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maritime security and defence

MS&D | **SMM**

PREPARING FOR
FUTURE CHALLENGES



Photo Michael Nitz

**INTERNATIONAL CONFERENCE
ON MARITIME SECURITY AND DEFENCE
HAMBURG, 6 TO 7 SEPTEMBER 2018**

GERMAN NAVAL YARDS



GERMAN NAVAL YARDS KIEL

is specialized in the design and construction of large and highly-integrated naval vessels, these including frigates, corvettes and offshore patrol vessels.

The shipyard continues a 180-year naval shipbuilding tradition with the roots lying in the activities of the former traditional shipyard Howaldtswerke-Deutsche Werft GmbH (HDW). Ships of all frigate classes currently used by the German Navy were built at this shipyard. The existing high-quality infrastructure provides a competitive advantage, as for example, GERMAN NAVAL YARDS KIEL boasts of the largest dry dock in the Baltic Sea region (426 meters in length) as well as a powerful portal crane with a lifting capacity of up to 900 tons.

GERMAN NAVAL YARDS KIEL is the last remaining German general contractor in the European tender for the new multi-purpose combat vessel (MKS180) for the German navy. GERMAN NAVAL YARDS KIEL is an internationally acknowledged yard for naval shipbuilding, having recently delivered two frigates to the Algerian Navy both, on time and budget. Currently, the shipyard is constructing four corvettes for another foreign navy. The company is also proud of being part of the consortium building the second lot of the K130-type corvettes for the Germany navy.

GERMAN NAVAL YARDS KIEL is part of the European shipyards alliance of PRIVINVEST – a leading supplier of naval solutions. The group includes world-renowned industry specialists like the French naval shipyard CMN and Isherwoods in Great Britain. The competencies of these sister companies complement the German naval shipyard in an ideal manner as system integrator of large and highly-integrated naval vessels.



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MS&D 2018

International Conference on Maritime Security and Defence

- PREPARING FOR FUTURE CHALLENGES -

Conference Programme (Room Chicago)

6 September

08:30 – 09:00 Registration

OPENING

09:00 - 09:15 Welcome addresses
Bernd Aufderheide, President and CEO Hamburg Messe und Congress
Jan Wiedemann, NAVAL FORCES, Chairman MS&D 2018

09:15 - 10:00 Keynote Speech
Developments in the worldwide maritime security situation
Rear Admiral (UH) Thorsten Kähler, Chief of Staff German Navy Headquarters

Panel I – MARITIME SECURITY

10:00 - 10:30 Maritime security and balance of powers in East Asia
Dr Sarah Kirchberger, Head of the Center for Asia-Pacific Strategy and Security, Institute for Security Policy, Kiel University (ISPK)

10:30 - 11:00 **Coffee**

11:00 - 11:30 China's strife for economic and military power
Dr Sarah Kirchberger

11:30 - 12:00 A Southern African perspective on maritime security
Rear Admiral (UH) (Ret) South African Navy Hanno Teuteberg

12:00 - 12:15 Q&A

12:15 - 13:15 **Lunch**

13:15 - 13:45 The effects of global warming on maritime security
Prof Dr Christian Webersik, Deputy Director, Centre for Integrated Emergency Management (CIEM), Department of Global Development and Planning, University of Agder, Norway

13:45 - 14:15 The impact of ice melting on the maritime security in the Arctic
Dr Patricia Schneider, Institute for Peace Research and Security Policy, University of Hamburg (IFSH)

14:15 - 14:30 Q&A

14:30 - 15:00 **Coffee**

Panel II – MARITIME DEFENCE

15:00 - 15:30 Flexible Interoperable Toolbox for Future Operational Requirements in Confined and Shallow Waters (FIT FOR CSW) - Modularity, Mission Modules and the way ahead
Commander (S.G.) Peter de Groot, Royal Netherlands Navy, NATO Centre of Excellence for Operations in Confined and Shallow Waters (COE CSW), Kiel

15:30 - 16:00 Propulsion systems for enhanced manoeuvring in confined and shallow waters
Kai Glasebach, Schottel

16:00 - 16:30 Protection of harbours and high-value naval installations
Sezgin Kama, STL Systems

16:30 - 17:00 Airborne Pollution Control in congested waters
Commander (S.G.) Stefan Becker, German Navy

17:00 - 17:15 Q&A

18:00 Bus leaves from the Central Entrance of SMM to MS&D Reception

18:30 MS&D Reception (on invitation only) at Hafen-Klub, Bei den St. Pauli Landungsbrücken 3, Hamburg

MS&D 2018

International Conference on Maritime Security and Defence

- PREPARING FOR FUTURE CHALLENGES -

Conference Programme (continuation) (Room Chicago)

7 September

08:30 – 09:00 Registration

Panel II – MARITIME DEFENCE (continuation)

- 09:00 - 09:30 Cyber security in the maritime domain – New threats for naval operations
Patrick O’Keeffe, Non-Resident Fellow at the Institute for Security Policy, Kiel University (ISPK), Managing Director AMC Solutions
- 09:30 - 10:00 Cyber security – Risks for complex vessel newbuilding and operations
Patrick Rossi, DNV GL
- 10:00 - 10:15 Q&A

Panel III – NAVAL TECHNOLOGY

- 10:15 - 10:45 International Structured Cooperation – Why, how and to what extent?
Dr Hans Christoph Atzpodien, Managing Director, Federation of German Security & Defence Industries (BDSV)
- 10:45 - 11:15 **Coffee**
- 11:15 - 11:45 More versatile and powerful than ever before: The Conventional Submarine of the future
Andreas Burmester, Member of the Executive Board, thyssenkrupp Marine Systems
- 11:45 - 12:15 IDAS - Interactive Defence and Attack System for Submarines
Klaus-Eberhard Möller, Diehl Defence
- 12:15 - 12:45 High Energy Laser (HEL) effectors for naval applications
Alexander Graf, Rheinmetall Waffe Munition
- 12:45 - 13:00 Q&A
- 13:00 - 14:00 **Lunch**
- 14:00 - 14:30 Military automatic und autonomous systems – Where is the “red line”?
Dr Ulrike Franke, European Council on Foreign Relations
- 14:30 - 15:00 Fully unmanned MCM Detect-to-Engage Operations
Christian Wornik, ATLAS ELEKTRONIK
- 15:00 - 15:30 VSR700 - The Vertical Unmanned Aerial System (VUAS) for military applications
Sebastian Mayr, Airbus Helicopters
- 15:30 - 15:45 Q&A

CLOSING

- 15:45 - 15:55 Chairman’s assessment of MS&D 2018
Jan Wiedemann, NAVAL FORCES
- 15:55 - 16:00 Closing Remarks
Bernd Aufderheide, President and CEO Hamburg Messe und Congress
- 16:00 End of MS&D 2018

Dear Delegate

I warmly welcome you to MS&D 2018.

MS&D was inaugurated by Hamburg Messe und Congress in cooperation with NAVAL FORCES magazine in September 2008 and has since developed into a world-class conference attracting high-ranking delegations from navies, coast guards, naval industry, UN, NATO, EU, international maritime organizations and other important members of the international naval community. MS&D is a unique event, which differs considerably from other maritime conferences, normally focusing on only a single subject. Under the topics SECURITY and DEFENCE, MS&D conferences attempt to cover the whole spectrum of modern threats, which may have to be dealt with by naval forces and naval industry, including peace keeping, evacuation and Humanitarian Assistance and Disaster Relief (HADR) operations.

The security political situation around the world is changing constantly. Threats that were believed to be matters of the past are suddenly back. New threats are emerging almost every day. Navies have to adapt their missions, tasks and tactics accordingly. Naval industry has to provide platforms and equipment required for a steadily increasing range of missions.

Are navies and naval industry prepared for future challenges? Our renowned international speakers will introduce their evaluation of the maritime security situation on the Seven Seas, Exclusive Economic Zones, territorial waters and harbours, the impact of global warming on maritime security, current developments in digital security as well as new trends in naval technology. Under the motto of this year's MS&D, PREPARING FOR THE FUTURE, they will suggest ways of countering possible threats or hostile acts effectively and efficiently.

I hope that MS&D 2018 will meet your expectations and provide answers to some of the questions you may have. Please feel free to visit the SMM maritime trade fair of which MS&D is a part. I wish you a successful conference.



Jan Wiedemann

Co-publisher NAVAL FORCES
Chairman MS&D 2018

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Ships of Standing NATO Maritime Group One (SNMG1) in front of Hamburg's newest landmark ELBPHILHARMONIE during a visit in November 2016: SPS "Almirante Juan de Borbón" of the Spanish Navy (left) and the British Royal Navy's HMS "Duncan".
Foto Michael Nitz

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Welcome on board!

On behalf of the entire SMM team, welcome to the International Conference on Maritime Security and Defence, the longest-standing part of the conference programme of SMM, the leading international maritime trade fair. Yet, something is different this time: The conference will last two days! This means that attendees will get a full spectrum of topics.

With three panels, 18 renowned speakers, and numerous discussion sessions, we are able to offer you an unprecedented variety of specialist presentations. This underlines the vital importance of security-related topics for the industry, including challenges such as climate change, the protection of ports and cyber security. The leitmotif of this year's SMM, „Trends in SMMart Shipping“, interconnects the individual parts of the MS&D programme, which we have been able to put together thanks to our media corporation partner, NAVAL FORCES magazine.

Enhancing transparency, boosting efficiency: Big data has arrived in the shipping industry. Similar to other segments, naval forces are increasingly taking advantage of the benefits of digitalisation. But besides opportunities, network integration also harbours risks. To give an example, on the current list of the „100 most influential people in the shipping industry“ published by Lloyd's list, hackers take 11th place. So what is the best way to handle digital threats? How can you prevent cybercrime? Our speakers will tell you about specific solutions, from antivirus systems and around-the-clock protection by IT experts through to effective defences against system manipulation.

