

Defense Innovation and the Future of Transatlantic Strategic Superiority: A German Perspective

By Christian Mölling

The Defense Innovation Initiative — also referred to as the Third Offset Strategy — was announced in November 2014, aiming to “identify and invest in innovative ways to sustain and advance U.S. military dominance for the 21st century.” To address the erosion of U.S. technological superiority and conventional deterrence, the U.S. Department of Defense announced an ambitious innovation-based program to offset the competition particularly from states in a long-term perspective. The assessments that served as the basis for this strategy — the rapid modernization of China’s defense, emerging Russian ambitions and capabilities, the need to foster exchanges between public and commercial actors in defense innovation, and the general spread of precision munitions and guided weapon systems — have remained relevant after the 2016 elections, and U.S. allies must consider how this initiative may affect their military cooperation in the long run. This analysis is part of a series of responses to the initiative from U.S. allies.

Technological superiority is key for the West’s military power. But the reality of how to maintain this superiority is changing. Instead of innovation in defense technology coming predominately from national programs linked to the military, innovation is now increasingly generated by the private sector and takes place around the globe. The competition of commercial companies for their consumers has also led to shorter innovation cycles, especially in the area of information technology, and to a geographical diversification of centers of innovation — with new hubs especially in Asia. The ability of non-Western actors to increasingly incorporate civilian innovation into defense applications has led, among other things, to the perception of a growing erosion of conventional deterrence and defense capabilities in relation to rising powers and new actors of international security.

The U.S. Department of Defense launched a major “Defense Innovation Initiative” in November 2014, also known as the “Third Offset Strategy” (TOS), which has huge implications for the U.S. allies — in particular for their governments (regarding terms of procurement and regulation) and armed forces (regarding operating and questions of interoperability). While the Trump administration may coin a different term in the future, the innovation initiative is here to stay, precisely because the thinking behind it remains valid. The way U.S. allies react to the initiative will have major implications for future interoperability between NATO countries but also for the vulnerabilities of individual NATO countries.



Germany's Reaction: Keep Calm and Carry On

Officially launched only three years ago, TOS has had little impact so far in Germany. Individual senior officials at the Pentagon and the German defense ministry have held talks, but the topic has not trickled further down the system. There are many governmental and civil actors who recognize the importance of investing in defense-related innovation within Germany, but only in general terms. In Berlin, there is recognition that a competitive defense industry and capable military requires investing in civilian companies that develop dual-use technologies. But there are not yet any official statements or analyses that propose a way forward.

To go by government statements in recent years, one might think that Germany was on the same page as the United States and on its way to developing its answer to TOS. For example, the 2016 White Book suggested that the government was aware of the erosion of its conventional deterrence capabilities.¹ It also states that constant innovation is needed for effective protection of armed forces and in order to maintain their superiority. In particular, it makes clear that short innovation cycles are necessary in information technology and underscores the importance of the role of civilian companies in the development of dual-use technologies. As a result, it underlines that the Bundeswehr must work more closely with new drivers of innovation such as startups and the digital sector.

The White Book also argues that it is necessary to preserve the country's own technological sovereignty by preserving key technologies and securing military capabilities and supply. It advocates a focus on cross-departmental coordination; the prioritization of research and technology measures; targeted

¹ The Federal Government of Germany, "White Paper 2016: On German Security Policy and the Future of the Bundeswehr."

industrial policy and procurement by the defense ministry; and export support. A government strategy paper on strengthening the German defense industry published in 2015 highlights the need to expand funding for research, development, and innovation.²

In reality, however, there is little awareness regarding the TOS among political decision-makers in Germany. Apart from some high-level officials who are conscious of its implications for Germany, no real policy changes have been made. The main reason for the lack of policy adaptation is that the majority of policymakers in Berlin do not understand that new technologies, even if not military in nature, generate military threats. Moreover, responsibilities are fragmented: There is no central authority or responsibility that can detect and assess threats that go beyond the specific area of one ministry. Instead, a variety of different security services and agencies at the federal level, plus regional authorities and coordinating bodies at state levels, are responsible for addressing such complex threats. Aside from police forces on federal and state levels, Germany also has domestic intelligence services on the federal and state levels. Moreover, the constitution strictly divides responsibilities of actors along internal and external security.

