

Witnesses to change

Defence transformation in comparative perspective

Danny Pronk
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Clingendael Report



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Summary

This report describes how three Western countries, Australia, Canada and Norway, deal with the challenges of defence transformation in light of the changes currently taking place in warfare and in the global world order. The report uses an analytical framework consisting of the following elements: the strategic context and resulting defence policies, the transformation taking place along the lines of the three traditional domains of military operations (e.g. land, sea, air), as well as in the so-called “new” military realms of space and cyberspace. The three cases were chosen because of their relative comparability with the Netherlands and with the Dutch armed forces in particular.

This report concludes that in all the three cases, the national security context is shaped by the changing character of war, a renewed great power competition, challenges to the rules-based global order, state fragility in the Middle East, Africa, and Asia, and technological advances. Given that today’s security situation has become ever more demanding and uncertain, this necessitates a higher level of cross-government cooperation to safeguard national security. There is a clear need to develop a congruent framework of civil-military cooperation, but only Norway has done this with its so-called *Total Defence Concept*.

All three are strengthening their capabilities in the intelligence, surveillance, reconnaissance, electronic warfare, space and cyber functions. Enhancements in these fields in particular focus on strengthening capabilities for processing, exploiting and disseminating the large volumes of data and on enhancing situational awareness across all domains and environments, including space. Furthermore, cyber capabilities in particular are strengthened in order to both deter and defend against the threat of cyber-attack and to improve the ability to defend own networks and systems.

In the land domain, armoured vehicle inventories are being modernised rather than replaced. The high cost of producing new designs, in light of the quantities required, has led all three countries to instead upgrade and extend the life of existing platforms. In the maritime domain, there is an increasing emphasis on blue-water capabilities for naval vessels, and the worldwide proliferation of submarine capabilities is driving a renewed focus on anti-submarine capabilities, including submarines and maritime patrol aircraft. In the air domain, all three nations are, or soon will be, introducing into their inventories F-35A Lightning II fighter aircraft. At the same time, the increased ballistic and cruise missile threat is driving a greater investment in advanced missile defences, both on land platforms and at sea.

Finally, with their respective space and cyber strategies, Australia, Canada and Norway have all three adopted a comprehensive and coordinated approach, involving not only the government (both defence and other departments), but also the private sector and academia. The security challenges related to space and cyberspace can in their respective views only be met by placing a strong emphasis on collaboration and partnerships among all the relevant stakeholders at both the national and international levels. In all three cases the respective defence ministries only hold responsibility for assuring cyber security in the defence sector. In the realm of space, all three countries see themselves as spacefaring nations and view their sovereign space-based capabilities as strategic national assets.

Introduction

Today, the renewed possibility of high-intensity conflict with peer military competitors, such as Russia and China, preoccupies many Western armed forces, even though operations elsewhere, such as in Africa, Asia and the Middle East dominate combat, training and logistics. At the same time, there is a growing awareness that trends such as urbanisation and digitalisation will make future military operations increasingly challenging. Adequately addressing these challenges requires more investment in bespoke capabilities, next to the more traditional capabilities for land, maritime, and air warfare. Furthermore, Western armed forces are looking to develop and field capabilities in new areas of warfare like cyber, space, robotics, and directed energy.

Also, whereas previously it was more common to only use the term “war” for international armed conflicts, involving a conflict between two or more states and where one of the parties had formally declared war, today the term “war” is used in many different contexts, such as hybrid, cyber, and political warfare. Particularly the use of the term *hybrid warfare* has increased in recent years, although it really does not imply anything fundamentally new. The term denotes more how state and non-state actors can exert influence through a combination of overt and covert, military and non-military measures. As a result, the distinction between peacetime, crisis and armed conflict has become increasingly blurred.

This report describes how three Western countries deal with the challenges outlined above and assesses how they intend to transform their armed forces. The analytical framework consists of the following elements: the strategic context and resulting defence policies, the transformation taking place along the lines of the three traditional domains of military operations (land, sea, air) and in the “new” military realms of space and cyberspace. The authors apply this framework to three cases: Australia, Canada and Norway, that were chosen because of their comparability with the Netherlands and with the Dutch armed forces in particular.

