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Innovation in Defense

New Horizons on the Defense Agenda

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EXECUTIVE SUMMARY

Innovation should be at the top of the defense agenda. Significant changes have taken place not only in the national and international security context, from cold war military postures to a much more complex and less predictable security situation. The sophistication of operations has also dramatically increased, and new technologies are enabling new ways of conducting military operations at an accelerating speed.

At the same time, the historically evolved complexity of defense organizations is hampering the ability of armed forces to effectively respond as quickly as required. The answer can no longer be the adjustment of individual bits and pieces. Armed forces must increasingly develop and incorporate the ability to innovate. Beyond transformation, this means embracing inevitable change and leveraging the full potential of doing things differently. Only then will armed forces be able to master the new paradigm of defense and the ongoing changes in the security context.

The following five dimensions of innovation in defense have to be considered:

BEST TALENT. The foundation for all armed forces is their people. Defense organizations have to promote and retain top performers in large numbers. Thus, armed forces are required to conduct strategic, more dynamic workforce planning, implement comprehensive military talent management (e.g., compelling career paths), and develop qualification approaches that offer a real advantage over other employers competing for the best talents and ensure superior capabilities for mission deployment.

SUPERIOR EQUIPMENT. Acquisition of military equipment often overruns initially projected costs and timelines and at the same time fails to meet the defined requirements. Armed forces need to strengthen their joint capability planning processes and reach for performance excellence in their procurement operating model. They should also address often neglected und underfinanced maintenance and logistics aspects to ensure an efficient sustainment of weapon systems and operations as well as the best value for money for the whole equipment life cycle.

DEFENSE 4.0. Digitalization has become a reality also for armed forces. Effective command, control, communication, and information are key enablers for military success. Armed forces should aim for superior technologies on an integrated and consolidated information and communication technology (ICT) platform. Digital and cyber have become must-have capabilities that necessitate significant investments in organization and people.

NEW DEFENSE MANAGEMENT. Defense management is still primarily concerned about budget and its utilization, employing mainly conventional public-sector tools. However, to really drive top performance and efficiency, full transparency on both cost and output is essential. And a number of best practices from the private sector, from lean to the optimization of organizational levels, can create significantly more effective and efficient organizations.

FOCUS ON THE CORE. Today, no country can ensure security on its own and armed forces are increasingly dependent on partnerships, cooperation, and additional capabilities of other players. Therefore, armed forces need to establish effective joint operating models to enable seamless cooperation on a national and international level as well as with civilian players. Focusing on the core will also be driven by proactive industry strategies to effectively leverage industry expertise and develop defense suppliers into an ecosystem of partners.

Many examples across the world show that innovation is possible. But fundamental transformation is needed, so innovation is not a one-off task, but rather fully embedded in the organization, processes, and mindset of armed forces. Therefore, defense leaders should aim high, set ambitious goals, and empower their people and organizations to reach new horizons through innovation. To promote an open and informed debate, we share our perspectives and experiences in this report.

INNOVATION IS THE NEW paradigm in defense. The need for the strategic modernization of armed forces is at an all-time high. Marked changes have taken place, not only in terms of national and international security but also in terms of new technological developments and the sophistication of operations over the past years. We live in times of considerable uncertainty, highly volatile security, and conflict patterns, as well as new, emerging threats with potentially high impact on national security and stability. Today's armed forces are confronted with increasing complexity driven by several converging factors. The time for gradual adjustments to changing security situations, technological advancements, and workforce structures is over.

The range and nature of security challenges have changed significantly over the last more than two decades since the end of the Cold War. Nontraditional threats like international terrorism and asymmetric warfare have emerged, raising the operational pressure on armed forces. Today's multipolar world is accompanied by the greatest instability since the Second World War[1]. Marked by an increasing number of new conflicts within and between countries, driven by fundamentalism, demographic developments, and environmental, economic, and political instability. Cyberspace has also become a new battleground. National cybercapabilities, however, vary considerably around the globe. While the armed forces of some countries, like the United States, Russia, China, or Israel, appear to have established considerable cybercapabilities and know-how, other armed forces clearly have to catch up.

