



Center for Maritime Autonomy Empowering the Navy for the Future

Concept Paper for the Belgian Navy
BEL-NLD Next Generation MCM Program

Bremen, September 2018

The history of disruptive innovation in warfare suggests that understanding how best to use a new technology is more important than developing the technology first, or even having the best technology. This places a premium on experimentation, prototyping, and an iterative process of concept development and technology improvement.

Scharre, "The opportunity and challenge of autonomous systems", p. 7

Leaders must learn how to marry the quite different personalities of technologists and seagoing officers to accomplish big advancements

Augier/Hughes, "Leading military innovation, past and present", p. 3

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1 Foreword

Around the globe Navies prepare for a future maritime environment that is subject to significant changes and thus likely to be more risk-prone. Technology development is one source of change. Progress in different technology areas such as artificial intelligence, big data, cloud computing, energy management, materials or robotics suggests new opportunities for naval forces but also offers new risks. Most importantly, however, naval innovation does not rest on technological proficiency only. Rather, Navies striving to innovate will require a holistic approach that brings together conceptual, cultural, organizational and technological change.

This concept paper on a prospective Center for Maritime Autonomy (CMA) lays out the vision of Atlas Elektronik on how the Belgian Navy could succeed in the upcoming new area of naval force development. The Belgian Navy is an ideal partner to launch the CMA because it is agile and open towards new concepts such as the mine countermeasures (MCM) toolbox. In adopting a holistic approach to naval innovation, the CMA will enable the Belgian Navy to play a pivotal role as a thought and practice leader on maritime autonomy in the 21st century. Furthermore, opening up the CMA for cooperation with partners from other European nations (and beyond) strengthens Belgium's strong European vocation and will be instrumental in shaping European thinking on future naval operations with unmanned systems.

The CMA concept builds on the internationally recognized, well-established competence of Atlas Elektronik in the fields of unmanned maritime systems, maritime electronics, MCM, and systems integration. The most recent decision of the UK Royal Navy to award the contract for the autonomous minesweeper system to Atlas Elektronik UK is testimony of the expertise, that Atlas Elektronik will leverage to the benefit of the Belgian Navy.

The CMA concept is related to the current Belgium-Dutch next generation MCM tender, but looks beyond the conduct of MCM operations unmanned systems. It portrays an ambitious vision for a broader transformation of the Belgium Navy commensurate with the requirements of a 21st century fleet that is fundamentally rooted in European capability requirements.

With this paper Atlas Elektronik sets the strategic umbrella that guides its offer for the MCM toolbox and the relevant systems integration as part of the next generation MCM program. Atlas Elektronik would be proud and honored to assist the Belgium Navy and her partners on embarking into maritime autonomy by establishing the CMA.

Dr Arne Kraft
Atlas Elektronik Campaign Manager

2 Summary

Strategic Guidelines: The 2016 Defense White Paper

Belgium's 2016 Defense White Paper sets the broad strategic guidelines for force development and thus also describes the politico-conceptual framework relevant for the Center for Maritime Autonomy (CMA):

- **Level of Ambition**

Securing global flows is a key narrative of the capstone document. This requires a whole-of-nation approach that extends from sea to land into cyberspace and includes airspace and space as well. The CMA therefore needs to adopt a multi-domain approach to maritime autonomy as well.

- **Strategic Partners**

Belgium's immediate neighbors Germany, France, Luxembourg, the Netherlands, and the United Kingdom are preferred partners that could be invited to contribute to the CMA, for example, by assigning naval, industrial, and research experts.

- **Force Design**

The White Paper puts a premium on agility and emphasizes the toolbox approach as a key force development paradigm. As a consequence, the CMA should contribute to modularity and flexibility by developing roadmaps to stimulate and exchange lessons identified/learned among all relevant warfare areas and naval missions.