Four indicative questions have been asked in each of the three case studies. The questions have intentionally been kept rather straightforward. And only unclassified, publically available data has been used to answer them. The answers to these questions provide an overview of the state of play regarding defence transformation in these three countries, without pretending that the analysis is either complete (e.g. by lack of insight in classified documents) or in-depth. However, the research results provide sufficient information for a comparative analysis to be subsequently undertaken.

- What is the strategic context and the resulting national security and defence policy?
- What are the strategic interests, goals/objectives, and activities in the defence realm?
- What are the investment plans for military capabilities in the three traditional domains of operations (e.g. land, maritime and air warfare)?
- How exactly are the “new” military dimensions of space and cyberspace incorporated into the armed forces?

The report ends with a section providing conclusions.¹

¹ All documents referred to in this report are listed in the annexed ‘Official Publications’ overview.

The case of Australia

According to the Australian *2016 Defence White Paper* six key drivers shape the development of Australia's security environment to 2036:

- the roles of the United States and China and the relationship between them, which is likely to be characterised by a mix of cooperation and competition;
- challenges to the stability of the rules-based global order, including competition between countries and major powers trying to promote their interests outside of the established rules;
- the enduring threat of terrorism, including threats emanating from ungoverned parts of Africa, the Middle East and Asia;
- the spread of extremism and violence is likely to be worsened by foreign terrorist fighters returning from conflict zones to Australia and other countries in the region;
- state fragility, including within Australia's immediate neighbourhood, caused by uneven economic growth, crime, social, environmental and governance challenges and climate change;
- the pace of military modernisation and the development of more capable regional military forces, including more capable ballistic missile forces;
- the emergence of new complex, non-geographic threats, including cyber threats to the security of information and communications systems.

Australia's *2016 Defence White Paper* notes that the roles of the United States and China and the relationship between these two global powers will be the most strategically important factors in the Indo-Pacific region to 2036. A strong and deep alliance with Washington is at the core of Australia's security and defence policy. The United States is expected to remain the pre-eminent global military power and will thus continue to be Australia's most important strategic partner. Next to this, the stability of the rules-based global order is considered to be essential for Australia's security and prosperity. A rules-based global order means a shared commitment by all countries to conduct their activities in accordance with agreed rules which evolve over time, such as international law and regional security arrangements. In Australia's eyes, this shared commitment has become even more important with growing interconnectivity, which means that events across the world have the potential to affect Australia's security and prosperity.

The document sets out three strategic defence interests which are of fundamental significance for strategic defence planning. To provide more detailed guidance for planning, each strategic interest is linked to a strategic defence objective which then sets out the activities the Australian government expects its armed forces to be able to conduct if it decides to use military power. See Table 1 for an overview of the three strategic interests as well as the three related strategic objectives and activities.

Table 1 Australia’s strategic defence interests, objectives, and activities

Strategic interests	Strategic objectives	Strategic activities
A secure, resilient Australia, with secure northern approaches and proximate sea lines of communication.	Deter, deny and defeat any attempt by a hostile country or non-state actor to attack, threaten or coerce Australia.	Providing the capability and resources to be able to independently and decisively respond to military threats, including incursions into Australia’s air, sea and northern approaches.
A secure nearer region (encompassing South East Asia and the South Pacific).	Contribute to the security of maritime South East Asia and support the governments of Papua New Guinea, Timor-Leste and of Pacific Island Countries to build and strengthen their security.	Strengthen engagement, including helping to build the effectiveness of regional operations to address shared security challenges, continue commitment to strengthened regional security architectures that support transparency and cooperation.
A stable Indo-Pacific region and rules-based global order.	Provide meaningful contributions to global responses to address threats to the rules-based global order which threaten Australia and its interests.	Work closely with the United States and other international partners to play an important role in coalition operations wherever Australia’s interests are engaged.

The Australian government will strengthen its armed forces in six so-called capability streams:

- intelligence, surveillance, reconnaissance, space, electronic warfare and cyber capabilities that ensure its armed forces have superior situational awareness;
- maritime and anti-submarine warfare capabilities that enable its armed forces to operate in more challenging maritime threat environments;
- strike and air combat capabilities that provide its armed forces with greater flexibility in responding to threats independently, or as part of coalition operations;
- land combat and amphibious warfare capabilities that provide its armed forces with greater capacity to conduct both combat and non-combat operations;
- key enablers essential to supporting the operations and sustainment of its armed forces;
- air and sea lift capabilities that help overcome the huge distances over which its armed forces are deployed and have to be supplied.