However, the historically evolved complexity of most defense organizations threatens to thwart their capacity to innovate and change. Over the past years, many armed forces have already undertaken a number of projects and programs to modernize. But many projects have failed, since they were all too often built on isolated measures targeting incremental improvements, such as cost-cutting, instead of approaches deeply grounded in the reality of armed forces' challenges. Driving real performance improvements in the armed forces requires an honest assessment of these challenges and the implementation of the right forward-looking measures that not only aim to solve current isolated problems but also take into account related challenges and levers in a strategic manner. For example, scaling up cybersecurity capabilities must be approached not only from an IT perspective, but also needs to consider organization, personnel planning, and qualifications. Only then can transformative measures lay the groundwork for sustainable advantages.
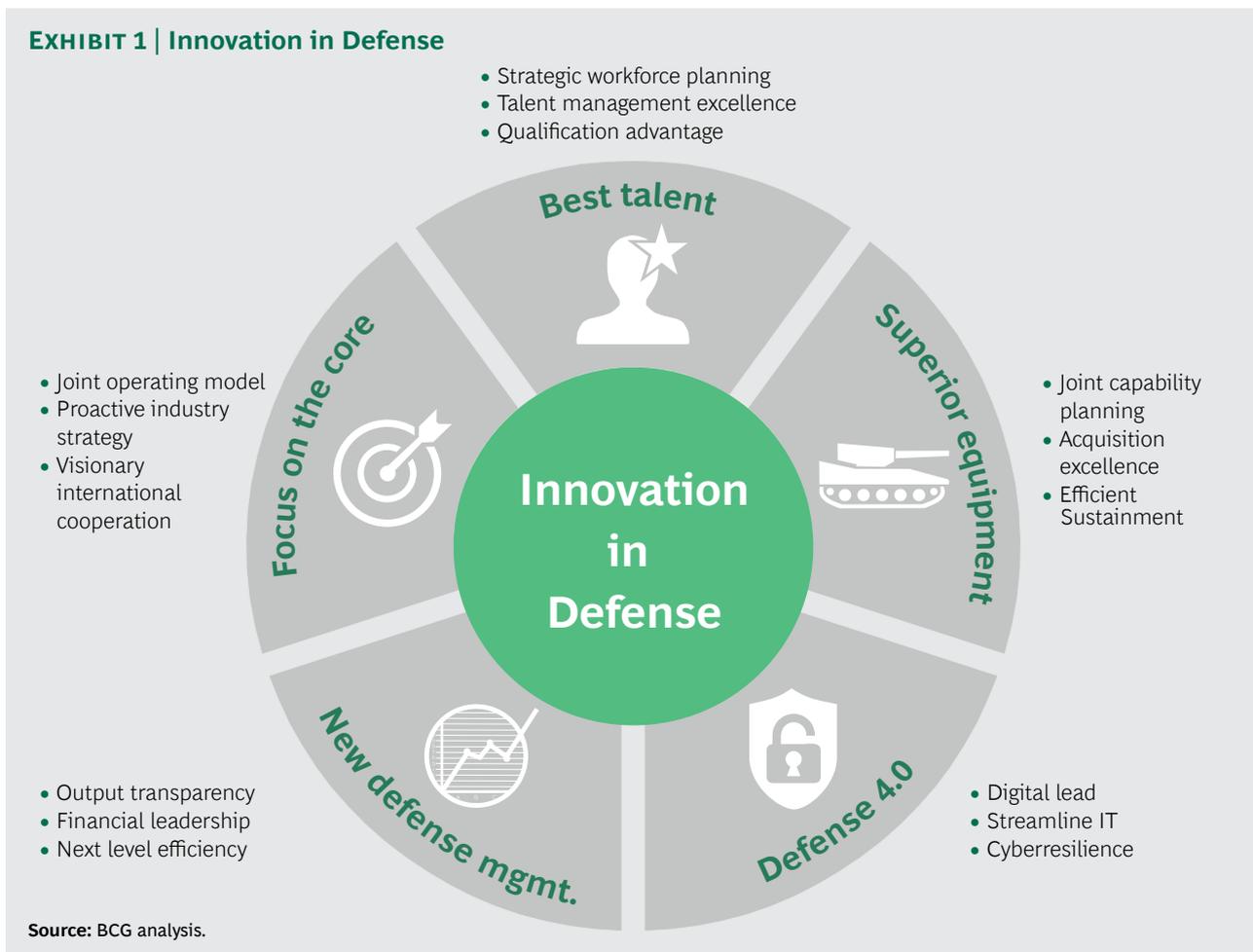
Therefore, the ability of armed forces to fulfil their political mission depends on innovation. Innovation is much more than the (partial) reaction to a changing context and immediate challenges. It is the anticipation and creation of the future from within. Finding holistic approaches, embarking on paths that are new for the defense sector, and confronting current challenges with measures that constitute innovation in a specific context and, if applied correctly, enable the armed forces to find

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answers to uncertain challenges of the future. This approach represents a new paradigm compared to the traditional perspectives of the past. It requires advanced management capabilities, new outlooks, and tools. While these can partly be informed by private-sector best practices, they must be explicitly tailored to and based on a sound understanding of the specific military context. In addition, armed forces in some countries have forged ahead with innovative approaches that can serve as models for others. While a wide range of innovation levers exists for the armed forces, the following provides a brief introduction to the five most relevant dimensions of innovation based on our extensive project experience.

Five Dimensions of Innovation

There are five areas for armed forces where change is required most and innovation is central to meeting the challenges of today while reaching the next level of performance. Each dimension includes innovation priorities as key levers for a strategic performance improvement of defense steering and operations. These priorities can support the needed discussion on innovation in defense and help identify targeted measures to tackle today's most pressing issues.

EXHIBIT 1 | Innovation in Defense

- Strategic workforce planning
- Talent management excellence
- Qualification advantage

Best talent

Focus on the core

- Joint operating model
- Proactive industry strategy
- Visionary international cooperation

Superior equipment

- Joint capability planning
- Acquisition excellence
- Efficient Sustainment

Innovation in Defense

New defense mgmt.

