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BATTLE OF THE ALLROUNDERS

***THREAT REALITY CALLS FOR MORE ADVANCED
MINE COUNTERMEASURES VESSELS***

The Indonesian Navy is about to receive two modern mine countermeasures vessels aimed at replacing TRIPARTITE type vessels that were commissioned in the late 1990s. (Artist impression: Abeking & Rasmussen)

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No capability, no action

Essentials of mine countermeasures vessel technology Part I

Naval fleets around the globe are continuing to invest in modern mine countermeasures vessel technology. The EMEA (Europe, Middle East and Africa) region plus Asia are poised to procure 33.5 percent of Western-built vessels of different classes, sizes and capability in the timeframe 2019-2030, according to industry sources. Naval Forces reflects upon selected programmes. Part II in March will be devoted exclusively to unmanned mine countermeasures platforms.

Threat is reality

Sea mines and other underwater explosives, varying in size, shape, operational mode and lethality, are classed as asymmetric threats and may be asynchronous weapons since their action typically occurs long after they were emplaced. Locating, identifying, classifying, defusing and neutralising them is a tough task. Naval fleets in many countries, over decades, were operating mine countermeasures vessels (MCMVs) of different classes, sizes and capability to cope with the threat. In many countries, the current inventories of MCMVs, need to be modernised or even replaced with new classes of vessels in the 2020s. Most of which were built in the 1980s and 1990s.

To make certain areas mine free or even mine-safe, the principal challenge is to reduce the time it takes to find, identify and eliminate them. Both advanced MCMVs and unmanned technology – remotely operated vehicles (ROVs) and other extended standoff ordnance detection methodologies – are playing a crucial role to combat the threat. Robotics are able to rapidly dismantle mine threats while minimizing the risk of exposing personnel to lethal minefields. This was one of the consequences in the NATO's orientation towards a strong unmanned component, adding to the capability of traditional MCM methods.

Wake-up call

To comply with its commitment to the defensive role in an extremely complex maritime environment most typical of the Baltic Sea, the Germany Navy, for instance, is keen to maintain an advanced MCM capability in the 2020s. The demand for a successor of the current purpose-built MCMVs is an urgent one. The fleet of eight Type 332 (Frankenthal class) minehunting vessels presently assigned to Flotilla 1 (*Einsatzflotille 1*) is subject to a constant reassessment and orientation to new threats. Official sources related to the Bundeswehr's WTD 71 (*Wehrtechnische Dienststelle 71*) located in Eckernförde claim that their growth margin for further upgrading is limited. Proposals received from industry call

for a new class of high-performance, high-mobility MCMVs, offering a more robust mine countermeasures capability than the current inventory of 1990-era platforms.

Another naval power in the Baltic, the Finnish Navy's main acquisition was the three-ship strong *Katanpää* class of Intermarine-built minehunters that were acquired under the MCMV 2010 programme. Their principal feature is the broad variety of MCM systems they can embark, the wide range of tasks they are able to perform and their full interoperability with EU and NATO forces in the case they participate in international missions. The *Katanpää* class design offers much more potential for wider international use than originally envisioned.

In October 2014, the Algerian National Navy signed a contract with Orizzonte Sistemi Navali as prime contractor and Intermarine (as a subcontractor) for one single MCMV plus an option for a second vessel based on the *Katanpää* class design. Commissioning of the first unit, named *El-Kasseh 1* (501), took place on 30 September 2017. Equipped with a Gaymarine Pluto Plus remotely-operated mine disposal vehicle and a Klein Marine Systems towed side-scan sonar, the vessel features a monohull design, constructed from composite materials. These advanced materials offer improved shock resistance against underwater explosions. Another feature is her diesel-electric power plant, with the prime movers con-



On 26 November 2020, steel for the first mine countermeasures vessel based on the German Navy's Frankenthal class was cut for the Indonesian Navy. (Photo: Abeking & Rasmussen)

sisting of a pair of 1,000-kW (kilowatt) MTU 8V-396-TE74 engines, while final drive comes from two Voith Schneider cycloidal drives, delivering a speed of up to 13 knots and a range as of up to 1,500 nautical miles.

Left: The Holm class multi-role craft HDMS Saltholm (MSD 6) was refitted as part of the MCM DNK between 2011 and 2012.

Centre: As flagship of NATO's SNMCMG1, the patrol frigate HDMS Thetis (F 357) was fitted with the MCM DNK C3 module.

