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Germany in Space – A Strategic Assessment

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The Federal Republic of Germany is one of the world's most powerful economies, ranking fourth in 2022, according to the World Bank [data](#). Its industrial base is also highly advanced technologically and innovative, and the German research-and-development infrastructure is one of the most capable in the world. However, despite having a thriving aerospace industry and a large state budget, Berlin does not wield military space capabilities that would reflect its potential. As of January 2024, Germany operates only ten dedicated military satellites, seven of which are well into their second decade of service and require replacement. This process is already underway, but the indigenous military space architecture is still well below the needs stemming from recent changes in the regional and global security environment.

This analytical piece attempts to assess German national security space capabilities against the background of the evolving security environment around Europe. For that purpose, we will first describe the current dynamics of European security from the German point of view. Secondly, we will review the capabilities of the German military space architecture. And finally, we will attempt to provide a strategic assessment of German space capabilities.

1. Security Environment

A significant change in the security environment around Europe is ongoing, which also has important ramifications for space security. It is, of course, associated with the changes in

the Russian Federation's attitude towards Europe and the West as a whole, which have happened within the last several years. For the purpose of this argument, we will provide only a short description of the Russian strategies and policies and their impact on European security.

The authorities of the Russian Federation, and, for the most part, the country's society as well, believe that Russia has been endangered by the hostile policy of the Western states, particularly of the United States. However misguided this perception is, it drives the Russian strategies and policies. The specific interpretation of history, ideological and cultural considerations, lack of understanding of the West, and particularities of the Russian political system and strategic culture form the basis of Moscow's grave misunderstandings and miscalculations regarding threat assessment. The perception of external threats and misguided belief in its own strength and the West's weakness has brought Russia to the catastrophic [decision](#) to escalate demands in 2021 to force the United States to accept the Russian sphere of influence and accommodate its need to institutionalise it. Western rejection of this offer, which would *de facto* mean reinstatement of the Iron Curtain, led to the war in Ukraine because the Kremlin decided that it would take by force what it was not given at the negotiating table.

This momentous mistake greatly contributed to the quickening of the deterioration of the security situation in Europe. Since 2014, the Western countries, alarmed by the Russian annexation of Crimea and subsequent invasion of the Donbas region in Ukraine, had acknowledged that Russia was not ready to accept the position of a reasonable stockholder in the Western-led world order. Since then, the Russian drive to restore the international position it occupied during the Soviet era was apparent. Due to the lack of significant ability to attract partners and allies, Russia had to resort to coercive measures. An aggressive attitude towards neighbours is also somewhat traditional, taking into account Russian imperial history, ideology, and political culture.

Consequently, Russia has manoeuvred itself into a very difficult position from which it is unable to back down. It has to pursue its maximalist goals in Ukraine, meaning that the Kremlin will not stop short of subduing all or almost all of the country. Moreover, the Russian authorities believe that that goal is feasible because the Western military and financial aid which keeps Ukraine afloat will surely diminish. Moscow believes that its economic potential, military might, and political resolve are sufficient to conduct a long war of attrition, which it will finally win.

Summarising, the security environment around Europe is characterised, at least from the German point of view, predominantly by the growing threat from Moscow. Moreover, it is apparent that Russia is, and will continue, fighting for the sphere of influence, and no one knows how big this sphere is supposed to be. The Kremlin's aspirations in that regard will most likely increase concurrently with the growth of its international sway, economic might and military capabilities. This situation will persist for the foreseeable future, which is why most of the current European political elites understand the necessity to defend Ukraine. It is viewed not only as an immediate need to defend the global order but also as

a pre-emptive measure against future Russian expansionist policies. However, Ukraine may fall, so the European nations are also preparing for future confrontations by increasing their military spending and adopting lessons learned on Ukrainian battlefields. One of the most important developments related to the Ukrainian conflict is the growing significance of space systems on every level of military operations, which is the focal point of this analysis.