- Output transparency
- Financial leadership
- Next level efficiency

Defense 4.0

- Digital lead
- Streamline IT
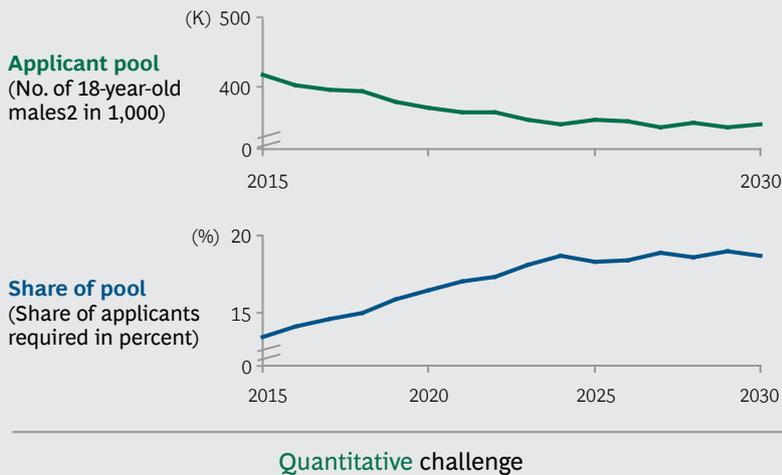- Cyberresilience

Source: BCG analysis.

Best Talent

The foundation for all armed forces is their people—soldiers and civilian employees alike. Defense organizations are required to promote and retain top performers in large numbers. This task, however, is becoming increasingly difficult. Demographic change and new expectations in the workforce result in more competition for the best talents. Consequently, the pressure is increasing on the armed forces to present themselves as an attractive employment opportunity for young talent and—more importantly—actually provide promising development and career paths to their workforce. This challenge is intensified by increasing skill requirements as military equipment and operations become more complex.

The mismatch between the actual supply and demand of key work-related skills are already significant today. In 2016, 40% of worldwide employers reported difficulties in filling their positions[2]. At the same time, skill requirements are changing quickly. With digitization, for instance, very different skill sets are emerging compared to what was needed in the past. According to a WEF analysis, by 2020 more than a third of the desired core skill sets of most occupations will be comprised of skills that are not yet considered crucial to the job today[3]. These developments require more transparent and dynamic planning in an integrated manner.

> Defense organizations are required to promote and retain top performers in large numbers.

EXHIBIT 2 | Quantitative and qualitative challenges in recruiting best talents

Major EU country: To fill vacancies in military personnel, applications of up to 19% of all males per cohort required[1]

"War for talent" unfolding

Applicant pool (No. of 18-year-old males2 in 1,000)

Share of pool (Share of applicants required in percent)

Quantitative challenge

Qualitative challenge

Changing value orientation of Generations Y and Z drives cultural rethinking

Complexity of operations, weapon systems, and IT increases skill requirements

Growing competitor pressure in recruiting from private sector

Source: BCG analysis.
Notes: Based on staff turnover of approximately 7% and taking plans to grow the military into account; 85% of recruits are male.
[1]Refers to the cohort of 18-year-old males [2]Numbers refer to live births in the years following 1995.

Armed forces require robust and dynamic workforce planning and state-of-the-art qualification measures to prepare and adjust for current and future capability needs. Key talent as well as skilled specialists need to be proactively identified, retained, and developed. And without a new level of performance excellence, HR organiza-

tions will not be able to match the demand in quantity and quality. We have identified three specific measures that offer an innovative approach for armed forces' human-resources management to cope with these challenges.

- **Strategic workforce planning.** Strategic workforce planning provides a fact base for labor demand and supply drivers and allows for a dynamic modeling of potential implications in various scenarios. It creates a clear and differentiated understanding of future skills needed by job families and specific services of the armed forces, like data scientists in cyberunits. Strategic workforce planning also allows for a better integration of military and civilian workforce planning, including optimized respite posting for military personnel in the support organizations in-line with specific capability needs. Thus, it serves as a comprehensive foundation for innovative human-resources measures from recruiting to talent management and qualification in conjunction with the overall defense strategy. In order to derive and actually implement the necessary changes from strategic workforce planning, clear incentives for the service chiefs to make these changes have to be implemented. Strategic workforce planning has already been successfully applied in the public sector and many large private-sector companies. As an example, it helped a large European employment agency to remarkably optimize its workforce capabilities. By creating transparency on future capacity risks within a 10-year workforce plan, 18 strategic, actionable, and impactful initiatives were implemented, among other things, to resolve existing and future skill mismatches, such as through professional retraining.

- **Talent management excellence.** Job satisfaction and career development are key to motivation and long-term performance. Therefore, military talent management should follow three objectives: compelling careers, strong engagement, and proactive retention. First, defense organizations should create personalized development plans based on the importance of the individual role for mission fulfillment and replacement complexity. Tailored careers for (key) personnel should be developed by a joint personnel-management body and allow staff to switch branches of the armed forces. Career paths should also include the opportunity for more movement between private-sector and military roles. For example, the US Department of Defense instituted new industry partnerships, enabling officers to work with America's leading companies for extended periods, even as long as a year. Second, armed forces must gain transparency on the workforce's engagement and understand drivers and root causes that prevent full performance. Serving in the military requires sacrifices. Hence, the creation of a strong cultural identity and positive public recognition as well as the prestige of reserves and veterans should be promoted. Third, involuntary turnover regularly creates critical vacancies and constitutes a severe loss of investment in recruiting and training. Therefore, customized retention initiatives need to improve the individual's working situation with general and personalized measures. For a major European ministry of defense (MoD), BCG identified more than 70 potential retention measures to effectively counter various root causes of dropouts from military service. Among others, these include a progressive onboarding phase for recruits and academic counseling for studying officers.