We will also jointly look at geostrategic consequences of global warming. If the predictions of a 65 centimetre rise of sea levels by the year 2100 hold true, this will have dramatic implications for ports and inhabited coastal areas.

Amid refugee crises, regional tensions and international terrorism, navies and coast guards around the globe are responding to new threats by updating and expanding their capacities – another topic that will be discussed at MS&D. Highly respected experts will highlight key trends in shipbuilding and weapon systems at this conference, which will once again be attended by numerous high-ranking naval delegations.

MS&D, which is supported by the German Navy, provides a platform for attendees to share information, views and experiences. I am confident that it will exceed your expectations not only in this respect but also in many other ways.



I hope you will learn many valuable facts, have great discussions and enjoy an inspiring stay in Hamburg.

Bernd Aufderheide

CEO & President

Commander (S.G.) German Navy Reserve



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Returning to the tasks of national and collective defence

Welcome to this year's iteration of the International Conference on Maritime Security and Defence, which aims to provide the strategic maritime perspective on the world and the challenges we face. This conference has developed throughout the years into a firm institution and integral part in the global exchange of important maritime developments and information amongst leaders, decision makers, military specialists, naval industries, related organisations and naval enthusiasts. This year, the topic of the conference is dedicated to the preparation for future conflicts, which immediately implies the question of how the future conflicts look like.

As we all are not in the possession of a crystal ball, it is necessary to carefully assess possible patterns of development by analyzing the current situation, the historical context and the options ahead. Such an assessment should then provide the frame for defining tasks, structures and the required equipment to face these future challenges.

From my perspective, without having an ultimate answer to that question, it appears more than obvious that most of us have been misled in our previous perception, that Europe was deeply embedded in an area of stable peace, security and prosperity and that future security challenges can be dealt with a solely focus on crisis management capabilities. We were wrong and we learned our lessons. As a result, the German Armed Forces and the German Navy have carried out their own review of the current situation. Such an evaluation needs to be frequently updated and adjusted, more often than we have done in the past.

As a result, our Navy is currently going through its largest modernization programme since the eighties. However, we also have to recognize that the path taken now presents us with enormous challenges, as we carry out the modernization process in parallel with a constant high workload of deployments, exercises, trainings and technological adaptations. Re-balancing the strategic alignment of tasks between defence and crisis management we are clearly returning to the tasks of national and collective defence, which require much more robust national command structures than it was previously the case. In addition we have to rethink our national leadership organization.

It is a matter of fact that current and future challenges can only be faced together in dialogue and through strong international cooperation and teamwork. The challenges and risks we face nowadays regularly have their origin not in our immediate vicinity. Events far away from our European homeland do directly influence our security and our prosperity. We have to face that. It seems as if a crisis



arc embraces the European peninsula. The related challenges arising from the described international security environment cannot be tackled by any country alone, but require a multilateral and multidimensional approach.

I am sure that the MS&D provides a forum which will contribute with new ideas, intensive discussions and the exchange of views to shed some light into this wide and interlinked area of possible future conflicts.

I wish you a successful conference, fruitful talks and lasting impressions.

Andreas Krause
Vice Admiral
Chief of the German Navy

Abstracts of Presentations

Developments in the worldwide maritime security situation

Today's geopolitical situation is complex and full of tension in many parts of the world. We are facing a situation of increasing instability accompanied by regional arms races. The governance of International Law is more and more challenged by the governance of military strength. This influences all of us. Welfare and development options of our world depend on free trade mainly conducted via the sea. Thus, Maritime Security is of utmost importance. In parallel, developments in technology generate a new operational environment. Potential maritime battles will not necessarily consist of classical duel situations anymore. They will be accompanied by hybrid warfare, adding new dimensions to the well-known three-dimensional battleground. For these reasons the German Navy has to be prepared to conduct operations anywhere in the world covering the full multidimensional intensity spectrum, including high end operations in the frame of collective and homeland defence. After decades of shrinking the German Navy starts to grow again. A large number of procurement and modernization projects are underway, or appear on the horizon, driven both by the accepted NATO capability targets as well as national ambition. Yet, growth constitutes challenges on its own. Procurement processes are slow, innovation cycles still too long. In order to stay competitive a closer cooperation between all actors in the field of development and procurement is imperative. Growth also has a big impact on personnel. The necessity to generate enough qualified people and to train them in a "new" environment requires major changes of our training infrastructure, including on-site training facilities for a multiple crew concept. The German Navy will remain a reliable actor in the multinational environment, taking on its responsibilities, ranging from regional to global orientation in a tiered approach. It will always be embedded in multinational endeavors from cooperation in operations all the way to structural integration of forces.

**Rear Admiral (UH) Thorsten Kähler,
Chief of Staff German Navy Headquarters**

Maritime Security and balance of powers in East Asia

The emerging great-power rivalry between the U.S. and China is about to become a defining element of the Asia-Pacific security situation, and has begun to influence the maritime strategies of most Asian countries. Submarine programmes have been started even in some lesser developed countries, leading some observers to note the beginnings of an arms race in Asia. Tensions in the East and South China Sea, the unstable situation on the Korean Peninsula, and strengthened military cooperation between old allies, but also new cooperation between unlikely partners such as China and Russia or Vietnam and the USA, are yet other facets of a new and uncertain trajectory. Starting from some basic geographic and geopolitical considerations, this presentation will trace the military-strategic interests, dependencies and threat perceptions of China on the one hand and of the U.S.-led alliance in the Asia-Pacific on the other, and will then discuss the impact of China's ongoing naval modernization on the strategic balance in Asia from this vantage

point. The role of new technologies, and in particular China's ambitious goals for space development, will be highlighted.

**Dr Sarah Kirchberger,
Head of the Center for Asia-Pacific Strategy and Security, Institute for Security Policy, Kiel University (ISPK)**

China's strife for economic and military power

Starting from the Taiwan Strait Crisis during the mid-1990s, China has begun to follow a systematic course of state-led economic and military growth. The major aim, according to state and party leader Xi Jinping, is to achieve a "rejuvenation" of the Chinese nation – a goal which seems to include the idea of repatriating all traditionally Chinese territories, and to once again assume China's leading role in the Asia Pacific. To a large extent, China's military and economic power rests upon maritime, and in particular, naval development. China's first overseas military base in Djibouti signals Beijing's ambition to achieve a stronger presence in the Indian Ocean. The Belt & Road Initiative, China's flagship project to intensify connectivity across Eurasia, now officially extends to the Arctic as well as to Africa and even the South American Continent. China's multifaceted relationship with Russia is also of particular relevance against the backdrop of the current world climate. Ever since the occupation of Crimea in 2014 caused a rift between the Western countries and Russia, both countries have massively intensified their mutual economic, political, military and technological cooperation. Joint Sino-Russian naval manoeuvres in NATO's home waters, such as the Mediterranean and Baltic Seas, are only the most visible manifestations of a much intensified cooperation. This presentation will analyze China's multi-layered initiatives to strengthen its own strategic position and to regain a powerful role in the world, and will discuss the possible impact of these strategies on Europe.

**Dr Sarah Kirchberger,
Head of the Center for Asia-Pacific Strategy and Security,
Institute for Security Policy, Kiel University (ISPK)**

A Southern African Perspective on Maritime Security The Forgotten Choke Point

The presentation serves as a reminder of the strategic importance of the Cape Sea Route, the changes and challenges in the geo-political landscape surrounding this route and provides insight in the future maritime security situation of this area.

On the Southern tip of Africa (often referred to as the forgotten continent) lies Cape Agulhas and the Cape of Good Hope (possibly the forgotten maritime choke point). Off the East coast of Africa, the Sea Lane of Communication (SLOC) runs off the dangerous coasts of Somalia and Yemen whilst to the West, the Gulf of Guinea has become a hotbed of maritime crime over the past decade. To the South lies the unforgiving seas of the roaring forties which channels any ship traffic close to the Cape of Good Hope. This Cape divides the often strategically overlooked Southern Atlantic and Indian Oceans and also provides a handy gateway to Antarctica.

Maritime trade remains the life blood of the world economy and the various SLOCs therefore remain the arteries that keep our con-

tinents connected. Within these SLOCs there remain maritime choke points that force shipping lanes to merge due to its geographic and strategic locations. In terms of oil barrels moved per day, the Cape Sea Route lies third in the world with 5,5 million barrels transiting per day, behind the Straits of Hormuz and Malacca. However, factoring in the vulnerability and proximity to flashpoints of the Suez Canal and Bab El-Mandeb, the strategic importance of the Cape Sea route remains undeniable.

Ashore, the Cape Sea Route circumnavigates the South African Development Community (SADC) group of nations with South Africa, Mozambique, Tanzania, Namibia and Angola being the main maritime actors. Conventions, treaties and plans are in place here to ensure security of their waters. These include the African Integrated Maritime Strategy (AIMS), the Djibouti Code and the SADC Maritime Security Strategy (SADC MSS). In addition, the relative stability of these countries plus the law and order secured ashore, contributes greatly to the security of vessels at sea. International cooperation is complicated by the perceived non-aligned status of the region, the establishment of a new world order with associated alliances (BRICS), the growing Chinese influence within Africa and a general mistrust of intentions.

However, despite a large amount of maritime conventions and the purest intentions, the surest way of ensuring maritime security within this vital SLOC is by means of policing, at sea and ashore. This requires a toolbox of maritime security capabilities, the integra-

tion thereof and finally the ability to effectively operate and maintain these capabilities.