2. German Military Space Capabilities

The following assessment entails only the most important data concerning military satellite systems. Thus, it is not necessary to delve deep into the technicalities and details of the organisation of the German space effort.

The Bundeswehr (German federal armed forces) operates SatComBw stage 2 communications constellation, comprising two ageing geostationary (GEO) satellites COMSATBw 1 and 2. They were [launched](#) in 2009 and 2010 and have limited capabilities relative to current needs, particularly regarding Internet connectivity. Nevertheless, in 2022 the operation of the system was [extended](#) till 2028. At the same time, [replacements](#) were procured, which aim to form a SatComBw stage 3 constellation, comprising COMSAT 1a and 1b, holding the same positions as its predecessors. They are scheduled to be launched in 2028/2029, [possibly](#) followed by a third craft.

The German military also operates a radar imaging satellite system SAR-Lupe. Five satellites, [equipped](#) with 1-meter resolution synthetic aperture radars (SAR), are located in low Earth orbits (LEO) at altitudes [ranging](#) from 468 to 751 km. They were launched in 2006-2008, so they are nearing the end of their lifespan, therefore, the process of their replacement is underway and nearing completion as of January 2024. The new radar imaging system is somewhat different from the older one. Instead of five identical SAR satellites, it consists of two SAR (SARah 2 and 3) and one phased array active radar (SARah 1) craft, which orbit in formation relatively close to one another at a mean altitude of approximately [500](#) km. The resolution of the new SAR radars is not known yet, but it is [advertised](#) by the manufacturer as increased in comparison to SAR-Lupe sensors. The SARah 1 went [operational](#) in October 2023, and numbers 2 and 3 were successfully launched on December 24, 2023; they should commence normal operations within several months.

In 2017, the German federal government [allocated](#) 400 million euros for procurement of an optical imaging satellite constellation, which until then had been considered too expensive. A new system is to be operated by the Bundesnachrichtendienst (BND), the German foreign intelligence agency. According to available information, a three-satellite constellation, nicknamed Georg, was supposed to be [operational](#) by 2022. However, as of January 2024, there is no mention of a planned launch.

Summarising, it should be noted that the German national security space architecture does not look impressive compared to the country's technological and industrial potential. The lack of LEO or modern GEO communication constellation hampers tactical use of satcom

systems as dedicated receivers are too big and difficult to operate in many situations. Additionally, the relatively limited Internet transmission capabilities are insufficient for transmitting the huge amount of broadband data that the modern military uses. Furthermore, the lack of an optical imaging satellite system makes the German military blind, which is only partially alleviated by modern radar imaging capabilities. However, only one three-satellite set of radar sensors, which will remain after SAR-Lupe goes offline, will have a relatively low revisit time and be vulnerable to countermeasures. Certainly, imaging and communications capabilities can be augmented by using services provided by allies, particularly the United States, or by commercial entities. However, seeking help from allies is politically sensitive, showing Germany's weakness and lack of strategic autonomy. Using commercial capabilities also brings some operational constraints because they are not that well-secured and/or do not have the same quality as dedicated military systems.

3. Strategic Assessment

The last several years have brought important developments within the realm of space security, greatly affecting current and future strategic realities around Europe. The conduct of the war in Ukraine only quickened and exposed these changes, which affected Germany as well. Consequently, new threats, constraints, and opportunities have emerged and should be taken into account in strategic military planning.

The war in Ukraine has amplified the significance of space systems, although it is not the first conflict in which satellites have been used extensively. The strategic and tactical use of satellite imagery, communications and navigation have been a military routine for decades. Until recently, the militaries and intelligence agencies were using only state-owned, dedicated military and intelligence-gathering systems, supplemented occasionally by civilian communication satellites for non-critical services. Meanwhile, the capabilities of an increasing number of commercial space systems have improved, often matching military requirements. This way, despite having no military space architecture, Ukraine has used military-grade space-derived communication and reconnaissance services obtained from commercial entities with the consent of the Western governments.

