

E X C L U S I V E



THE CASE FOR C2 CAPABILITY LIFECYCLE GOVERNANCE

Strengthening NATO's **Command and Control**

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Photo by Torbjørn Kjosvold,
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AS A STAFF OFFICER at the NATO Command and Control Centre of Excellence (NATO C2COE), Major Ralph Dekker of the Royal Netherlands Air Force is intimately familiar with the critical role that command and control (C2) plays in the planning and execution of operations and exercises. It is the glue that binds our forces, enabling effective decision-making and coordination. C2 is not just a set of processes, procedures and technologies — it is an essential capability that requires deliberate governance.

Since March 2021, the NATO C2COE has been a member of the Research Task Group (RTG) Human Factors and Medicine (HFM) 342 on C2 Capability Lifecycle Governance. This RTG is composed of scientists from Australia, Canada, Sweden, and the United Kingdom. All of them are renowned experts in the field of C2 and work within their nations' defence research organizations, often closely linked with the armed forces of their respective countries. Being well connected within NATO, the NATO C2COE can act as a bridge to translate scientific ideas into information that operators, leaders, and governance bodies within NATO and partner nations can use.

One of NATO's strengths is the diversity of its members and partners and the capabilities they can bring to the coalition. Optimal use of these military and non-military capabilities is dependent on effective C2. Therefore, NATO and partners must develop their C2 capabilities with timely integration in mind, and this requires cooperation between NATO, NATO commands, nations, functional branches and services to understand how C2 systems can be integrated via formal and informal command and control relationships. On behalf of the HFM 342, Major Ralph Dekker will argue in this article why treating C2 as a capability and governing it over its lifecycle is essential to make C2 fit for purpose for national and international collaboration and cooperation.

Major Dekker will also explain why the absence of C2 capability lifecycle governance is an important challenge, what still needs to be done to effectively govern C2, and why more effort is important.

NATO's Current C2 Improvement Initiatives

There are currently several initiatives that, entirely or in part, aim to improve C2 within NATO across different time horizons. The overarching longer-term initiative is the NATO Warfighting Capstone Concept (NWCC). It contributes to the Alliance's efforts to strengthen its deterrence and defence posture and offers a vision in support of maintaining and developing NATO's decisive military advantage by continuously adapting the military instrument of power.

The NWCC outlines five warfare development imperatives: cognitive superiority, layered resilience, influence and power projection, cross-domain command, and integrated multi-domain defence. These imperatives aim

to guide NATO's military thinking, organization, and action across multiple domains.

The Cross-Domain Command Concept (CDCC) will be the main driver for C2 change within NATO to facilitate effective multi-domain operations (MDO). The purpose of the CDCC is orchestration for success and to offer a long-term conceptual perspective on C2, aiming at 2040. In the near term, NATO has also developed its Alliance Concept for MDO. Approved in March 2023, the document provides a roadmap for implementation of MDO by 2030, including MDO C2.

"NATO as a warfighting system" is also a near-term development and implementation initiative. It is led by Supreme Headquarters

Allied Powers Europe (SHAPE), with the full involvement of the NATO Command Structure, the newly established Allied Reaction Force Headquarters, parts of the NATO Force Structure and various other entities.

Aside from these initiatives, there is NATO's digital transformation and the Federated Mission Networking (FMN) concept, with the vision for day-zero interoperable forces made available for missions by NATO countries, NATO and partners.

These programmes do not solely aim to enhance C2, but they do affect C2 development. Additionally, there are efforts to develop C2 within NATO countries, within doctrine, and in NATO's training and exercises.



It can be challenging to grasp how initiatives such as FMN, digital transformation, MDO and CDCC are interlinked. The greatest challenge, however, lies in transforming these concepts into practical use within NATO. There will be hurdles to overcome in the course of implementation, and there may be details that the concept developers have missed. But who governs and solves these issues?

Challenges of C2 Capability

Indeed, there are challenges with C2. The Research Task Group (RTG) was motivated by the observation that efforts to transform C2 have only been partly sufficient so far. C2 practice has remained very similar to what it was more than 20 years ago. Technological, doctrinal, and conceptual changes have certainly occurred, but few, if any, truly substantive transformation efforts have yielded appreciable results.

