means that they are no longer part of the "soldier system" in the strict sense.
- Gatling guns and multi-barrelled weapons belong to the heavy machine gun category in terms of weight. Today's common designs fire smaller calibre ammunition. Nevertheless, there is a tendency to increase range and effectiveness with variants in larger calibres. Dillon, for example, offers the 503D, a multi-barrelled weapon in .50 BMG.

The machine gun remains a core element of infantry combat power.

Bolt Action Sniper Rifles

	Accuracy International AX G22A2	Barrett MK 22 Mod 0 (MRAD-Variant)	C.G. Haenel RS9 (G29)	Steyr Arms SSG M1
Photos f.l.: Accuracy International, Barrett, C.G.Haenel, Steyr Arms				
Calibre	.300 Winchester Magnum (7.62 mm x 67)	MK22 Mod 0: 7,62 mm x 51, NATO .300 Norma Magnum, .338 Norma Magnum (also 6.5 Creedmoor, .260 Remington, .300 Winchester Magnum, .338 Lapua Magnum)	.338 Lapua Magnum (8.6 mm x 70)	.338 Lapua Magnum (8.6 mm x 70) 7.62 mm x 51 NATO 6.5 Creedmoor
Magazine capacity	5 cartridges	10 cartridges	10 cartridges	10 cartridges
Length	1.250mm/1.030 mm	7,62 NATO: 1077 mm .300 Norma Magnum: 1229 mm .338 Norma Magnum: 1255 mm	1.275/1020 mm	1280mm/1080 mm (Standard 27.16" .338 Lapua Magnum-barrel, shoulder stock folded/extended)
Barrel length	26" (660 mm)	7,62 NATO: 20" (508 mm) .300 Norma Magnum: 26" (660 mm) .338 Norma Magnum: 27" (686 mm)	27" (685mm)	.338 Lapua Magnum: 27.16" (690 mm) 7,62 NATO: 20" (508 mm), 25" (635 mm) 6.5 CM: 25" (635 mm)
Optics	Steiner ZF 5-25 x 56 with TReMoR-3-reticle	Leupold&Stevens Mark 5 HD 5-35 x 56	0-1-D, 850 Schuss/Minute	Kahles ZF 6-24 x 56 K624i
Weight	7200 g (empty)	7,62 NATO: 6300 g (empty) .300 Norma Magnum: 7000 g (empty) .338 Norma Magnum: 7000 g (empty)	7540 g (empty)	6820 g (empty)



The Panzerfaust 3 is a member of DND's Recoiless Grenade Weapon family (Bundeswehr)

Designated Marksman Rifles and Sniper Rifles

There have been numerous developments in the field of designated marksman rifles and sniper rifles in recent years. This applies from a conceptual, tactical and technical perspective. The latter developments mainly concern optics, networking and new calibres. The focus is on more precise hits at ever greater distances.

With the increasing availability of smaller, compact optics and fire control systems, the distinctions between riflemen, designated marksmen at group level and highly specialised snipers are now becoming blurred. Every warfighter should be able to hit man-sized targets at the 'infantry half-kilometre' with his assault rifle. Designated marksman rifles are now widely used. They can be used to hit targets accurately at up to 600 metres and suppress enemy forces at up to 800 metres. The next level up is the semi-automatic sniper system with an accurate range of up to 800 metres. For sniper operations beyond 800 metres, bolt-action rifles, especially in the calibres .300 WinMag (7.62 mm x 67) or .338 Lapua Magnum (8.6 mm x 70), are still the weapon of choice. This enables the sniper team to operate at ranges of up to 1600 metres. Both calibres are represented in the German Armed Forces with the G22A2 from Accuracy International and the G29 from C.G. Haenel. The U.S. Army deviated slightly from this. Its new multi-calibre Mk22 (Barrett MRAD) can be set up for 7.62 mm x 51, .300 Norma Magnum and .338 Norma Magnum (8.6 mm x 63). This means that, if necessary, the ammunition can be

exchanged with both the universal machine guns and the new mediumweight large-calibre machine guns.

Grenade launchers

Other current developments in the infantry toolbox mainly concern multi-shot portable grenade launchers. One outstanding project is the US Army's Precision Grenadier System (PGS). In autumn 2025, FNH USA was commissioned by the US Army to further develop the 30mm grenade launcher Multi-Purpose Tactical Launcher MTL-30. A similar approach comes from Barrett and MARS with the Squad Support Rifle System (SSRS) for 30mm x 42 grenade cartridges. Rheinmetall presented its Squad Support Weapon 40 (SSW40) in live-fire testing in 2025. This system relies on the larger 40 mm x 46 grenade, which is available in both low-velocity and medium-velocity versions.

Ceterum Censeo: Training remains a core element of firepower

Readers of the author's publications can recite the familiar Ceterum Censeo by heart: using the infantry toolbox requires solid technical skills. Continuous training, further education and the principle of "train as you fight" are essential prerequisites for this. Good training lays the foundation for operational readiness and combat readiness.

Jan-Phillipp Weisswange

Personal clothing and equipment systems

FIRST-LINE EXPERIENCE

Personal clothing and equipment increase the operational capability of police forces and the combat effectiveness of soldiers. Individual uniformed personnel literally experience the care and attitude of their superior commanders on their own bodies.



German Army infantry soldiers training for urban operations. Clothing and personal equipment must be optimally harmonised with individual weaponry. (Bundesheer)

The better the components – weapons, ammunition, optics/optronics, peripheral devices and personal equipment – harmonise with each other, the greater the impact on the individual combat effectiveness of each warfighter or the operational capability of each law enforcement officer. Therefore, both police and military personal clothing and equipment systems fulfil a variety of tasks. They offer comfort, the safest possible transport and the fastest possible access to the reconnaissance, combat, command/communications and operational equipment carried. They protect against weather conditions, dangers and threats in the respective operational environment. The camouflage effect protects against reconnaissance by the enemy,

while the warning effect ensures better visibility and thus protection against hazards in road traffic. In both areas, operational clothing should be as robust as possible, but also lightweight and ergonomic. Finally, clothing and equipment systems should contribute to a positive and professional image – for example, in the sense of a kind of corporate identity and with regard to the strategically important recruitment of young talent. In addition, they must be suitable for the widest possible cross-sectional use by a highly diverse group of people. Last but not least, the personal clothing and equipment reflect the superior commander's appreciation for the soldiers or police officers entrusted to them.



New command and operational equipment such as public safety digital radio, bodycams and IFAKs required new carrying equipment for the individual police officer (IM NRW)



Anti-riot equipment, protective equipment and uniform used by the North Rhine-Westphalia police force (Bernd Thissen/IM NRW)

Personal clothing and equipment systems follow a layer design approach. This starts with underwear and extend to rucksacks or other transport and carrying equipment. All components complement each other in a modular fashion and offer the wearer the greatest possible flexibility to adapt to the respective mission, terrain and weather conditions, as well as the threat situation.

Police: Functional blue widely used in Europe

In recent years, the colour blue – albeit in different shades – has become prevalent among the various police forces in Europe. This is sometimes complemented by signal-coloured clothing or equipment items or applications. The purpose here is actually to improve visibility, as the dangers posed by poor visibility – for example, in road traffic – predominate during daytime duty. Another trend can be



The French armed forces are currently introducing the F3 combat uniform in BME camouflage pattern. (Armee Francaise)



(Bundeswehr)

“Innovation has taken on a whole new meaning for land forces. I want us to embrace this innovation from the bottom up. I firmly believe that innovation always arises when tactical leaders – platoon commanders, company commanders – are faced with a tactical problem and then find a solution to it”

Generalleutnant Dr. Christian Freuding, Inspector of the German Army

seen in the uniforms for daily duty. Functional cuts have replaced the previously more formal service uniforms. Ballistic protective equipment is now standard, usually combined with stab protection. This can often be adapted to the threat situation on a modular basis – including a helmet.

Personal equipment has now often been improved for the police. More modern service weapons have been accompanied by new holsters (often with level 2 or 3 safeties) and magazine pouches on the belt. New command and operational equipment – such as public safety digital

radio, tasers and the new category of medium-range rifles ("patrol rifles") – have made it necessary to integrate their accessories into the police equipment and clothing system. Individual first aid kits, including tourniquets, and body-worn cameras (bodycams) have also been widely used for several years. As bodycams are intended to document operations in a legally compliant manner, they are also expected to have a de-escalating effect.

In addition to the usual functionality, the focus for the anti-riot-uniforms is on flame and acid-resistant properties. Some of the operational clothing is cut wide so that it can



The German Armed Forces' "Multitarn" pattern, shown here in use by German Combat Divers, is set to be introduced for the entire force from 2026. (U.S. Army)



The German Navy's new shipboard clothing system. (W.L. Gore)

be worn over body armour. This approach is also said to have a de-escalating effect. Modern protective helmets can be combined with modern respirators. Modern helmet ecosystems can cover the full spectrum of threats from public order applications to ballistic threats.

Multinational modernisation of military uniforms

But it wasn't just the police authorities that modernised. Numerous armed forces have introduced new clothing systems in recent years. Examples include Denmark (M/11 combat uniform), France (F3 Bariolage Multi-environnement/BME), Great Britain (Personal Clothing System/PCS and VIRTUS), the Netherlands (Defensie Operationeel Kleeding Systeem/DOKS and the soldier system Verbeterd Operationeel Soldaat Systeem/VOSS), Austria (new camouflage uniform), Portugal, Romania and Hungary. The Scandinavian countries Denmark, Norway and Sweden have implemented their joint clothing project, Nordic Combat Uniform. Norway and Sweden are already outfitting their first recruits with the new uniforms. Russia (Ratnik) and China have also modernised their clothing and equipment systems several times in recent years.

Following the "Zeitenwende" (turning point), Germany has accelerated the provision of funds to equip all soldiers as quickly as possible with the new Kampfbekleidungs-satz Streitkräfte (KBS; Armed Forces Combat Uniform) and Modulare Ballistische Schutz- und Trageausstattung (MOBAST/Modular Ballistic Protection and Carrying Equipment). Both sets are so extensive that the traditional

lockers in the barracks are no longer sufficient to accommodate all the new equipment. However, acceptance is high overall, as the "Zeitenwende" can literally be experienced first-hand.

Switzerland plans to start issuing its new Modular Clothing and Equipment System (MBAS) in 2026. MBAS replaces the previous "Tenue C", the work suit. The system comprises 148 items. The respective components are divided into personal equipment and operational and training material. Each soldier receives them according to their specific tasks and functions.

Most universal pattern for most environments

The modernisation of uniforms has brought with it another multinational trend: the colour schemes of many armed forces are becoming more similar. Camouflage patterns that can be used as universally as possible are to largely replace traditional environment-specific ones in order to simplify logistics. The "Multicam" camouflage pattern created by the New York-based company Crye Precision is setting the style. It became a trendsetter in the "global war on terror". After a brief detour with the green-grey pixelated Universal Camouflage Pattern, known as "mould camouflage", the US Army introduced its "Scorpion" variant across the board. Previously, the British, Danes, Belgians, Hungarians, Portuguese and, most recently, the French had replaced their various patterns for woodland and desert with Multicam or national variations thereof. The Swiss also developed the new "Multiumfeld-Tarnmuster 16" for their MBAS. The German Armed Forces, in turn, want to take this step from 2026 onwards. The German "Multitarn" print, currently reserved for special forces, is to replace the five-colour camouflage print ("Flecktarn"), the three-colour camouflage print (erroneously called "Tropentarn" in Gerado Talk) and the



The Swiss Army will issue the Modular Clothing and Equipment System from 2026. The "Multiumfeld-Tarnmuster 16" (multi-environment camouflage pattern 16) is recognisable as a Swiss development. (VBS)



Modern clothing systems are designed to allow maximum freedom of movement (Bundesheer)

desert camouflage print for all branches of the armed forces. In view of the foreseeable likely area of operation in Central Europe, critics are quite sceptical about the "multicamisation". They argue that patterns of this type were developed for arid environments and are therefore too light for the Central European battlefield. Other experts counter that climate change and combat in built-up areas are good reasons to switch to Multicam-coloured patterns.