- **Qualification advantage.** Many armed forces have realized that their qualification programs are often inefficient and outdated. However, the optimization of workforce potential through training, learning, and development is ever more needed to ensure the sophisticated capabilities required in modern armed forces. To create a qualification advantage over other employers in the "war for talent" as well as in military missions, three objectives have to be pursued: a close alignment of qualification and career tracks, state-of-the-art training methods, and insightful performance measurements. BCG's Client Learning System has shown that strong learning results can be achieved if in-person learning is combined with digital approaches. It furthermore enables a much broader reach and scale, key aspects for continuous learning, and development especially for soldiers deployed away from their home base.

Superior Equipment

Results of military acquisition projects are often exceeding initially projected budgets and timelines while missing the expected quality. The acquisition of military equipment is already a highly complex multistep process, which takes place in a very challenging market and with many political considerations. Due to the acquisition of military equipment having been focused on long-lasting and large platforms, a number of common problems have been observed across defense procurement organizations: overly detailed requirements set at an early stage and continuously changing requirements over the course of the project's life cycle, a lack of procurement tools and functional expertise (e.g., project, risk and obsolescence management), and ineffective leveraging of the defense industry to reach capability objectives.

Traditional military equipment, especially large and complex weapon systems, like naval vessels, are operational for up to 30–40 years. Under such long runtimes, achieving and maintaining superiority in military missions is becoming more and more difficult, especially as security situations are changing quickly and innovation cycles are becoming ever shorter. Military equipment is shifting to smaller, cheaper, and more disposable autonomous platforms. In that context, armed forces have to find ways to effectively ensure the superiority of their equipment and gain flexibility for short-term adjustments to changing capability needs. The increasing importance of onboard systems and more software-based innovation means that changing requirements could be addressed more readily over the life-span of a platform. Expanding technical features and growing system complexity, however, lead to a higher risk of downtime and require more effective maintenance. Overall, the focus of innovation is moving to the private sector and defense-procurement organizations need to incorporate private-sector experience more effectively.

Armed forces have to find ways to effectively ensure the superiority of their equipment and gain flexibility for short-term adjustments to changing capability needs.

Procurement will change fundamentally in the future. Digital trends, like big data and advanced analytics can provide powerful insights into cost and procurement processes. Artificial intelligence (AI) further allows for process automation and the support of key procurement process steps. AI can enable the identification of superior solutions and provide negotiation support. For example, AI can help manage multi-dimensional trade-offs beyond price, like warranties and payment terms. Overall, the acquisition of defense must find an agile way of procurement and adjust its organization and approach to the disruptive changes in military equipment.

EXHIBIT 3 | Significant Rise in Software Complexity and Increased Acquisition Cycle Times

Fighter jets: Once competed on speed, now on digital smarts with significant rise in software complexity
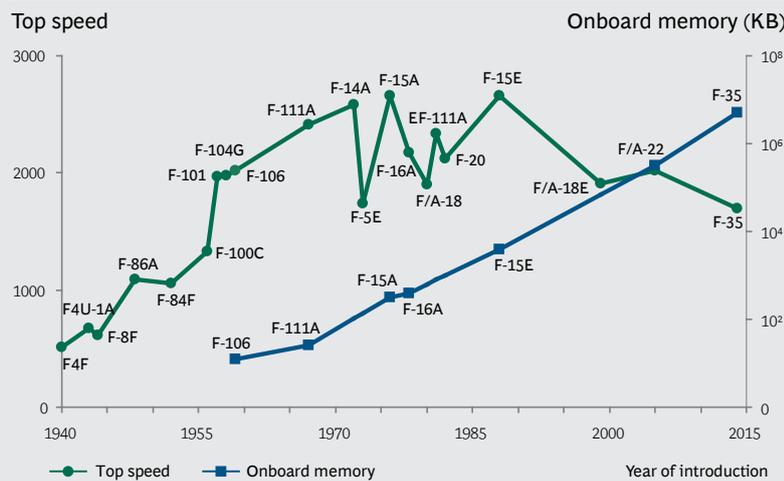
Acquisition cycle times have increased over the past 70 yrs
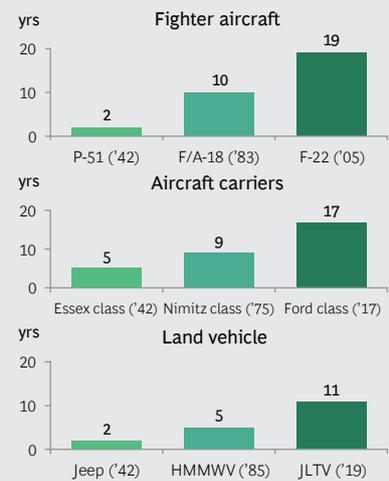
Source: Aging Avionics in Military Aircraft, Air Force Science and Technology Board, National Research Council, 2001; Fighter-Planes.com; BCG analysis.
Notes: Only US fighter (not attack or bomber) aircraft included. In years where two fighters were introduced, only the fighter with the higher airspeed was included.