Right: The containerised C3 module is designed according to the 'plug-and-play' concept. (Photos: Guy Toremans)

History lessons are crucial

German shipbuilders in particular look back to a long history of designing, constructing and outfitting conventional MCMV hulls with an array of manned/unmanned systems. Among them is Abeking & Rasmussen (A&R), which is based in Lemwerder near Bremen, and is supplier of the German Navy plus many other fleets over decades. The first wooden mine-sweepers were built as early as WWI. In 1930, "R 2", A&R's hull number 2655, was the prototype of German minesweepers for decades. Several hundred units were built in different variations and exported; in the mid-1950s, the Pulau Rau class was delivered to the Indone-

sian Navy. Another variant, the Schütze class, was built in the 1960s for the Federal German Navy; the last units were exported in the 1970s to Brazil. Belonging to the Aratù class, five units with a displacement of 245 tonnes are still in active service, proving their high-quality design and craftsmanship.

A&R's expertise in the field of monohull MCMVs in particular is the result of a decade-long process of research and development. The Ministry of Defence (MoD) in Jakarta, Indonesia, recently opted for a 62m long design from A&R based on the proven design of the German Navy's Frankenthal class. Two vessels are to be delivered to the Indonesian Navy, replacing two TRIPARTITE type MCMVs (Pulau Rengat class) that were commissioned in 1988. The vessels are made of non-magnetic steel (NMS). Production is now in progress; on 26 November 2020, steel for the first unit was cut. NMS was first used in the 1980s for the German Navy's Hameln class (Type 343) and later for the Frankenthal class (MJ 332), Thomas Haake, A&R's sales director navy, explained. The same was the Alanya class for the Turkish Naval Forces. Vessels of all three classes have been built by A&R.

A&R has since continuously developed and improved this type of MCMVs, which have become larger with a length of about 62m and a width of 11 metres. The propulsion system is a standard configuration of two shafts with controllable pitch propellers, electric loiter drives and MAN V175 diesel engines. Mine-hunting is based on a hull-mounted sonar (HMS), ROV and mine-clearance divers; but autonomous underwater vehicles (AUVs) are also envisaged. The MCM equipment is supplied by Teledyne Reson, a leading provider of high-quality underwater acoustic solutions.

For the production of the hulls, A&R is also using its modern, in-house developed



3D-laser-welding system, Thomas Haake explained. The advantage of this cutting-edge technology is clear: low thermal distortion and high-precision, particularly for reliable and resilient welds. A&R is also promoting its latest design, the APEX Protector, offering a platform for different or varying combat intensities. Designed as a monohull platform,

it is purely a commercial design that can be fitted with varying mission modules, allowing for a unique modular design for the spectrum of deployments, from patrol and surveillance to MCM. The platform can be fitted with a modular deck plus a flight deck for unmanned helicopter drones or vertical replenishment (VERTREP) operations.

◁ Six modern minehunters will be delivered to the Belgian Naval Component and six to the Royal Netherlands Navy, each fitted with the complete drone system consisting of a total of more than a hundred underwater, surface and aerial drones entirely dedicated to mine warfare missions. (Artist impression: Belgium Naval & Robotics)

Monohull vs multihull

A&R is also known for unconventional options. The code word is SWATH (small waterplane twin-hull) as offered in the mid-2000s to the Latvian Navy. The SWATH platforms on offer range in length from 20m to 70m, with the larger designs well-suited to act as a 'mother ship' for unmanned systems. In September 2006, Latvia selected a development of the A&R 25-m pilot boat for a class of five multipurpose boats, which it ordered the following year. They were the first new surface assets ordered for the Latvian Navy. Three vessels were constructed at the A&R shipyard and delivered to Riga Shipyard in Latvia, while the remaining two vessels were constructed in Latvia, with A&R delivering material packages.

Keeping in mind modularity and multi-functionality, concept tests of a side-scan sonar module have been performed, achieving decent results; the Skruna class vessels might become an important element of the MCM capability of [the] Naval Flotilla in the future," the commander of the Patrol Boat Squadron, Commander JG Peteris Subbota, told Naval Forces in 2011. The SWATH technology innovated by A&R is more expensive than other existing technologies; but, as it gives the necessary stability with a smaller hull length, the cost of building such a ship is comparable to the cost of building a catamaran and more economical than ordering a single-hull ship.