Sweden, Norway and Finland, on the other hand, remain true to their style of cross-sectional uniforms. Sweden and Norway have developed new camouflage patterns, but these are largely based on their predecessors in terms of design. Finland is sticking to the M/05 pattern it introduced at the beginning of this millennium.

At sea

But it's not just on land that things are happening – there's also movement at sea. The German Navy's seafaring personnel are currently being issued with a new modular shipboard clothing system. It comprises several items of clothing. The new shipboard and combat uniform consists of a jacket, trousers and combat shirt. The new shipboard clothing also includes a waterproof jacket and trousers in navy blue for use in harsh weather conditions. The outfit is complemented by a cold-weather jacket for use in low temperatures. The new shipboard clothing is characterised above all by its flame-retardant properties (Gore Pyrad technology), modern cuts and high wearing comfort.

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The Norwegians also introduced a new winter camouflage pattern with their Nordic Combat Uniform. (Norwegian Ministry of Defence)

Effect before cover

The conflict scenario of the future will affect even individual soldiers. Drones and uncrewed systems are here to stay. Combat in urban terrain, but also in and around positions in other terrain sections from the coast to the mountains, requires new or rediscovered equipment and armament. All of this in turn has an impact on personal carrying equipment. It is used to transport ammunition, combat equipment and other tactical gear in the "second line of equipment" on the person. Personal protective equipment, in turn, primarily offers protection against ballistic threats. At the very least, ballistic protection against shrapnel and ricochets makes sense, as 70 to 90 per cent of casualties on the battlefield in near-peer or peer-to-peer conflicts are due to the effects of artillery.

In principle, carrying and protective equipment can be worn separately or in combination. The first philosophy is followed by coupling carrying systems, combat vests or chest rigs, i.e. tactical equipment pouches worn in front of the chest. These are worn over the ballistic protection.

Plate carriers or ballistic vests with sewn-on fixed ammunition and equipment pouches or fastening systems are prime examples of the combination philosophy. The German Armed Forces' MOBAST is a current examples of this. It also features the PALS loop system, which has become the global standard with the US MOLLE (Modular Lightweight Load carrying Equipment) carrying system. Plate carriers usually focus on hard ballistic inserts (against armour-piercing rifle rounds) and therefore offer a slightly smaller area of protection. However, most models can be expanded modularly. Some of the battle belts often worn in conjunction with plate carriers can also accommodate level 1 soft ballistics, thus offering protection against 9mm projectiles or shrapnel.

The helmet is one of the core pieces of personal protective and carrying equipment. It not only offers

protection against impacts, blows or ballistic threats. Rather, it also serves as an interface for additional equipment that increases protection, but also reconnaissance capabilities and effectiveness. This includes night vision goggles or communication sets with hearing protection. The German Armed Forces are currently introducing a new "combat helmet for the armed forces", but have already begun modernising their existing stock with a successor family of full-cut and high-cut models. This is scheduled to be introduced in 2026.

Mess kits, field rations, and catering equipment

"No food, no fight!" Anyone who reads the numerous eyewitness accounts from all sides of the great wars of the last century knows how much of an impact food has on operational readiness and morale. Curiously, field catering equipment has hardly changed in recent decades. The pocket stoves or mess kit sets still look much the same as they did in the trenches at Verdun. This has long since ceased to be the case for field catering. Today's ready meals for the German Armed Forces not only cater to as wide a user group as possible by renaming them from "one-man pack" to "one-person pack", but also ensure that vegetarians and vegans do not go hungry thanks to their variety of meals. Freeze-dried meals such as the "Tactical Food Pack" or "Travellunch" are space-saving to carry and easy to prepare.

Rucksacks

In the "third line", spacious rucksacks adapted to the carrying equipment ensure that soldiers can comfortably carry their tent equipment, spare clothing and other "luxuries" with them on marches. Modern designs



The C4I equipment integrates the individual soldier into the digitalised battlefield (MoD UK)

allow quick access to stored equipment without having to empty the entire rucksack first. Modern patrol or day packs are the same size as those used by combatants in the Cold War and earlier conflicts.

Outlook

In terms of clothing and personal equipment, modern materials, designs and cuts provide significantly higher protection and comfort. Ultimately, modern clothing and personal equipment also express the appreciation and status that individual soldiers or police officers enjoy among their employers, superior commanders, and in society.

Jan-Phillipp Weisswange

Layer system – the lines of gear

In the military sector, the "lines of gear" principle has become established for equipment. According to this equipment layer concept, the first layer ("first line of gear") includes everything necessary for survival. The second layer ("second line of gear") includes everything needed for combat, i.e. carrying kit, combat vest, plate carrier and the like. The "third line of gear" or third layer then constitutes the "luxury" items – usually a large rucksack with a sleeping bag, tent equipment, food and spare clothing. In addition to this ideal theory, there are also various intermediate layers. These include, for example, the "breakaway pack". This is a small rucksack containing water, emergency rations, additional ammunition and protection against cold/wet weather. It is packed ready in the large rucksack of the third layer and, if necessary, is transferred to the second line of gear.

Individual small arms do not fall into the layer system, but belong to the individual soldier. The long weapon (mostly the assault rifle) can be connected to the second layer via carrying or safety straps. Depending on the choice of holster, the pistol may already be in the "first line". In the military, however, holsters and magazine pouches are usually found in the second layer.



Soldier from the German Navy's Seebataillon wearing the latest combat clothing and equipment system, combat helmet, communication set with hearing protection and backpack system. (Bundeswehr)



An U.S. Army's soldier system approach includes data and night vision goggles, M7 assault rifle, Android Tactical Assault Kit (ATAK) and Black Hornet drone (U.S. Army/PEO Soldier)

Operations in the digital theatre

WELL CONNECTED FOR OPERATIONAL SUCCESS

For the police, other public services, and authorities and organisations with security tasks, and of course for the armed forces, reliable radios, communication networks as well as C4I systems are crucial factors for operational success.

Digital radio communications for public safety

In the field of internal security, numerous authorities and organisations with security tasks – police, fire brigade, rescue services, civil defence organisations and many more – usually deal with emerging operational situations. This requires secure, high-performance communication across

authority boundaries. In the mid-2000s, in Germany the "Digitalfunk Behörden und Organisationen mit Sicherheitsaufgaben (Digitalfunk BOS, public safety digital radio)" replaced analogue BOS radio. Digitalfunk BOS is based on the Terrestrial Trunked Radio (TETRA) standard. Operated by the German Federal Agency for Public Safety Digital Radio (BDBOS), it is the world's largest radio network based on the TETRA standard.

According to the BDBOS, the German federal networks have around 220 connected federal authorities and network gateways to state and local networks. More than 300,000 federal employees are connected to the federal networks. Over 5,000 base stations cover more than 99.2 per cent of the territory of the Federal Republic of Germany. Network availability is 99.97 per cent. Around 50 million radio messages are sent per month on average. Since 2019, the German Armed Forces have also been able to use the public safety digital radio with up to 40,000 participants. This makes sense, especially in times of hybrid threats, but also for administrative assistance in the event of a disaster.

The core services of the tap-proof public safety digital radio include group communication, emergency calls and calls for help via a dedicated button, alerts (via pager), a short data service (SDS) for text messages and numerical codes, GPS-based location tracking, end-to-end encryption and broadband services.

The individual users are connected to each other via various end devices via the public safety digital radio network. Currently, over a million end devices are registered in the network. The personnel are usually equipped with handheld devices, known as Handheld Radio Terminals (HRT). Active Paging Radio Terminals (APRT) are used for alerting. Special forces are equipped with Special Radio Terminals (SRT). The vehicles are equipped with Mobile Radio Terminals (MRT). In buildings or mobile control centres, on the other hand, there are Fixed Radio Terminals (FRT). These offer multiple workstations. All end devices must be certified according to fixed standards to enable secure end-to-end encryption and interference-free communication. Public safety digital radio is constantly being modernised.

From the infantryman of the future to the cyber warrior

In the military sector, keywords such as networked operations, multi-domain operations, digitisation of the battlefield, combat clouds and software-defined defence are now part of the standard repertoire of armed forces planners worldwide. Most of today's multidimensional warfare concepts are similar. According to these concepts, networked combat units consisting of individual soldiers, their land, air, sea, cyber and space platforms, as well as robots, drones and other uncrewed systems, work together to master operations that sometimes run parallel to each other in different intensity spectra in all domains. All actors on the digitalised battlefield regularly feed information into the shared network, so that everyone always has an up-to-date common operational picture of the situation. This shortens the sensor-to-effector chains: enemy forces can be detected and engaged more quickly. Soldier systems and radio equipment form the interfaces for individual soldiers for digital operations. Artificial intelligence (AI) supports commanders in evaluating the flood of information and preparing decisions.



Public safety digital radio communication equipment of the Hesse State Police: Handheld Radio Terminals (HRT) and a mobile command post with Fixed Radio Terminals (FRT). (Polizei Hessen)



(BDBOS/Ramazani)

“Our goal is to connect the entire public administration in a reliable, secure and sovereign manner.”

Jens Koch, President BDBOS
Federal Agency for Public Safety
Digital Radio

Horizontal, vertical and multinational networking

The digital battlefield, with its horizontal, vertical and multinational networking, poses considerable challenges. The numerous players on the digital battlefield generate ever-increasing amounts of data in ever-shorter periods of time. At the same time, these data volumes must be evaluated ever more quickly and transferred to an ever-increasing number of actors. Radio equipment and corresponding peripheral devices therefore play a central role in digitalisation. Thanks to their digital radio equipment, platforms act as "digital nodes". Furthermore, communication networks must not only be designed to be more powerful, but also as robust as possible – including against electronic warfare measures.



The L3Harris AN/PRC160(V) tactical HF/VHF radio was also procured by the German Armed Forces (L3Harris)



The IdZ-E5 soldier system integrates German infantrymen and mechanized infantrymen into networked operations (Rheinmetall)



Anduril's approach to the U.S. Army's SBMC program (Anduril)



With the Centurion programme, the French armed forces are modernising their FELIN soldier system (Jan-P. Weisswange)

The German Armed Forces has launched two major projects, "Digitalisierung Landbasierte Operationen (Digitalisation – Land-Based Operations, D-LBO)" and the "Tactical Wide Area Network for Land-Based Operations (TaWAN LBO)", to further strengthen its command and control capabilities. The core function of TaWAN LBO is to provide an open transport network for Federated Mission Networking (FMN) based on Protected Core Network

(PCN) to connect the upstream tactical D-LBO networks to the rear core network CIR. In conjunction with D-LBO, the TaWAN LBO network is intended to enable high-speed data connections deep into the rear area. Another challenge is communication with partner nations on the digital battlefield. This is currently done via specific interoperable radio equipment, which, however, is only available at certain command levels. The FMN-standards created on the initiative of NATO are intended to facilitate the future interoperability of different networks and combat management systems. Ideally, this will be achieved via interfaces that enable a "plug-play-fight" approach. One of the first FMN-Ready Forces on the German side is to be Panzerbrigade 45 "Litauen".



Soveron Software Defined Radio family supplied by Rohde&Schwarz: Soveron D, Soveron VR, Soveron HR und Soveron AR (Rohde & Schwarz)

Soldier systems

Soldier systems integrate dismounted soldiers into networked operations. Several manufacturers offer such systems or components for this purpose.

