The road to a maritime ballistic missile defense Command & Control capability
Maritime Ballistic Missile Defense

As the leading Danish defense and aerospace company, Terma was selected by the Danish navy to deliver C-Flex to the three new anti-air warfare (AAW) frigates of the IVER HUITFELDT class. The C-Flex system is also deployed throughout the rest of the Danish navy vessels.

Although the IVER HUITFELDT class frigates were built for the AAW mission, the frigates were prepared for a potential Ballistic Missile Defense (BMD) mission from the initial design phase. All systems onboard the ship have a clear pathway to BMD functionality through upgrades or can easily be replaced with BMD capable systems.

The three frigates of the IVER HUITFELDT class were commissioned into service in the Danish navy from January 2014 through March 2015.

Their main armament consists of the Thales NL SMART-L and APAR radars and the Lockheed Martin Mk. 41 Vertical Launch System, capable of firing the long-range missiles such as the Standard Missile-2 (SM-2), SM-3 or Tomahawk cruise missile.

The Ballistic Threat

In an ever-changing world, the threat from ballistic missiles is constantly increasing both in numbers and in complexity. During the past 5 years, the number of ballistic missiles in the world outside of the U.S., NATO, China, and Russia has risen by 1,200 reaching a total of 5,900.

Several of these are able to reach Europe and other NATO nations. The biggest numerical increase of ballistic missiles has been in the medium and intermediate range ballistic missiles. In addition, the precision of these weapons has increased, meaning that some of them are now able to hit within 10 meters from a distance of more than 2,000 kilometers.

The NATO BMD system

Recognizing the increasing threat to NATO nations, the alliance adopted a change in its original theater ballistic missile defense plans in 2010 at the Lisbon summit.

Following this summit, NATO changed its focus from theater ballistic missile defense to territorial ballistic missile defense of European nations and populations. These changes fell in line with the new US European Phased Adaptive Approach, designed to counter the same threat to Europe in a phased approach.

The NATO BMD system is founded on voluntary national contributions with respect to sensors and weapon systems, whereas NATO common funding is used to develop and field the command and control structure and systems.

At the NATO summit in Wales in 2014, Denmark announced its decision to upgrade at least one frigate of the IVER HUITFELDT anti-air warfare class, with a BMD sensor and to offer this newly developed capability to NATO as a relevant and robust addition to the system.

To prepare for the upgrade of the Danish frigates, Denmark also announced their intention to join international studies and forums, such as the maritime theater missile defense forum.

Achieving a Danish maritime Command & Control capability for ballistic missile defense

Since 2004, Terma has been working in the BMD domain, through cooperation with international partners, studying the inherent BMD challenges, possible solutions and potential application of our capabilities in the command and control domain.

Through a significant investment in research and development we have built a set of BMD features and functions called BMD-Flex that will represent the backbone of the upgrades to our existing C-Flex Command and Control system for the coming Danish maritime ballistic missile defense contribution to NATO. Being built on the same software platform as C-Flex, the relevant software modules in BMD-Flex can easily be integrated into C-Flex to create a maritime integrated air and missile defense (IAMD) system.

During the incremental development phase, BMD-Flex was tested extensively with a high degree of focus on interoperability with international partners. In the years from 2007 – 2011, the system participated in both NATO and US CWIX and CWID trials, where it was tested and demonstrated in the IAMD domain with test partners such as NATO ACCS, US C2BMC etc.

The keystone event of the testing and validation of the BMD and IAMD capabilities took place in April 2011 where BMD-Flex was included in the US Navy and Missile Defense Agency’s Flight Test Maritime 15 (FTM-15). The purpose of the test was to test and verify the interoperability of the US elements of the European Phase Adaptive Approach (EPAA) off the cost of Hawaii. Connected to the live Link 16 network from a US Navy laboratory, BMD-Flex successfully received and processed all the data that was sent on the Link 16 network, proving that the Command & Control software is fully capable of interoperating with allies and partners in the BMD and IAMD domains.
In 2011, Terma was awarded a contract by the Danish Defence Acquisition and Logistics Organization (DALO) to perform a feasibility study of the BMD upgrades options for the IVER HUITFELDT class frigates. The focus of the study was specifically to look at the Command & Control system and the interoperability conditions with NATO partners and allies. During the study, tests were performed to demonstrate the maturity of the BMD-Flex features and functions as well as the low risk approach of integrating them into the IVER HUITFELDT class’s C-Flex Command & Control system.

**Affordable and low-risk solution**

Since the BMD mission was already considered in the design phase of the IVER HUITFELDT class frigates and several smart decisions were made with respect to which systems and sub-systems were deployed and integrated, the Danish maritime ballistic missile defense contribution to NATO will prove to be an affordable solution with the lowest possible risk.

Terma’s extensive work with the Command & Control software in the BMD and IAMD domains, especially with regards to interoperability with other relevant Command & Control systems, combined with our recent involvement in international studies, together with DALO, will serve to minimize the risk of upgrading the key component of the IVER HUITFELDT class frigates to the desired BMD capability.

**Summary**

With the work that has been done over the last 10 years, building the BMD-Flex Command & Control system and preparing the future integration of these relevant features and functions into the Danish Navy’s C-Flex Command & Control system, the journey to a Danish maritime BMD capability has already begun. Working together with major international partners in the design, development and test phases has ensured the relevant capability will be delivered.

The Danish decision to contribute to the NATO BMD system with a robust and relevant maritime BMD sensor onboard an IVER HUITFELDT class frigate falls well in line with NATO’s decision to develop and field a ballistic missile defense system to defend European nations, populations and armed forces against the ever growing threat.

The maritime contribution will guarantee the most flexible and adaptable capability, that can easily go anywhere in the world defend deployed forces or population centers from rogue nations or non-state actors.

At the center of this capability, the C-Flex Command & Control system will assist the Danish Navy’s operators in making the critical decisions needed to counter the proliferating threat from ballistic missiles throughout the world.
Operating in the aerospace, defense, and security sector, Terma supports customers and partners all over the world. With more than 1,300 committed employees globally, we develop and manufacture mission-critical products and solutions that meet exacting customer requirements.

At Terma, we believe in the premise that creating customer value is not just about strong engineering and manufacturing skills. It is also about being able to apply these skills in the context of our customers’ specific needs. Only through close collaboration and dialog we can deliver a level of partnership and integration unmatched in the industry.

Our business activities, products, and systems include: command and control systems; radar systems; self-protection systems for ships and aircraft; space technology; and advanced aerostructures for the aircraft industry.

Headquartered in Aarhus, Denmark, Terma has subsidiaries and operations in The Netherlands, Germany, Belgium, UK, India, UAE, Singapore as well as a wholly-owned U.S. subsidiary, Terma North America Inc. Terma North America Inc. is headquartered in Arlington, in the Washington D.C. area, with other offices in Georgia, Texas, Alabama, and Virginia.