- **Joint capability planning.** Failure in capability planning bears the greatest potential for value destruction, as it affects all subsequent stages of the project life cycle. Custom processes and organizational structures for strategic joint capability planning should be established to ensure that all relevant requirements are actually considered and integrated as early as possible. Joint capability planning should aim for an integrated perspective that recognizes that traditional boundaries of the branches of the armed forces are blurring in operations. A comprehensive top-down and bottom-up planning process can help combine the strategic perspective with perspectives from personnel planning, budgeting, procurement, and IT, while considering the full life cycles of military equipment. An effective planning process and a supporting organizational setup would increase armed forces' responsiveness to quickly changing capability demands. Both also ensure the alignment and effective prioritization of budget use across armed forces. A truly fact-based and strictly mission-oriented process is needed, instead of the still prevalent thinking in successor models of large monolithic weapon systems. This approach can be supported by a joint capability planning

office with a clearly defined role and responsibility, including managing and controlling or even promoting innovation. And the performance of the planning office and overall process should be measured with regard to the actual capabilities generated in quantitative and qualitative terms.

- **Acquisition excellence.** Armed forces must find a way to systematically improve their acquisition operating model. Key objectives should be enhanced effectiveness and efficiency of the procurement organization including enabling the cross-functional collaboration of highly skilled procurement experts. Further objectives should be a stronger outcome focus on capability, costs, and risk, as well as more effective collaboration with industry partners. Innovative technologies like advanced analytics to decrease costs on long-tail spend as well as smart automation and artificial intelligence to optimize the efficiency of workflows can support this. Also, state-of-the-art procurement skills (e.g., design-to-cost or category management) have also shown significant optimization potential. Target cost analysis, for instance, often constitutes a quick win for procurement organizations. With an implementation time of only 2–8 weeks, costs can be reduced by 5–15% for selected product categories. Such quick wins are important to building momentum for change and financing further innovation initiatives.

- **Efficient sustainment.** The sustainment of military missions is critical to ensure operational readiness. A systematic approach to maximizing the availability of up-to-date systems and military personnel during operations is necessary. Key areas for action are smart maintenance, lean logistics, and putting the availability of capabilities at the center of strategic optimization. The improvement of maintenance through a better understanding of cost drivers, predictive analytics, and creating synergies through international cooperation can help reduce costs and increase the availability of ready-to-use equipment at the same time. For instance, BCG found that divesting several units of a weapon system and reinvesting the saved money in maintenance can increase the overall availability of that specific weapon system by up to 30 percent without additional costs. Moreover, optimizing the logistics during operations should be understood as a strategic military advantage. Through better operational execution and optimized make-or-buy decisions, sustainment of capabilities can be improved. Furthermore, the application of big data, for instance, can provide real-time digital views of (potential) supply chain disruptions and help generate risk mitigation strategies.

Defense 4.0

Effective command, control, communication, and information will probably be the key enabler for military success in the coming years. From supporting functions, like enterprise resource planning, to weapon systems in operation, such as recognized air picture, ICT is the crucial building block and covers almost all areas in modern armed forces. ICT complexity, maintenance, and update requirements have been significantly expanding over the last years and will likely continue to expand rapidly in the future. However, the replacement of legacy systems, regular cleanups and investments in efficient, state-of-the-art ICT systems have been neglected too often in

While defense organizations' backlog in ICT modernization is often already critical, the external pressure is rising, too.

defense organizations. Historically evolved legacy applications, data structures, and infrastructure patterns are causing high operating costs that limit the impact for required ICT investments. Over decades, systems were regularly built in silos, creating a hurdle for interoperability. In addition, ICT systems are too often highly fragmented, which causes significant standardization and scalability challenges—factors that are essential for an effective IT. These challenges will only grow larger with time, as military operations become even more digital. However, the overly complex nature of fragmented ICT landscapes in defense organizations hinders the ability of armed forces to quickly adapt to new and changing requirements and leverage ICT for innovation.

While defense organizations' backlog in ICT modernization is often already critical, the external pressure is rising too. Cyberspace has become a new battlefield and related threats necessitate innovative responses. Last year, NATO officially reported an average of 500 cyberincidents per month—an increase of around 60% over 2015[4]. ICT should become a core item on every general's agenda. Armed forces have to invest considerable resources in modern ICT infrastructure and capabilities to respond to the challenges of the 21st century.

EXHIBIT 4 | Relevance of Cyber and ICT for Military Success Is Increasing

90% of all **global data** was created during the last 2 years[1]
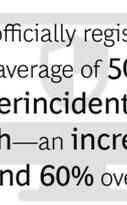
NATO officially registered an average of **500 cyberincidents per month**—an **increase of around 60%** over 2015[2]
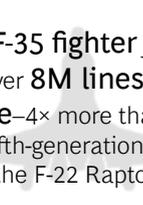
About **80 computers** and **100 km of cables** are built into the **Eurofighter**[3]

Global defense **IT market** expected to reach **USD 108.4B** by 2020[4]

Cybersecurity market is predicted to reach close to **USD 161B** in revenue by 2020[5]

The **F-35 fighter** jet has over **8M lines of code**—4× more than the first fifth-generation fighter, the F-22 Raptor[6]

Notes: Number of cyberincidents reflects an increase in the number of cyberattacks, but also wider network coverage and protection.
[1]SINTEF/ScienceDaily. [2]NATO Cyber Defence Fact-Sheet. [3]Federal Ministry of Defence. [4]Technavio, 2016. [5]Technavio, 2015. [6]Lockheed Martin.