With a framework agreement signed in February 2025, the Bundeswehr is procuring a modernised design of the "Infanterist der Zukunft – Erweitertes System (Infantryman of the Future – Extended System, IdZ-ES). This is based on the IdZ-ES VJTF 2023 soldier system already in use with the System Panzergrenadier. With the new "VJTF 2023 obsolescence-adjusted" design, obsolete

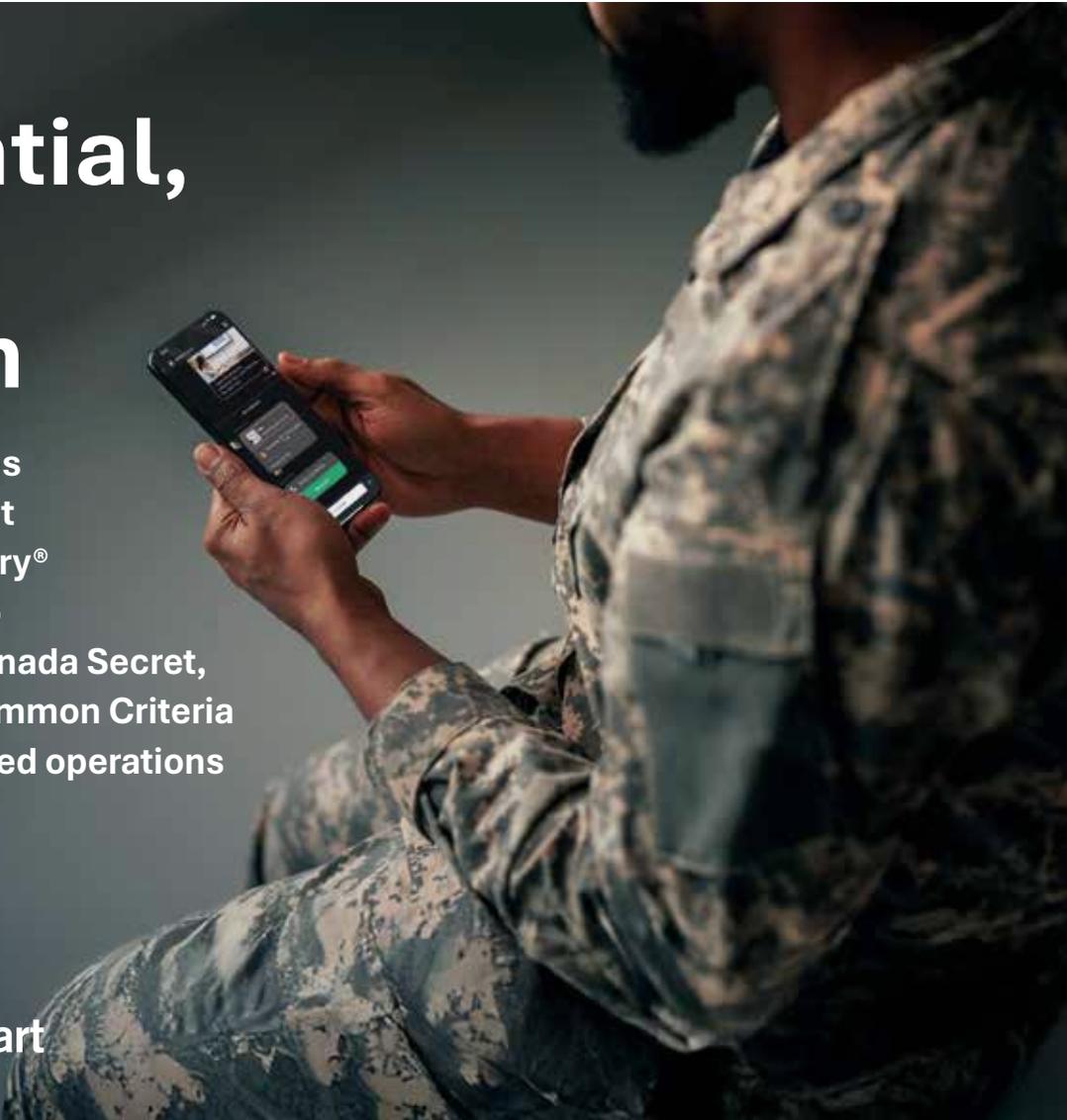
components are being eliminated and communication and data exchange capabilities with the Boxer armoured transport vehicle and Puma infantry fighting vehicle platforms are being implemented and prepared for the airborne platform. The revised basic hardware of the soldier systems is also prepared as far as possible for connection to the D-LBO information and communication network.

The German approach focuses on the platoon level. A platoon system comprises 34 individual soldier systems and a range of peripheral components. These include advanced IT equipment, optics, optronics, as well as

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A German cyber soldier identifies enemy signals using the PR200 Portable Monitoring Receiver (Bundeswehr)



U.S. Army CEMA Warriors monitor enemy radio signals using the Terrestrial Layer System Brigade Combat Team Manpack (U.S. Army)

clothing, protective equipment and carrying equipment. Rheinmetall is the general contractor and, as the system manager, coordinates the work of more than 30 sub-contractors.

In principle, every soldier has a UHF group radio. Selected soldiers – couriers/messengers, squad leaders and platoon commanders – have additional equipment in the form of two radios and a tablet-like command device. The older IdZ-ES platoon system still uses the SOLAR 400 UHF radio. With the adaptation to the VJTF 2023 design status, adjusted for obsolescence, the command equipment comprises the following components:

- Elbit E-Lynx PNR 1000 D UHF radio
- R&S HR 5000 VHF radio (command equipment only)
- Getac MX50 user terminal (until further notice)
- Communication equipment: 3M Peltor ComTac VIII headset and CeoTronics 3C MultiPTT push-to-talk button

The E-Lynx PNR 1000 D is also used as part of the D-LBO programme. The aim is to integrate the IdZ-ES into the future networking of all platforms in the land domain.

The French armed forces, meanwhile, use the Fantassin

à Équipement et Liaisons Intégrés (FELIN; roughly translated as "infantryman with integrated equipment and communications") soldier system supplied by Safran/Sagem and Thales. Between 2010 and 2015, a total of around 23,000 soldier kits were delivered to the troops. The latest version is the FELIN V1.3 variant, which was commissioned in 2016.

As a modular system, FELIN also includes improved communication equipment and sensors, hand weapons and modern targeting aids, new tactical clothing and lighter ballistic protection and carrying equipment. In the FELIN V1.3 upgrade, it is optimised for the SitComdé tactical terminal and the combat management system. The equipment can be configured according to operational requirements and the role of the individual soldier within the unit or formation.

At the end of 2019, the French defence procurement agency DGA launched the Centurion programme. Running until 2026, the Centurion programme aims to promote innovations for dismounted soldiers – for example in the areas of protection, camouflage, networking and ergonomics – by enabling their rapid integration into infantry equipment. Promising technologies are to be quickly identified and brought to series production. The advantages of short exploration, development and testing cycles are to be exploited. The innovations could ultimately be integrated into the current FELIN programme and the future SCORPION combat management system.

In the US armed forces, networking is taking place in several programmes, some of which are running in parallel. NETT Warrior (NW), introduced in 2010 and modernised several times since then, considers the equipment of military commanders from the infantry section level upwards. As a cross-platform system, NW uses military handheld radios as an interface for integrating commercially available smartphones into the command and communications network at brigade level. This allows soldiers to use their devices to access applications for sending messages and exchanging

data, tracking their own forces, coordinating movements with other units or requesting fire support. The system can also be networked with the sensors of uncrewed platforms. NW uses, among other things, the map-based position identification software Tactical Assault Kit (TAK) and other applications. The latest version of NW is said to feature improved artificial intelligence to optimise the interface with new Future Warrior devices.

There has been movement on the Integrated Visual Augmentation System (IVAS), which should be available to every dismounted soldier. IVAS was originally based on the Microsoft HoloLens 2 headset, which uses holographic technology to superimpose digital images over real images. IVAS is thus designed not only to enhance night vision and reconnaissance capabilities, but also to feed augmented reality situational information, three-dimensional terrain maps or a compass into the soldier's field of vision. In March 2025, the project moved from the "IVAS Next" stage to "Soldier Borne Mission Command (SBMC)".

The SBMC is intended to provide a single platform for deployment, training and education. Tactical mixed reality is designed to improve soldiers' situational awareness on the battlefield and enable them to identify potential threats more quickly. It is also intended to enable tactical planning and networked information exchange,

as well as augmented reality Synthetic Training Environment (STE). The SBMC is to include

- Robust head-up display (HUD), cables, body-worn computer package (puck)
- Conformal Wearable battery (CWB)
- Squad radio
- Power recharge
- SiVT, infrastructure and equipment ("SiVT in a box")
- Tactical Cloud Package (TCP)
- Cloud services

The U.S. Army awarded development contracts to An-duril and Rivet. Both companies presented initial approaches for SBMC at the AUSA 2025 trade fair.

Dismounted electronic warfare

Electronic warfare has become significantly more important as the war in Ukraine shows. Own troops and units must protect themselves from reconnaissance in the digital or electronic environment. Private smartphone use poses a major and very complex threat in this regard. It is also important to make one's own networks and command and control systems resilient to enemy attacks. Conversely, enemy vulnerabilities

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The Sirius Compact L20C from Saab is a passive communication ESM sensor (Communication Electronic Support Measure, C-ESM) that detects electronic radiation in a 360-degree angle around the device (Saab)



High-performance field cables and reliable connectors, both at command posts and on personnel, contribute to the protection of networks on the hardware side (Jan-P. Weisswange)

can be exploited to deceive or paralyse their networks through "non-kinetic effects".

Electronic Warfare (EW, in German Elektronische Kampfführung, or EloKa) is certainly present in the German and other armed forces in a land-based form. The U.S. Army has set up cyber battalions. Small Expeditionary CEMA (Cyber Electromagnetic Activities) teams support larger units and formations with electronic warfare capabilities. The equipment at the tactical level includes the Terrestrial Layer System Brigade Combat Team (TLS BCT) Manpack, a backpack-based system manufactured by Mastodon and CACI. This is intended to significantly strengthen SIGINT and EW capabilities at the tactical level. One of the lessons learned is that users need to be better trained, including with regard to updates. Furthermore, the Manpack is to be connected to command and control systems, such as the EW Planning and Management Tool X or the Android Tactical Assault Kit (ATAK) and the Windows Tactical Assault Kit (WinTAK).

The Bundeswehr's Cyber und Informationsraum (CIR) branch, which has been upgraded to a separate branch of the armed forces, has specialised electronic warfare forces at its disposal in the form of the "Airborne Component for Electronic Warfare for Close Support in Operations" (in German „Luftlandefähige Komponente für den Elektronischen Kampf zur Nahunterstützung im Einsatz“, LEKE). These cyber soldiers support the Bundeswehr's special operation forces by detecting, locating and analysing electronic signals – in close proximity to enemy forces and in high-risk missions worldwide. LEKE forces can gather important information in difficult operational situations, disrupt enemy communications and operate in close proximity to target persons. They therefore not only have comprehensive electronic warfare training, but also master the tools of the infantry trade.

Another aspect: in times of increasing electronic warfare, networking can also mean wiring! Fast, interference-free transmission of high data rates is now achieved using powerful fibre optic cables. To render jammers ineffective, even drones are now controlled via fibre optic cables.

Human creativity and intelligence

Digitalisation never ends! But especially at the individual user level – and not only there – it will continue to raise numerous mundane questions: How and with what devices do I interact with the network and the command and control system? How much does my equipment weigh? Can I concentrate on my tactical behaviour and the use of weapons, or am I already overwhelmed by the mere operation of these devices or even the flood of information they generate? How can I tell if enemies have hacked into the network to get info or spread misinformation? And what happens if I run out of juice? So, human creativity and intelligence will still be needed for individual police officers and soldiers on the networked, digitalised theatre of the future.

Jan-Phillipp Weisswange

Optic and optronic options for operators

SENSORS FOR ALL SITUATIONS

The old German military wisdom "He who shoots faster and hits better wins the firefight" is still valid. With regard to today's police forces and military operators in times of hybrid warfare, however, it could be extended as follows: "Whoever engages faster and more accurately to the clearly identified target with an effect appropriate to the threat, copes with all forms of conflict".

The individual operator must recognize, detect and identify potential threats at an early stage in order to be able to neutralize them if necessary - even to rule out the risk of collateral damage or "blue-on-blue" or "friendly fire".