To capture the challenges in one sentence: the problem with fixing C2 is the C2 you are trying to fix — and sometimes the C2 of those trying to fix it. I strongly favour this phrase because it shows that there are multiple challenges. One of the RTG's aims is to apply a scientific approach to improving and implementing C2 change programmes.

Scientifically, the heart of the challenges is encapsulated in Conway's Law, which originated in the software development world but which has since found validity in all contexts involving design. Conway's Law states that a design will always reflect the communication patterns of the design team. In C2 design, it is usually the same system — or some sub-part of it, often at a particular echelon — that seeks to implement change. However, when stovepipes, rigid hierarchy and rival power centres are already present in the system, the design process will only reproduce these same un-agile elements. Thus, the "C2 physician" is usually unable to heal themselves.

When external participants are brought



A Viking amphibious vehicle carrying U.S. Marines disembarks a Dutch landing craft near Sandstrand, Norway, during Exercise COLD RESPONSE 2022. Photo by NATO

in, for example scientists, they may themselves be organized according to scientific stovepipes (psychology, sociology, engineering, computer science, mathematics) and therefore fail to engage with C2 as a sociotechnical system. The capability development process that enhances military forces can also be stovepiped and bureaucratic, and so fail to account for the human dimension, which is fundamental to C2. Additionally, we should not underestimate the significant role that military culture, with its long history of heroes and myths, plays in reinforcing traditional ways of doing business.

In light of all these factors, it becomes understandable why C2 change programmes, as a key part of governance, often end up reproducing the same system or suppressing the shoots of change that a new programme might have successfully sprouted.

What Is C2 Capability Lifecycle Governance?

Our analysis of C2 challenges and review of change initiatives has led us to the conclusion that NATO needs C2 capability lifecycle governance. But what, precisely, is that? To define this term clearly, the RTG reviewed how all the separate terms — C2, capability, life cycle, and governance — are understood and applied in NATO and other settings. This provided a framework for understanding how all these terms are interconnected, based upon which we wrote a preliminary definition.

C2 is considered the overarching joint function within NATO, and agile C2 is seen as a fundamental requirement in dealing with complex, uncertain and rapidly changing environments. However, C2 can also be treated as a capability. Whereas a capability represents the means to achieve specific military effects, joint functions are about how these capabilities are employed cohesively across different services and domains in joint operations. Both perspectives are needed. It is important to note that one does not develop a joint function; one develops joint capability. Hence, improving C2 as a capability will improve C2 as a joint function.

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Leopard 2A4M tank live fire, Latvia. Photo by NATO



Capability refers to being able to do something — more precisely by utilizing combinations of resources in processes to achieve outcomes. The NATO Allied Joint Doctrine (AJP-01) describes C2 capability as "a dynamic and adaptive sociotechnical system configured to design and execute multi-domain operations through the comprehensive approach. Its purpose is to provide focus for individuals and organizations so that they may integrate and maximize their resources and activities to achieve the objectives."

The term *lifecycle* aligns with the ISO/IEC 15288 standard, which provides a common process framework covering the lifecycle of human-made systems. The basic premise is that capabilities are formed over time through capability development endeavours consisting of a combination of projects. One challenge for these endeavours is to keep up with and adapt to the ever-changing geopolitical and technological context.

In addition, the ISO/IEC 15288 standard is primarily focused on technological systems, and is not a lifecycle model for organizations or human capital. This is why we argue that there is a need to also take a lifecycle perspective for non-technological and sociotechnical systems.

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Governance emphasizes long-term strategic oversight and policy-setting across the network of public bodies, corporations and other entities engaged in an endeavour. The term encompasses both formal regulations and informal guidelines. NATO's guidelines for good governance aim to foster professionalism and mitigate corruption risks, but are not sufficient for C2 capability lifecycle governance. Governance uses a pluralistic approach that includes not only the public sector but also