- **Digital lead.** Armed forces should aim for holistic solutions that integrate ICT across all architectural layers of the armed forces (i.e., infrastructure, applications, military systems, and ICT enablers). Such an overarching integration includes a joint strategic roadmap to clear roles and responsibilities and strong joint technology governance across the defense organization and helps effective skills buildup. This approach can dramatically improve the effectiveness of military operations. With BCG's support, a European MoD developed an integrated ICT operating model, which led to a significant increase in agility and

scalability while identifying up to 21% in cost savings on top. It additionally helped to relieve the armed forces from burdensome ICT-related complicatedness and freed up capacities—a key prerequisite to initiating further innovation and coping with ever faster innovation cycles of digital technologies. In the long term, armed forces need to anticipate major developments in the tech space. As more military capabilities such as unmanned autonomous weapon platforms, cyber-defense and even tech-enabled infantry rely heavily on ICT technology, more ICT will be happening outside of the classic ICT department. Thus, ICT departments should start thinking about how they will operate in the future, such as by bringing ICT experts and the business side (i.e., soldiers) closer together in cross-functional, agile teams to promote innovation.

- **Streamline IT.** Armed forces should build on best practices in cleaning up and consolidating fragmented ICT landscapes. Streamlining ICT bears great savings potential that frees up capital for needed ICT reinvestments. Key objectives are the standardization and centralization of legacy systems as well as the reduction and optimized use of infrastructure to minimize the needed variety of technologies, processes, and skills, hence increasing cost efficiency. This requires a strong joint infrastructural backbone where scale and consistency matter. For a European MoD, BCG found and delivered up to 30% in cost savings through a reduction of overly complex ICT. These savings allow the country's armed forces to make the required investments and help develop further ICT innovations. Moreover, a streamlined defense ICT is a key enabler of joint operations and improved operational readiness.

- **Cyberresilience.** The urgency stemming from increasing cyberattacks causes armed forces to heavily invest in necessary cybercapabilities. The objectives are twofold: First, the buildup of proactive cyberdefense capabilities to defend and deter, and second, long-term resilience by having the right strategy, governance, organization, and processes in place to reduce the number of successful attacks to a minimum and ensure continued operations after a breach. As existing cybercapabilities are often spread across defense organizations and related to a broad and diverse set of areas, a first step toward more advanced cybercapabilities should be a critical assessment of which mechanisms of cyberdefense are already in place and at which maturity level. Key questions that need to be answered relate to the scope of the armed forces' role and responsibilities and their delineation from other government agencies, the capabilities and talent needed to cover the scope, how these capabilities fit into the operating model and organizational structure, and, given the urgency, which measures should be prioritized. Further steps, as already observable in advanced armed forces, could include the establishment of cybercommands, first incubated in signals intelligence and then shifting toward stand-alone commands (e.g., the German Cyber and Information Space Command or the United States Cyber Command).

New Defense Management

In times of increasing complexity and rapid change, leaders in defense are challenged to ensure the availability of required capabilities and therefore the efficient use of resources. Defining output and performance measures in the military context is challenging, but military readiness can serve as a useful key performance indicator. In addition, armed forces' management must be empowered to fully understand and effectively manage invested resources and their direct output. In the past, defense management has focused primarily on cash outflows rather than full cost transparency across processes and organizational silos. Analytical insights from enterprise resource planning and budget structures, such as by expressing costs consistently across all branches of the armed forces, are being insufficiently leveraged.

The organization of armed forces often has untapped potential for efficiency gains. Particularly complex and overhead-heavy organizational structures and redundancies are some of the challenges. Current approaches in defense are falling short in the following three key areas because modern management tools still have not been fully implemented: understanding costs, measuring results, and improving execution. BCG has identified three innovative management approaches that can help.

EXHIBIT 5 | Deep Understanding of Cost Drivers Allows Strategic Cost Reduction and Increase in Availability

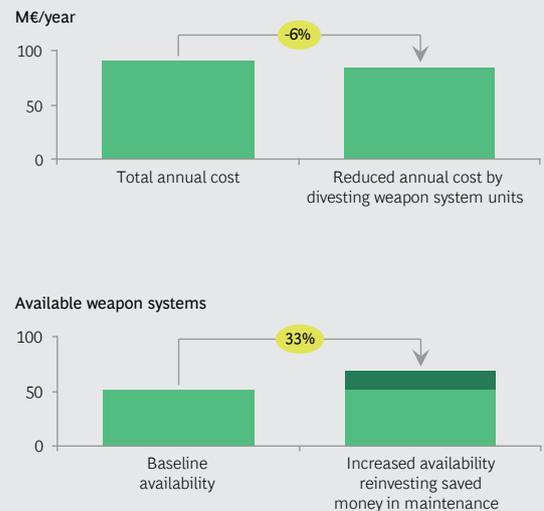**Helicopters:** Total cost consists of four key cost buckets with different underlying drivers

Key cost buckets	Detailed cost buckets (examples)	Underlying cost driver
	Weapon system	No. of heli.
	Site costs	Fleet
Investment	…	…
	Flight crew	No. of heli.
Operating	Line maintenance crew	No. of heli.
	Trainers	Fleet
	Fuel	Flying hours
	…	…
	Depot maintenance crew	No. of heli.
Maintenance	Contracted mainten. driven by no. of heli.	No. of heli.
Defense overhead	Add. spare parts driven by flying hrs	Flying hours
	…	…
	Overhead defense costs	Fix. overhead

Strategic reinvestment of saved cost to increase overall availability of weapons systems

M€/year — -6%
Total annual cost → Reduced annual cost by divesting weapon system units

Available weapon systems — 33%
Baseline availability → Increased availability reinvesting saved money in maintenance

Source: BCG analysis.