Modern optics and optronics and night vision technology offer ever-increasing performance while reducing weight, size and energy requirements. Thanks to these ever-decreasing size, weight and power (SWaP) values, today's small arms are no longer equipped solely with classic mechanical or iron sights. At least in the Western hemisphere, red dot sights and reflex sights prevail, often supplemented by magnification attachments. Depending on the weapon and its intended use, the spectrum then ranges from compact telescopic sights to fire control sights and other assistance systems. Additional equipment from the 'soldier system' complements these attachments, especially night vision goggles, laser light modules, binoculars, telescopes, observation optics and other handheld devices. Larger electro optical sensor systems or even other technologies like Radar supplement the man-portable equipment.

Soldiers mainly use the optics on their handguns to detect, discover, identify and engage targets. There are basically three categories of military marksmanship, which are based on the user's level of training: rifleman, designated marksman/sharpshooter and sniper (see box page 48). The corresponding weapon systems – including optics – are divided into four levels. They are subdivided into the categories of assault rifle, designated marksman rifle/sharpshooter rifle, semi-automatic sniper system and bolt-action sniper rifle. However, the boundaries between these categories are becoming increasingly blurred.



Night vision goggles, optical sights and laser light modules are among the man-portable sensors (Rheinmetall)

Reflex- and red dot sights

Reflex and red dot sights have little or no magnification. The shooter picks up the target via a red point or a small reticle. The shooter can keep both eyes open, the field of view remains almost unlimited and situational awareness is maintained. Such optics are significantly less susceptible to tilting and can be used in almost all weather conditions. Where the shooter sees the red dot, he also hits - assuming correct adjustment of the sight as well as correct triggering.



Hensoldt ZF4-MKO; shown here in a package with the Aimpoint ACRO-P2 red dot sight. (Jan-P. Weisswange)



Optical sights and laser light modules are also becoming increasingly popular for pistols (Rheinmetall)

Since the end of the 1990s at the latest, reflex or red dot sights have become the military standard for assault rifles, carbines and submachine guns. Thus the G36, introduced in 1997 at the Bundeswehr, carried the HKV main combat sight from Hensoldt over the 3x4° 3x magnifying target optic, which, according to today's interpretation, would probably be referred to as a reflex sight. In the same year the US Army ordered CompM4 optics from the Swedish red dot pioneers Aimpoint for the first time on a larger scale, which was fielded as the M68 Close Combat Optic. In the mean-

time, the number of Aimpoint products has reached millions in many armed forces as well as police formations worldwide. The holographic EoTech sights are still widely used models. These use not only a red dot, but a reticle. Other prominent examples widely in use come from Mepro-light, Leupold, Steiner, SIG Sauer or Trijicon (especially the Advanced Combat Optical Gunsight/ACOG family). Optical sights are increasingly being used for pistols as well. This makes it easier to use pistols with night vision technology.



US infantryman with night vision goggles and XM157 fire control sight on his M7 assault rifle (U.S. Army)

Magnifiers for larger ranges

On some battlefields, even the average rifleman has to fight at greater distances. And he must be able to identify threats early and clearly identify his targets. For most reflex sights there are therefore additional devices with triple or quadruple magnification. Examples for those magnifiers are the Aimpoint 3X-P, the G33 and G43 from EoTech or the Hensoldt magnification kit VGN 3X.

Alternatively, some armed forces also issue optics with a lower magnification and a smaller red dot sight on top – the Bundeswehr, for example, the Hensoldt ZO 4x30 scope with the RSA reflex sight. For the new German standard assault rifle "System Sturmgewehr Bundeswehr", the German armed forces have ordered the Elcan Specter series. It can be switched between none and a quadruple magnification.

U.S. Army and U.S. Marine Corps issued the Trijicon TA31RCO ACOG for their M16A4 assault rifles (AN/PVQ31-A/M150) and M4 carbines (AN/PVQ-31B) respectively. Similar to the Meprolight M21, the quadruple magnifying Trijicon optics have a reticle illuminated by a tritium source and/or a fiber optic and therefore do not require a battery.



The Royal Marines' L403A1 carries an optical package consisting of a Vortex 1-10x patrol scope and Aimpoint Acro-P2 (MoD UK)

Compact scopes for patrol and combat

A further option is to combine a red dot sight and a compact variable rifle scope in one device. Such compact scopes with red dots in the reticle or illuminated reticles offer excellent characteristics for close range combat. In addition, they offer magnification ranges up to eight times – suitable for practical use by designated



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The British Armed Forces are procuring the Qioptic Talon Fused Weapon Sight across the board. It works as a sensor fusion device with both residual light amplifier and uncooled thermal imaging technology. (MoD UK)



The Thales Xtraim combines a reflex sight with an uncooled thermal imaging device (Jan-P. Weisswange)



The compact Andres TigIR night vision attachment, shown here in use on a light machine gun (Andres Industries)

marksmen and all this with compact dimensions and low weight. A further advantage remains common to all low magnification optics: The shooter can keep both eyes open when aiming to maintain a better situational awareness.

First examples of optics in this category include models such as the Steiner M5Xi 1-5 x 24, the Kahles K16i 1-6 x 24, the Minox ZP 1-8 x 24 or the Schmidt & Bender models 1.5-8 x 26 PM II Short Dot and the new 1-8 x 24 PM II Short Dot CC. In more recent projects, such as the British L403A1, such “patrol scopes” become standard for cross-sectional weapons, not only for designated marksman rifles. As early as 2018, the United States Marine Corps had equipped all M27 assault rifles (an HK416 variant) with the Squad Common Optic, aka Trijicon VCOG 1-8 x 28. Shortly before their M27 modernisation, in 2017, the Marines had introduced another version of the HK416 as the M38 DMR. This carries a Leupold TS-30A2 Mark 4 (2.5-8 x 36).

The German Armed Forces have equipped their G27 DMRs with either a Schmidt&Bender 1.5-6x20 rifle scope (G27P) or a Hensoldt 4x30i rifle scope with an attached Hensoldt RSA-S reflex sight. The FN SCAR DMR used by the French Army also features variable optics in the form of the Schmidt&Bender 1-8 x 24 CC PMII.

The British Royal Marines modernised the L129 Sharpshooter Rifle, which was first procured for use in Afghanistan. The L129A2 now fires 6.5 Creedmoor ammunition and can also be converted to 7.62 mm x 51 calibre. Furthermore, instead of the older Trijicon 6x48 optics, it has been fitted with a Leupold Mark 5 HD 3.6-18 x 44 variable scope and a Huxwrx XX-QD silencer. The L129A2 thus no longer serves only as a DMR, but also as a sniper support weapon.

High Performance Optics for Sniper Rifles

Snipers use high performance scopes and additional equipment. The German G28 rifle, originally procured as a DMR, comes standard with a Schmidt&Bender 3-20 x 50 PM II. This meant that it was in the league of semi-automatic sniper systems right from the start. The G210 short-range sniper rifle for special forces/military police (a HK MR308A6) uses a Schmidt & Bender 5-20 x 50 PM II Ultra Short.

For sniper missions beyond 800 metres, bolt-action rifles are still the weapon of choice, especially in the calibres .300 WinMag (7.62 mm x 67) or .338 Lapua Magnum (8.6 mm x 70). This enables the sniper team to operate at ranges of up to 1600 metres. Both calibres are represented in the German Armed Forces with the G22A2 from Accuracy International and the G29 from C.G. Haenel. Both feature the Steiner ZF 5-25 x 56 variable rifle scope with TReMoR-3 reticle. The U.S. Army chose a Leupold&Stevens Mark 5 HD 5-35 x 56 for its new multi-calibre Mk22 (Barrett MRAD). The Austrian Armed Forces, on the other hand, equipped its Steyr sniper rifle with a Kahles 6 – 24 x 56 K624i.



KSK sniper team with Steiner 5-25 x 56 rifle scope on G29 and Spotter 45/60 spotting scope (Bundeswehr)



U.S. Special Forces Sniper with MK22 sniper rifle (U.S. Army)

Cross-sectional fire control sights?

Fire control sights are already widely used on shoulder-launched weapons or crew-served weapons, such as the Hensoldt Dynahawk/ FLV 4x30 and FLV 5.5x30 or the Aimpoint FCS. In recent years, there had been several approaches for cross-sectional optics with integrated fire control computers not only for sniper rifle systems, but also for standard assault rifles. A few years ago, Steiner debuted the Intellitgent Combat Sight (ICS) 6x40. It has an integrated laser range finder and a ballistic calculator. It can store ballistic data from up to 50 cartridge

types in different calibers. The shooter measures the distance to the target and the ICS adjusts the correct aiming point for the selected ammunition. The optics are well suited for multi-caliber systems or heavy assault rifles and designated marksman rifles. Another approach is networking of different weapon optics and other sensors. Examples would be Beretta and Intellitronika with the "i-protect", Colt Canada with the "Soldier Weapon & Observer Recon Devices (SWORD)", FN Herstal with the "Target Acquisition & Situational Awareness Module (TASAM)", Meprolight with the Foresight and SIG Sauer with the Ballistic Data Exchange Packet BDX.



The Safran Electronics JIM compact weighs less than two kilograms and is procured by the German Armed Forces as a long-range thermal imaging observation device. (Safran Electronics)

Half a kilometre as standard

After completing their basic training, riflemen should be able to reliably hit man-sized targets at the infantry half-kilometre range with their standard assault rifles. Many of the assault rifles used today are equipped with magnifying optics or compact telescopic sights with variable magnification of up to eight times – known as patrol scopes.

The “designated marksman” or “sharpshooter” is known in Germany as the Zielfernrohr- or for short ZF-Schütze. In a relatively short period of time, ranging from a few days to a few weeks, those riflemen learn the skills required to fire accurately at longer ranges. They operate at the level of their subunit – usually a section, squad or platoon – and engage targets beyond the range of standard small arms. The designated marksman regained prominence in the Global War on Terror in Afghanistan in the late 2000s – and with him specialised small arms like the “(Squad) Designated Marksman Rifle (DMR, SDMR)”, “Sharpshooter Rifle” or “Enhanced Battle Rifle (EBR)”. Ideally, these rifles come from the standard small arms family. This facilitates training, operation and spare parts supply. It also makes it more difficult for the enemy to immediately identify the sniper moving with his group. DMRs usually have a larger calibre – currently 7.62 mm x 51 in the Western hemisphere – and use a relatively low magnification scope of between four and eight times. This enables a precision of one to two minutes of angle (1 MoA/minute of angle = 29.08 mm at 100 metres). This means that the sharpshooter is able to hit targets accurately at up to 600 metres and suppress them at up to 800 metres. The sniper, on the other hand, has the most extensive training. He usually operates at the level of his unit or formation and also carries out reconnaissance or fire support tasks. He combats high-value enemy targets and can operate at distances of 1500 metres and more. A sniper rifle has a minimum accuracy of one MoA. Snipers also usually operate in teams. They are assisted by a spotter who is also trained as a sniper. The sniper team also carry more complex weapons, optics and other equipment. Semi automatic sniper systems and bolt action sniper rifles systems remain the weapons of choice.

A new boost came with the U.S. Army's Next Generation Squad Weapon (NGSW) programme. The new M7 assault rifle fires a larger-calibre long-range cartridge in the form of the 6.8 mm x 51. It also features an XM157 fire control sight. This means that US Army infantrymen carry a weapon equipped with a patrol scope, an adapted fire control computer, a laser rangefinder and a silencer, with only 20 rounds in the magazine. In terms of equipment and weight, this system falls into the category of a telescopic rifle, if not a semi-automatic sniper rifle. However, it seems unlikely that this weapon concept will render snipers obsolete. Nevertheless, despite all the innovations in fire control sights, the same applies as in general for red dot and reflex sights: If technology fails, solid tools and ballistic expertise are required. Therefore it makes sense to continue to train aiming with conventional mechanical sights. These continue to serve as a makeshift solution (“Back Up Iron Sights/BUIS”).

Fight at Night

Especially on today's battlefields or operations theatres with their constantly changing lighting conditions in urban areas, but also in forest and trench warfare, night vision technology significantly increase combat effectiveness. Increasingly affordable night vision technology and ever-decreasing SWAP values mean that night vision and night combat capabilities are now the rule rather than the exception on the battlefield.