Accordingly, the Australian future armed forces will be more capable, agile and potent, with more emphasis placed on joint operations. To achieve comprehensive situational awareness, the intelligence, surveillance and reconnaissance capabilities will be strengthened, including via the P-8A Poseidon maritime patrol aircraft and the MQ-4C Triton unmanned aircraft system, and the imagery and targeting capacity will be enhanced through improved analytical capabilities, enhanced support and space-based capabilities. The Australian government will also strengthen the cyber

workforce and systems to both deter and defend against the threat of cyber-attacks. Next to this, modernising maritime capabilities will be a key focus, both in the fields of surface warships, via acquisition of new large-hulled multi-purpose patrol vessels, and new submarines. The air force will be equipped with a new air combat capability primarily centred around the F-35A Lightning II. Also, more air-to-air refuelling tankers will be acquired to support future combat, surveillance and transport aircraft. The Australian land force will be equipped with new personal equipment and armoured combat reconnaissance and armoured infantry fighting vehicles, as well as new combat engineering equipment and upgrades of the existing M1 Abrams main battle tank fleet.

Together with the *2016 Defence White Paper*, in 2016 the Australian government released a 10-year *Integrated Investment Program*, a detailed capability investment plan for the future force covering all major elements. It includes major acquisitions of new weapons, platforms and systems and investment in information and communications technology, infrastructure and the enabling workforce. The plan will guide the implementation of the bulk of investment over the decade to 2026 to build the future force and achieve the outlined capability goals. The programme focuses on the first ten years of investment, with a broader guidance on the second decade to 2036 where feasible, to allow for a longer-term investment portfolio planning.

The Australian government also released a *Defence Industry Policy Statement*, that is focused on maximising the industrial capability necessary to achieve the government's defence strategy. It states that the fragmentation of current defence industry programmes will be addressed by consolidating numerous industry and innovation initiatives into two key initiatives that have clear and measurable outcomes for defence capability. The government will also streamline its approach to tendering and contracting to reduce red tape and make it easier for the defence industry to support the armed forces. As a result, a Centre for Defence Industry Capability has commenced operations. Also, a Defence Innovation Hub commenced operations, undertaking collaborative innovation activities from initial concept through prototyping and testing to the introduction into service. Finally, a Next Generation Technologies Fund enables Australia to better position itself to respond to strategic challenges, retain a technology "edge" against adversaries and provide game-changing capabilities for the future.

Australia's International Cyber Engagement Strategy addresses the full breadth of cyber issues, from trade to cybercrime, from international security to international cooperation, and from human rights to sustainable development. With its cyber strategy, Australia has clearly adopted a comprehensive and coordinated, multi-stakeholder approach to cyber affairs, involving the private sector, civil society, academia, and the government. It aims to achieve its objectives in cyberspace through cooperation, partnerships and practical action. It states that Australia will cooperate internationally to reduce the risk of cybercrime and promote peace and stability in cyberspace.

The case of Canada

According to *Strong, Secure, Engaged: Canada's Defence Policy* three key security trends shape future events: the evolving balance of power, the changing nature of conflict, and the rapid evolution of technology.

- Trends in global economic development are shifting the relative power of states, from the West to the East, and – to a lesser extent – from the North to the South, creating a more diffuse environment in which an increasing number of state and non-state actors exercise influence. This shift supports positive global change, such as the alleviation of poverty, and the democratisation and empowerment that often accompany economic development. However, this shift has also been accompanied by weak governance and increasing uncertainty. In this era of growing multi-polarity, the United States is still unquestionably the only superpower. China is a rising economic power with an increasing ability to project influence globally. Russia has proven its willingness to test the international security environment. As a result, a degree of major power competition has returned to the international system.
- The characteristics of conflict have changed significantly over the last 10 years – from the underlying causes to the actors involved and their methods of warfare. During this period, both state and non-state actors have shown greater willingness to use violence to achieve political ends, taking a particular toll on civilians. The Middle East is currently the most violent region in the world, primarily as a result of the ongoing conflicts in Syria and Iraq. While many African states have made impressive progress, others continue to struggle with conflict and fragility. As a result, demands on United Nations peace keeping operations have reached historic highs.
- The information revolution is one of the key drivers of many of the developments in the world. Modern militaries rely on networks and data to plan and carry out missions. Much of what gives Western armed forces their technological and tactical advantage stems from space-enabled systems, and agile information management and technology tools to aggregate and manipulate large quantities of data.