Among these actors, a broader vision of technological innovation as a key piece of broad strategy is largely missing. In particular, the danger of losing Germany's military cutting edge is portrayed in government statements and documents as a threat in operational or tactical terms rather than strategic or systemic terms. That is to say, the discussion is generally about a certain capability that would be neutralized through new developments by adversaries, or about the losing the ability to conduct a certain type of operation due to missing equipment and training. The discussion, even among the defense community, largely omits broader questions of overall strategic superiority.

Threat perception is not necessarily the key driver of innovation; nor is necessity. Germany is actually massively dependent on defense innovation. Its armed forces as a whole rely on cutting-edge

² The Federal Government of Germany, "Strategy Paper of the Federal Government on Strengthening the Defence Industry in Germany," Berlin, July 8, 2015.

technology. The alternative — taking heavy losses — is politically unacceptable. The defense industry also relies on cutting edge technology: Its business model is to generate high tech capabilities and sell them to partners who are able to pay for the quality and in turn finance the next round of innovation. But it appears that the industrial sector has not seriously taken note of the ongoing reversal in global defense innovation, meaning that civilian sources of research and innovation are becoming ever more important than the military's own efforts.

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While Germany is aware of its weaknesses in conventional capabilities, its level of ambition is not comparable with the United States. Germany does not seek to deter China or other actors across the full spectrum of capabilities (including nuclear) or as a single state. Additionally, the German armed forces are also in a degraded state: The Bundeswehr has suffered severely from two decades of underspending in maintenance, spare parts, and training, as well as from limited investment and insufficient innovation. Their primary concern is to get the current generation of equipment working again, not to generate the next generation.

The incentives for Germany to take defense innovation more seriously are likely to come less from the United States but more from Europe. Germany fully supports the EU's Global Strategy, which sees the EU as a credible security provider.³ This leads immediately to the question of which capabilities are needed to provide security and, to a certain degree, also against whom or what. Moreover, the idea of “strategic autonomy” — which the Global Strategy identifies as an objective — raises the bar for innovation within the EU. If the EU wants to be autonomous in strategic areas like space technology and semiconductors, it needs a strategy and a serious amount of resources to invest.

³ European Union External Action Service, "A Global Strategy for the European Union's Foreign and Security Policy," June 2016.

Furthermore, Germany is pursuing an ambitious defense cooperation program with France — which President Emmanuel Macron will likely push as well. Thus, Germany will come under pressure to go beyond rhetorical support for European defense. If it fails to do so, it may face harsh criticism for failing to step up — even when the security of Europe is at stake. While Germany aims to develop defense technology in cooperation with partners, these partners find working with Germany more constraining than enabling. Germany continues to be a top arms exporter in Europe, selling about as much abroad as France.⁴ However, the export of defense equipment and the development of dual-use technologies are politically highly disputed in Germany. Controversy has even led to the postponing of a deal on infantry fighting vehicles to NATO Allies like Lithuania and halting the contribution of components to helicopters jointly produced with France in the past years. Thus, the partners who are willing to develop and export jointly with Germany may worry that they might become hostage to a volatile domestic debate. As a result, European innovation in defense and dual-use technologies may even take place without Germany. Moreover, because of the controversy around dual-use and the arms industry in general, Germany does not have the same level of synergy between civil technology and defense that other countries do. This limits the vibrancy and innovation of the national defense innovation ecosystem — despite Germany's strong and diverse technical innovation landscape.