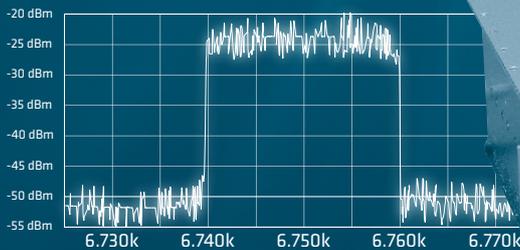
Rear Admiral (UH) (Ret) Hanno Teuteberg

The effects of global warming on maritime security

In recent years a debate has emerged whether climate change impacts, more specifically climate variability with regard to precipitation and temperature, can lead to insecurity. These narratives gained traction in policy and academic circles, and attracted considerable attention. Climate change manifested in rising global mean temperatures, more variable and extreme weather is threatening national security, such as the resilience of national and international energy systems. Stronger storms, more intense flooding, and prolonged droughts will all impact the way we produce and consume energy. Yet, climate change will also open new opportunities, for instance for resource extraction and new shipping routes in the Arctic, all bearing environmental, political and social implications. Moreover, there are evident links between climate change mitigation and energy security: while countries need to reduce carbon dioxide emissions to mitigate global warming, they also need to reduce oil import dependency to achieve energy security. Both can be addressed by increasing the share of carbon-neutral energy sources. This, however, confronts us with difficult choices. The production of renewables or nuclear energy can compromise human

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Prof Dr Christian Webersik,
Centre for Integrated Emergency Management (CIEM),
Department of Global Development and Planning,
University of Agder, Norway

The impact of ice melting on the maritime security in the Arctic

The ice melting in the Arctic influences also the security environment. On the one hand, different scenarios are discussed for the use of new sea passages. These can shorten sea routes considerably and might also make the exploitation of underwater resources more attractive. On the other hand this opens also options for the navies like demonstrating national interests via exercises and buying suitable ships. How does the big variety of state- and non-state actors in this region solve their conflicts and govern its space? The paper addresses questions like “What actors other than littoral states and inhabitants do play a role because of the strategic geopolitical interest in the region? What problems are currently discussed which might have an impact on the security environment? How do Germany and the EU participate in this?”

Dr Patricia Schneider,
Institute for Peace Research and Security Policy,
University of Hamburg (IFSH)

Flexible Interoperable Toolbox for Future Operational Requirements in Confined and Shallow Waters (FIT FOR CSW) - Modularity, Mission Modules and the way ahead

The focus on modularity is ever increasing as it becomes the focal point of many procurement programmes throughout the world. It seems to be the answer to everything. The constant factor in all discussions is that modularity is always viewed as the solution. Modular designs often open the door for additional difficulties and add challenges pertaining to complexity and cost. Modularity has become kind of a hype. It is a buzzword to sell and it overshadows what it is really about, namely our needs and capabilities for the future. What we do require for the future is not modularity just because it is modular. We must aim in particular at creating cost advantages by simple but effective solutions as well as multinational procurement and use. Especially we need to be able to adapt to changing situations for all kinds of missions in different scenarios. What is required in order to achieve adaptability? According to a definition provided by the Rand Cooperation (“Designing Adaptable Ships; modularity and flexibility in future ship design”, 2016), adaptability consists of modularity and flexibility. There is no doubt, modularity is the answer as we seek to field the newest technologies aimed at tackling challenges in Confined and Shallow Waters. However, if we go modular, then standardisation is a must for connectivity and interoperability.

A new NATO Smart Defense initiative (SD1.44), called FIT FOR CSW, will study from a holistic point of view the use of modules and the creation of a Flexible Interoperable Toolbox for Future Operational Requirements in Confined and Shallow Waters. The purpose of this Project is “to define required capabilities and evaluate the suitability of modular components, capable of being deployed from a variety of multinational platforms in order to perform tasks in CSW operations”. Consequently, the outcome of this conceptual study

should be “to foster synergy in developing, procuring and operating a set of compatible components, thus enabling nations to maintain a broad(er) set of affordable and effective capabilities for maritime – combined and potentially also joint – operations, especially in the challenging environment of Confined and Shallow Waters.” The project encompasses all domains (air, surface and subsurface) and will cover all warfare areas. The near-term goal is to further detail challenges and possibilities as we look for innovative and affordable solutions for the future. Past research has provided us with a good starting point on how to better equip our forces to overcome challenges faced in the challenging environment of Confined and Shallow Waters.

Commander (S.G.) Peter de Groot,
Royal Netherlands Navy, NATO Centre of Excellence for
Operations in Confined and Shallow Waters (COE CSW)

Propulsion systems for enhanced maneuvering in Confined and Shallow Waters

Deployment of military vessels in Confined and Shallow Waters requires platforms that can safely operate and navigate in this environment. The propulsion system of the ship provides a vital contribution to fulfil the mission. Available on the market is a wide range of systems that can be configured to support any mission in blue water but also in Confined and Shallow Waters. No matter if a vessel is defined to provide a versatile platform or is purposely built for confined water operations, the propulsion system has to be selected to provide the best possible performance for the entire range of operational requirements. The presentation will give an overview over the available systems for ships facing the challenges of operating specifically in confined waters. An emphasis is put on auxiliary systems to enhance maneuvering such as tunnel thrusters, pump jets and retractable azimuth thrusters.

From the statement of requirements on to the design stage and shipbuilding process it is important to be aware of the advantages and the challenges that have to be considered when designing the ship for a specific environment. Therefore the designers, shipbuilder and operators should be up to date with the developments in industry and the available options for the ship propulsion.

Kai Glasebach, SCHOTTEL GmbH

Protection of harbours and high-value naval installations

For the self-protection of harbour entries, coastal areas as well as for monitoring national waters an observation and monitoring system is required for optimizing the responding time against any unwanted asymmetric threats, terrorism as well as sabotage activities.

The 3rd generation of the underwater safety sensor chain system of STL Systems AG has the technical capability and sensitivity to measure magnetic, electric, acoustic, pressure and seismic signatures of submarines, vessels and ships, torpedoes, unmanned vehicles, swimmers and divers by using the respective sensors for detecting the specific signature of unwanted targets.

The sensor belt system measures minor active or passive electric and magnetic field changes emanating e.g. from electric activity, corrosion currents and magnetic material as well as the acoustic or pressure signatures of the unwanted invader. This challenging task is mastered by a system’s optimized use of available high technologies like STL’s 32 bit high resolution data acquisition, highly sensitive preamplifiers, very low noise magnetic and electrical field

sensors, acoustic sensors with highest accuracy, together with state-of-the-art underwater data acquisition hardware and highly optimized evaluation software.

According to the design, the interface for power and data will be provided from the harbour security information centre due to redundancy aspects with two lines each to different underwater connection boxes (UWCB). The UWCB will be cascaded with each other via hybrid fibre-optic cable carrying power and data to each UWCB. The distance between the most distant UWCB and the harbour security information centre may range up to 30km.

The system design will be realized as customer requested configuration depending on the total number of sensors in accordance with the total chain length of the protected area, the sensor nature and the seabed geometry. A system layout optimized for the specific area, ensures the discovery of almost each invader, independent of its size, especially if magnetic sensors are combined with acoustic and active and/or passive E-Field sensors on each UWCB module. All magnetic sensors are complemented by tilt sensors and allow precise alignment of the sensor array and each sensor relative to each other. Therefore, the signals of neighbored sensors can be correlated and allow for high-resolution target detection and even tracking. The optional acoustic sensor front-end is based on Omni-directional low noise hydrophone followed by a very low noise amplifier and 32 bit analogue digital converter (ADC).

Sezgin Kama, STL Systems

Airborne Pollution Control in congested waters

The presentation will briefly outline the history of Pollution Control in the TTW of Germany. The presenter will draw a line from the first steps to nowadays' high-tech equipped Oil-Pollution Control Aircraft, while shedding light on events of the last decades. As economic growth is on the high rise, traffic on the high seas is increasing - so does pollution. To efficiently monitor the merchant shipping lanes, the German Navy has to cooperate with other European countries. The two Dornier 228 aircraft operated by the German Navy are well integrated into a European Pollution Control Network. Highlight of that cooperation is e.g. Super-CEPCO, a 24/7 approach to monitor specific shipping lanes in a joined approach. The presenter will round off his briefing with the EDA project of a common Maritime Situational Awareness Aircraft - a chance to deepen the European efforts of fighting pollution and control our borders.

Commander (S.G.) Stefan Becker, German Navy

Cyber Security in the maritime domain – New threats for naval operations

Threats in cyber space are constantly rising with severe consequences that go frequently unnoticed. Current cyber security strategies are not able to counter and deter intrusions in various



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domains that were previously taken for granted. The rapid development of information and communication technologies poses a new challenge to national and international actors, and thus militaries. In an unprecedented manner, gaps in global security policies are emerging like never before. Reliance on the benefits of cyber technologies as well as protection against its vulnerabilities presents a security challenge across several domains, agencies, and national-level processes. The overarching goal of a National Cyber Security Strategy (NCSS) is to ensure the integrity of national sovereignty in cyber space and beyond.

At sea, ships and naval vessels heavily rely on modern communication and data exchange technology. Within the global trade systems as well as in military operations ships are exposed to numerous vulnerabilities. Therefore, a comprehensive cyber security strategy must include a multidimensional and multidisciplinary approach to protect warships.

In this presentation I will provide an overview of emerging and intensifying cyber threats to naval platforms. My message: "It takes more than an excellent IT solution to ensure sustainable protection of the sovereignty of naval vessels."

Patrick O'Keeffe,
Institute for Security Policy, Kiel University (ISPK),
Managing Director AMC Solutions

Cyber Security – Risks for complex vessel newbuilding and operations

From Red teams, Blue teams, Purple teams, to false flags and the dynamics of incident feedback loops, cyber defence and cyber systems engineering have much in common with navy drills and battle preparedness. But the fighting on this modern battleground starts at the cyber supply chain management and continues through the validation tests of Advanced Threat Analysis (ATA) and Advanced Threat Protection (ATP) systems. As part of the complex vessel newbuilding supply chain, scarce cyber systems engineering and threat management skill sets are required.