In line with its title, Canada's defence policy outlines a vision of a Canada to be: *strong* at home, its sovereignty well defended by armed forces also ready to assist in times of natural disasters, other emergencies, and search and rescue; *secure* in North America, active in a renewed defence partnership with the United States; and *engaged* in the world, with the armed forces doing their part in contributions to a more stable, peaceful world, including through peace support and peacekeeping operations. See Table 2 for the related strategic initiatives and activities to defend Canada, protect its interests and values, and contribute to global stability.

Table 2 Canada’s strategic defence vision, initiatives, and activities

Strategic defence vision	Strategic initiatives	Strategic activities
Strong at home, its sovereignty well defended by a Canadian Armed Forces also ready to assist in times of natural disaster, other emergencies and search and rescue.	Anticipate and better understand potential threats to Canada and Canadian interests so as to enhance our ability to identify, prevent or prepare for, and respond to a wide range of contingencies.	Prioritise investments in joint intelligence, surveillance and reconnaissance (ISR) capabilities. Enhance intelligence collection, analysis and fusion Capabilities. Support and leverage the expertise of the academic community.
Secure in North America, active in a renewed defence partnership in NORAD and with the United States.	Adapt proactively to emerging challenges by harnessing new technologies, fostering a resilient workforce, and leveraging innovation, knowledge, and new ways of doing business.	Enhance role and capabilities of the Reserve Force. Adapt to evolving challenges and opportunities in the space domain. Leverage cyber capabilities in support of military operations. Leverage the unique benefits associated with remotely piloted systems.
Engaged in the world, with the Canadian Armed Forces doing its part in Canada’s contributions to a more stable, peaceful world, including through peace support operations and peacekeeping.	Act with decisive military capability across the spectrum of operations to defend Canada, protect Canadian interests and values, and contribute to global stability.	Responding concurrently to multiple domestic emergencies in support of civilian authorities. Meet NORAD obligations. Meet commitments to NATO under Article 5. Contribute to international peace and stability.

Canada’s future military must be agile, flexible and responsive in meeting these challenges. The reserve force is seen as an integral component of the armed forces. Ninety-seven percent of Canadians live within a 45 minute drive of a reserve unit, and its reservists come from all walks of life, making them truly citizen soldiers. The size of the reserve force will grow by 1,500 to 30,000 and receive new operational roles and become further integrated into the total force. The armed forces will also create a more agile model that supports the transition between full- and part-time service that meets the needs of both the service members and the institutions. Reserve units and formations will be assigned new roles that provide full-time capability to the armed forces through part-time service, including urban search and rescue, cyber operators, intelligence operators, and linguists.

Together with *Strong, Secure, Engaged*, Canada also issued a *Defence Investment Plan 2018-2023*. According to this, Canada will:

- recapitalise and modernise both its light and heavy armoured land vehicles;
- purchase two joint support ships for the navy. These will support operations at sea and ashore, by delivering fuel and other supplies to vessels at sea and by possessing facilities for the operation and maintenance of helicopters, as well as medical and dental services;

- procure 15 new warships under the Canadian surface combatant project, for which the BAE Systems Type 26 Global Combat Ship design has been selected; this will be further customized to meet Canada's particular requirements and to incorporate indigenous systems and equipment;
- purchase 88 advanced fighter aircraft, with procurement of the F-35A Lightning II as the most likely outcome;
- establish a joint task force X that provides human intelligence capabilities in support of military operations at home and abroad.

Back in 2010, the government of Canada launched a national effort to defend against threats in cyberspace with its *Cyber Security Strategy*, which was updated in 2018. To realise this vision, the government and its partners will work together across three themes:

- through collaborative action with partners and enhanced cyber security capabilities, it will better protect Canadians from cybercrime, respond to evolving threats, and defend critical government and private sector systems;
- by supporting advanced research, fostering digital innovation, and developing cyber skills and knowledge, the government will position Canada as a global leader in cyber security;
- in close collaboration with the provinces, territories and the private sector, the government will take a leadership role to advance cyber security in Canada and, in coordination with allies, work to shape the international cyber security environment in Canada's favour.