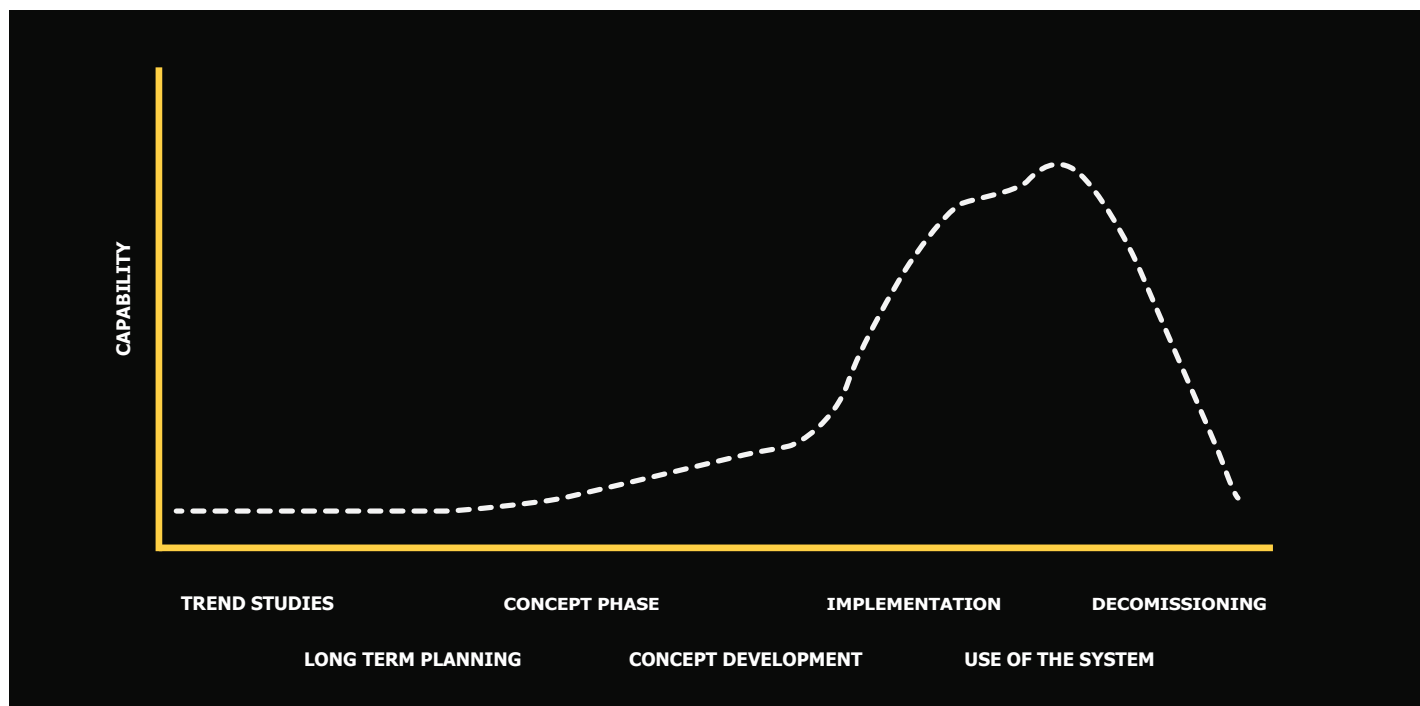
the private sector, non-profit organizations, and various social groups including voluntary public organizations. It focuses on inter-organizational network formation and the importance of trust for flexibility. Many actors and stakeholders are outside of the military chain of command and can make decisions without considering NATO decisions. Combining all these terms leads to a working definition for C2 capability lifecycle governance:

Command and control capability lifecycle governance is the systematic approach for overseeing and managing the development, deployment, and maintenance and evolution of command and control capability over time within an inter-organizational networked military context.

This governance enables C2 capability alignment with strategic objectives, operational needs, and regulatory standards throughout the C2 capability lifecycle, adapting to dynamic

Exercising civil-military cooperation during NORDIC RESPONSE 2024. Photo by Stian Olberg, DSB





Above

Illustration of a hypothetical, generic capability development process alongside its corresponding capability level curve.
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geopolitical and technological environments. C2 capability lifecycle governance is not only about technology and the military organizations; it always starts as a sociotechnical system and thus revolves around people. C2 capability governance should remain aligned with existing guides for good governance.

Benefits of Governing C2 as a Capability

- **Governing C2 as a capability will allow development of C2 that meets the demands of the future security environment (FSE).** We expect the FSE to feature intense conflict across a wide range of domains in complex and uncertain operational environments, which will require flexible, adaptive, multi-domain C2. Therefore, C2 development by stovepiped service branches is not an effective means to achieve multi-domain C2, both nationally and in a multinational context.
- **Governing C2 as a capability will foster a cross-service multi-domain C2 culture.** Each service or branch maintaining its own C2 development reflects the traditional culture of militar-

ies, which has thwarted C2 transformation. Creating a whole-of-military C2 governance structure can promote a culture in which agile, multi-domain C2 is valued. Governance will facilitate the balancing of multiple valid perspectives on C2 in a way that is challenging for disparate organizations to achieve. This approach promotes a willingness to accept different C2 perspectives.