- **Output transparency.** A common definition of military operational readiness as a key output of the armed forces is needed to measure the status of actual military capabilities at any given time. It provides transparency on deficits and helps prioritize actions and investments. For instance, structured monthly reporting on the availability of recognized air pictures helped a European MoD to define more effective service level agreements to resolve outages. The reporting established transparency on key capabilities and enabled the MoD's senior leadership to prioritize the deployment of resources in a much more efficient and effective manner.

- **Financial leadership.** Armed forces should advance their cost analysis capabilities. Advanced data analytics of structured as well as unstructured data can help create cost transparency and provide detailed and differentiated insights into resource consumption (e.g., by branch, unit, weapon system, and project) as well as effective monitoring and management based on visual dashboards, instead of budget consumption over time. Even on the basis of minimal information, with the use of advanced analytics, critical decisions can be prepared and value can be delivered faster. As an example, a large armed forces organization, together with BCG, developed a fact-based approach to create full cost transparency on processes and organizations by correctly allocating spending. This approach led to significantly improved decisions based on solid data, created opportunities for strategic performance enhancements, and allowed for forward-looking investment in new capabilities.

- **Next-level efficiency.** Best practices from the private sector can help rigorously improve efficiency. One proven approach is delayering, which means "flattening the pyramid" by decreasing management layers and increasing spans of control. This is a proven approach employed, inter alia, in the army headquarters of a NATO member country with 15,000 FTEs. In this specific example, in-scope positions were reduced by 25%, increasing the managers' span of control and simplifying command structures. Besides cost savings, delayering also helps in reallocating responsibilities and accelerating decision-making. Resulting efficiency gains increase armed forces' ability to align with and respond to rapidly changing defense and security needs. Moreover, by understanding how the organizational structure, processes, and governance in defense organizations drive the behavior of individuals and how the related behavior drives performance, further improvements and innovation can be realized.

Focus on the Core

Today, no country can ensure security on its own and armed forces are increasingly dependent on partnership, cooperation, and the additional capabilities of other players. Although armed forces have realized that other military and nonmilitary actors—public and private—can deliver certain tasks more effectively and efficiently than many defense organizations themselves, the process of further international integration of the armed forces and outsourcing has been slow. Until now, the fear of the loss of national sovereignty and little faith in the reliability of partners have hindered the integration of military capabilities. At the same time, limits in terms of budget and people constrain the immediate establishment and sustainability of the full spectrum of military capabilities. In a world of scarce resources for each state, it is no longer the most efficient solution for each country to maintain the full spectrum of forces independently. Consequently, armed forces have to reflect critically on what they can still do themselves and in which areas they should cooperate.

Maintaining a sustainable security policy based on a broader definition of security also often involves the cooperation of military and civil organizations—whether state organizations or NGOs. New threats and complicated security situations through cyberspace and unconventional warfare require innovative responses from the armed forces and other security agencies of the world. Moreover, with regard to private sector cooperation, armed forces have not yet transformed mere supplier relationships with the defense industry into long-term partnerships. The armed forces are increasingly dependent on contractors to deliver needed capabilities and innovative solutions. This is a particularly challenging task, as industry relationships touch areas of national interest.

- **Joint operating model.** A defined joint operating model is fundamental for strengthening collaboration and cooperation of armed forces. In a first step, a tighter integration of the services of the armed forces on a national level, in other words, the army, navy, and air force, should be pursued. At the same time, the capability of seamless cooperation with other military partners is crucial to pursuing national defense and security policy—bilaterally and multilaterally, within and without existing alliances to allow for a flexible response to changing defense requirements. Moreover, lessons learned from recent military engagements clearly show the need for a broader definition of security, understanding military as an important element of foreign and security policy that must, however, be embedded in a broader strategy for peace. Therefore, military organizations must proactively prepare for cooperation with civilian partners, "civilian-military cooperation" (CIMIC), both domestically and internationally, for instance the International Red Cross and Red Crescent Movement. Such advanced joint operating models should entail clear responsibilities among all partners through effective cooperation agreements. Additionally, joint operating models must be complemented by strong overarching support functions, such as with regard to the integration of ICT.

- **Proactive industry strategy.** Armed forces have to leverage the often superior industry expertise and efficiency. A proactive industry strategy should include building a supplier ecosystem of private-sector partners that is able to serve the armed forces' need for innovation and that is based on strategic decisions and proactively managed. Armed forces must move beyond to the traditional transaction-based supplier relationships. Instead, partners of the supplier ecosystem should be qualified, integrated early on, and managed flexibly in terms of outsourcing and insourcing competences. Leveraging and managing the supplier ecosystem and establishing strong partnerships can help integrate broad industry expertise more effectively, especially with regard to new technologies. It furthermore creates stronger incentives for the industry to ensure that required capabilities, including R&D, are actually delivered.