Let us reiterate that the use of space systems as a *force multiplier* is not new; however, the dissemination of commercially available space-derived military-grade capabilities which give non-space-faring nations significant advantages is. This way, Ukraine benefits unprecedentedly from using commercial optical and SAR imagery and the broadband Internet. On the other hand, Russia [does not possess](#) extensive military-grade satellite capabilities and has limited access to commercial markets regulated by the Western governments.

The second [trend](#) in space security, well-visible in the last several years, is an increase in diversity and maturity of counterspace measures. It naturally coincides with the increased use of space systems for national security purposes. Leading nations not only need to use their space systems for surveillance, positioning, and communications, but some of them also design capabilities to deny these benefits to other nations. A variety of electronic and cyber warfare measures have been developed and are frequently used, not only during

open conflicts. There is also a question of destructive anti-satellite (ASAT) weapons, which have been technologically feasible for decades but were never deployed in strategically significant quantities. Currently, four nations have openly displayed ASAT capabilities, of which Russia probably has the greatest experience in the development of means of attacking satellites in orbit. Furthermore, non-destructive lasers are being used to blind or dazzle imaging satellites, and more powerful lasers may soon come along with other directed-energy weapons.

Summarising to this point, we should highlight two complementary trends in space security. The first is the increasing use of space systems, including commercial ones, for national security purposes; one might say that the militaries and intelligence agencies have become increasingly dependent on space systems. The second trend refers to growing capabilities designed to degrade adversaries' satellite systems to hamper their ability to conduct missions and to the dissemination of these capabilities worldwide.

That is why the United States, a nation which is an unquestioned leader in the use of space for national security and so particularly dependent on satellite systems, is already addressing the problem of the growing vulnerability of increasingly important space systems. The U.S. military space architecture is in the process of restructuring from the relatively small constellations of huge, expensive and difficult-to-replace satellites to a disaggregated system consisting of a great number of smaller, cheaper and easily replaceable craft. It is widely believed that it is the future of national security space systems; France and China have recently also started to develop similar concepts.

Considering German space architecture from the point of view of the trends indicated above and matching them with the developments of the security environment around Europe, we can see several important consequences.

1. The growing threat from Russia will require an increase in the effectiveness of space capabilities as a *force multiplier*, which is instrumental in improving deterrence posture. Enhanced deterrence is undoubtedly vital for Berlin, which faces Central and Eastern Europe and has a growing interest in cooperation with nations in these regions. Furthermore, as an important European power, Germany must also contribute adequately to the collective deterrence and defence of the NATO alliance. The latter aspect is essential because the strategic autonomy of Europe as a whole and individual European states has become ever more important since the United States is no longer a reliable ally, what Donald Trump proved during his 2016-2020 tenure as president and what he is proving as a candidate in the 2024 presidential elections. Consequently, as a leading European nation facing the East, Germany must have significant military space capabilities.

2. On the other hand, the growing effectiveness of counterspace measures must be considered. From the German point of view, it is of particular importance that Russia has been developing these capabilities for decades and amassed significant knowledge and experience regarding ASAT operations. Furthermore, having experienced a disadvantageous po-

sition in the war with Ukraine regarding satellite use and having difficulties with the development of its own military space potential, Russia will most probably redouble efforts to design and field numerous counterspace capabilities.

3. The most important consequence of the fast-growing counterspace capabilities is that, most probably, the existing space systems will soon be prone to quick degradation in case of conflict or heightened tension. Thus, the German capabilities, which will encompass two GEO communications satellites and one three-piece radar imaging in the foreseeable future, seem fragile at best, particularly because they are facing a [proficient](#) adversary such as Russia. A likely quick increase in the Russian counterspace capabilities will not be matched by the improved resilience of the German military space architecture.

4. Summarising, the German government faces a difficult dilemma, as it needs autonomous space capabilities for national security missions, but at the same time these capabilities may easily be compromised in the near future. As of January 2024, it is not known if Germany has a viable strategy to address this problem.

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