Understanding and communicating the objectives of what can be perceived as 'stale' cyber security requirements and controls can be a challenge. Stimulating projects and dynamic knowledge sharing techniques are examples of frameworks that can help build and train cross-functional teams to support the organisation in being on the look-out for fast evolving cyber-attack technologies and techniques. Engaging system vendors and yards in sharing threat inventories with the owners and operators of complex vessel newbuilding has been found to significantly help overcome contractual layers and create stronger cyber systems engineering teams that design and build more resilient cyber dependant vessels. Similarly, by involving information security teams in cyber risk assessments activities, which target vessels, their interfacing systems and the newbuilding lifecycle, improvement areas can not only be clarified but also point to newbuilding lifecycle deficiencies: obsolescence management, overconfidence in outsourced responsibilities, blind spots from insufficient barrier management are valuable findings that, when addressed, raise the difficulty level for our opponents.

Patrick Rossi, DNV GL

International Structured Cooperation – Why, how and to what extent?

International and Permanent Structured Cooperation (PESCO) is a highly modern European buzzword in our current discussions on

fostering efficiency and competitiveness in the European Defence Industry. Nevertheless it has to be stated that the various ideas about PESCO are significantly different among key European players.

Another supposed and intended driver behind more defence and armament cooperation across the EU is the toolbox of the European Defence Funds (EDF). The European Defence Industrial Development Programme (EDIDP) is just entering the final stage of the political debate and most likely will be in force by mid 2018.

Apart from these instruments, but also based on their political impact the key question of this contribution is: what will be the key drivers behind a real cooperation in future European Defence and Armament programmes?

From a practical point of view, supported by experience collected in the past, the key drivers will be military, political and only in third rank industrial.

It will be pointed out how this has to be understood. Examples will be shown for cooperation structures, which already have shown their success.

Dr Hans Christoph Atzpodien,
Managing Director of the Federation of German Security
and Defence Industry (BDSV)

More versatile and powerful than ever before: the Conventional Submarine of the future

Submarines are still one of the most important assets in the inventory of modern navies. They remain the ultimate stealth weapon, capable of delivering powerful weapons like heavy weight torpedoes or missiles without any warning.

To fight this threat, ASW technology is also advancing: modern active sonars, bi- and multistatic sonar systems, AUVs, USVs like the SEA HUNTER, magnetic detection and satellite based synthetic aperture radars increasingly threaten today's submarines.

The paper explains recent developments in ASW and the corresponding developments to the submarine. These include:

- Reduction of signatures especially in target echo strength and magnetic signatures for future designs
- Advances in the field of underwater endurance including batteries, propulsion and AIP
- Improvements in sonar systems especially in bi- and multistatic algorithms
- New and improved weapons and countermeasures like IDAS and SEASPIDER
- The use of unmanned systems

The speech will end with an outlook on what underwater warfare may look like in the future.

Andreas Burmester,
thyssenkrupp Marine Systems GmbH, Germany

IDAS - Interactive Defence and Attack System for Submarines

Nowadays the mission profile for modern conventional submarines includes operations in shallow waters in the coastal areas. In general coastal areas are highly frequented by airborne ASW activities. By operating in this environment, submarines are particularly vulnerable to airborne ASW threats. Restricted by confined and shallow waters typical manoeuvres like diving and escaping into deeper water are often not an option under such circumstances. But even in deep water conditions there might be a necessity to react on airborne ASW activities. The IDAS Consortium, a coop-

eration of Diehl Defence and thyssenkrupp Marine Systems, develops the weapon system IDAS (Interactive Defence and Attack system for Submarines), which enables the submerged submarine to actively defend itself against airborne ASW threats in case of detection. IDAS is a weapon system based upon a fibre-optically connected, IIR Seeker-guided autonomous missile, which is launched from a torpedo tube by means of a specialized ejection container. This container is loaded with four missiles. It features the main dimensions and mass of a typical heavy weight torpedo. This provides an extremely easy integration for new submarine building projects as well as for refit solutions of existing submarines, e.g. during an overhaul. The missiles are ejected by means of a hydraulic system, which is integrated in the ejection container. The solid propellant rocket motor (sustainer) is ignited immediately after the missile has left the torpedo tube. The missile “flies” towards the surface, where the second rocket motor stage is activated. Accelerated by this “booster” the missile breaks the surface and heads towards the target expectation area.

Inflight, the operator on board the submerged submarine can communicate with the missile via a fibre optical cable allowing him to support the target seeker head’s task of identifying and tracking the target until impact (human-in-the-loop).

The IDAS Consortium offers customers the choice between a stand-alone-integration into the boat and a full integration into the submarine’s combat management system. The IDAS system provides - as the only system worldwide – submerged submarines with a protection against airborne threats, which will completely change the paradigms of ASW. As a secondary benefit, IDAS will enable submarines with a precision attack capability against small and fast surface vessels and coastal targets, e.g. in asymmetric scenarios.

**Klaus-Eberhard Möller,
Diehl Defence**

High Energy Laser (HEL) effectors for naval applications

Asymmetric warfare has faced navies around the world with new types of threats, which forces new requirements in the reaction of naval platforms. Situational awareness and the capability to react in a reasonable way, focusing on self-defence with a minimum of collateral damage and the possibility of de-escalation is a compelling need.

Ships may encounter asymmetric threats at any time, particularly in coastal waters and narrow and busy shipping lanes. After successful detection and verification of the threat there is only very little time to initiate active measures for self-protection. The measures initiated must have an immediate effect, serve self-protection, shall be deployed observing the rules of engagement, and ultimately minimize potential collateral damage or rather completely prevent it. These basic requirements are integral parts of all work of RWM for the development of new effector systems – and this already from the first idea to final operability. This of course also includes a life cycle management, including the associated obsolescence management to maintain established weapon systems across the entire service life with high availability. A laser weapon system consists of different components among which the Laser Weapon Module (LWM) is the key component. The LWM consists of a High Energy Laser and a Beamforming Unit (BFU) for fine tracking and beam focusing. Commercial-off-the-shelf fiber lasers have been modified for naval applications. The BFU provides diffraction limited beam focusing, target imaging and fine tracking.

Using Rheinmetall’s Beam Superimposing Technology (BST), the output power of several LWMs can be concentrated in a single spot on the target and the energy density transmitted increases directly with the number of LWMs. Due to the scalable laser power the LWM has an outstanding flexibility with regard to escalation and de-escalation in conflicts: Neutralizing complete weapon systems like aircraft, Unmanned Aerial Systems (UAS) by defeating the optoelectronics, neutralizing Remote Control Weapon Stations (RCWS) by defeating the ammunition, downing UAS, stopping Zodiacs® and jet skis. Effective protection from a large spectrum of modern air and naval threats could be achieved by increasing the laser power per platform and combining several LWM on different platforms by using the BST. RWM has proven the capabilities of their demonstrators in numerous demonstrations. In 2015, for the first time in Europe, a HEL MLG 27 light naval gun was successfully tested on board a ship performing live firing. The available database from the previous work allows reliable evaluations to design a LWS for successful defence. These considerations in turn are decisive for the requirements of integrating a LWS in a ship. From the scenario requirements for laser performance, mass, volume, energy demand and linkage to a Command and Control system can be derived for an LWS by “simple” engineering. The weapon deployment and thus also the operative use of an LWS is then controlled via the interface in the Command and Control system.

Asymmetric threats place new challenges to navies around the world. They are not foreseeable, work concealed, and countering them requires an unprecedented depth of situational awareness to adequately counteract the threat in a targeted way. In addition to that the commander of a force responding to an asymmetric threat more often faces pressing time problems in the decision process and initiation of adequate reaction measures. Rheinmetall deals ofensively with these requirements and is convinced that HEL-Effectors provide options for a reasonable response.

**Alexander Graf, Vice President,
Head of Programmanagement Directed Energy**

Automatic and autonomous systems - where is the red line?

Autonomous military systems are the latest military technology everyone likes to speculate about. At the moment, the debate is oscillating between discussions of “killer robots” and promises of bloodless robot warfare. But what are autonomous systems, how and why are they used and are they really more concerning than automatic weapon systems? In what context may autonomous systems be military for the military, and what are the ethical concerns surrounding the use of such systems and Artificial Intelligence more broadly in warfare? The presentation will answer these and other questions and discuss how to think about the deployment of new technologies in warfare.

**Dr Ulrike Esther Franke,
European Council on Foreign Relations (ECFR)**

Fully unmanned MCM Detect-to-Engage Operations

Future Naval Mine Countermeasures will undergo a transformation from a dedicated platform approach towards an increased usage of unmanned off-board assets taken from a comprehensive MCM toolbox. Ideally a mothership, which remains off the minefield, deploys modular capability hubs of USV-like size carrying MCM assets, which allow for a single-path-detect-to-engage task. Atlas Elektronik composed such set-up through combining

its USV ARCIMS with the AUV SeaCat equipped with a high-resolution synthetic aperture sonar for detection and classification of small underwater objects. A smart automated target recognition processing enables the system to continue in-situ decision making, topped off by a subsequent launch of the mine identification and disposal system SeaFox, operated from a remote command station. Besides sticking to the principle of keeping the man out of harms way the overall system design consistently pursues the objective to stay highly efficient, i.e. highest classification area coverage output per unit of time with lowest staffing.

**Christian Wornik,
Atlas Elektronik**

VSR700 – The Vertical Unmanned Aerial System (VUAS) for military applications

The VSR700 is Airbus' new tactical Unmanned Air System designed to fulfil the demanding requirements of global navies and those of armies in the 21st century's contested and highly agile

battlefield. The air vehicle offers the best endurance of any VUAV (Vertical takeoff/land Unmanned Air Vehicle) available today. It can operate from small corvettes to major warships in the most demanding conditions. Its performance enables it to carry a full tactical load of high capability major sensors. The air vehicle is the largest size possible to fit into most ships together with an existing helicopter and not replace it. Designed for simple maintenance and low logistic requirements it is the optimal tactical platform.

