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Veröffentlichungsversion / Published Version
Stellungnahme / comment

SWP

SWP Comment

NO. 11 MARCH 2024

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Need for Action due to Technical Innovations

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As the demands on German foreign and security policy increase in a Europe characterised by multiple crises, so do the demands on the German armed forces. In order for the Bundeswehr to become more assertive and effective as a deterrent, despite limiting factors such as personnel and materiel shortages, it must be able to employ new technologies more quickly and extensively. The faster and more effectively these technologies are harnessed, the more advantages they will bring on the battlefield. The current political will for change, the pressure to adapt due to the evolved security situation and the increase in financial resources are creating an unprecedented momentum.

In his speech on 16 September 2022 at the Bundeswehr Conference, Federal Chancellor Olaf Scholz called for the Bundeswehr to become "the best-equipped armed force in Europe". This was his direct response to the Russian war of aggression against Ukraine. For the Bundeswehr, this means rapidly increasing its capabilities, which currently are not sufficient for comprehensive national and alliance defence in terms of quantity and, in some cases, quality. This is mainly due to the fact that they have not been sufficiently developed to perform their main mission, having been underfunded for many years. At the same time, the Bundeswehr lacks the ability to adapt to rapidly changing conditions. Many of the requirements for increasing performance are known, but so far there has been a lack of targeted implementation. In addition to the challenges associated with personnel and materiel shortages, this is particularly evident in the lack of — or the limited introduction and use of — new technologies such as artificial intelligence (AI), unmanned systems of various sizes and the underutilisation of new types of ammunition such as loitering munition. What all three have in common is that they fundamentally change the dynamics of armed conflict. They not only boost the overall speed of activities, they also make the battlefield more transparent and increase lethality. Without their rapid and broad-based integration, German armed forces will not be able to survive. If the necessary steps are not taken now, the challenges will increase in the future because it will be almost impossible to compensate for important developments and adjustments.

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Crowding out effects

In the public eye as well as the processes in which decisions are made about the Bundeswehr's armaments, the focus is on large and expensive weapons systems such as fighter aircraft, frigates and tanks. As a result, smaller armaments projects that do not have sufficient funding or personnel are sidelined. However, it is precisely these systems that create the basis for the interaction of reconnaissance, command and control resources, thereby generating a uniform situational awareness. Tanks and ships, for example, are still important on the battlefield. Nevertheless, the latest procurements of these so-called monolithic systems are only a small portion of the necessary changes needed in the German armed forces. The decisive factor for the outcome of a war is not a single weapon system, but the coordinated and effective use of all available means in a network. This requires a balance between expenditures on monolithic systems and on interfaces, decision accelerators and coordination elements in the operation and deployment of armed forces. Another challenge is the structure of the military procurement system. It is still designed to plan and procure very thoroughly and slowly with little funding. If new technologies are to be introduced quickly and made widely available, the procurement system quickly reaches its limits. There are only a few exceptions and solution approaches here.

Insufficient digitalisation

The peace dividend, including the lack of prioritisation of national and Alliance defence, has meant that the Bundeswehr has not been sufficiently modernised. This has been accompanied by a lack of digitalisation efforts in the overall system of the armed forces. Among other examples, this can be seen in outdated weapons and communications systems that are unable to communicate and operate efficiently on a modern battlefield. The Bundeswehr is a long way from being able to exchange real-time information and process data quickly and accurately for support tasks. However, in order for state-of-the-art technological means such as digital command and control systems, unmanned systems and AI to be used at all, basic prerequisites still need to be established. One of these is to collect sufficient amounts of high-quality data for data processing systems such as AI. Digitalisation means more than just replacing radio equipment in some of the weapons systems. It should ensure that information and data are quickly collected, analysed and stored in a way that is accessible to many users and rendered usable. At the same time, it helps to speed up processes and make procedures more transparent. Germany is well behind its NATO allies such as France and the United Kingdom when it comes to expenditures on digitalisation.

Technical possibilities

The range of technical possibilities offered by innovations that can be used for military purposes has become almost unmanageably large. The majority of innovations now come from the civilian sector.

By utilising new developments, some weapons systems or system networks can be completely replaced now or in the near future. One example of this is drones, which can replace manned reconnaissance equipment such as helicopters and aircraft. Drones are cheaper to procure and operate than manned systems. At the same time, they can be exposed to higher levels of risk when performing tasks. Even if fully fledged replacements are not yet available in all areas, changes must be sought due to other factors such as costs, materiels and savings on personnel. The skilful integration of new technologies can also act as a force multiplier for existing system alliances. For example, the use of drones as a reconnaissance tool for artillery — provided they are integrated effectively — allows for greater precision and faster engagement of targets. Of all the innovations, greater attention

must be paid to AI technology in the current development of armed forces. Its use has the potential to transform the military in the same way that gunpowder, the internal combustion engine and the internet once did. AI systems differ in the way they operate and the tasks they can solve. Specifically, machine learning and vision, robotics and the development of neural networks are particularly important for armed forces. After all, Germany is among the top 10 in the world for basic AI capabilities. Building on this, military capabilities must be improved and new ones developed. The United Kingdom, which ranks ahead of Germany here, recently founded its own institute to focus on this issue. The aim is to research new forms of AI and analyse the impact on its own security. The "AI Safety Summit 2023" at Bletchley Park in the United Kingdom kicked things off last November.