Seeking full-scale protection against sea mines, naval fleets draw on robotic technologies fitted to modern MCM platforms. Pictured is the minehunting equipment fitted to Finnish Navy Katanpää class MCMVs including the Kongsberg Hugin 1000 AUV (left) and Saab's Double Eagle Mk2 ROV (right). (Photo: Guy Toremans)



SWATH platforms can remain within the “comfort zone” much longer, since ship stability benefits enormously from the catamaran-type hull concept, thereby increasing the crew’s capabilities, according to A&R.

Modularity makes these boats multifunctional. The Latvians acquired the boats primarily as patrol boats, for a combination of patrol, constabulary and search-and-rescue. The service envisaged a later upgrade to an explosive ordnance disposal (EOD) and MCM equivalent as their part of the Baltic Sea hosts plenty of unexploded underwater weapons, taking into account, however, that the EOD or MCM role would not have to be fulfilled at the same time as, say, patrol or diving support or SAR. The Latvian Navy currently operates five ex-Dutch TRIPARTITE Coastal Minehunters (MHCs). All are expensive to operate

and to maintain and all of them have relatively large crews.

Unstoppable rise of unmanned systems

Seeking full-scale protection against sea mines, many navies draw on robotic technologies fitted to their MCMVs. ROVs and other extended standoff ordnance detection methods

remain high on the agenda of should it comes to the introduction of successor classes in the 2020s, for example, in Belgium, France, the Netherlands and the United Kingdom.

As to the increasing significance of unmanned systems, a major influencer and traditional supplier to many navies is Atlas Elektronik, which expects future cooperation between AUVs and ROVs (tethered and autonomous) in MCM missions as an important

way forward to increase stand-off distance between MCM units and the threat, ranging from sea mines to the growing number of waterborne explosives. An interesting mine disposal tool effective against floating and drifting mines is Atlas Elektronik’s Cobra system. It can be fitted to the re-usable SeaFox AUV offering an EOD capability from surface to a depth of 300 metres.

Naval preference is to use robotics for rapid deployments to an operational area. The next step is unmanned MCM platforms as exemplified by Atlas Elektronik UK’s (AEUK) Atlas Remote Capability Integrated Mission Suite (ARCIMS). The concept offered to the Royal Navy (RN) was described as a next-generation unmanned MCM solution. What makes the system suited for complex MCM tasks is its capability of being deployed and operated from the shore and from an MCMV.

Other NATO countries’ concepts of operation could be a ‘blue print’, however. As an example, the core of the MCM Denmark (MCM DNK) concept is a containerized IMCMS C3 system, which is supplemented by a variety of containerized systems such as Atlas Elektronik’s SeaOtter and SeaFox AUVs,

an influence minesweeping gear, a clearance diving store and containers for accommodating MCM equipment. As of September 2019, the MCM DNK ‘toolbox’ was made up of two Holm class multi-role craft: HDMS Hirsholm (MSD 5) and HDMS Saltholm (MSD 6); four optionally-manned Minor Standard Vessels (MSF 1, 2, 3 and 4); a C3 container; a clearance diver container; an administrative container; and an additional container for stores, spare parts and a team of eight officers, eight petty officers and 16 ratings.

The Belgian-Dutch minehunter project achieved a major systems functional review milestone last year. Exactly one year after the notification of the contract, the Belgium Naval & Robotics (BNR) team achieved a new contractual milestone on 23 May 2020. The overall programme calls for the delivery of twelve minehunters fitted with modern drone systems (toolbox) to the Royal Netherlands Navy (RNIN) and the Belgian Naval Component. At the height of the COVID-19 crisis, the BNR teams reached the new milestone within the framework of the two services’ mine warfare project, which validates the functional and architectural studies of all the systems relevant

for the new minehunters designed by Naval Group, including computer networks, electrical installations, propulsion or combat systems, as well as those of all drones developed by ECA Group, all of which are key elements of the vessels. This review also focused on the systems of systems that provide mission management, communication and cybersecurity, as well as on the fitment of drone systems.

Conclusion

The demand for newer MCMVs with capability upgrades is an urgent one since many fleets operate 1980- and 1990-era vessels, which are becoming near-obsolete. While the new-generation of MCMVs may face completely new challenges in the future, unmanned systems (robotics) are about to transform MCM missions. The next step is unmanned MCM, with naval preference to use unmanned platforms for rapid deployments to an operational area. An example is Elbit Systems’ Seagull unmanned surface vehicle (USV), an advanced platform that already roved its multi-mission capability during a series of at-sea testing campaigns in recent years. **NAFO**

The Algerian National Navy has commissioned the first of two Intermarine-built mine countermeasures vessels, El-Kasseh 1 (501), on 20 June 2017. (Photo: Giorgio Arra)