- **Naval Missions**

The White Paper explicitly refers to Unmanned Maritime Systems (UMS) with regard to mine countermeasures (MCM). But other naval missions discussed in the White Paper such as anti-submarine warfare (ASW), harbor protection, and coastal patrols could benefit from UMS as well, thus suggesting future mission areas for the CMA. But whatever missions the Belgium Navy will execute with UMS, one aspect will be key: UMS and the respective payloads need to be systematically integrated into the overall C4ISTAR value chain – a principle that defines a key guideline for the CMA.

- **Defense Research and Technology**

Belgium only spends a very limited amount of money on defense R&T. This underlines the need to tap into other policy areas, the vibrant Belgium startup and cluster communities as well as the broader industrial portfolio to leverage

investments of partners. The CMA should play an instrumental role in opening doors to these partners.

▪ **Personnel**

Ultimately, the Defense White Paper leaves no doubt that the Belgian Armed Forces need to seriously invest in retaining existing and attract new personnel. In this regard, a smart approach to setting up a pool of UMS Expert Reservist could be a major contribution by the CMA.

A New Center for Maritime Autonomy: Why?

Maritime autonomy is much more than the use of assets and payloads that can accomplish tasks with limited or without human input. In order to successfully leverage autonomous systems, navies – and their partners in industry and academy – need to understand how the advent of these systems can change naval operations. Innovation – defined as novel ways in which the combination of legacy systems and new unmanned systems (Manned-Unmanned Teaming) – requires a comprehensive approach to cultural, conceptual, organizational, and technological change. In doing so, the CMA will empower the Navy to meet tomorrow's challenges by

- Embracing a holistic understanding of autonomy
- Considering naval and maritime UMS missions/use cases
- Advancing multi-domain thinking and systematic integration of UMS (and their payload) into the C4ISTAR value chain
- Leveraging the new paradigm of swarming
- Pushing flexibility and modularity to advance organizational agility
- Advancing operators' exposure to UMS in particular through training and providing a pool of different UMS to work with
- Expanding the personnel base able to use UMS, inter alia, by creating a pool of UMS Expert Reservist
- Strengthening and expanding the Belgian defense ecosystem with the CMA as a major hub and gateway

In addition, the CMA is embedded in Belgium's European DNA: The center could be opened up for cooperation with European partners within the new PESCO (permanent structured cooperation) format while at the same time tapping into the European Defense Industrial Development Program and the future European Defense Fund to co-fund specific programs of the Center.

Tasks

The ultimate goal of the CMA is to successfully manage all risks and benefits entailed with the use of UMS. Most importantly, the Center engages in large-scale de-risking of operations with UMS. De-risking is important given existing cultural

hurdles that might inhibit the use of UMS, the lack of operator familiarity with these systems, and the financial risks entailed with UMS. But, de-risking the UMS use in particular on the conceptual and technological side is also important in order to push the envelope for a broader set of UMS missions and to become more daring. The more the CMA succeeds in making UMS missions less risk-prone, the more the Belgian Navy can rely on maritime autonomy. This is essential given the future naval environment where UMS are likely to make significant contributions with regard to multi-domain operations and capability distribution. Against this background, the CMA will

- provide analyses of operations with a particular focus on adversarial capabilities and capacities
- engage in Concept Development and Experimentation and offer a testbed
- advance hands-on training and education and conduct exercises
- look into applied research and development and rapid prototyping
- consider testing and certification as complementary, but most likely prospective tasks
- offer an unmanned systems pool to provide multiple users with the option to get acquainted with many different systems
- and reach out to relevant communities via communications, events and special support services.

Mission Areas

Today, the use of UMS is limited to few missions only. In order to broaden the envelope for the future use of UMS there is an urgent need to systematically develop roadmaps to transfer knowledge and experience from today's most common missions to mission areas that have so far been underexplored. The CMA tackles this challenge by focusing on three broad mission sets:

- Conceptual missions address different questions relevant for naval force development such as the future maritime conflict picture, strategic communications challenges that come with the use of UMS as well as legal aspects.
- Naval missions are at the core of the CMA. In addition to exploring the benefits of UMS for MCM the center will also look at harbor protection, coastal patrol, ASW, amphibious operations, and counter UMS operations.
- Already today the commercial sector is an ardent user of UMS. The CMA will explore synergies by addressing several maritime missions as well, in particular offshore infrastructure protection, unexploded ordnance (UXO), and seabed mining to explore marine resources.