Germany's Defense Innovation Ecosystem

Innovation is generally understood as taking place within a system where a network of institutions in the public and private sectors interact to initiate, import, modify, and diffuse new technologies. Traditionally this ecosystem has been national. However, as the EU's role as funder and rule-setter for innovation comes into play, more incentive structures and competencies

⁴ According to the Stockholm International Peace Research Institute, the German government granted permission for arms sales of €6.85 billion in 2016, accounting for around 5.6 percent of the world's weapons exports.

that determine the rate and direction of technological learning are becoming transnational — at least within Europe.⁵

Germany's innovation ecosystem is characterized by a multi-faceted infrastructure, a wide variety of disciplines, well-equipped research facilities, and competent talent. In all, there are more than 800 publicly-funded research institutions in Germany — universities, universities of applied sciences, non-university institutes, and federal and *Länder* (state) institutions. The biggest are the Fraunhofer Society for the Promotion of Advanced Research, the Helmholtz Association of German Research Centres, The Max Planck Society for the Advancement of Science, and the Gottfried Wilhelm Leibniz Science Association. There are also various research and development centers run by industry. Public and private research institutions increasingly cooperate. Industrial and academic institutions pool their research and development activities in networks and clusters. Thus, cooperation between the private and public spheres is common practice.

However, military innovation is largely cut off from this generally well-integrated national innovation ecosystem. There is a systematic and deliberate “firewall” between civilian and defense research and long-established concern in society and parts of the political landscape over dual-use research. There is a deeply embedded perception of “good” and “bad” innovation in Germany. Civilian research is seen as contributing to the wealth of the nation and fits Germany's self-image as a country of ideas and engineers. Many Germans perceive defense research, on the other hand, as undermining a peaceful world. Some universities reject funding by the armed forces and defense industries.

More importantly, the government is also traditionally split on this issue. The defense ministry stresses its commitment to defense/military research and innovation and also mentions the importance of the civilian industries in order to cope with contemporary

challenges and compete internationally.⁶ As such, in its industrial research report of 2015, it already set out the importance of working with various civil organizations. But the Ministry of Education and Research is traditionally opposed to a closer link between civilian and defense-related research.

Within the defense ministry, two divisions are responsible for innovation, research, and development. First, the ministry's planning division, supported by the Bundeswehr Office for Defense Planning, which studies the changing environment and resulting capability needs and produces reports such as the recent internal *Strategic Perspective 2040*.⁷ The Office for Defense Planning has also published several studies that focus on specific technologies, but not on innovation as an overarching perspective and its consequences for German security and its ability to defend itself. Second, the armaments division does its own research and technology within the defense ministry's military science and technical departments and in cooperation with the Fraunhofer Society for the Promotion of Applied Research (FhG), the German Aerospace Center (DLR), and the Franco-German Research Institute Saint-Louis, and as part of project-funded research by awarding contracts and grants to third parties within industry and private business, universities and colleges, and to non-university research institutions.

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The German defense industry also conducts its own research. This is in turn guided by the priorities individual companies see in their target markets with new products and versus their competitors. Hence, investment is not necessarily linked to a German or European demand or threat assessment.

⁵ Organization for Economic Cooperation and Development, "National Innovation Systems," 1997, p.10, <https://www.oecd.org/science/inno/2101733.pdf>.

⁶ Bundesministerium der Verteidigung, Wehrwissenschaftliche Forschung Jahresbericht 2015.

⁷ The German Weekly *Der Spiegel* obtained a leaked copy of the document: See https://magazin.spiegel.de/SP/2017/45/154110330/index.html?utm_source=spon&utm_campaign=vorab.

The German government also has civilian programs linked to the broader field of security, but within a definition of security that excludes the military dimension. As a result these programs are cut off from defense industry research and funded lines run parallel, rather than being combined. One example of such non-military security research is the Research for Civil Security program, the education ministry (BMBF) made about €279 million available for 122 projects aim of improving the civil security of citizens between 2007 and February 2012.⁸ In addition, industry has contributed approximately €79 million. Research is being carried out on solutions for complex security scenarios in 48 projects in the focal areas of “protection of transport infrastructures,” “rescue and protection of people,” “protection against the failure of utility infrastructures,” and “securing supply chains.”