The highly advanced AFCS (automatic flight control system) from Airbus Helicopters H225 is the basis of the VSR700's autonomous system. The flight control and mission control elements of the system come from proven UAS technologies. Fielding state of the art capabilities the whole system is ready to evolve as technologies develop and requirements advance. Due to the Manned-Unmanned teaming capability, the VSR700 is linked and connected to different assets and supports the "systems of system" approach. A truly versatile system, able to provide advantage and positive change to all areas of operational activity.

**Sebastian Mayr,
Airbus Helicopters**

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Life of Type Extension (LOTE) of Naval Assets – addressing the challenges of reliability and availability



Today many navies are facing the challenge of maintaining the required reliability and operational availability of their aging fleets. So-called LOTE – Life of Type Extension - approaches can provide a sound solution to support navies in overcoming this challenge. DNV GL has developed a flexible and levelled LOTE approach, which offers not only lifetime extension but also technical assurance for a vessel's entire life cycle. One of the key features of DNV GL's LOTE approach

is that it is not confined by a predefined fixed procedure but is subject to a continuous development and improvement process as a result of the lessons and insights from practical applications. Application on varying platforms with several different DNV GL's approaches has proven its practical applicability, robustness and value.

The approach is focused mainly on the hull structure but also includes the machinery systems. The scope and optimum analysis depth can reflect the needs and boundary conditions of the particular project. Weapon systems are intentionally excluded from the scope of the investigations, as these lie outside the traditional role and expertise of a classification society.

While the conditions as well as the prospective future maintenance and repair needs of the machinery systems are mainly determined by means of a dedicated Navy CAP (Condition Assessment Program) survey, a combined simulation and survey based procedure is used for the hull structure.

tural strength baseline is the key element of this procedure. Here the minimum required scantlings or maximum tolerable diminution (corrosion) margins to ensure safe and reliable operation in compliance with the applicable Rules and standards are calculated. In many cases this is about unveiling the implicit available margins of the structural design, as in former times it was common practice to design naval ships without explicitly stated corrosion margins. This step is commonly accompanied by an extensive fatigue assessment of the most fatigue-sensitive structural details.

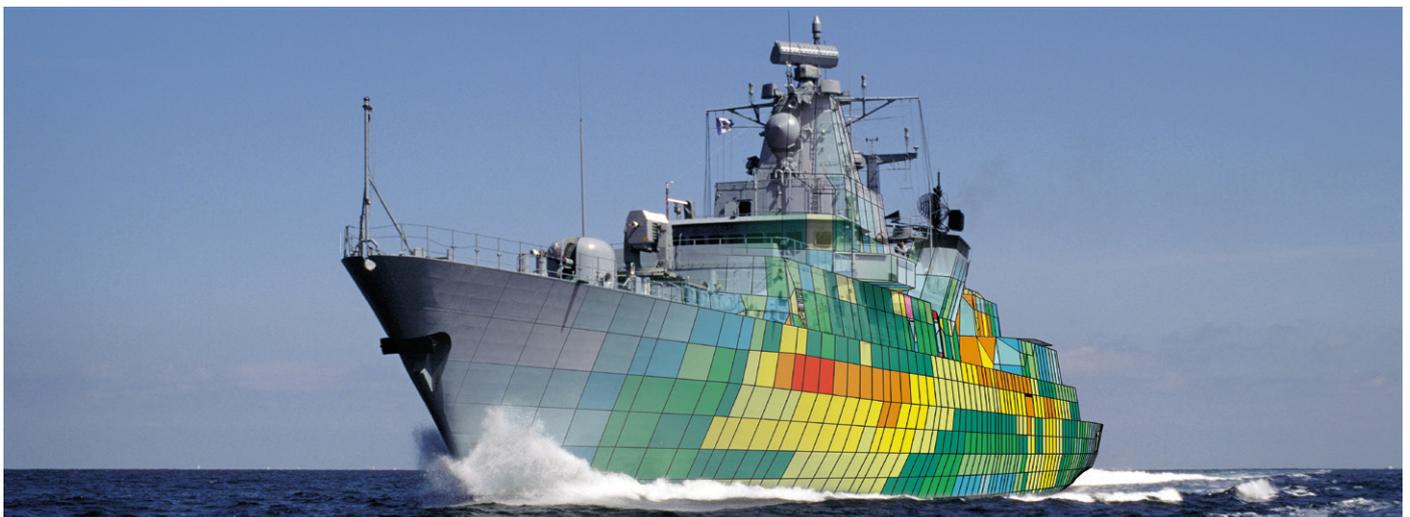
The full potential of the procedure is realised if the global loads are also assessed by means of a global strength analysis, under consideration of fully balanced direct calculated wave load cases. This will result in a picture not only of the most realistic loads, but also of the load carrying behaviour of superstructures and the effect of large openings on the stress distribution, which are of particular importance in naval surface ships. To assess local loads like green water, tank pressures etc. the application of the related prescriptive classification Rules is recommended. DNV GL Navy Rules have been proven as an advanced and flexible and practical basis in this respect in several projects.

Finally, the results of dedicated thickness measurements and the survey findings are benchmarked against the hull structures' baseline to determine the actual condition of the hull structure and if any immediate repair measures are necessary. Furthermore, the expected extent of future maintenance and repair measures is defined, which provides a sound basis for medium and long term planning.

When a similar level of information is gathered on the machinery systems the DNV GL LOTE approach can also be used to provide data to optimize spare part management, which can have a major impact on operational availability.

The benefits of DNV GL's LOTE approach are not limited to simply lower costs as a result of reduced repair or renewal efforts. They also offer increased flexibility for repair and maintenance scheduling, as well as planning for future inspections and maintenance, including spare part management.

The author Dr Olaf Doerk is Head of Department Structures, DNV GL Maritime



DNV GL's LOTE - using advanced simulations to unlock enhanced operations (Picture: DNV GL)

Biographies

Dr Hans Christoph ATZPODIEN, Federation of German Security and Defence Industries (BDSV e.V.), Berlin

Dr Hans Christoph Atzpodien (born 1955) studied Law at Bonn University where he also earned his doctorate degree. He started his professional career as a member of the legal department of Otto Wolff AG, Cologne, in 1982. In 1990 he joined Thyssen Industrie AG, Essen, followed by several high level management positions in the Thyssen-/thyssenkrupp-Group, amongst them as Managing Director/CEO of Thyssen(Krupp)Transrapid System GmbH (1997-2001), Member of the Executive Board of ThyssenKrupp Technologies AG (2001-2009), CEO/Chairman of the Executive Board of ThyssenKrupp Marine Systems AG (2007-2012), CEO/Chairman of the Executive Board of ThyssenKrupp Industrial Solutions AG (2013-2015) and Chairman of various Supervisory Boards, amongst them ThyssenKrupp Marine Systems GmbH and Atlas Elektronik GmbH (until end of 2016).

In August 2017 Dr Atzpodien took over as Managing Director of the Federation of German Security and Defence Industries (BDSV e.V.), Berlin.



Bernd AUFDERHEIDE, Hamburg Messe und Congress GmbH

Bernd Aufderheide was born in Herford, North Rhine-Westphalia, on 15 April 1959. He has a degree in Anglo-American History, English Philology, Ancient History and Macro Economics from the University of Cologne. He held management positions at various trade fair companies in Germany and abroad. He has been CEO of Hamburg Messe und Congress GmbH (HMC) since January 2004 and was appointed President of HMC in April 2007.

Alongside his work for HMC, Bernd Aufderheide is also honorary Commercial Judge in Hamburg. He holds the rank of Commander (Senior Grade) in the German Navy Reserve, and serves on the Executive Committee of half a dozen professional associations, societies and organisations.



Commander (S.G.) Stefan BECKER, German Navy

Commander (S.G.) Stefan Becker was born and raised in the former German Democratic Republic. After finishing school and getting his higher education entrance qualification, he joined the Air Force as a conscript. He served as a radar operator



in an early-warning radar station and left the armed forces after his 12-month basic military service. He signed in as student but was approached by the Navy asking him to rejoin the armed forces and fly as an MPA pilot on BREGUET ATLANTICS. He joined the Navy in 1997 and finished officer training at the Naval Officers School in Flensburg. Before entering flight service, he acted as Platoon Commander and Squadron XO in the German Navy's Technical School, Parow. After completion of his flight training, Commander Becker flew BREGUET ATLANTICS until 2005. He was amongst the first ones to complete flight training in Valkenburg/NL on P-3C ORIONS. In 2010 he joined the German Maritime Battle Staff for 2 ½ years as Subject Matter Expert (SME) for Fixed and Rotary Wing Aircraft. His last two posts in Naval Air Wing 3 "Graf Zeppelin" were XO of an operational squadron and Head of Standardization for Fixed Wing Aircraft. Since July 2017, Commander Becker has been acting as Head of Branch "Plans/ Policy/ Concepts and Development" for Fixed Wing Aircraft in the Naval Air Command.

Andreas BURMESTER, thyssenkrupp Marine Systems

Andreas Burmester was born in 1963 in Lübeck, Germany. After basic military training in the German Navy he studied Physical Technology and Mechanical Engineering at the University of Applied Science in Luebeck, graduating with a degree "Engineer". Since 1989, he has worked in Kiel in various positions and fields for Howaldtswerke-Deutsche Werft GmbH, now thyssenkrupp Marine Systems GmbH, in departments associated with submarine production. Since 2010, Andreas Burmester has been Member of the Executive Board, thyssenkrupp Marine Systems, in several positions.