Partners: It's All About the Network

Belgium only spends about 0.2% of its defense budget on defense R&T, but the government invests 1.19% of its overall budget on research and development (R&D). This suggests that in order to ramp up R&T efforts to meet current and future capability requirements, there is a need to leverage investments made in other policy fields, by academic partners, and the private sector.

Therefore, the CMA will develop a comprehensive partnership program to make maximum use of the technology expertise of Belgium's research and industrial ecosystem. In doing so, the CMA will be a major hub within this ecosystem for applied research and development focusing on the naval and maritime application of unmanned systems. In addition, the Center will also become a major gateway for Belgium's partners to connect with international stakeholders and vice versa. The CMA will open up avenues to a broad set of partners:

- In the international defense arena, the CMA can join forces with different Centers of Excellence that have been established within NATO, the NATO Center for Maritime Research & Experimentation (CMRE) and the European Defense Agency.
- The Belgian defense industry offers opportunities for cooperation through two key clusters – the Skywin aerospace cluster of Wallonia and the Flemish Space Industry – and on an individual basis with companies like BATS (C4I systems), OIP (sensors) and the RHEA Group (cybersecurity) to name but a few.
- Besides the defense industry, Belgium's regions offer a vibrant cluster community. For example, the CMA could tap into the Blue Cluster of Flanders (marine industry), the Belgian Offshore Platform in Brussels, or the InfoPole Cluster of Wallonia (information and communication technology, ICT).
- Belgium's startup community is equally vibrant offering opportunities for cooperation in technology fields like robotics and unmanned systems, artificial intelligence, augmented/virtual reality, cybersecurity, as well as data analytics.
- In all of these technology fields Belgium's two regions also offer most interesting research institutes, such as the two high-performance computing institutions Canaero (Wallonia) and the Vlaams Supercomputer Centrum, the IdLab at the Ghent University with a focus on distributed intelligence and machine learning as well as several research institutes working on additive manufacturing, materials technology and energy management.

Atlas Elektronik and the CMA: Priorities

Atlas Elektronik is proposing to establish the CMA as the premier initiative to establish a long-term partnership with the Belgian Navy as well as Belgian companies and research institutes. This partnership extends beyond the current tender for the Belgian-Dutch next generation MCM program. Setting up the CMA would

open a new gateway for Atlas Elektronik to engage strategically with the Belgian Navy that would be most beneficial to advance the existing product and technology portfolio. Atlas Elektronik is committed to the following activities

▪ **Strategic Support**

Atlas Elektronik will

- provide up to two industry experts for 12 months or longer
- will make dedicated infrastructure investments worth up to €10M over four years to set up the Center's testing infrastructure and to develop the new Virtual Undersea Battlespace Training Simulator
- facilitate the exchange of experience among different Navies by inviting Navies that use products of Atlas Elektronik to engage with the CMA
- provide content and financial support for the Center's strategic communication activities.

▪ **Technology Co-Development**

Atlas Elektronik will engage with the Center to leverage Belgium's technology base in order to launch five technology co-development initiatives. These initiatives will focus on

- Establishing the Virtual Undersea Battlespace Training Simulator, a first of its kind, to literally "walk" and "drive" through a synthetic undersea environment
- developing concepts and technology for multi-domain swarming
- using UMS as instruments of electronic warfare and under adversarial electronic warfare operations
- advancing the idea of expandable UMS
- providing new solutions for energy management.

▪ **Applied Product Enhancement**

Applied product enhancement describes Atlas Elektronik's ambition to take recourse to the CMA as its "hands on" test lab to further develop existing products. This could, inter alia, include ideas like using commercial gaming controllers to navigate UMS, explore to what extent existing STANAGs still live-up to the current level of technological maturity, multi-sensor layering with the use of different UMS, the use of UMS as communications relays and navigational support assets, the provision of graded effects with UMS, and large area detection of sedimented or buried objects as well as non-intrusive classification.