Canada also recognises that the space sector is a strategic national asset and seeks to ensure it remains a spacefaring nation. In this regard, *Exploration, Imagination, Innovation: A New Space Strategy for Canada*, released in 2019, prioritises future Earth observation capabilities. Canada will soon launch a new constellation of satellites, the RADARSAT Constellation Mission (RCM), that will provide near-real-time data to allow for important evidence-based decision making in response to the changing climate and security threats. A three-satellite synthetic aperture radar configuration will provide daily revisits of Canada's vast territory and maritime approaches, as well as daily access to 90 per cent of the world's surface. For example, the effects of climate change are increasingly evident in Canada with the rising number of floods, droughts, wildfires, as well as melting polar ice caps and rising sea levels, and the full scope of these catastrophic events will be observed and monitored by the RCM. Over its life, the RCM will help increase knowledge of climate processes and their impacts, and thus properly target policy responses. Canada has identified a need to continue to benefit from high-quality data, such as provided by the RCM. The Canadian Space Agency and other government departments are therefore already planning for continuity beyond the expected lifespan of the RCM by launching concept studies to examine options for a successor solution.

The case of Norway

Given that the international security situation has become more demanding, necessitating a higher than ever level of civil-military cooperation to safeguard national security, the Norwegian government aims to further develop civil-military cooperation within the framework of its so-called *Total Defence Concept*. In this, the Norwegian Ministries of Defence and of Justice and Public Security have key roles. The *Total Defence Concept* was originally developed in the period after the Second World War and closely linked to civil protection and emergency preparedness legislation. The changing situation after the end of the Cold War resulted in the armed forces contribution becoming more important, and the concept had to be reconsidered in light of this development. Today, the concept is to a large extent situational. In some cases, the armed forces support civilian operations, while in other situations the armed forces are supported by civil resources. Total Defence, as a concept, is simply intended to ensure the best possible utilisation of society's limited resources when it comes to tasks such as prevention, contingency planning and consequence management across the entire spectrum of crises. Within this framework, a number of formal and informal fora and civil-military cooperation bodies at the central, regional and local levels have been established in Norway.

Norway's *Total Defence Concept* is tailor-made for today's hybrid threats. This is understood to mean threats from state- or non-state actors, via the use of a combination of political, military, and economic instruments, as well as information and civilian means, to exploit vulnerabilities, create turmoil and achieve objectives. The use of the term hybrid threats has increased in recent years, although it really does not imply anything fundamentally new. The term may have its foremost value in raising awareness of how actors can influence through a combination of overt, and covert, military and non-military measures. The purpose of the use of hybrid threats is to influence the authorities of a country to make decisions in favour of the aggressor – decisions that would not have been reached without such a hybrid campaign. Such a method creates uncertainty and confusion about what is happening and about the intention behind the activities. Individual incidents may occur within various sectors, and at considerably long intervals. To uncover incidents as part of a unified campaign, and to be able to deal with them in the best possible way, is thus a demanding task. A situation with hybrid threats and incidents will often be challenging in terms of attributing individual incidents to a single aggressor. It creates doubts as to whether individual incidents can be seen in wider context, and it may be unclear what the aggressor wants to achieve. Since the distinction between peacetime, security crises and armed conflict may be unclear, it may be challenging to determine whether a threat situation is of a civilian or a military nature.

This calls for good civil-military coordination as prescribed in Total Defence in order to agree on countermeasures.

According to *Setting the Course for Norwegian Foreign and Security Policy*, a government white paper issued in 2016, Norway’s security situation is now assessed to be more challenging than it has been for a long time. This changed security environment has had implications for Norwegian defence policy. In its white paper, the Norwegian government identified three main courses of action as crucial for safeguarding Norwegian security in these times of change: maintaining and building on the already well-established principles of Norwegian security policy, strengthening the European and Nordic dimensions in Norwegian security policy, and intensifying Norway’s efforts in Europe’s unstable southern neighbourhood. In *Capable and Sustainable: Long Term Defence Plan*, the Norwegian government identified four strategic priorities for its armed forces: strengthening national defence, strengthening NATO’s ability for collective defence, contribute to international crisis management, and further development of the *Total Defence Concept*. See Table 3.

Table 3 Norway’s strategic defence priorities, goals, and investments

Strategic priorities	Strategic goals	Strategic investments
Strengthen national defence.	Improve readiness levels, combat power and survivability.	F-35A Lightning II fighter aircraft.
Strengthen NATO’s ability for collective defence.	Improve ability to receive allied reinforcements. Increase allied military presence and exercises.	Submarines.
Contribute to international crisis management.	Maintain situational awareness and ability to conduct crisis management operations.	Intelligence capabilities maritime patrol aircraft.
Further development of the <i>Total Defence Concept</i> .	Mutual support and cooperation between the armed forces and civilian authorities.	Ground-based air defence.

