

Autonomy and Asymmetry: The Future of Norway's Defence 2022-2042

If Russia's invasion of Ukraine in 2022 spurred a reassessment of European security, it also served as a poignant reminder to Norway of how quickly armed conflict can force, if not require, transformation of military technologies and norms to better prepare for future wars. In a matter of months, NATO members coalesced to respond with direct lethal military aid to Ukraine, including Norway.¹ Finland and Sweden joined NATO, creating a Scandinavian bloc for the first time since the alliance was founded in 1949. Russia's brinkmanship over European energy also raised the strategic value of — and risk to — Norway's oil and gas sector.

Even amid the ongoing conflict, it is time to revisit assumptions in Norway about how armed conflict will evolve from today through 2042 and what that means for Norway's defence technology priorities in relation to threats from Russia and beyond. The lessons of how Ukraine and Russia employ emergent technologies in a war that seems to have one boot in the past and one in the future should prompt deep introspection about Norway's military operations.

Some of the key technological concepts surfaced in this examination will be familiar, but what differs is how they can be employed in disruptive ways: such as whether to defend Norwegian territory with mechanized forces in depth at the border or whether to draw in an adversary's land and naval forces to better destroy them on familiar ground with armed autonomous drones. Other issues are plainly new, such as defining the responsible use of autonomously armed drones inside Norway's northern territory during a wartime scenario with Russia or China. Many of these technological advances have roots in civilian innovations, such as artificial intelligence (AI) software and commercial drones. All of them require facing the uncomfortable aspects of disruption that require reappraisal of whether the way things were done in the past will be sufficient to confront the present and future world as it is, not as we wish. While Norway is a core member of NATO and will soon remake longstanding defence partnerships with Sweden and Finland, it should not shy away from its own technology-forward approach to national security.

Norway's Challenge – And Opportunity

The Challenge: Norway's armed forces are historically small in number yet this highly professional force has transformed in recent years to perform myriad 21st century missions that are unique to the nation. As a NATO member, it must defend Europe's longest coastline, patrol the skies over the stormy and strategically vital North Atlantic, maintain a small but economically and culturally vital border with Russia, as well as jointly protect Arctic interests such as Svalbard and natural ocean resources, in addition to assuring cyber and electronic infrastructure. It also has a fresh mandate to reimagine defence cooperation with new Scandinavian NATO allies Sweden and Finland.

The challenge for Norway today is growing numbers of potential asymmetric threats in each of these areas posed by the new technologies changing warfare, while traditional military threats requiring highly capable conventional forces have not gone away.

Furthermore, Russia's military failures in Ukraine are no guarantee that future operations will not succeed or at least be catastrophically harmful to Norway. Reform to Russia's armed forces is certain after Ukraine, and it likely to address many of their operational shortcomings the conflict exposed and may even accelerate its technological transformation.

It is tempting to assess Norway's current and future military by its budget or the number of active-duty troops or squadrons of fighter jets. After all, it is a force that is half the size it was at the end of the Cold War.² Yet spending has more than doubled since then to historical highs as the force has become more technologized.³ It is unlikely that Norway's military will grow in end strength to past peaks, which therefore requires a fresh way of thinking about military strength and the role that technology can play in it. Moreover, Norway's growing population of ageing citizens may pose challenges to filling the ranks of the armed forces.⁴

The Opportunity: Recent advancements in robotics, software, satellites, and autonomy place a new onus on Norway's leaders to carefully consider the technological possibilities in areas such as robotic systems capable of supplanting human forces, powerful individual weapons to target aircraft and armoured vehicles, and lower cost commercial geospatial data. Technological asymmetries can be turned into advantages with the right policies and investment. As such, this review offers an opportunity to consider how the above challenges can be addressed with investment in new technological capabilities that link to current and near-future warfare trends, including those present in the conflict in Ukraine such as:

- Commercial space is vital for situational awareness and communications
- Defending civilians requires hard power because laws and norms are insufficient
- Mobile phones and AI create new battlefield transparency and cognitive effects
- Civilian expertise in AI, drones, and software is central to tactical operations

As well, Norway must contend with more than the threat of Russia. As NATO recently asserted at its Madrid Summit in 2022: "We face systemic competition from those, including the People's Republic of China, who challenge our interests, security, and values and seek to undermine the rules-based international order."⁵ Irrespective of recent public tension between Beijing and Moscow, China's military interoperability with Russia continues to expand, particularly in the Arctic.⁶ China's growing defence-industrial capabilities, particularly in autonomy, hypersonic missiles, offensive space capabilities, and advanced shipbuilding portend Russia-like consideration of Beijing's strategic interests and how military presence, if not force, may be used.