Commander (S.G.) Peter de GROOT, Royal Netherlands Navy NATO Centre of Excellence for Operations in Confined and Shallow Waters (COE CSW)

Commander de Groot joined the Royal Netherlands Navy in 1988, while serving in the Netherlands Merchant Navy as a third mate. From 1988 until 1992 he predominantly served in Mine Counter Measures, with two operational deployments in 1988 and 1991 in the Persian Gulf. In 1995 he transferred to the major combatants. In 1997 he qualified as a Principal Warfare Officer – Underwater Warfare and subsequently served as a PWO-U on HNLMS "Tromp", until 1999. After six years in Naval Intelligence, with operational deployments in Iraq and Afghanistan, in 2005 he joined HNLMS "Van Amstel" as her Operations Officer, until 2007, when he transferred back to MCM, as Commanding Officer of HNLMS "Maassluis". In 2010, after a short period as



Coordinator Underwater Acoustic Research with the Netherlands Defence Material Organization, Commander de Groot joined the Maritime Warfare School at HMS Collingwood, UK, as Staff Warfare Officer Underwater Warfare, teaching Anti-Submarine Warfare to prospect PWOs of the Royal Navy and international PWO students.

Commander de Groot's last posting before joining the Centre of Excellence for Confined and Shallow Waters in Kiel as Staff Officer Surface Operations, was at the Netherlands MOD as Staff Officer J5 Plans, with an operational deployment in 2015 with the UN in South Sudan as a Staff Officer Joint Operations Centre.

**Dr Ulrike Esther FRANKE,
European Council on Foreign
Relations (ECFR)**

Ulrike Esther Franke is a Policy Fellow at ECFR. She works on German and European security and defence, the future of warfare, and the impact of new technologies, such as drones and Artificial Intelligence (AI). She has published widely on these and other topics, among others in Die ZEIT, Frankfurter Allgemeine Zeitung, RUSI Whitehall Papers, Comparative Strategy, War on the Rocks and Zeitschrift für Außen- und Sicherheitspolitik. She regularly appears as commentator in the media.



**Kai GLASEBACH,
Schottel**

Kai Glasebach was an officer in the German Armed Forces (Bundeswehr) for 12 years. After having graduated in Mechanical Engineering and Master of Business Administration (MBA) in Munich and Reutlingen, Germany, he joined SCHOTTEL in 2011. In recent years, he has held several positions within the SCHOTTEL sales organization. The SCHOTTEL Group, with its headquarters in Spay/Germany, production sites in Dörth/Germany, Wismar/Germany and Suzhou/China and a world-wide network of own service and sales subsidiaries, is one of the world's leading manufacturers of propulsion and steering systems for ships and offshore applications. Since 2016 Kai Glasebach has been heading the navy & governmental sales department. With his team he is responsible for the technical assistance within the global sales organization as well as the market analysis and product development for military applications. Previously he was sales manager for a broad variety of propulsion systems, with focus on the regions BeNeLux/France and afterwards the Middle East.



**Alexander GRAF,
Rheinmetall Weapon Munition**

Alexander Graf was an officer in the German Navy. Before leaving the Navy he was commanding officer on mine hunting/sweeping vessels in the 4th and 6th Mine Squadrons. He retired as a Lieutenant Commander. During his time in the Navy he studied politics at the German Armed Forces University in Munich. Since July



2000 he has been working for Rheinmetall Weapon Munition GmbH. He started as a regional sales manager for naval products in Ratingen. In 2009 he took over responsibility as a project manager for national and international R&D projects. At the beginning of this year Mr. Graf became the head of programme management for Directed Energy Effectors.

**Rear Admiral (UH) Thorsten
KÄHLER,
German Navy**

Rear Admiral Kähler joined the then Federal German Navy in 1973. He studied Economics and Organizational Sciences at the German Armed Forces University Hamburg and then served on board different submarines. After an exchange tour on the French Navy training ship FS "Jeanne d'Arc" from October 1982 to March 1983 he attended the Principle Warfare Officer (PWO) course at the Dutch operations school, Den Helder. From July 1984 to September 1987 RA Kähler had assignments as ASW officer, PWO and Underwater/Operations Officer on frigates. He then attended the 30th Admiral Staff Officer Course at the German Armed Forces Command and Staff College, Hamburg. Further assignments between 1990 and 1997 were Executive Officer, destroyer "Bayern", Planning and Training Staff Officer Destroyer Flotilla, Precommissioning Commanding Officer and subsequently first Commanding Officer, frigate "Bayern". After several staff assignments in MOD he took over as Commander 6th Frigate Squadron in October 2001. From November 2003 to May 2005 he served as Staff Officer "NATO Force Planning" in IMS NATO HQ Brussels, followed by assignments as Head of functional area, Policy Planning & Advisory Staff and Deputy Chief, Policy Planning & Advisory Staff, MOD. During his assignment as Commander Flotilla 2 from October 2009 to December 2012, he commanded Standing NATO Maritime Group 2 (SNMG2) from January to November 2012. From January 2013 to December 2014 RA Kähler was Director Security Policy, Political Affairs I in MOD, before taking over his present position as Chief of Staff, German Navy Headquarters in February 2015.



**Sezgin KAMA,
STL Systems**

Sezgin Kama was born in Luebeck / Germany in 1971. As radio and communication systems engineer he started his career at Hagenuk Marinekommunikation and joined Rohde & Schwarz for managing international projects for Navy Systems. At SAM Electronics he was responsible for projects in the field of magnetic measurement systems for navy ships. In 2014 he joined STL as project manager for a novel overrun deperming system in Asia and as marketing director. In 2017 Sezgin Kama handed over the unique overrun deperming system to a navy in Far East. World wide he is promoting harbour protection systems for coastal areas which are excelling in combining the technologies of deperming, degaussing and multi influence measurement systems as well as innovative software, hardware fulfilling safety demands and STL in house sensors.



**Dr Sarah KIRCHBERGER,
Institute for Security Policy,
Kiel University (ISPK)**

Dr Sarah Kirchberger (b. 1975) is the Head of the Center for Asia-Pacific Strategy and Security at the Institute for Security Policy at Kiel University (ISPK). She is the author of *Assessing China's Naval Power: Technological Innovation, Economic Constraints, and Strategic Implications* (Springer, 2015). Sarah Kirchberger holds an M.A. and a Ph.D. in Sinology from the University of Hamburg. Before joining the faculty of the Asia-Africa-Institute at the University of Hamburg as an Assistant Professor of Contemporary China in 2010, she had served for three years as a naval analyst with shipbuilder Blohm + Voss, Hamburg, charged with analysing naval developments world-wide in cooperation with technical departments and naval sales executives. Originally trained as a specialist of Chinese Communist Party history during studies in Hamburg, Trier, and Taipei, Sarah Kirchberger began researching China's naval development during 2011, and has since continued to focus on related topics. Other current research interests include domestic Chinese reform discourses within the CCP; military-technological co-operation between China, Russia and Ukraine, the strategic importance of the South China Sea for China's military planners and China's space and naval strategy.



**Sebastian MAYR,
Airbus Helicopters
Deutschland**

After graduating in business administration with a focus on consultancy and marketing, Sebastian Mayr launched his professional career in the automotive industry at MAN Nutzfahrzeuge AG in 2007. He worked in the sales department of the truck division, responsible for the scheduling of all worldwide manufactured trucks. After two years, he moved into the bus division and was working as sales engineer for city busses. Therefore he focused on the implementation of the needs of the operating sales organization. During this time, he also was the project manager from a sales perspective for Euro6 and the introduction of a new generation of city busses. In 2011 Sebastian Mayr moved to Rheinmetall Landsysteme GmbH in Gersthofen (near Augsburg) where he was responsible for all Rheinmetall delivery shares of the UK-programmes FRES and Warrior. In 2013 he joined Airbus Helicopters Deutschland GmbH in Donauwoerth and started as Programme Manager for the CH-53, responsible for several projects of this weapon system. From the middle of 2015 he was appointed Research & Technology Programme Manager in the Military Support Center and took care of all cross-platform R & T topics. Since September 2017 Sebastian Mayr has been working as Key Account Manager Future Systems & Technologies, SOF and is responsible for new developments and innovations related to the German Armed Forces, as well as the interests of Special Operating Forces.



**Klaus-Eberhard MÖLLER,
Diehl BGT Defence**

Klaus-Eberhard Möller studied Aeronautical Engineering at the Technical University, Braunschweig. From 1979 till 1985 he was Systems Engineer for Guided Missiles at Bodenseewerk Gerätetechnik (BGT) in Ueberlingen, before taking over as Project Manager for various missile system R&D studies, many of them including successful flight tests. From 1998 till 2004 he was Programmanager Antiradar-Missiles, from 2003 till 2004 also responsible for the naval missile projects IDAS and RBS15 Mk3. After the merger of BGT and Diehl Ammunition Systems to Diehl BGT Defence in 2004, Klaus-Eberhard Möller became Head of Productmanagement "Naval Multi Purpose Missiles".



**Patrick O'KEEFFE,
Institute for Security Policy,
Kiel University (ISPK), Managing
Director AMC Solutions**

Patrick O'Keeffe is an international security and policy expert focusing on the multidisciplinary environment of aerospace, maritime, and cyber. In his function as the Managing Director of AMC Solutions and Non-Resident Fellow at the Institute for Security Policy at Kiel University (ISPK), Center for Asia-Pacific Strategy and Security, Patrick O'Keeffe is supporting various entities in the transformation of aerospace, maritime, and cyber strategies and policies. Until recently, Patrick O'Keeffe served as a German Navy Officer at the NATO Centre of Excellence for Operations in Confined and Shallow Waters (COE CSW), facilitated between NATO partners, UN bodies, academia and industry, and presented as guest speaker and opening keynote at several security conferences. An aerospace engineer specialized in astrodynamics and satellite operations and a former military aviator, Patrick O'Keeffe studied international law and economics, and publishes on maritime security and space capabilities in the Asia-Pacific region. ("Military-Strategic Aspects of the South China Sea Issue", Konrad Adenauer Stiftung, 2017; "China's Naval and Space Strategy – The South China Sea as the Key to Global Power Projection", Springer, 2018).