In *Capable and Sustainable: Long Term Defence Plan*, the Norwegian government reaffirmed that NATO and the transatlantic security community remain the cornerstone of Norwegian security and defence policy. The most significant change in the security environment is perceived to be Russia’s growing military capability and its threatened use of force. However, it is noted that the High North continues to be characterised by stability and cooperation, and Russian strategies for the Arctic still emphasise international cooperation. It is also noted, however, that Norway faces serious challenges related to developments in the Middle East, Northern Africa, and the Sahel. Furthermore, the proliferation of increasingly advanced weapons and technologies represents a dual challenge. On the one hand, they have an impact on the threat environment. On the other hand, they have wide reaching economic consequences

as countering them requires continuing modernisation by even smaller armed forces. In order to address this full spectrum of conflict, the Norwegian armed forces will continue to provide capable and modern forces on land, at sea and in the air.

In line with its strategic defence priorities and in order to achieve its strategic goals, substantial investments will be made in the Norwegian armed forces. Within the land systems programme the CV90 and M113 armoured vehicles will be upgraded, and a new 155mm artillery system will be acquired. Further acquisitions are in the field of equipment for the dismounted soldier. This includes personal equipment in protection, clothing, mobility, communications and endurance. In the naval systems programme helicopter-carrying coast guard offshore patrol vessels will replace the current vessels. The new vessels will have a reinforced hull and are designed to operate NH90 helicopters. Norway is also replacing its current submarines. This investment will be done in partnership with Germany. Towards the end of the outlined period, the navy's current frigates will undergo a mid-life update to ensure continuation of the vessels' operational capability. The investments in the air systems programme are centred on replacing the F-16 with the F-35A Lightning II. In all, 27% of the total materiel acquisitions in the 2016-2026 timeframe is related to the F-35. Next to this, there will be a mid-life update of the C-130J, an upgrade of the medium-range NASAMS II air defence system, and Norway will seek to replace its maritime patrol aircraft after the ageing P-3C Orion is withdrawn from service.

Until now, career personnel within the armed forces has consisted primarily of commissioned officers, with the education system structured accordingly. A wide-ranging personnel reform aims to diversify this set-up, working towards a future where commissioned officers comprise 30% of armed forces personnel, and other ranks comprise the remaining 70%. Concurrently, the Norwegian Home Guard will be reformed, consisting of a new National Territorial Command, rapid reaction forces (3,000 soldiers) and follow-on forces (35,000 soldiers). In this way, the Home Guard can act as a rapid mobilisation force in times of crisis. With its local connections, it is also an important link to civilian society and a number of emergency preparedness agencies. Based on their local territorial responsibilities, the district commanders of the Home Guard handle the daily coordination and interaction with civilian actors in the country's counties and municipalities. With the Home Guard having a presence throughout the country and very good local knowledge, this makes it an important resource in the Norwegian security and emergency preparedness efforts. The main tasks of the Home Guard are guarding and securing important military and civilian objects, national crisis management, assistance to the Police in accordance with instructions and other support to civil society.

Between Heaven and Earth: Norwegian Space Policy for Business and Public Benefit notes that space activity is a means to serve national interests. There are three factors that make policy adjustments necessary to better secure these national interests.

The first is technological change, with advances in recent years having dramatically expanded the range of applications for space-based technology. The second factor is a change in its own needs. Space-based technologies provide cost-effective options for addressing specific policy challenges that have assumed central importance in the past few decades, such as management of the High North and climate and environmental issues. The third factor is change within the international organisations that have long represented the framework for investment in space activity. Without international collaboration, a robust and efficient space sector is unthinkable, so the best way to approach such collaboration in the future will depend on developments within the international forums to which Norway has access.