Norway's military posture today also embodies a useful tension between high-tech platforms and traditional defence: 5th generation F-35 fighters patrol Arctic skies flying tens of thousands of feet overhead small-unit long-range reconnaissance foot patrols along the Russian-Norway border. This is a useful paradigm for understanding how emergent technologies can contribute to Norway's security but not at the expense of common sense or overreliance on vulnerable systems.

The following concepts reflect this realistic understanding of what is technologically possible, but politically or culturally feasible. At the same time, it should be clear that some of the ideas offer a path that will lead to clear departures from traditional ways of thinking about the Norwegian military and how it employs technology. It would be easy to discount some of these concepts for being too radical. Even with that categorical reaction, it is worth considering the rationale behind them all the same because they address underlying truths that future conflict will be waged at machine speed, with increasing autonomy, and greater peril to civilian populations from cognitive and kinetic effects.

Norway's Solutions:

Thinking clearly about the future of warfare and technology's role in it requires imagination. Yet such thinking must also anchor to a central line of questioning. In this case, the crucial questions are focused on threats, priorities, and operations:

- What technology areas will create new or amplify existing threats to such an extent that they will affect the defence sector in the next 10-20 years?
- What technology areas should the defence sector emphasize in order to avoid weakened defence capabilities in relation to Russia the next 10-20 years?
- What types of technology should the defence sector use to maximize interoperability with allies and partners for the next 10-20 years?

What these questions lead to is the conclusion that to prevail in a high or mixed intensity war with Russia during the next two decades, Norway should invest in next-generation situational awareness and targeting, as well as seek-and-destroy weapons systems capable of semi- or fully autonomous target selection.

As an example, traditional mechanized armoured forces are still vital to domestic and foreign military operations during this period. Yet the introduction of Sweden and Finland into NATO allows for a reconsideration of how Norway should defend Finnmark at a time when heavy armoured vehicles are increasingly vulnerable to both long- and close-range weapons systems. Instead, small, fast-moving, lightly armoured units equipped with short- and medium-range strike weapons like rocket artillery, as well as organic anti-air and anti-drone defence systems, can have the same or greater destructive capability at greater range but with less exposure to Russian artillery or long-range missiles fired from within Russian territory than traditional units. In the air, fifth-generation fighters like the F-35 will jointly defend Scandinavian airspace with the aid of autonomous unmanned fighter and ground attack aircraft, while providing crucial data and sensing capabilities to ground and maritime forces. Norway's naval forces will necessarily operate with squadrons of distributed manned and unmanned squadrons for surface and undersea missions given the growing lethality of Russian and Chinese anti-ship missiles.⁷ As part of a renewed Scandinavian defence, Norway could become a regional or European leader in such autonomous and human-machine teamed systems by partnering with U.S. and other allied software, sensors, and robotics programs. This

would represent a new specialization for the Forsvaret of the late 2020s and 2030s and complement Swedish and Finnish capabilities.

Threats 2022-2042 *What technology areas will create new or amplify existing threats to such an extent that they will affect the defence sector in the next 10-20 years?*

There is a long list of military-oriented or specific defence technologies that will have a significant impact on the threat environment faced by Norway. Some, such as synthetic biology or quantum computing, have the potential to be truly game changing at some point in the near future. Yet the following three military technology threats that fuse next-generation software, AI, and breakthrough hardware are already extremely consequential whether or not it is Russia or another nation that employs them.

- Space-based surveillance, communications, and offensive systems
- Inexpensive autonomous armed drones and unmanned ground systems
- Smartphones and AI personalize cognitive and kinetic warfare

Space Data: This is a new era for commercial space-based data from small satellites that has major implications for future warfare. Precise and accurate information about imagery on Earth is now accessible and relatively affordable due to a new generation of inexpensive and ultimately disposable satellites. At the same time, advances in AI make processing this new wave of data much faster and more reliable. Recently, space-based surveillance has shown to be extremely effective for Ukrainian forces for establishing situational awareness and targeting in its defence against Russia. Norway's sensitive maritime oil and gas resources and infrastructure can be assumed to be one such target of persistent space-based surveillance; this is also part of a solution to protecting those same assets. The emerging market for data from space will make hiding — and defending — much more difficult in the 2020s and 2030s, as will small satellite constellations owned by nation states.⁸ As precision weapons like rocket artillery and armed drones proliferate, the ability to locate targets from space will become increasingly important, particularly in contested airspace.