**Patrick ROSSI,
DNV GL**

Patrick Rossi is currently the Maritime Cyber Security Service Manager for DNV GL Maritime. He is responsible for product development strategy for cyber security, including e-learning solutions for staff and crew as well as cyber security apps for management. Prior to DNV GL, he served in various roles in aerospace and software quality assurance, including Technical Director for the development of software solutions used in measuring and controlling the quality of software manufacturing. Patrick Rossi is the main author of the latest recommended



practice DNVGL-RP-0496 Cyber security resilience management for ships and mobile offshore units in operation. Patrick Rossi is also a senior Integrated Software Dependent Systems (ISDS) approval engineer and has spent three years in three major Korean yards helping with the implementation and verification of ISDS on various newbuilding projects of complex and software intensive vessels. Patrick is part of the DNV GL team that has developed ISDS and has published a paper on the consideration of software alongside of hardware failure modes to help industry perform more holistic system FMECAs. Patrick Rossi received his Engineering degree in Automated production engineering from the Montreal ETS University and his Masters in Cybernetics from the Paris EPF University.

**Dr Patricia SCHNEIDER,
Institute for Peace Research
and Security Policy, University
of Hamburg (IFSH)**

Patricia Schneider studied political science and economics at the universities of Bamberg, Galway/Ireland and Hamburg. She finished her studies in 1998 as Diplom-Political Scientist. In 2003 she earned her Dr. phil. at the University of Hamburg. Patricia is senior researcher at the Institute for Peace Research and Security Policy at the University of Hamburg (IFSH). She was co-leader and Project Coordinator of "PiraT – Piracy and Maritime Terrorism as a Challenge for Maritime Trade Security" (www.maritimesecurity.eu). She is lecturer and coordinator of the postgraduate Master's programme Peace and Security Studies, as well as co-editor of the quarterly journal "S+F. Sicherheit und Frieden - Security and Peace" (www.security-and-peace.de). She is a member of the Expert Committee on the Indian Ocean Region of the German Foreign Office.



**Rear Admiral (UH) (Retired)
Hanno TEUTEBERG**

Hanno Teuteberg joined the South African Navy (SA Navy) in 1977 and qualified as a seagoing combat officer onboard Type 12 Frigates followed by a stint as a Hydrographic Officer. In the mid-80s, he moved to the submarine branch where he followed the normal career path to commanding a submarine and then the flotilla itself (1998). During the SA Navy's acquisition project phase of it's Meko 200 Frigates and Type 209 Submarines, he served as the Defence Attaché in Berlin. Promoted to Rear Admiral (JG) in 2006, he moved back to Simon's Town to take up the post of Director Force Preparation followed by stints within operations and business planning at both the operational and tactical levels (Maritime and Joint Head Quarters). He was promoted to Rear Admiral in early 2013 and acted as the Chief Director Maritime Strategy followed by another promotion to Deputy Chief of the Navy in 2014. Retiring from this post in 2017, he has kept himself busy with a variety of maritime related activities.



**Prof Dr Christian WEBERSIK,
University of Agder, Norway**

Christian Webersik is professor of development studies at the Department of Global Development and Planning at the University of Agder (UiA), and Deputy Director of CIEM (Centre for Integrated Emergency Management). Before joining UiA, he was a Japan Society for the Promotion of Science – United Nations University (JSPS-UNU) Postdoctoral Fellow at the United Nations University's Institute of Advanced Studies (UNU-IAS). Before that, he was a Fellow at the Earth Institute at Columbia University hosted by the Center for International Earth Science Information Network (CIESIN). He is holding a D.Phil. in politics and international relations from Oxford University.



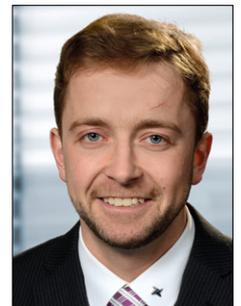
**Jan WIEDEMANN,
Mönch Publishing Group/
NAVAL FORCES**

Jan Wiedemann spent 37 years as an officer in the German Navy. After completing officers training, he joined the German Naval Air Arm, underwent pilot training in the USA and subsequently flew the F 104G STARFIGHTER, at first as a "line pilot" and later on in various command and staff functions in Naval Air Wings 1 and 2, interrupted only by a three years tour as an instructor pilot on T 38 jet trainers in the United States. From 1984 to 1987 he served at NATO HQ AFNORTH in Oslo. He then attended the Norwegian Defence College and became the German Defence Attaché in Norway. After staff assignments in MOD, Naval Staff and Joint Forces Staff he became the German Defence Attaché in West Africa. Jan retired from the Navy in 2000 and joined Mönch Publishing Group, Bonn, Germany to become the Publisher of NAVAL FORCES magazine. When retiring from this job in 2011, he volunteered to continue to support NAVAL FORCES with special projects – one of them MS&D.



**Christian WORNIK,
ATLAS ELEKTRONIK**

Christian Wornik was born in Arnsberg/North Rhine Westphalia, Germany, in 1981. He joined the German Armed Forces in October 2001 and served as an officer mainly in the Naval MCM branch. Besides his responsibility as XO of FGS "Sulzbach-Rosenberg" he was qualified as clearance diver and explosive ordnance disposal expert. Although being a temporary career officer he was awarded the Commanding Officer credential and commanded MCM vessels in various assignments. He left the German Armed Forces in October 2014 with the rank Lieutenant Commander. After finishing his master thesis for the MBA he joined ATLAS ELEKTRONIK GmbH, Bremen in March 2015 as a Sales Manager for Naval MCM Systems.



Countering Anti-Access/Area Denial - What Maritime Forces Can Do

Anti-Access/Area Denial simulation studies revealed that NATO needs urgent re-orientation of its future capability requirements to deter, counter or, if ordered, defeat a stronger foe during a large-scale, theatre campaign.



The author Dr Stefan Nitschke is Editor-in-Chief of the German defence magazine *wehrtechnik*



The Russian A-222 BEREG 8x8 coastal artillery system and P-15M TERMIT (SS-N-2 STYX) anti-ship missile can form part of an advanced A2/AD exclusive zone.
(Photo: R. Chan)

Changing Security Balance

For years, NATO sought to build-up the appropriate responses to a steadily increasing threat: Anti-Access/Area Denial or A2/AD. Recent analysis undertaken by the NATO Command and Control Centre of Excellence (NATO C2COE) confirmed that own capabilities are not sufficient enough to counter A2/AD capabilities that are being established in a number of regions, including the Black Sea, Eastern Mediterranean and Baltic Sea. Since at least 2013, Russia has altered the security balance in the Baltic Sea region, as well as in the Black Sea and Eastern Mediterranean, by establishing large A2/AD exclusive zones. Russia's power projection in these regions has been further extended by fielding the S-400 air defence system in occupied Crimea in August 2016 and in the western portion of Syria in November 2015. NATO sources said such advanced air defence systems were brought to these regions to create A2AD 'bubbles' that prevent any opponents from establishing air supremacy in strategically significant theatres. The Baltic States, much of Ukraine, and the Black Sea, northern Poland, Syria, and parts of Turkey fall under these A2/AD bubbles created by S-300 and S-400 air defence systems. However, Russia operates advanced air defence not only in these regions and within its own territory, but also cooperatively through the Joint Air Defence

Network in Belarus and Armenia. NATO sources write that these defensive systems can be utilised to impede the ability of the United States to defend its NATO allies, notably by disrupting the ability of both the US Air Force and US Navy to access conflict zones in the event of a crisis.

Is the party over?

As an attempt to deny an adversary's freedom of movement on the battlefield, A2/AD also has a maritime dimension due to the fact that a strong foe may use the spectrum of ship-based aircraft and long-range cruise missiles to prevent own military movement into an area of operations. Within this scheme, area denial is more defensive in character, typified by the use of weaponry like land-based and shipborne air defence systems. A "massive array of defensive weapons, positioned at land-based installations from the Kola Peninsula to Belarus", according to NATO, means that Russia's military will be able to survive a first strike and to respond with sufficient strength to inflict unacceptable damage on an enemy. Because modern military technology is required to uphold a sufficient "offensive" capability in the form of anti-access, it is almost exclusively practiced momentarily by advanced

regional powers such as Russia and the People's Republic of China (PRC).

According to a report to Congress in 2017, entitled "Military and Security Developments Involving the People's Republic of China 2017", the use of A2/AD by the Chinese military directly opposes the local and regional interests of the United States and its allies. The paper says that this situation can leave the US and allied militaries vulnerable when operating in these disrupted regions. As said by the authors of the report, the PRC is currently progressing with a "comprehensive military modernisation programme that will improve its ability to conduct A2/AD, power projection operations, and nuclear deterrence," of which A2/AD should include a range of key capabilities the US and its allies do not fully field in the Asia-Pacific region, including long-range precision strike (by fielding conventionally-armed, short-range ballistic missiles, as well as long-range, ground- and air-launched land-attack cruise missiles); ballistic missile defences (by developing a 'missile defence umbrella' consisting of kinetic-energy intercept at exo-atmospheric altitudes greater than 80km, as well as intercepts of ballistic missiles and other aerospace vehicles within the upper atmosphere); and surface and undersea operations. The latter encompasses what the report to Congress in May 2017 summarises as follows: "The fielding of coastal defence cruise missiles, air-/surface-/sub-surface-launched anti-ship cruise missiles, submarine-launched torpedoes, and naval mines is sufficient enough to put US and allied forces at high risk."

Now, this situation can produce more devastating effects: With the induction of the next generation of surface combatants (e.g. Type 055 guided-missile destroyers), the building of a variety of offensive and defensive capabilities could permit the People's Liberation Army Navy (PLAN) to achieve sea control within what the service calls the "near seas," as well as to project combat power into the "far seas", the latter of which could be limited in character, however.