- **Governing C2 as a capability will drive transformations needed to make C2 fit-for-purpose for complex environments.** It is hard to see how NATO could achieve the required C2 capability using traditional C2 approaches. Treating C2 as a governed capability would channel necessary resources and institutional support to C2 transformation. As a governed capability, integration of C2 across service branches and allies, including civilian bodies, can achieve multi-domain C2. The top-down direction provided by effective governance, with necessary authority, will help overcome some of the obstacles to C2 transformation.

In summary, governing C2 as a capability will support NATO in overcoming many social,

organizational, bureaucratic, and other obstacles that thwart organizational change.

What Could C2 Capability Lifecycle Governance Look Like?

C2 is more than a technical function; it is a capability that shapes military outcomes. By recognizing this and treating C2 capability from a sociotechnical perspective, NATO can improve C2 governance and elevate its C2 practice. C2 governance is not bureaucratic red tape, but rather an investment in our operational success. As we face rapidly evolving and increasingly complex security challenges, we ought to empower our forces by treating C2 as the vital capability it truly is.

Creating a code of best practice for C2 capability lifecycle governance is a work in progress. The RTG's first step towards this is the production of a set of principles and high-level guidance for how NATO and its members could begin journey towards governing C2 as a capability. The principles promote a culture that values agility and innovation, an inclusive process for balancing the perspectives of all C2



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Above, from left: A Turkish naval aviator conducts helicopter-submarine winch exercise during DYNAMIC MANTA 2024, photo by NATO; exercising total defence during NORDIC RESPONSE 2024, photo by Stian Olberg, DSB; a Swedish Marine stands on the deck of a fast assault boat during NORDIC RESPONSE 2024, photo by NATO

stakeholders, and a flexible organization that can govern C2 capability development across all time horizons.

C2 governance requires the balancing of multiple valid perspectives on C2 in a way that is challenging for disparate organizations to achieve. Therefore, we require an agreement on what C2 is and how best to govern it. C2 capability lifecycle governance further needs to promote continuous evaluation. There need to be mechanisms to regularly assess C2 effectiveness and adapt as needed.

Finally, investment in human capital is critical. This includes developing leaders who understand both the art of war and the science of governance. C2 capability governance will require educated, motivated individuals across a wide range of disciplines, fostered by a training and education system capable of producing C2 experts.

Call to Action

Having described why we need C2 capability lifecycle governance and what it could look like, we need to ensure implementation. How can we achieve this, and avoid ending up with nothing but a great study report?

There is still much work to do. We need to establish a NATO guide of best practice for C2 capability lifecycle management in order to standardize C2 governance practices across member nations. We need to determine where and how to apply governance and how this interconnects. And in this case, "we" does

not merely refer to the RTG-342: I refer to the ecosystem needed to implement and further develop C2 capability lifecycle governance, including NATO Allied Command Operations, NATO Allied Command Transformation, the NATO Force Structure and the Allies. This aligns with the Washington Summit Declaration, which called for further strengthening of NATO C2.

We at the NATO C2 COE recommend closer engagement with relevant stakeholder groups across participating nations, including identifying those who might assume C2 governance roles. Framing the concept of C2 capability lifecycle governance and understanding the interdependencies of its components could enable input on what should be included in a code or guideline for C2 capability lifecycle governance. By sharing insights and best practices, we can collectively enhance C2 effectiveness. Remember, C2 is not just a process — it is our lifeline on the battlefield. The era we live in and the future we face demand good C2 capability lifecycle governance in order to provide decisive military advantage. ✦

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References

The article is based on the work of the RTG. Individual chapters have been and will be presented at the International Command and Control Research and Technology Symposium (ICCRTS). NATO C2COE has published and will publish further results. The RTG has also presented and will present outcomes during NATO C2COE's annual seminar.

The RTG-342 final report is expected to be published by December 2024 on the NATO STO website.