With communications, the Starlink platform shows how effective space-based small satellite alternatives to terrestrial Internet access during wartime.⁹ For Norway, this is both risk and opportunity. Defensive fortifications or movement of materiel, for example, will be detected immediately. At the same time, purchased satellite data offers near real-time access to information on Russian preparations and movement.

Robotic Autonomy: The past three years revealed a growing profile for drones in warfare, from the 2020 Armenia-Azerbaijan conflict¹⁰ to Ukraine's present battlefields, even with the rudimentary level of control and semi-autonomy that exists today. Small and inexpensive drones can now be equipped AI-powered target-recognition systems, as well. As drones move from surveillance roles to regularly attacking targets, this will only grow and will evolve tactics. Russia's experience in Ukraine with drones shows a willingness to regularly employ them in warfare, and its import of foreign-made drones

such as Iran's indicate it is going to continue employing armed drones.¹¹¹² Many nations are proliferating drone systems, to include China as a leading exporter. Meanwhile, Ukraine's crowd-sourced and civilian-driven drone innovation shows a new leading technological edge, while its military flies Turkey's TB2 drone that can operate largely autonomously.

A mix of heterogenous robotic capabilities will be a staple of future conflicts. Armed ground systems are poised to emerge onto battlefields, as well, in a replication of the aerial drones evolution. The recent Nord Stream 1 and 2 pipeline explosions point to the sort of high-consequence strategic economic attack that an undersea robotic system might carry out in the future with greater autonomy and therefore stealth.¹³ The significant shift ahead is to see such systems operating without control stations and high-bandwidth communications that are necessary today. To that end, NATO is reportedly preparing a strategy for the responsible use of autonomy, in another recognition of evolving robotic systems. Even if NATO members adhere to such guidelines, it is unclear whether states such Russia or China will do so even as they develop and employ autonomous weapons systems.¹⁴

Smartphones and AI: Smartphones on 21st century battlefields are ubiquitous, but what's evolving during the past few years is their tactical and even strategic effects. There is a developing fusion of AI-powered image processing, scaling information and cognitive campaigns using social media, and ever-more refined kinetic and electronic targeting capabilities honing in on mobile devices. Just as space-based surveillance is creating new levels of operational transparency, the proliferation of high-quality smartphone cameras linked to cloud computing means that as soon as information is identified with a handheld device it can be shared across civilian or military networks, not just social media. In a recent example, Ukraine's software developers are real-time creating apps alerting citizens to air raids, while the government's eVorog chat program enables registered users to rapidly report Russian equipment or personnel, data which is screened by AI.¹⁵¹⁶

Just as smartphones are sensors, they are vectors of information — and disinformation. The contest to capture an individual's attention and influence their emotional state or real-world actions is in effect an evolution toward cognitive warfare, which could see the precision targeting of individuals but at scale using new AI systems.¹⁷ Among those systems are text-generating tools called Large Language Models, which have the ability to churn out an unending stream of realistic, human-like writing on social media and elsewhere. The open-source LLM Bloom features 46 languages and 13 programming languages.¹⁸ As well, image generation and manipulation tools using AI are also proliferating as easy-to-use programs, of which some social media consumer apps offer a preview.¹⁹ In Ukraine, deep fakes quickly emerged in the conflict with a spoofed video of President Volodymyr Zelensky ordering Ukrainian forces to stand down.²⁰ Both of these software capabilities will increasingly be managed by AI programs themselves, a

form of autonomy that is going to influence everything from propaganda to civil discourse during conflict.