Roughly speaking, three technologies can be distinguished in today's common devices: image intensifiers, uncooled thermal imaging devices and cooled thermal imaging devices. Image intensifier and thermal imaging technology can be combined through “sensor fusion”.



The USMC's C-UAS system uses radar and electro-optical sensors to detect drone attacks at an early stage. Also involved: the human airspace scout (USMC)

This is done, for example, by the Enhanced Night Vision Goggle – Binocular (ENVG-B) from L3 Harris, which is widely used in the US armed forces. L3 Harris also offers a command module that provides additional tactical information via digital overlays.

Since 2021, the German Armed Forces have procured tens of thousands of XACT nv32 (Elbit Systems) and Mikron BNVG (Theon Sensors and Hensoldt) night vision goggles and also have other models in use, including the famous "Quad Eye" alias Ground Panoramic Night Vision Goggle (GPNVG, L3 Harris). This is already a step towards cross-sectional use.

Small arms, for example, can be made suitable for night combat by attaching night vision devices. These are mounted "in line" in front of the daytime optics. Scopes with illuminated reticles or red dots usually have several night and daylight settings. Another option is to use pure night combat optics. Red dot and reflex sights on assault rifles or pistols can also be used in conjunction with night vision goggles.

Laser and laser light modules are also among the optical and optronic attachments. Equipped with various illuminators and markers in the visible and IR spectrum, they are used to detect and identify or mark targets in poor lighting conditions or to illuminate the immediate surroundings.

Handheld reconnaissance optical equipment

Reconnaissance and surveillance of terrain sections or buildings, identifying targets or persons at long distances requires dedicated, non-weapon-mounted, extremely powerful optical equipment. The same applies to

joint fire support tasks. This equipment includes binoculars, high-magnification spotting scopes and multifunctional binoculars. The latter offer night vision capabilities in addition to daytime vision, integrated laser rangefinders and can record photos and videos. They can also be used in areas where GPS/GNSS is not available. In addition, they can be networked with C4I systems. This is intended to facilitate facial recognition, for example.

Outlook

Modern optics, rifle scopes and night vision devices make it possible not only to bring effect to the clearly identified target at an ever earlier stage and with greater accuracy. They also shorten the training time and increase effectiveness. Meanwhile, modularity is also the standard for optics an optronics. A mixture of daylight vision, image intensifier and thermal imaging technology, adapted to the respective weapons and applications, seems promising. In this way, effect and cover can be effectively combined - and any opponent can be confronted with appropriate intensity.

Despite ever lower SWaP values and increasingly affordable costs, the fundamental question remains as to which combatant really needs which optics and other attachments on which weapon. Fire control sights, for example, appear to be useful on sniper rifles or crew served weapons or shoulder-launched munitions. In contrast, a smaller optic and a laser light module should be sufficient for an assault rifle. It is also important to consider that the respective shooter must be able to operate their optics and attachments 'blind'.

Jan-Phillipp Weisswange



German Paratrooper with Smartshooter SMASH fire control sight on ZF rifle G27 (German Armed Forces)

Deployment of and countermeasures against uncrewed systems in all domains

DRONES AND DRONE DEFENCE

Drones and other unmanned/uncrewed systems are changing the nature of warfare. They are now also part of hybrid conflict. This raises the question of how they can be combated, in what environment and with what intensity.

Whether in the air, on the ground, above or below water – almost all warfare concepts include systems summarised under the collective term "UxS" (see box) in their considerations. The infantry toolbox has itself included various small and micro drones as well as the very similar "loitering munitions" for some time now. The soldier system also includes various drone defence measures.

Changing warfare

It is not only drone warfare that has developed rapidly over the last decade. The same applies to the associated unmanned or uncrewed platforms. In the "Global War on Terrorism", the focus was still on long-range precision strike capabilities. In the meantime, more and more

new combat methods and drone types have come to the forefront of military attention. Larger models – such as the Iranian Shahed 136 or its Russian version, the Geran-2 – attack strategic targets, critical infrastructure such as power plants, barracks or transport hubs, and even the civilian population from a distance of several thousand kilometres. Entire swarms are deployed to overwhelm air defences. Drones continue to be used for target reconnaissance. They direct artillery fire and observe and evaluate its effects. They can also reinforce or even lay barriers.

Larger UAVs or unmanned ground systems can evacuate the wounded, monitor dangerous terrain, bring in supplies or relieve their human comrades of further "dull, dirty, dangerous tasks". Extensive trials have been

underway in numerous armed forces for some time. The ELROB experimental series is another example.

At sea, unmanned systems have now achieved strategic successes. Ukraine, not known as a maritime power, inflicted considerable losses on the Russian Black Sea Fleet with uncrewed surface vessels. This apparently impressed the Russian Navy so much that it has since developed and tested its own concepts for unmanned naval combat systems in the Baltic Sea.

On the battlefield itself, i.e. at the tactical level, smaller aircraft are now proving their effectiveness. In Ukraine and Gaza, for example, these include first-person view (FPV) drones, which the drone operator controls from a first-person perspective thanks to real-time transmission of the camera target image. Another new weapon is loitering munitions, airborne precision munitions that can be deployed on demand. There is no doubt that at least the smaller categories of drones – similar to ammunition – are now considered consumables. According to their own statements, Ukrainian companies are now producing five-figure quantities of models such as the Bomber-Copter Vampir or the smaller Shrike every month. The Ukrainian Armed Forces now even have their own branch for unmanned systems – the Unmanned System Forces (USF). One of their most successful units is the 414 Separate Unmanned Strike Aviation System Brigade 414 "Magyar". Its commander, Brigadier General Robert "Magyar" Brovdi, explains its combat effectiveness as follows: "We make up only two per cent of the Ukrainian Armed Forces' manpower, but we account for a third of enemy losses." At the high-level "Landeuro 2025" conference in Wiesbaden in July, Brovdi advised NATO countries to urgently revise their concepts and upgrade their equipment. "What will you do when swarms of Shahed 136s appear over your cities in Europe?" He continued: "Four Ukrainian drone teams can currently turn a NATO air base into a Pearl Harbour within a quarter of an hour from a distance of ten kilometres."



The DefendTex D40 can be fired from 40 mm grenade launchers or launched by hand. It can be used for reconnaissance and combat. Flight time 30–60 minutes, maximum range 20 kilometres (MoD UK)

Other armed forces are now following suit: on 3 April 2025, the German Chief of Defence presented far-reaching procurement plans. "Drones and loitering munitions are to modern warfare what tanks were 100 years ago: a game changer," according to an accompanying statement. "Due to their impact on the battlefield, they will soon be an integral part of the armed forces, as will the protection of soldiers from such weapons. Both have the highest priority in the Bundeswehr's procurement." In November 2025, the Inspector of the Army, Lieutenant General Christian Freuding, announced plans to set up six new "medium-range batteries" by 2029, which are to be equipped with loitering munitions. The Austrian Armed Forces, for their part, want to implement drone operators in all their battalions down to platoon level. As a first step, the Austrian armed forces had already ordered 315 Magni-X reconnaissance drones in July 2025.



Many police forces have started to operate Uncrewed Aerial Systems (IM NRW)



The Black Hornet nano drone can conduct reconnaissance day and night and flies up to two kilometres. Flight time is around 25 minutes (U.S. Army)



(BMI Schacht)

“Our goal is clear: to pool expertise between the federal and state governments, develop new defence capabilities, and integrate police and military drone defence systems. [...] We are in the midst of a technological

arms race between drone threats and drone defence – in both the hybrid and military spheres.”

Alexander Dobrindt, German Federal Minister of the Interior



The Recon Robotics Scout X helps with reconnaissance in buildings (MoD UK)



The FALKE UAS in use by the German Armed Forces. (Bundeswehr)

Image change

But it is not only the Bundeswehr and other armed forces that are responding to the changes in drone warfare. The image of these devices, which were still ostracised by large sections of German politics and the public during the Afghanistan mission, has changed. In fact, unmanned systems combined with artificial intelligence are now regarded as miracle weapons in social media and in the politics and arts sections of the daily press in this country. This is helped by the fact that drone warfare always has a propaganda component. On TikTok, Twitter/X and other networks, there are numerous professionally produced videos showing successful attacks by FPV and other drones on enemy positions, vehicles and even individual soldiers. Devices costing a few hundred or thousand euros can take out weapon systems worth several million euros.

Consequently, more and more new players are currently entering the emerging security and defence industry, hoping to ride the wave of wonder weapons. Investors promise quick money for promising approaches. Panicked administrations in Brussels, Berlin and elsewhere, faced with decades of security and armament policy failures, are receptive to quick, gentle and easy solutions. According to some protagonists in the start-up industry, the press and politics, entire "drone walls" are to protect NATO's eastern flank in the future. In view of the current gold rush atmosphere, other experts in industry, the armed forces and the strategic community are warning of a new "New (War) Economy Bubble" that could burst at some point. "The desire for simple, inexpensive protection of NATO's eastern flank without the use of large military units is understandable, but drones are not a panacea," writes the German Armed Forces on its website on the occasion of its drone procurement in April 2025. "Technological development is also advancing rapidly in the field of drone defence, and drones and loitering munitions have potential disadvantages in terms of speed, armour and weather susceptibility. They are a building block for successful defence in combined arms combat. However, modern and powerful large weapons systems – tanks, artillery, combat aircraft and ships – are still necessary for credible deterrence." One thing is certain: as the market for drones and loitering munitions grows, countermeasures (Counter-UAS, C-UAS)

are becoming increasingly important. The UAS-C-UAS arms race is now advancing at least as fast as that for armour and penetrators.

Other approaches to drone defence range from mechanical obstacles such as wire mesh barriers in positions and on combat vehicles ("turtle tanks") to jammers, shotguns, fire control sights, powerful machine guns, hunting and ramming drones, and high-energy lasers. Wire-guided drones, on the other hand, can be cut down with kitchen scissors.

Drone defence

Drones are not miracle weapons in themselves. There are numerous countermeasures. Drones are relatively easy to combat because they often fly slowly and very low. The challenges lie in detecting and distinguishing small drones (mini and micro drones) and in defending against swarm attacks.

Effective drone defence first and foremost requires the networking of various sensors, effectors and other actors in all dimensions. This allows threats to be detected early, command processes to be accelerated and attacks to be repelled with appropriate intensity. After all, the proverbial shooting of sparrows with cannons can, in a civilian environment, involve higher risks than those posed by the drone itself.

Let's stay in the military sphere for now. The days when many Western armed forces in particular neglected their air defence are over. The German Army, for example, is rebuilding the army air defence corps, which was disbanded in 2011. Even their older, phased-out weapon system, the Gepard self-propelled anti-aircraft system, is considered one of the most reliable and effective Western weapon systems in Ukraine. Newer air defence systems currently being introduced combine effective sensors and several types of effectors.

These include, first and foremost, cannon-based air defence. A cannon-based drone defence system is an effective means of defending against drones at close range – i.e. up to a distance of around four kilometres – in terms of cost-benefit, efficiency and reliability. Numerous European countries rely on systems such as the Skyranger 30 and Skyranger 35, as well as Skynex from Rheinmetall. Skyranger is the mobile version of Rheinmetall's drone defence system. Skynex is a system comparable to Skyranger, but is "remote-controlled", i.e. it is not self-propelled. It is transported to its deployment location by truck. In connection with the European Sky Shield Initiative, several countries have already placed significant orders for air and drone defence systems.

The Skyranger 30 is a highly mobile hybrid air defence system that combines a cannon and guided missi-



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US Marines unload supplies from a Tactical Resupply-UAS resupply drone. (USMC)

Uncrewed systems – on land, at sea and in the air

Unmanned/uncrewed systems are collectively referred to as UxS. The U stands for unmanned or, more advanced, uncrewed. The small x is replaced by the abbreviation for the respective domain in which the platform operates. G stands for "ground", A for "air" (currently the most extensive portfolio) and S for "surface" (water surface, which can refer to both seas and inland waters). Finally, the "S" at the end stands for "system". The "S" is replaced by a "V" for "vehicle" or "vessel" when referring only to the drone itself as a remote-controlled component of the system.