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These projects interact with the wider network of national and international non-military projects and across disciplines, the research is sourced by a broad and open innovation system. This in turn creates not only more value for money, but also means that industry and businesses invest heavily into research and technology. Through institutionalized cooperation between industry and public research entities such as universities, the results can flow between actors.

However, this flow excludes the defense sector. The German defense innovation ecosystem does not create synergies in the way it could. It is largely in the research and development phase that costs can be cut — especially in the digital economy. The use for various applications of one technology developed

during the research and development stages makes the duplications of effort unnecessary. Permeable borders and flows of knowledge, ideas, and people across civil and military domains and various scientific disciplines are key to more innovation. This contributes to the return of investment into innovation on a system level.

But in Germany, these synergetic effects are missing in the dual-use area — in other words, where broader areas of technology and innovation can contribute to both the civil and military domains. This in turn increases costs and leads to a duplication of research and development, fragmented islands of knowledge, and a reduction in the availability of research and development resources and the competitiveness of products and producers. Competitors are increasingly successful because they quickly develop high-quality defense applications from both commercial and civilian technologies. These competitors are not only those states Germany is competing with on both political and industrial levels, like China or Russia, but also political partners like the United States, U.K., and France who nonetheless will seek individual economic advantage and support their industries in developing competitive products.

As the center of gravity for innovation moves quickly toward the non-military side, actors that benefit from civilian developments acquire a growing potential in technology but also in military terms. Eventually, the costs for countries like Germany to counter these developments through traditional military capabilities will increase exponentially as they are becoming ever-more specialized and isolated from the civilian and commercial (innovation) world. With traditionally shrinking numbers of units but also traditionally increasing research and development costs, the costs per unit for military solutions will increase. At the same time, means of attack originating from the commercial/civilian spin-offs will become even cheaper. Thus, from the point of view of national welfare, military security solutions are becoming more expensive — and the irony is that this is happening precisely because other countries are making more effective use of dual-use applications.

⁸ Federal Ministry of Education and Research, "Research for Civil Security 2012–2017," https://www.bmbf.de/pub/Civil_Security_Framework_programm.pdf.

A look at Germany’s partners illustrates the point. France and the U.K. systematically integrate their civilian and military innovation systems and thus make an additive use of their research and development spending for overall security. Instead, Germany tends to duplicate research and development through parallel work in the civilian and military domains and thus neutralizes parts of the investment.

One area where Germany may be overcoming its dual-use aversion problem is cyber. The Cyber Command that was established by the defense ministry in 2017, which is tasked with connecting with the civilian world, could be a test case of these new ways of working. Among its first initiatives was the Cyber Innovation Hub (CIH) innovation platform.⁹ The CIH is a pilot project that aims to

create a regular exchange between people from the fields of research, science, and industry in order to stimulate the development of dual-use technologies that could be used by the Bundeswehr in the future — a mixture of an innovation agency and a tech procurement center. Together with the High-Tech Start-Up Fund (Gründerfonds), the CIH has started to invest in young, innovative technology companies that could be of value for German defense industry. For example, the High-Tech Start-Up Fund invested 600,000 since 2005 euros in young, innovative technology companies — and will provide up to €2 million in follow-up financing.

Germany’s Innovation Path Must Run Through the EU

As the system is more than the sum of its parts, risks and threats are not based on single projects and technologies but on the clever links between them. The more such technologies are of civilian origin,

⁹ Cyber- und Informationsraum der Bundeswehr, “Startup-Pitch: Gründerszene Meets Bundeswehr,” July 26, 2017, http://cir.bundeswehr.de/portal/a/cir/start/service/archiv/2017/juni/lut/p/z1/hY_RC4lwEMb_I2-znPq4kkQosYTKvcRwwxa2yVJSQ398k8A36R4-uPt99xOHDk7ANB9Vx50ymve-bxi5kXRd5GGNDiiOQkRjilGKjxjIBM5w-WdhHq0FoghqlaHxGfFiRuJNwIAJGvRGSzepak9opr53lzhgMNB1E3IZ60mgBDQIZxtM5IP4Q8v9tqpWcZiVm9MU-0Ajf8-7vJ2ehub0tehlZVr6GwzPXVKWUfcFzmZF_w!!/dz/d5/L2dBISEvZ0FBIS9nQSEh/#Z7_694IG2SOM07520A7A1091Q1080.