Priorities and Interoperability 2022-2042 *What technology areas should the defence sector emphasize in order to avoid weakened defence capabilities in relation to Russia the next 10-20 years and how might they reinforce interoperability with allies and partners?*

The other side of risk from technologies changing warfare is opportunity. The same inventions and innovation that exacerbate current and future threats to Norway also indicate where to focus research and investment. This requires consideration, too, of Russian military capability and investment plans, as well as a realistic assessment of their effective execution during the next two decades. Caution is needed, however, in assuming the failures of Russian forces in Ukraine²¹ will be the failings of late 2020s and 2030s Russian military forces. While military reform of the past five years in Russia has proven to be hollow, it is also possible that the same mistakes will not be made again. Either way, there are enduring aspects to the threat Russia poses to Norwegian territory and Norwegian forces operating abroad in support of NATO: threatening Arctic and North Sea lines of communication (including Svalbard), air-defence denial zones over Scandinavia, seizing and holding territory in Finnmark through massed armour, medium- and long-range precision and area weapons fired from inside Russia, as well as cyberattacks and “grey zone” operations.

Each of the following priorities addresses these threats:

- Autonomous aerial, maritime, and ground systems for rural- or open-territory (surveillance, logistics, attack)
- Small unit anti-armour, anti-ship, and anti-air: Javelin in every closet
- Commercial space access and support

Autonomy 3.0: Even in the era of software-driven warfare, the ability to mass large numbers of forces still rings true — even if it strikes a different note. Advances in robotics and AI-powered autonomous will enable nations to mass force differently than in the past, and in ways that are difficult for conventional defences to counter. It also opens new avenues for defence. Today’s swarm-capable munitions like the Naval Strike Missile already show the potential of such systems and preview how they might develop.

Consider that Norwegian military forces must cover over 385,000 square kilometres of territory and a coastline of more than 25,000 kilometres. Using unmanned and largely autonomous systems to patrol Norwegian territory would allow for a judicious use of manned platforms such as F-35 fighters or Norway’s six Skjold-class missile ships. Many strategic areas in Arctic Scandinavia, such as Cap of the North where Finland, Norway and Sweden share interests and territory, are sparsely populated yet constitute

significant land and maritime portions of each country. Such an area is difficult to patrol, let alone defend, with traditional mechanized forces. Using more numerous autonomous air, ground, and sea systems for joint or unilateral patrolling, logistics support, and deterrence would allow for extending that presence beyond what has been traditionally possible.

Take the example of Norwegian military patrols on oil and gas infrastructure in the wake of the Nord Stream pipeline attacks; this presents a resources challenge to the Forsvaret if this mission becomes an enduring one.²² Such persistent surveillance and interdiction missions are well suited to autonomous maritime and air systems whose data is collected and sorted by AI onboard or on the ground. Yet current unmanned aerial systems spending in the air domain, for example, is less than 1% of 2021-2028 Defence Ministry forecasts; land domain spending for UAS is under 5%.²³

Similar explorations of operational trade-offs of are underway with the US Marine Corps Force Design 2030 reforms.²⁴ By giving up main battle tanks and some fighter aircraft, the Marine Corps seeks to reinvest those resources in smaller units of infantry supported by robotic and autonomous systems whose military capabilities are on par with the conventional weapons they replace. Moreover, it will allow Marines to operate near China, often without direct support from conventional US military resources, and deploy a new generation of unmanned platforms, such as the NMESIS robotic wheeled vehicle armed with Naval Strike Missiles or the Metal Shark autonomous ship armed with loitering munitions.²⁵

One of the abiding defensive challenges is how to protect Finnmark and southern Norway from a Russian incursion in the north. In the case of such a scenario, a Brigade North defensive line in or south of Finnmark could be reinforced and patrolled with autonomous ground and air vehicles, which could be armed and tasked with deterring or interdicting Russian forces. Similarly, an ongoing challenge of regional resupply to Finnmark during wartime could be addressed with the new generation of autonomous cargo aircraft.²⁶ Similar tactics could be used with unmanned maritime surface and undersea systems along Norway's extensive coastline for patrol and supply. Because such autonomous robotic platforms' software can train in AI-powered synthetic environments, they can be readied for wartime use without requiring as much real-world training.²⁷ They also allow for reconsidering the composition of land units, such as the Norwegian Army's Brigade North. Acknowledging the break with traditional conceptions of military force and the attendant operational ethics issues of weaponized autonomy, a shift by the Norwegian military to employ autonomous robotic systems compensating for its end strength would allow for a novel way to counter massed (or dispersed) Russian ground forces with less risk and greater precision.

To be sure, robotic systems have their own logistical challenges and operational limits. Yet there is existing software and robotics expertise in Norwegian society, and where it is lacking it could be developed as a national resource of expertise in developing robotics for austere environments. The likely growing use of autonomous weapons

systems by Russia, and China means not letting those nations take a lead that will be difficult to close operationally — or ethically.