The report to Congress also cites another threat. There are signs that the PLA is continuing to develop capabilities for "non-war missions", as well as operations in emerging domains such as cyberspace, space, and the electromagnetic spectrum. Called 'cyber operations', the Chinese thinking could lead to massive cyber-attack operations that could support A2/AD by targeting critical nodes to disrupt adversary networks throughout the region. China believes its cyber capabilities and personnel lag behind the United States, however; but, to deal with these perceived deficiencies, the

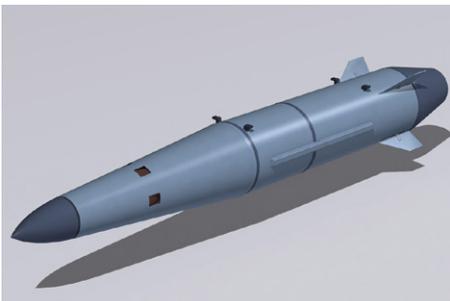
PLA is constantly improving training and domestic innovation to achieve its cyber capability development goals. Besides its seemingly prosaic appellations, Moscow is also beginning to field similar capabilities in the military. The current focus is on implementing technology that could unify space, cyber, and electronic warfare (EW) capabilities for use against large-scale naval operations undertaken by an adversary in Polar regions.

Reality Check of Countermeasures

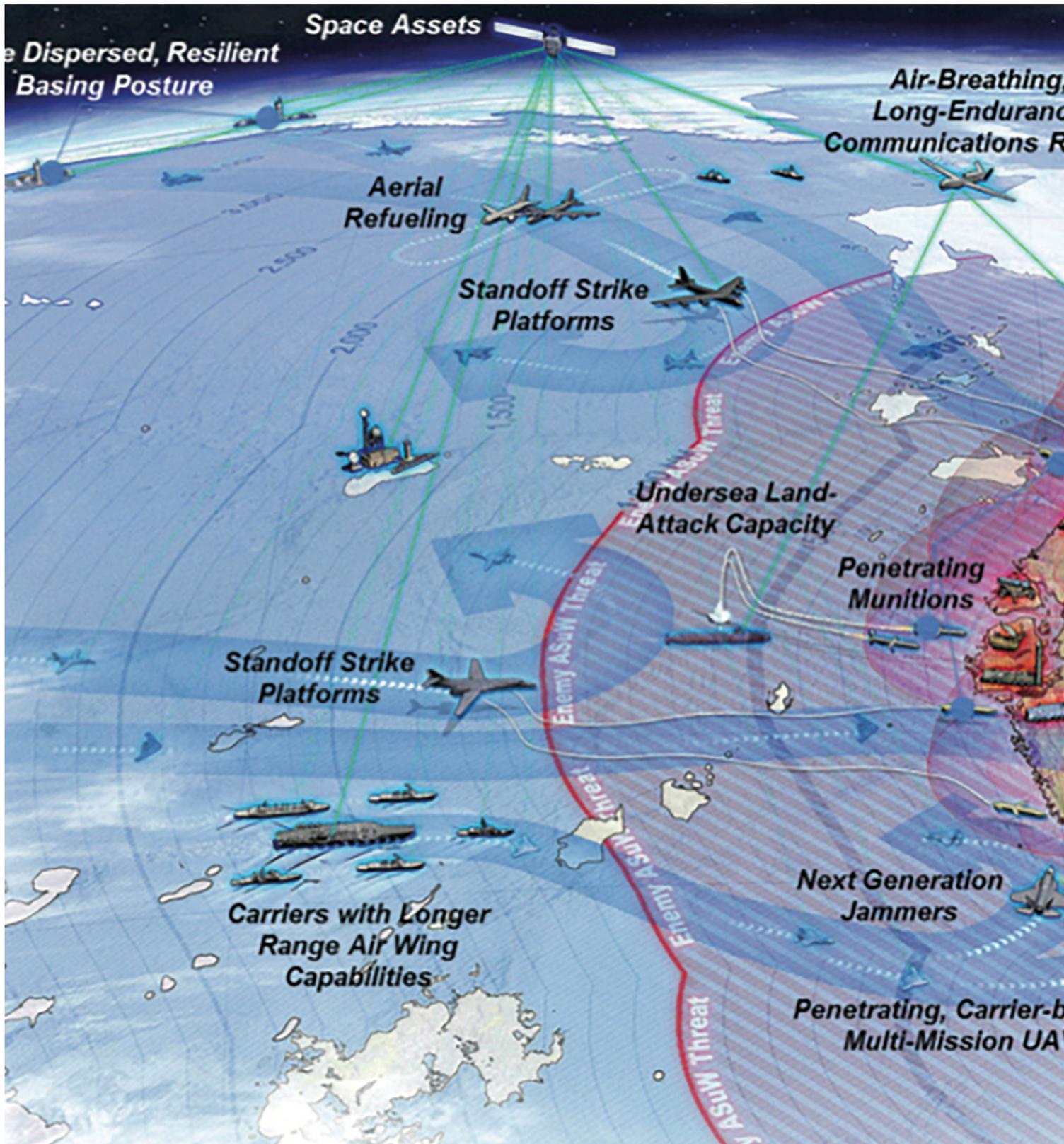
Countering or, if ordered, defeating A2/AD leaves much scepticism over existing capabilities and capacities. Of vital interest to NATO, countering A2/AD requires a "complete re-orientation" of its abilities. Some of the particularly promising options – directed energy systems, electromagnetic railguns, electronic countermeasures, cost-effective kinetic interceptors – must be established quickly; but, their 'conceptualisation' still poses a variety of risks, both technically and financially. The latter aspect may hamper NATO's ability to project military power in disrupted regions. Amid endemic budget cuts, in September 2014, Secretary of Defense Chuck Hagel unveiled a "Third Offset" strategy to "[maintain] our ability to project power globally, to deter potential adversaries, and reassure allies and friends despite the emergence of A2/AD threats."

Meanwhile, in clear response to the continuing development of A2/AD exclusive zones by the Chinese military, the Japanese Maritime Self Defense Force (JMSDF) prepares for its own A2/AD in the East China Sea. In response to Beijing's assertiveness in the East China Sea, Japan has, according to reports circulated in December 2015, begun placing truck-mounted, 180km range Type 88 anti-ship missile batteries on over 200 islands in the region, many of which form part of the First Island Chain. It is the domestically produced variant of the American HARPOON anti-ship missile.

NATO military strategy and planning is beginning to recognise the imminent threat posed by Russia's A2/AD capabilities mainly in the Baltic Sea and adjacent Polar regions, as well as in the Eastern Mediterranean and Black Sea region. Completely new risks are being considered when planning security operations in the Baltic Sea region and beyond, also possibly in Polar regions adjacent to the Kola Peninsular, which is strategically important for Russia because of its huge strategic metal resources (e.g., zirconium, titanium, co-product rare earth elements), most of them feeding Russia's aerospace and aircraft industries.



Long-range cruise missiles, launched from land-based positions, aircraft or sea-going platforms, can be deployed in A2/AD exclusive zones. Pictured on the left is the Russian Kh-47M2 KINZHAL hypervelocity missile (carried here by two MiG-31 fighter bombers) showing similarities to the land-based 9K720 ISKANDER tactical ballistic missile (right). (Photos: Russian MoD; Sputnik/Vladimir Sergeev)



A2/AD simulation study examining issues surrounding the impact of A2/AD environments on NATO future capability requirements.
(Graphic: NATO C2COE/Jan Nijmeijers)



*The PLAN is about to receive the first four Type 055 guided-missile destroyers as a new class of approximately 12,000-tonnes combatants that can employ larger cruise missiles and escort a carrier battle group into 'blue' waters.
(Photo: Chinese internet)*

In sum, the amount of ballistic missile defence (BMD)-capable surface assets in NATO – cruisers, destroyers and frigates – equipped with long-range interceptors could be deployed for defence against ballistic missile attacks. Currently, the US Navy deploys 17 Aegis BMD-capable warships – equipped with the latest SM-3 interceptors – only in the Pacific region for defence against such attacks, eventually leaving the European theatre without any capacities. Cruise missile defence for US maritime forces in this region is provided by Aegis ships equipped with SM-2 and ESSM interceptors. The current focus is on implementing additional capacities in the European theatre; but, there also is an urgent need to strengthen the few European naval powers (Denmark, France, Germany, Italy, Netherlands, Norway, Spain, UK) in their widely proclaimed willingness to establish a real ship-based BMD capability. While effective for layered missile defence, the current inventory of destroyers and frigates is not designed or equipped to defeat large-scale missile salvos from A2/AD exclusive zones. If not fielded in the near future, the Russian military could oversaturate their current missile defence systems with relative ease by attacking with large numbers of anti-ship ballistic and cruise missiles. To counter missile salvos and other A2/AD threats, new technology is being researched and tested, including: significantly improved EW elements fitted to existing shipborne architectures and specialised aviation; longer-range precision strike missiles like the NSM; 'navalisation' of existing air-launched cruise missile inventories for ship-based power projection; high-speed (hypervelocity) kinetic interceptors; higher speed, longer-range, fibre-optically-guided torpedoes with 'smart' warheads; electromagnetic railguns or electric guns as presently researched at the French-German Research Institute of Saint-Louis (ISL); laser weapons; 'weaponised' drones. Surface ship- and submarine-based systems will play a major role to put A2/AD activities at risk.

SMM area plan



The SMM/MS&D 2018 Team



The SMM/MS&D 2018 Team (left to right):

Tarik Cavus, Nora Ebbinghaus, Diana Eckert, Vanessa Martens, Carin Steinbach, Christoph Lücke, Claus Ulrich Selbach (Business Unit Director Maritime and Technology Fairs), Julia Glawe, Christel Greiner, Verena Jahn (Projectmanager SMM Conferences), Cerstin Probst, Karen Zeigert, Neele Grieger, Katja Dietermann, Simone Nakötter, Ariane Bitting, Ferit Aydal.

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