- **Visionary international cooperation.** Models of sharing assets and capabilities in international partnerships constitute an innovative approach to deploying resources more efficiently and enabling additional military capabilities. Especially in regions of already strong political and economic interdependencies, like Europe, it makes sense to create a system of division of labor and to accept a mutual military dependency. No member of the European Union needs armed forces to attack another member and no member needs to be able to defend itself alone if attacked from the outside. Also, existing military alliances could be further advanced, for example by pooling capabilities more strongly as implemented in NATO's Airborne Early Warning and Control System (AWACS). Without the AWACS, the command structure of NATO cannot fully execute its ability to plan and run military operations. Visionary international cooperation means leveraging the related potential for more military integration. It requires the clear definition of partner-specific roles and responsibilities in bilateral and multilateral setups and should aim for continuous advancement of these partnerships to expand the breadth and depth of integration in the long run. One example of such a visionary international cooperation is closer collaboration in air policing. The cooperation between Belgium, the Netherlands, and Luxemburg in the context of NATO illustrates a possible first step. The Belgian Air Component and the Royal Netherlands Air Force have been taking four-month turns to ensure Quick Reaction Alert fighter jets are available 24 hours a day, 365 days a year to be launched under NATO control. International arrangements such as this allow armed forces to ensure key capabilities in a more cost-efficient, effective, and internationally coherent manner while fostering long-term peace through integration and interdependency.

Conclusion: How to Drive Innovation in Defense

Making innovation in defense a success is a key task for defense leaders. Innovation cannot be simply delegated and worked off along a plannable process. It needs to be enabled, above all by inspirational leadership and a supporting culture. BCG has identified three key areas for action to jump-start innovation in defense.

Define the innovation agenda. Recognizing the large differences in starting points, armed forces should first develop a sound understanding of their overall position and role and then derive the relevant types of innovation that would bring the required change. These types of innovation can refer to the organization and processes of the armed forces, the design of the operating models, the military equipment, or the overall capabilities. Once the need for change is identified, suitable innovation areas for action as outlined above can be effectively prioritized. Impact and feasibility can serve as criteria to define flagship projects for kick-starting the momentum of innovation.

Set up the organization for innovation. Large organizations like armed forces cannot be set up for innovation as a whole merely by means of a small innovation unit. Exploiting innovation potential and developing a stable process of continuous innovation that changes the underlying organization over time requires top-level steering, an overarching advisory board including external experts, and strong planning and innovation incubators, driving and supporting specific projects under the authority of the different branches.

Support people to embrace innovation. People are the heart of change and innovation. Soldiers and civil employees need to understand and accept innovative approaches to fully support new ways of working. Change will invoke emotion and defense leaders must be prepared to provide strong support in several dimensions, such as guiding and helping the affected workforce through the change process while ensuring day-to-day and extraordinary operations continue undisrupted. Military and civil personnel at every level must be enabled to continuously identify innovation potential and push for its implementation. Processes and incentives should be in place to bring new ideas to life and people should be equipped to successfully manage the realization of innovation projects.

Innovation is indispensable. In the future, no armed forces will be able to fulfill the given political tasks, to cope with the new security and military challenges, or to develop superior performance to optimally protect the lives and health of its soldiers without breaking new ground. Creating the required conditions for innovation should therefore be a top priority for all military and related political leaders to reach new horizons in defense and security.

NOTES:

[1]See also Munich Security Report 2017: Post-Truth, Post-West, Post-Order? Available online at https://www.securityconference.de/en/discussion/munich-security-report/.

[2]According to ManpowerGroup's 2016/2017 Talent Shortage Survey, the highest talent shortage since 2007. Available online at http://www.manpowergroup.com/wps/wcm/connect/389b7a9d-cfe2-4b22-bd61-f0febc709cd6/2016_TSS_Global_Infographic+-+Final.pdf?MOD=A-JPERES.

[3]WEF, 2016, The Future of Jobs Report. Available online at http://reports.weforum.org/future-of-jobs-2016/skills-stability/#view/fn-16.

[4]NATO, 2017, NATO Cyber Defence Factsheet. Available online at http://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2017_05/20170515_1705-factsheet-cyber-defence-en.pdf.

This reflects an increase in the number of cyberattacks, but also wider network coverage and protection. However, BCG insights indicate a much higher rate—undisclosed numbers are likely to be 10–30 times higher.

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Further Reading

A New Procurement Strategy for Defense Contractors
https://www.bcgperspectives.com/content/articles/engineered-products-project-business-new-procurement-strategy-defense-contractors/

Becoming a Digital Frontrunner in Aerospace and Defense
https://www.bcg.com/publications/2017/transformation-becoming-digital-frontrunner-aerospace-defense.aspx

How Governments Can Get Technology Transformations Right
https://www.bcgperspectives.com/content/articles/public-sector-tranformation-how-governments-can-get-digital-transformations-right/

How to Gain and Develop Digital Talent and Skills
https://www.bcg.com/publications/2017/people-organization-technology-how-gain-develop-digital-talent-skills.aspx

The Pentagon's "Force of the Future" Reinvents Hiring
https://www.bcgperspectives.com/content/articles/engineered-products-project-business-human-resources-pentagons-force-future-reinvents-hiring/

For Further Discussion

If you would like to discuss this report, please contact one of the authors.

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