The US Army is testing various UGVs as part of its Small Multi-Purpose Equipment Transport (S-MET) Vehicle programme. The robot dog is primarily used for reconnaissance (US Army)

NATO distinguishes between drones (unmanned aerial vehicles) as follows:

Class	Category	Normal operational level	Normal Operating altitude	Normal operational radius	Supported Troop leader	Example
Class I < 150 kg	Micro (< 2 kg)	Tactical sub-unit	Up to 200 ft (LOS) AGL	Up to 5 km (LOS)	Platoon, group	Black Hornet, MIKADO
	Mini (< 15 kg)	Tactical sub-unit	Up to 3,000 ft AGL	Up to 25 km (LOS)	Platoon, squadron Company	Skylark, FALKE (Vector)
	Small (> 15 kg)	Tactical unit	Up to 5,000 ft AGL	50 km (LOS)	Battalion, regiment	Scan Eagle, HUSAR
Class II (150 – 600 kg)		Tactical unit	Up to 18,000 ft AGL	200 km (LOS)	Brigade, Division	Watch-keeper
Class III (> 600 kg)	MALE	Operational/ area	Up to 45,000 ft MSL	Unlimited (BLOS)	Joint Task Force	Heron TP, Predator
	HALE	Strategic/ National	Up to 65,000 ft MSL	Unlimited (BLOS)	Commander in the operational area	Global Hawk
	Strike	Strategic/ National	Up to 65,000 ft MSL	Unlimited (BLOS)	Commander in the operational area	Reaper

1 foot (ft) = 30.48 cm
 HALE = High Altitude Long Endurance
 MALE = Medium Altitude Long Endurance
 AGL = Above Ground Level

LOS = Line of Sight
 BLOS = Beyond Line of Sight
 MSL = Mean Sea Level

les. Using airburst ammunition ("AHEAD technology", programmable detonation time before the target), the system is particularly effective against small unmanned targets such as drones. While the cannon offers advantages at short ranges, the integrated guided missile can be used to increase the range. As a networked and mobile system, a Skyranger battery is also easily capable of combating a swarm of drones, thus avoiding a "saturation effect" with a large number of drones.

The German Armed Forces have already received a Boxer Skyranger 30 as a test model. It is soon to be equipped with MBDA's DefendAir surface-to-air missile. This is designed to be suitable for defending against small and micro drones and has the ability to engage multiple targets simultaneously. Further Skyranger 30s will be delivered to various customers from mid-2026. Orders have been placed so far by Austria, Denmark, Germany and Hungary. Ukraine received the Skyranger 35, a pure cannon-based system with a larger calibre cannon (35 mm instead of 30 mm).

Below cannon-based air defence and guided missiles, jammers are among the most widely used means of drone defence – both in the military and, above all, in the civilian sector. They interrupt communication between the drone and the drone pilot. The aircraft can then either be brought down to land or "taken over".



The UGV from German start-up ARX Robotics can carry various payloads, shown here in a reconnaissance version. (ARX Robotics)

Another approach is to use shotguns. From the outset, this type of weapon has been used for hunting or sport against fast-moving aerial targets. In addition, shot loses speed and energy quickly, which makes it suitable for use in urban environments. Manufacturers such as Benelli and Fabarm have recently presented such approaches, and Norma has also developed a drone defence shotgun cartridge.



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**MITTLER
REPORT**



The Nerod RF drone fist from French manufacturer MC2 (distributed in Germany by Teuto Defence) is one of the most widely used jamming systems of its kind. (Jan-P. Weisswange)



Man-portable GNSS spoofing transmitters deceive drones by transmitting false satellite signals and position data (Jan-P. Weisswange)

Machine guns have also been used for anti-aircraft defence since time immemorial. Weapons with a higher rate of fire are important here – for example, the MG3 or the Dillon M-134 multi-barrel Gatling gun, which is equipped as the MG6 in the German Armed Forces. Some ammunition manufacturers, including RWS, have already introduced various types of cartridges for drone defence, which are designed to facilitate use in civilian environments. Fire control sights such as the SMASH from Smartshooter enable targeted single shots at drones. Drones can also be defended against from the air – for example, by hunter or ram drones. Experiments with trained birds of prey have also been conducted. Laser weapon systems require only electrical energy to operate. A laser weapon system can be used as long as electricity is available. Lasers can engage particularly small and agile targets that are difficult to hit with conventional ammunition. Because a laser weapon system only "fires" photons, any collateral damage during deployment, e.g. in urban areas, is very low. In addition, the costs ("cost per engagement") are relatively low.

Conclusions for the individual soldier

What does this arms race involving drones and drone defence mean for individual soldiers and law enforcement officers? There is consensus that unmanned systems are here to stay. More and more of them, but not all, will complement the infantry's toolbox and enhance the reconnaissance capabilities, survivability, connectivity, assertiveness and effectiveness of individual combatants. Individual soldiers will increasingly rarely have to keep drone logs or even prove their medical fitness to fly in order to operate them. Conversely, individual soldiers and LEOs must be familiar with the principles of operation and capabilities of unmanned systems and take them into account in their operational planning and execution. Only in this way can they protect themselves from their effects on the battlefield. Even if our robotic comrades eventually take on a completely humanoid form, human intelligence and creativity will continue to be essential.

Jan-Phillipp Weisswange



Versatile vehicles for tactical operations

MANY ROLES

“Death before dismount” is an old saying in the cavalry. Numerous tactical vehicles in different categories are available for complex police operations and military missions.

The Bundeswehr's new airborne vehicle can also carry an electric motorcycle (Bundeswehr)

Tactical vehicles for police and military applications can be roughly divided into three categories: light, medium and heavy. This classification follows the newly created force categories of the German Army (see box on page 61). The following discussion focuses primarily on the light category. This category can be further subdivided. The spectrum ranges from bicycles to small tactical vehicles to patrol vehicles. The latter category also includes most of the police's specially protected tactical vehicles.

Small tactical vehicles – fast, powerful and simple

Small tactical vehicles (STV, in German Taktische Kleinfahrzeuge TKF) weigh up to one tonne and have at least two axles. They are mainly used to transport personnel and equipment quickly over difficult terrain. These small vehicles can also be configured as sensor or weapon carriers. This versatility opens up a number of possible applications for STVs: reconnaissance patrols, assault, courier and reporting trips, casualty evacuation or surveillance tasks to protect rear areas – to name but a few. The protection of such platforms is largely limited to the personal protective equipment worn by the crews. Ne-

vertheless, high mobility undoubtedly also contributes to the overall protection concept – even if, in times of FPV drones on the battlefield, fast-moving platforms are increasingly under threat.

The high mobility of STVs applies both actively and passively. Not only are the platforms themselves highly mobile, they are also relatively easy to transport. Due to their small dimensions and low weight, STVs can be transported by air: A medium transport helicopter such as the CH-53 or CH-47 can usually carry two or even more STVs. This means that they can be transported quickly by fixed-wing and rotary-wing aircraft, together with their crews and in conjunction with their sub-units and units. Ideally, they can begin their mission directly from the aircraft.

If a STV fails and has to be abandoned, it is relatively easy to render it permanently unusable. And even if this is not the case, the enemy does not capture any high technology. Compared to other large equipment, replacements are inexpensive.

The STV category includes, for example, all-terrain vehicles (ATVs), snowmobiles (Ski-Doos) and light tactical off-road vehicles such as the widely used Polaris MRZR, which is used by the US armed forces as the L-ATV.

Airborne platforms and light reconnaissance and combat vehicles

Above the STV is the class of tactical medium-class vehicles (TMV, Taktische Mittelklassefahrzeuge, TMF). These vehicles also offer only minimal protection and weigh between one and 4 tonnes. Most of them are airborne vehicles or light reconnaissance and combat vehicles. They usually have room for a crew of three to four and can carry heavier weapons such as grenade machine guns, heavy machine guns, automatic cannons or guided missile systems. The vehicles are air-transportable and usually also air-loadable. Prominent examples include the Ground Mobility Vehicle 1.1 used by US Special Forces, the Caracal procured by the German and Dutch armed forces as an "airborne platform". The Defenture Mommoth, which is currently being introduced as the "Aufklärungs- und Gefechtsfahrzeug 2" (reconnaissance and combat vehicle) by

the German Army's special forces, weighs around 8,800 kilograms, which puts it in the next higher class of patrol vehicles in terms of weight.

Patrol vehicles

In contrast to the aforementioned categories, patrol vehicles offer a relatively high level of protection against small arms fire, ballistic threats, IEDs and mines. Originally designed as light reconnaissance vehicles, this class of vehicle gained considerable importance after the end of the Cold War in stabilisation missions abroad. The patrol vehicles are in the weight class between four and ten tonnes, with larger and heavier variants weighing up to 16 tonnes. In the German Armed Forces, for example, class 2 and 3 "protected command and function vehicles (Geschützte Führungs- und Funktionsfahrzeuge/GFF)" fall into this category. Despite their high level of protection, patrol vehicles can reach



German mountain infantryman on a Ski-Doo during an exercise in Arctic terrain (Bundeswehr/ Carl Schulze)



GSG9 operators on motorcycles (Bundespolizeidirektion 11)

relatively high speeds of around 100 km/h on the road and are also highly manoeuvrable off-road. They can accommodate at least four people. They can also carry heavy weaponry or other equipment.

Well-known examples of this vehicle category are the MOWAG/GDELS Eagle family, the ACS Enok, the Iveco Defence Vehicles LMV and the Oshkosh Joint Light Tactical Vehicle. The KNDS Dingo family is also widely used; in the German Armed Forces, it falls into the GFF3 class, which is at the upper end of the patrol vehicle category.

Police armoured vehicles

The police in Germany are among the oldest users of armoured vehicles. Visitors to the Panzermuseum in Munster can see one of the oldest vehicles of its kind on display there. The "Schupo-Sonderwagen", a Daimler DZVR 21, dates back to the Weimar Republic. During this period, the police officers of the time found themselves caught between all fronts in turbulent times, sometimes marked by street fighting. This required robust equipment. The latest attempts by today's law enforcement officers to procure a new generation of specially protected vehicles are therefore met with scepticism by some concerned citizens. A few fear that the police are preparing to quell popular uprisings. However, those who harbour such concerns are mostly those who are less concerned with armoured steel than with aluminium – as a material for their hats.

Special armoured vehicles have been part of standard police equipment for decades. Since the 1970s, the Sonderwagen 4 has shaped the appearance of armoured police vehicles in Germany. The vehicles, known as SW4 for short, are currently still in service, primarily with the technical units of the federal and state riot police. These units also have water cannons in their inventory, which are often used in conjunction with the armoured vehicles. The primary purpose of the armoured vehicle is to clear barricades, transport forces to dangerous operations and evacuate endangered persons from danger zones. The Bundespolizei (German Federal Police) also use the SW4 at airports to secure endangered areas or aircraft. It has now been partially replaced by more modern models, such as the MOWAG/GDELS Eagle IV or the ACS Enok 6.1. In addition, the SW4 is to be replaced on a large scale, as it is slowly reaching the end of its service life and is no longer quite up to date in terms of motorisation, protection level and ergonomics. A successor generation to the SW4 has been in preparation for several years. In addition to the vehicles mentioned above, some police authorities have also procured models such as the Achleitner HMV Survivor or the Survivor R from Rheinmetall MAN Military Vehicles.

Special armoured vehicles have also come into focus for federal and state procurement authorities due to additional tasks and the changed terrorist threat landscape. It should be mentioned in passing that such vehicles, with their relatively inconspicuous appearance, have always been used for close protection. In this form – hardly distinguishable from civilian cars – they can conceal their



Rheinmetall's modular Ermine family currently consists of an Unmanned Ground Vehicle (UGV), a side-by-side buggy and a quad. Various 4x4 and 6x6 variants are available. All vehicles are based on the same diesel-electric hybrid drivetrain and base platform. Hermine small vehicle can be configured as an ATV or a buggy (Rheinmetall)



German Air Force Combat Rescuemen on Polaris MRazer (Bundeswehr)



Enok 6.2 from the Bavarian state police (Polizeipräsidium Mittelfranken)



Defenure Mammoth (Jan-Phillipp Weisswange)



The Iveco LMV is fielded by the Austrian Bundesheer as Husar (Bundesheer)

own approach or even presence during special operations. Specialist companies such as Armoured Car Services (ACS), the Frankfurt-based Friederichs Fahrzeugbau, PSV-Shield, Stoof International, Welp Armouring and many others leave nothing to be desired in this regard. Police forces must adapt to new types of terrorist threats not only at home, which require a higher level of protection, greater off-road capability and better effectiveness.