Small Unit Combat Capability: The iconic imagery of “St. Javelin” as a pop culture meme in Ukraine underscores how significant soldier-portable anti-armour systems like the FGM-148 Javelin are in an era of persistent surveillance and targeting.²⁸ Indeed, the United States and NATO members supplied Ukraine some 17,000 Javelins in less than a week in March.²⁹ What advantage Russia had with its armoured forces was radically reduced by the proliferation of these portable anti-armour weapons. Other models have been rushed Ukraine, too. Of course, most of these weapons were shipped hurriedly after Russia invaded Ukraine. Whether they would have had a deterrent effect on Moscow were they already in place is debatable; yet it’s undeniable that they would be able to thwart the free movement of spearhead armour units as well as harass supply columns. The same could be true in Norway, particularly in Finnmark, by acquiring highly portable and concealable anti-tank missiles like the Javelin so that Norwegian Army and Home Guard forces had access not to hundreds, but thousands of missiles and launchers.

This approach by Norwegian military forces to territorial defence, as well as deploying in support of NATO in the Baltics, for example, would be aligned with technology trendlines converging on small units that can find their own targets with their own drones and access to satellite imagery, then attack them with their own anti-armour or weapons systems before dispersing. These are not partisan tactics from the 1980s, but a networked approach to small-unit warfare that exploits an invading adversary’s need to consolidate force around seized terrain. Portable anti-air, anti-ship and anti-drone systems could also be dispersed along similar lines to deny airspace access from lower-altitude threats from attack drones and helicopters, as well as close-air support jets. As a model, reforms by the US Marine Corps to increase the combat power of small units portends this sort of almost inevitable reform of combined arms forces in high-threat contested environments.³⁰

Geospatial Data and Communications: Geospatial data from civilian satellites for military operations are becoming increasingly affordable — and effective. From exposing Chinese government transformation of South China Sea reefs³¹ into military facilities to documenting pre-invasion Russian troop movements and wartime human rights violations in Ukraine³², there is a revolution underway with commercial space satellites. Norway is already active in the military space domain, to be sure, including Norwegian satellites carrying Arctic communications payloads for the US Space Force.³³ The Svalbard Archipelago, one of the world’s most important collections of satellite ground stations, naturally positions Norway as a space-oriented nation.³⁴ This new generation of satellites and data represents a new opportunity for this status to evolve with the technology.

While conventional military- or intelligence-grade satellites can cost hundreds of millions of kroner, it is no longer necessary to outright acquire them. Defence spending plans — at less than 1% of 2021-2028 spending in the space domain³⁵ — for military space

are relatively small and may be insufficient given the high-bandwidth requirements of military systems of the late 2020s and 2030s. Commercial imagery or communications bandwidth is available with “space as a service,” as are other orbital services related to specific terrestrial sensing tasks. This is already an area of interest and investment for many NATO member militaries, including the United States.³⁶ As the economic value of space activity grows, so does its strategic value, yet much of that value will come from geospatial data or bandwidth from commercial assets, such as Starlink has shown in Ukraine. To that end, Svalbard’s military importance is only going to grow; the severing of an undersea fibre-optic cable from Svalbard to mainland Norway in January 2022 indicates the potential strategic vulnerability there and its potential as a target from Russian forces or interests.³⁷

Conclusion

These are vital questions considering how new technologies like lower cost geospatial data, AI-powered information campaigns, increasingly powerful individual anti-armour and anti-air weapons, and autonomous vehicles and aircraft could be used to reimagine the defence of Norway, as well as support Forsvaret operations abroad. Russia may be the near-term focus, but these explorations are also applicable to other strategically important areas, such as the growing importance of Arctic trade routes to nations like China. Allies and partners are essential, not just operationally in the defence of Norway but in how the nation prepares for the unthinkable. There are also lessons to be drawn elsewhere regarding technology and transformation, such as the Force Design 2030 reform of the United States Marine Corps, and emerging concepts around the civilian-military composition of combat units using new capabilities like drones. The war in Ukraine offers myriad hard-won lessons, too, but it is important to remember that Russia in 2022 will be different than the Russia of 2032 or 2042. To be sure, for all the focus on technology and the questions about the future of Norway’s defence, it is impossible to understand, and prepare for, what kinds of technologies will shape future conflicts without remaining focused on the human experience of 21st century warfare.

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