In the recent *National Cyber Security Strategy for Norway* it is noted that digitalisation carries a range of challenges with it. Digital infrastructures and systems are growing ever more complex, global and integrated. Hybrid threats are blurring the traditional dividing line between peace and armed conflict, and are challenging the conventional division of responsibility between the civilian and the military sectors. The Norwegian Ministry of Justice and Public Security is responsible for coordinating cyber security in the civilian sector. This ministry holds a special responsibility for national cyber security, and has outlined the government's policy for cyber security, including requirements and recommendations for both public and private companies. On the other hand, the Norwegian Ministry of Defence holds responsibility for cyber security in the defence sector. The cyber security challenges must therefore be resolved by placing a strong emphasis on collaboration and partnerships among the relevant stakeholders at both national and international level. This strategy places emphasis on both ministries working together to reinforce cyber security.

Conclusions

In comparing how the three case studies of this report, Australia, Canada and Norway, deal with the national security challenges of today and tomorrow and how they intend to transform their respective defence organisations and armed forces in order to deliver the right capabilities to be able to meet these security challenges, a number of conclusions can be drawn.

First, although the three countries are located in widely different geographical regions, all of them feel the need to transform their respective armed forces in order to deal with the security challenges of today and tomorrow. In all three cases, the national security context is shaped by the changing character of war, renewed great power competition, challenges to the rules-based global order, state fragility in the Middle East, Africa, and Asia, and technological advances. All are looking to develop and field capabilities both in the traditional areas of land, maritime, and air warfare, as well as in new areas of warfare, like space and cyberspace.

Second, even though all three countries assess that today's international security situation has become ever more demanding and uncertain, necessitating a higher than ever level of cross-government cooperation to safeguard national security interests, only Norway has developed a congruent framework of civil-military cooperation for this purpose. In its so-called *Total Defence Concept*, the Ministry of Defence and the Ministry of Justice and Public Security have key roles to play. The concept itself simply intends to ensure the best possible utilisation of society's limited resources when it comes to prevention, contingency planning and consequence management across the entire spectrum of crises. Within this framework, both formal and informal fora and cooperation bodies at the central, regional and local governance levels have been established.

Third, all three countries are strengthening their capabilities in the intelligence, surveillance, reconnaissance, electronic warfare, space and cyber functions. Enhancements in these fields in particular focus strengthening capabilities for processing, exploiting and disseminating the large volumes of data and on enhancing situational awareness across all domains and environments, including space. Furthermore, cyber capabilities in particular are strengthened in order to both deter and defend against the threat of cyber-attack and to improve the ability to defend their own networks and systems.

Fourth, in the land domain, armoured fighting vehicle inventories are being modernised rather than simply replaced. The high cost of producing new designs, in light of the quantities required, has led these countries to instead upgrade and extend the life of existing platforms, rather than replacing them. Armoured utility vehicles, cheaper and less complex than traditional platforms, are continuing to prove popular with the three respective armies still engaged in operations against non-state adversaries. Research and development work continues on unmanned ground vehicles. However, the initial interest seems more directed towards unmanned or optionally manned logistics and support vehicles, rather than in the development of combat platforms.

Fifth, in the maritime domain, there is an increasing emphasis on blue-water capabilities. Power-projection capabilities remain in demand, but there is a renewed focus on the ability to engage at sea as well as from the sea. The growing complexity of the maritime domain is leading to a general rise in capability requirements for naval vessels, particularly for surface combatants like frigates. The worldwide proliferation of submarine capabilities is driving a renewed focus on anti-submarine capabilities, including submarines, frigates and maritime patrol aircraft. There is increasing interest in introducing innovative capabilities in the maritime domain, such as unmanned and directed-energy systems.

Sixth, in the air domain, all three nations are, or soon will be, introducing into their inventories F-35A Lightning II fighter aircraft. At the same time their air forces are in the process of revamping their air-to-air and air-to-surface missile inventories. Several countries, including China, Russia and the United States are developing and starting to field weapons capable of hypersonic (Mach 5+) speed. This increased ballistic and cruise missile threat is driving a greater investment in advanced missile defences, both on land platforms and at sea.

Finally, with their respective space and cyber strategies, Australia, Canada and Norway have all three adopted a comprehensive and coordinated approach, involving not only the government (both defence and other departments), but also the private sector and academia. The security challenges related to space and cyberspace can in their respective views only be met by placing a strong emphasis on collaboration and partnerships among all the relevant stakeholders at both the national and international levels. In all three cases the respective defence ministries only hold responsibility for assuring cyber security in the defence sector. In the realm of space, all three countries see themselves as spacefaring nations and view their sovereign space-based capabilities (e.g. satellites) as strategic national assets.

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