Necessities

If the performance of the German armed forces is to be improved, more attention must be paid to digitalisation and the use of new technologies. Only the broad-based introduction and use of new technologies will allow for the possibility of success on the battlefield in the future. These technologies not only enable considerable increases in efficiency and performance levels, they also ensure that their potential for future use can be recognised and realised. In concrete terms, this means that appropriate interfaces must be incorporated for all armaments projects: hardware components on the one hand, and software compatibility on the other. Due to the accelerating pace of new inventions, the military should change its approach towards introducing new technologies. This concerns both the general procurement of systems and the updating of military doctrines and procedures of the armed forces. In order to synchronise existing system networks and new technological acquisitions, it is important to define precisely which objectives are to be achieved at very brief, regular intervals. Special channels can be used in the short term until a fundamental change in the procurement system is made.

AI — There are now extensive possibilities for applying different types of AI in a military context. The Bundeswehr should pursue a two-pronged approach: On the one hand, AI must be used in the specific areas where it is already being used by other armies in order to prevail against a potential enemy. This is necessary for unmanned systems, for example, where electromagnetic jamming can restrict the exchange of data and commands. These systems must be able to react autonomously using AI and follow the previously set command. On the other hand, all areas of the Bundeswehr must begin working with AI in order to be able to assess and utilise the potential of these unmanned systems. Specifically, human—machine interaction must be understood. A good example is support in making decisions on the battlefield. The AI can be fed with all available information — such as reconnaissance data from satellites, drones, reports from people, data from other sensors — and develop possible courses of action. The human then makes the decision. It is also essential to have a strategy for how AI should be handled militarily, to what degree it should be prioritised and how the greatest possible benefits can be achieved. The introduction and use of AI requires investments of around 10 per cent of the defence budget in order to avoid the crowding out effects.

Unmanned systems — Unmanned systems are being used more and more frequently on the battlefield for a wide variety of tasks such as reconnaissance, engagement and disruption of the opponent's operations. The advantage of large drones, which can compete with medium-sized aircraft, is that they are able to monitor large areas thanks to their reconnaissance capabilities. They have also established themselves as long-range weapon carriers. Some of the smaller drones are used as weapons themselves and equipped with explosive charges, which they then fly into

the target or drop in the target area. In addition to the cost savings, they offer the great advantage that they do not have to take into account the requirements of humans in a cockpit and can therefore be exposed to greater dangers. Some drones can now be flown from a "first person viewpoint", which not only makes them faster, but also more accurate. France opened a drone flight school in July 2023 to enable rapid and tangible progress in this area. Cooperation and intensified exchanges with partners on the use of unmanned systems can increase their chances of success.

Loitering munition — The Bundeswehr must become more effective and powerful on the battlefield. One possible means is the use of loitering munition, which has several advantages. On the one hand, it can be launched without the need for heavy large-scale equipment such as howitzers, and it can effectively engage targets under human supervision. On the other hand, it can have a more precise effect on the battlefield than an artillery shell, for example, as its target engagement can be stopped right up until shortly before impact. At the same time, it can hit targets more accurately because the time between issuing the command to fire and striking the target is shorter than when using artillery, for example. This new type of ammunition is either already in use in almost all Allied armies or is in the process of being procured. The Bundeswehr has not yet made any concrete decisions about its use.

Conclusion

The German armed forces face the challenging task of quickly advancing its capabilities with limited resources. The exploitation of new technological means creates new imperatives and opportunities for action, offering enormous potential. However, what is still lacking is a coherent application strategy and the widespread implementation of these technological means.

By constructively integrating existing materiels, new unmanned systems and loitering munitions, along with the incorporation of AI, significant military superiority could be achieved. Despite the various dangers associated with the introduction of AI, unmanned systems and loitering munitions, there can be no delays in implementing these technological measures, and it must be understood that they cannot be avoided entirely. Allocating 10 per cent of the defence budget specifically for digitalisation, AI and new technological developments opens up the possibility of avoiding the displacement effects that large arms projects have on smaller ones. With an eye on the future of new technologies, the maxim must be: "What the machine can do, it must do, the rest is left to humans."

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ISSN (Print) 1861-1761
ISSN (Online) 2747-5107
DOI: 10.18449/2024C11

(English version of SWP-Aktuell 14/2024)