Defense Research and Development Spending (millions of euros) in the EU 2015

Source: EUROSTAT, Datenbank

Area of Research	Germany	France	Italy	United Kingdom	EU28 (average)
Civil Research and Development	25,082	13,156	8,204	11,759	897,93
Defense	820	1,017	63	2,364	4,658
Total	25,902	14,173	8,267	14,124	94,451
Defense spending as percentage of total spending	3	7	1	17	5

the more the dual-use activities of other actors have to be assessed not only in economic but in security and defense terms. In today's world we face complex threats derived from the effective use of non-military sources that consequently generate military threats. The development of artificial intelligence is one example. This is a very specific thing that is missing from Germany's awareness, and thus from Germany's strategy: the morphing of non-military tools into military threats. As an open, liberal society and one of the political and economic cornerstones of Europe, Germany needs an overarching approach to risks and threats of non-military origin. Innovation therefore needs to be assessed from an overarching perspective with regard to its consequences for German security and its ability to defend itself.

While the recent White Book correctly identified and analyzed the type of risks the country is now facing, this is not a replacement for a constant and frequent analysis of developments affecting the German economy, political system, and society. This type of analysis ought to go beyond the responsibilities of individual ministries. Precisely because individual ministries have so much influence over government policy, a horizontal body that reports to the whole cabinet is needed. Funding that is conditional on the cooperation between ministries and agencies would also create incentives to do so.

Germany abstaining from systematically harvesting dual-use technologies for its defense domain has not made the world a safer place and has not made Germany safer either. The opposite is true: Because other actors are making more effective use of the innovation in the civilian domain for their defense application, Germany is behind the curve in two respects. First, it cannot compete, offer solutions, or be an equal partner in joint ventures. Second, Germany's adversaries can take advantage of the relative weakness of the country and its vulnerabilities.

Attempts to narrow this gap through a deeper civil-military integration of research and development networks and by fostering the exchange of results will have to overcome the distrust and fear toward dual-use technologies that is so deeply embedded in German society. Thus, while intentionally integrating

the civilian and military innovation systems makes sense from a purely functional perspective, the ideological stumbling blocks may simply be too high. The other idea currently making the rounds is that of an agency based on the U.S. Defense Advanced Research Projects Agency (DARPA). This would be a military agency but would nonetheless try to take advantage of dual-use potentials emanating from civil society.

Neither civil-military integration nor a German DARPA will be popular among German politicians. Thus, the key to a sustainable cutting-edge defense and security technology will be a narrative that raises the awareness that, in the tech world, inaction offers no protection. For example, Germany has not been spared cyber-attacks because of its large and effective cybersecurity system — quite the opposite. By failing to develop effective security responses, the German government is failing in its responsibility toward its own citizens.

The best way to move forward with more defense innovation may be through the EU. In this way, Germany is already active in the security and dual-use programs offered by the European Commission. New initiatives like the Permanent Structured Cooperation (PESCO) and the European Defence Fund (EDF) are also of such political importance that Germany will not thwart them without facing serious criticism. Once they are up and running, the initiatives will also offer opportunities for more joint research and development with preferred political partners. It would also fit with the idea of "strategic autonomy" and a more capable defense technological and industrial base.

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About the Transatlantic Security Project

GMF's Transatlantic Strategic Superiority in the 21st Century project aims to study key transatlantic perspectives on defense innovation and its implications for defense cooperation in the 21st century. The project, led by GMF's Paris office in partnership with Airbus, addresses the strategic and industrial aspects of defense innovation in the United States, France, Germany, and the United Kingdom, and fosters transatlantic dialogue on such issues.

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