One aspect remains to be noted: experience from the terrorist attacks in Paris and London shows that even smaller, normal patrol cars can hardly make their way through the traffic chaos caused by panic – even in daily rush hour traffic, some cities already experience traffic jams stretching for kilometres. Motorcycles therefore represent one approach to quickly deploying robust forces with personal ballistic protection equipment and weaponry appropriate to the threat. The Counter Terrorism Specialist Firearms Officers (CTSFOs) of the London Metropolitan Police, for example, can reach the scene of an incident on BMW F 800 GS motorcycles. The

two-cylinder four-stroke engine delivers 85 hp and a top speed of 204 km/h. The German Federal Police's counter terrorism formation GSG9 also has this specialisation. If necessary, motorcycles can even be partially armoured or equipped with removable protective shields for subsequent intervention. Possible solutions for this have been developed, for example, by Universal Shield and the Swabian protection specialist BSST GmbH.

Combat vehicles for medium military forces

In the German Armed Forces, class GFF4 follows class GFF3, which primarily includes the Boxer armoured transport vehicle. This is the main weapon system of the German Army's new medium forces. Medium forces are intended to be "a completely new element [...] with wheeled, highly mobile units that can be deployed quickly and without long preparation times throughout NATO's European area of operations." The German Army is thus adopting a concept that other NATO partners have been familiar with for some time. Due to



Main battle tanks and infantry fighting vehicles – here the Leopard 2 A7 and Puma – complement each other in combat (Bundeswehr)



The Schakal wheeled IFV carries an unmanned turret derived from the Puma IFV with a 30 mm MK30-2/ABM automatic cannon. (KNDS Germany)



The new Luchs 2 reconnaissance armoured vehicle is equipped with a 25 mm automatic cannon, with Ceretron from Hensoldt serving as the central mission system. (GDELS)

their geography, the Italian armed forces, for example, needed mechanised forces that could be deployed quickly and move along the country's extensive coastal borders to repel amphibious attacks, for example. This led, among other things, to the "Centaurus" wheeled armoured vehicle. In the 2000s, the U.S. Army established rapidly deployable brigade combat teams whose main weapon system gave them their name: the Stryker Brigade Combat Teams use a variety of variants of the 8x8 Stryker wheeled armoured vehicle, which is based on the GDELS Piranha III.

As mentioned above, the main system of the German medium forces is the GTK Boxer armoured transport vehicle, distributed by ARTEC GmbH, a joint venture between KNDS and Rheinmetall. Thanks to its modular design, consisting of a drive module and a function module, the Boxer can be configured for a wide range of functions. Initially, the German Armed Forces had four variants at its disposal: infantry section armoured personnel carrier, mobile command post vehicle, heavy protected ambulance and driving school vehicle. Further versions have already been ordered: the Schwere Waffenträger Infanterie (heavy infantry weapon carrier; a direct fire support vehicle with a manned turret and 30 mm automatic cannon MK30/2 ABM), the "Schakal" wheeled infantry fighting vehicle (IFV) with the unmanned turret of the Puma IFV equipped also with the MK30/2 ABM, the Skyranger 30 self-propelled anti-aircraft system and the RCH155 wheeled howitzer. Furthermore, the Luchs 2 will complement the portfolio as a new generation armoured reconnaissance vehicle. However, this is based on a 6x6 Piranha from GDELS. The German Army intends to continue procuring wheeled mortar systems, armoured transport vehicles, wheeled engineer capabilities and other wheeled systems in all branches of the armed forces so that the medium forces can achieve their full operational value. The medium forces are thus taking on the role of "innovation drivers" not only in conceptual terms, but also in material terms.

Armour – heavy combat vehicles

Heavy combat vehicles include main battle tanks (MBTs) and infantry fighting vehicle (IFVs). These are mobile on tracks and have very high off-road capabilities and a high level of protection. MBTs can use their main armament to engage enemy main battle tanks and combat vehicles at long ranges. Infantry fighting vehicles usually have medium-calibre cannons and anti-tank guided missiles as their main armament. The grenadiers in the rear of the combat compartment can fight both from the vehicle and dismounted. Current developments in the field of heavy combat vehicles are primarily aimed at heavier armament with longer range and higher penetrating power, better digitalization, C4I, and networking, integration of uncrewed subsystems, human-machine-teaming, and new protection technologies against ballistic and drone threats.

Jan-Phillipp Weisswange

Force categories of the German Army

For the Bundeswehr, national and alliance defence today means that NATO's eastern flank is no longer located in the middle of its own country, but that the areas of operation are located over a thousand kilometres to the east in the Baltic States. As a result, the German Army will field three force categories in future. These include light forces, primarily infantry such as light infantry (Jäger), paratroopers and mountain troops. They can be deployed quickly over long distances, especially by strategic air transport. This makes them the "first responders" in crisis areas or during evacuation operations. However, they do not have sufficient endurance to fight armoured or mechanised opponents. This would primarily be the task of the heavy forces, which mainly consist of armour and mechanised infantry troops. With their Leopard 2 MBTs and Puma IFVs, they have high firepower and protection. On the other hand, they can only be moved slowly over long distances. The new medium forces are intended to bridge this gap between the light and heavy forces.

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Mehler Protection bets on “SCILT” against drones

CLOSE-IN VEHICLE PROTECTION

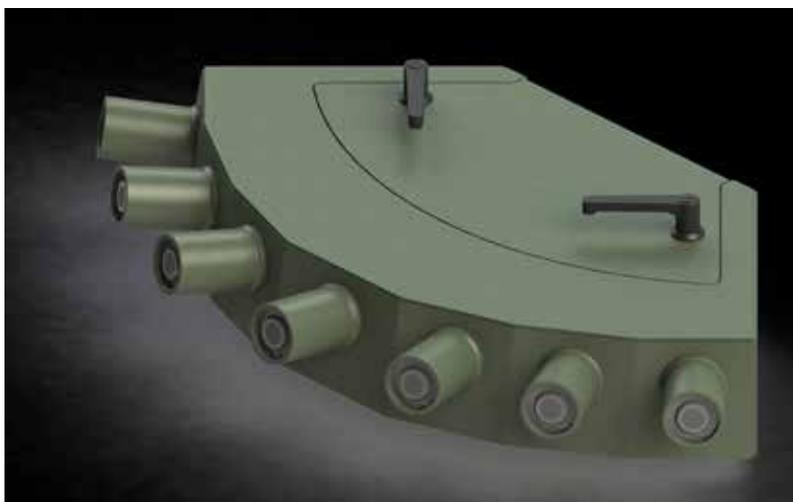
Drones now strike ground vehicles from extremely short range – often from a ditch, at the last moment. Mehler Protection is developing “SCILT”, a stand-off close-range protection system combining sensors, staged alert levels and effector modules. Its public debut is planned for Enforce Tac 2026 in Nuremberg.

Uncrewed Aerial Systems (UAS) – commonly known as “drones” have long ceased to attack vehicles only from above. They wait in the terrain, pop up at the last moment and hit where conventional air defence cannot pivot in time. In Königslutter, Mehler Protection is developing a stand-off close-range protection system that brings together effector modules, sensors and the engagement logic directly on the vehicle. Its first public appearance is planned for Enforce Tac in Nuremberg 2026 – built around a concept that deliberately prioritises robust operation and scalability.

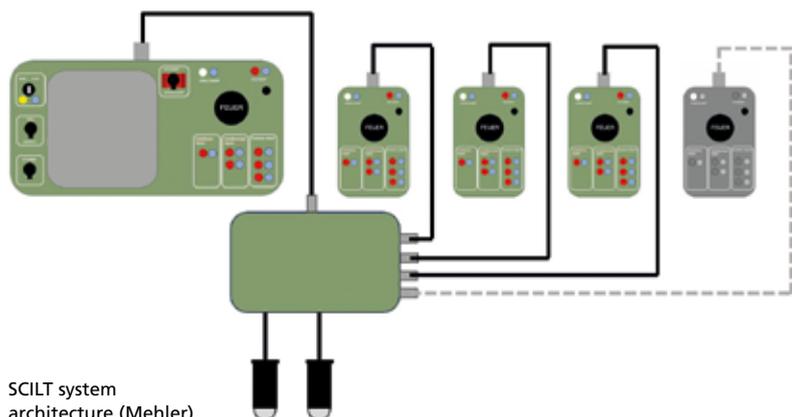
“At first, it was a classic attack from the upper sector,” says Christian Vahldiek, Managing Director Platform Armor at Mehler Protection. Vahldiek is a mechanical engineer and has been with the company for 16 years; he has worked in the defence sector since 2005. At the Königslutter site he is responsible for platform protection – deeply versed in the subject, unflappable in tone, and close to shop-floor reality, manufacturing and certification. “Now they park the things in the grass, in the ditch, and then they rise ten metres behind the vehicle,” the 49-year-old family man adds. The threat thus shifts from the vertical into the immediate vicinity: drones no longer come only from above, but from the flank and rear – sometimes very low, emerging from the terrain. Anyone who takes this attack geometry seriously arrives at a simple conclusion: protection must not only work “upwards”, but all-round – and it has to be available when the drone is already right on top of you.

“Not everyone has a Skyranger 30 in the platoon”

Anyone talking about Counter-UAS protection for ground vehicles quickly ends up with mobile air defence: programmable ammunition, radar, networked sensors, sometimes complemented by missiles. Yet Vahldiek points to a gap that becomes visible in practice faster



The SCILT effector modules for the front and the sides. (Mehler)



SCILT system architecture (Mehler)



The proof plate shows the fragmentation density of the effectors (Mehler)

than in concept papers: “Not everyone has a Skyranger 30 in the platoon. We probably won’t be able to procure that many.” The classic principle of “accompanying air defence” made sense against aircraft, he says. “But with drones, we have a huge problem.”

The reason is not only the drone as a technical object, but the way it is employed: mass, angles, proximity. For some detection and engagement chains, this becomes a saturation issue. Vahldiek puts it bluntly: “In terms of detection density, with even a low number of targets it’s basically over – then you go into saturation.” At the same time, he observes, countermeasures do not cover all approach angles that have become reality on the battlefield. And that hits especially those platforms that are not permanently moving under the umbrella of accompanying air defence.

Market snapshot: many building blocks – and a “last layer”

The counter-UAS market now offers a broad toolkit: from signals intelligence and jamming through EO/IR sensor suites to self-propelled anti-aircraft gun solutions and modular end-to-end systems. Soft-kill can work if the drone depends on radio links or navigation. Kinetic solutions – guns with airburst, interceptors or even directed-energy approaches – address the desired effect more directly but are often designed for unit/area defence rather than as the “last protective layer” for every single vehicle. That last layer is precisely what Mehler aims at with “SCILT”. Vahldiek describes the system in the imagery of layered air defence: “If you look at it as multi-layer air defence, this is the epidermis of the onion.” His point is deliberately vivid: “The Skyranger won’t be able to do anything if the drone pops up five metres behind the vehicle from a ditch. No chance.” This is less a dismissal of existing systems than a description of the situation: the attack happens at the last moment, in the immediate close-in envelope – where an outer defensive layer runs up against physical and temporal limits.

Platform protection is everyday business – just barely noticed

Vahldiek explains Mehler Protection’s move into an active close-range protection solution by pointing to the company’s Platform Protection DNA. The portfolio, he says, has been present for years across air, sea and land – often in daily use without users even noticing the manufacturer. As an example, he cites protection solutions for the Bell UH-1D in operational contexts such as Kosovo – technology shaped by concrete in-service requirements. As a more recent major project he points to the German Federal Police: “In the last three years we have re-equipped the entire Federal Police Super Puma fleet with ballistic protection.” The Transall is also emblematic of how invisible many protection solutions are. Fragment-protection mats on the sides were simply “there” in day-to-day use – functional but rarely discussed as a separate protection technology. Vahldiek puts it into perspective: platform protection often works in the background; users perceive it as part of the platform, not as a standalone capability.

“Main supplier to the German Navy”

In the naval domain Vahldiek is confident: “We can say with pride that we are the main supplier to the German Navy for almost all seagoing platforms currently under construction. Whether it’s K130, FD424, F126 – everything comes from Mehler.” This does not mean “the whole ship”, but specific, ship-typical protection areas: exposed crew positions, and zones that “can lead to a unit kill” if hit – areas with large quantities of explosives, missiles or torpedoes.

His description of the protection logic is matter of fact: define the threats, stop what can be stopped passively, and then think further where a hit cannot be prevented.

“We assume an impact. What we do is reduce the effects inside the ship, limit fragment development to sections, in order to increase the ship’s survivability.”

At first glance, that seems far removed from counter-drone protection on a ground vehicle – until Vahldiek sketches a scene that brings the idea back to the immediate close-in range: in the dark, a small, hard-to-detect underwater drone appears right next to the ship’s hull – so close that there is barely any time between detection and action. He transfers that logic to ground vehicles: the problem is not the wide airspace, but the last moment in the immediate vicinity.

“SCILT”, the “somewhat sharper smoke-grenade launcher”

The working title for Mehler’s solution is “SCILT” (editor’s note: an Old High German form of “shield”). Vahldiek explains it with a comparison that sticks: “In the end, it’s a somewhat sharper smoke-grenade launcher.” Internally, he says, the system was at times carried under the tongue-in-cheek working name “Stabil fog generator”.

“Simple” here does not mean simplistic, but deliberately low-barrier: integrable, retrofit-ready, affordable to operate – and therefore feasible at scale. Development took about a year and a half; internal development costs are described by the company as a high six-figure amount. The first version is planned to be available from summer, as an effector package with sensor kits and trigger units that can be integrated into different vehicle configurations.

When it comes to specific ranges, Vahldiek is deliberately restrained. He provides neither detection ranges nor effective engagement distances, speaking consistently instead of close and very close range. For him, brochure numbers matter less than a reproducible effect under operational conditions.

Vehicle data bus, remote units, three alert levels

For integration, Vahldiek focuses on a straightforward approach: the effector modules are controlled via a vehicle data bus – “that can also be integrated into existing systems.” Where vehicles lack such interfaces, the system is intended to work as a self-contained package: with its own close-range surveillance and a trigger chain that directly cues the modules.

He does not think of the engagement logic as “one box, one button”, but as a distributed system: “I have remote units that can be installed at various positions in the vehicle and that allow the overall system to be triggered from anywhere inside the vehicle.” The operator is guided through escalation stages: first detection, then a closing-in assessment, and finally the moment when triggering is recommended. Vahldiek describes these as a “detection alert”, a “closing alert” and a “trigger alert” – a gradual tightening of the situation until the critical point is reached.

What happens then, he puts deliberately plainly: “Ammunition is blown into the air. Right. That’s exactly it.”

And he justifies the concept with a sentence immediately understood by soldiers: “More is more. I say that quite deliberately. It’s not just one drone that attacks.” In his depiction, the standard case is not a single threat but several – hence the need to saturate the immediate surroundings with effect in an instant.

Ammunition and engagement envelopes: “controlling hazard areas”

The most sensitive aspect of any stand-off active solution is not only the effect outward, but the effect in the immediate surroundings: accompanying troops, dismounted infantry, convoy movement, urban terrain. Vahldiek explicitly uses this as an argument for “SCILT”. He compares it with classic stand-off active systems where each shot can be extremely expensive: “Per shot – six-figure amounts. Even if I intercept an anti-tank missile – that’s crazy.” With drones, the implicit message is clear: the cost and ammunition curves become unsustainable when scaled.

At the same time, he points to the need to manage self-hazard: “You have to talk openly about it – the issue of self-risk, your own troops in the vicinity.” This is where his ammunition logic comes in: “With the ammunition used, it is possible to take that into account.” His core point: “With the type of ammunition I load here, I am able to control hazard areas.”

Then he gets specific: “In the end, it’s a shotgun calibre we use here – commercially available ammunition, starting with rubber projectiles, up to hardened-core ammunition, tungsten-carbide fragments and armour-piercing variants that can be fired.” That spectrum runs from non-lethal options to hard target effect – allowing deliberate configuration depending on the scenario.

The consequence, however, is this: if you want to control effect, you must also control direction. Vahldiek describes a sector logic: “I can switch sectors off.” In a convoy, for example, you can deactivate the front and rear sectors and be “protected only on the side”. This allows the system to be tailored to movement and formation.

Angles, configuration, “lateral sectors”

How the system is mounted and where it is intended to act is, for Vahldiek, not an aesthetic question but a direct consequence of observed attack patterns. He describes different configurations with components that cover different directions depending on installation. And he explicitly relativises the classic “from above” reflex: what matters today, he says, are primarily lateral approach directions – partly frontal as well – because they dominated the scenarios of recent months.

That ties directly back to his opening observation: drones no longer “orbit overhead” but surge out of the terrain from rear and flank aspects. For “SCILT” that means not a simple “roof solution”, but an arrangement that covers the dominant approach sectors – and crucially, addresses downward/low-angle trajectories into the ground-level envelope in the first place.



Testing external ballistics and terminal ballistics. (Mehler)

48 test campaigns and the “sweet spot”

To underpin the effect rather than merely claim it, Mehler measured the system in a broad test series. “We ran a total of 48 test campaigns,” says Vahldiek. These included external ballistics and terminal ballistics, temperature behaviour and trigger reliability – right down to electromagnetic ignition and firing-pin safeties.

In addition, the team worked on the technical optimum between barrel length and residual energy – ensuring that sufficient effect still arrives at the target. The takeaway from this testing: what matters is not brochure figures, but a stable, repeatable effect under varying conditions. Vahldiek explains the effect via measurement series on fragment density: “Fragment-density investigations using standard targets.” Plates were used to record coverage and distribution. On ammunition, he cites magnum buckshot with 3.6-millimetre pellets as an example and refers to variants using steel as well as tungsten carbide to increase target effect.

Decisive, he says, is the correct distance: “There is always a sweet spot where I have maximum fragment density and distribution.” The trigger recommendation is geared precisely to that – cueing the operator to the moment when fragment density in the target will be highest.

“Man in the loop” and the next stage

In its first version, “SCILT” remains deliberately “man in the loop”. Vahldiek describes a staged logic with three alert levels: first a target is detected, then assessed as closing, and only in the third stage does the system focus on the trigger moment. The aim is not to bombard the operator with constant stress signals, but to build situational awareness early and enable a clear decision at the end.

For the next development stage, Vahldiek signals more automation – while pointing to the key risk: misclassification. Autonomous systems must reliably distinguish between a drone, a bird and other objects. That is why the human decision remains central for now; more autonomy is planned as a development path once technology, procedures and approval processes support it.

Customer, context, expectations

In platform protection, Mehler Protection traditionally works closely with prime contractors and delivers components to military technical delivery standards – from bonded window frames and automated welded assemblies to doors, hatches and spall liners. In customer terms, Vahldiek is clear: the Bundeswehr and governmental end users are the decisive reference. “SCILT” is thus not conceived as a “gadget”, but as an add-on for self-protection system for users who must send vehicles into an environment where drones have become the new normal.

The final assessment remains sober: “SCILT” is not meant to replace mobile air defence, nor to promise miracles. It addresses the moment when the drone is already “there” – in the ditch, behind the column, in the immediate close-in envelope. Vahldiek frames the goal for the troops as a “meaningful addition to existing systems” and a solution “for all non-combat vehicles” that have become valuable targets as well. He ends on a personal note: “My greatest wish is to deliver real benefit to the soldiers who need it.”

Jürgen Fischer,
Freelance Editor-in-Chief of
Europäische Sicherheit & Technik (ES&T).



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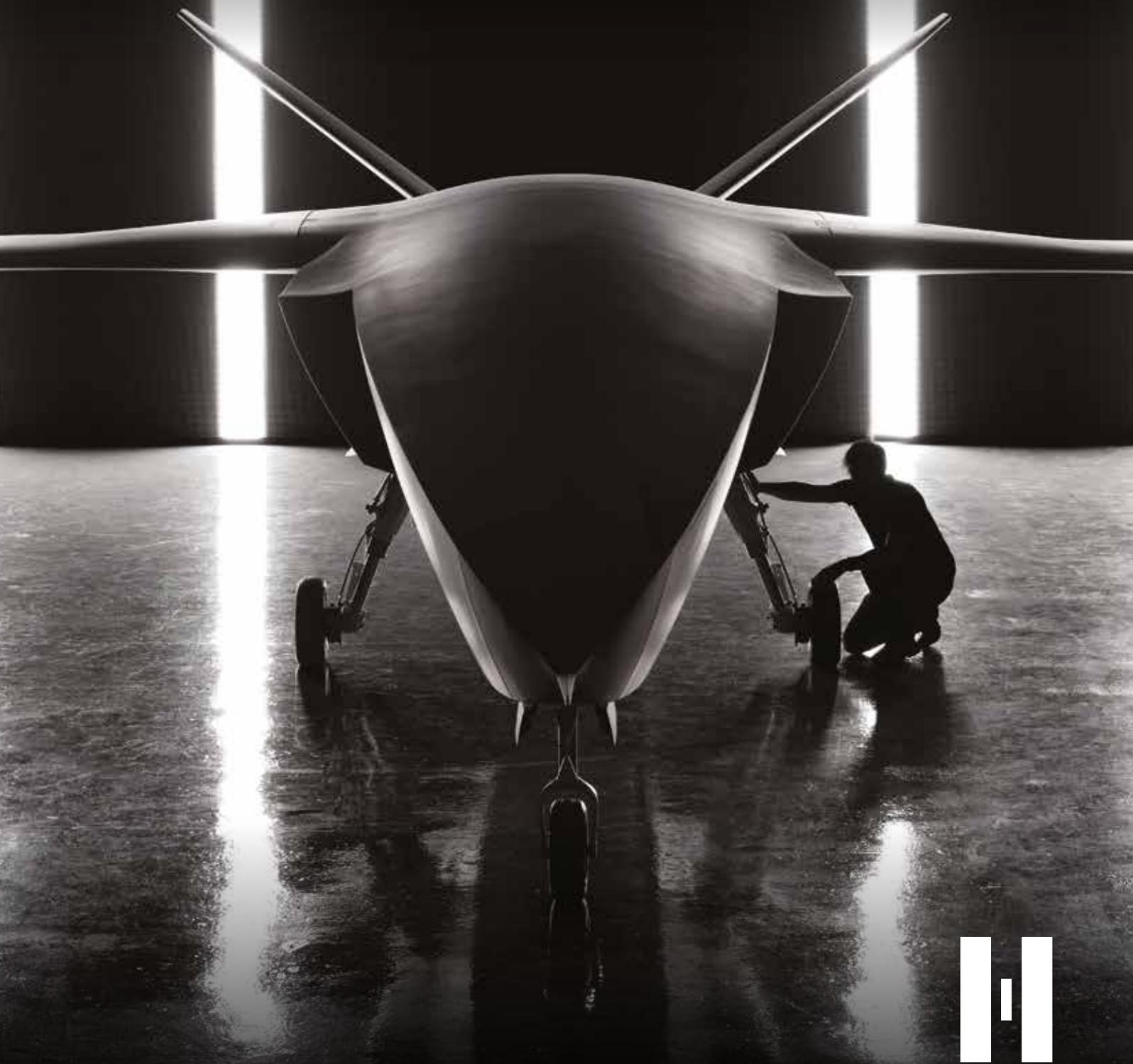
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