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maritime security and defence

MS&D



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**INTERNATIONAL CONFERENCE
ON MARITIME SECURITY AND DEFENCE**

HAMBURG, 04 TO 05 FEBRUARY 2021

MS&D 2021

International Conference on Maritime Security and Defence

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CONFERENCE PROGRAMME

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04 February 2021

OPENING

09:30-09:45 Welcome addresses

- Bernd Aufderheide, President and CEO Hamburg Messe und Congress
- Jan Wiedemann, NAVAL FORCES, Chairman MS&D 2021

09:45-10:25 Keynote I
The Worldwide Maritime Security Situation and Expected Future Challenges

- Vice Admiral Andreas Krause, Chief of the German Navy

10:25-11:25 Keynote II
The Past Predicts the Future - Reviewing 40 Decisive Years for Maritime Security as the Basis for Future Developments

- Vice Admiral (Rtd) Lutz Feldt

Panel I – MARITIME SECURITY

Expeditionary Operations

11:25-11:55 The European Union's Contribution to Maritime Security

- Vice Admiral Hervé Bléjean, Director General, Military Staff of the European Union

11:55-12:10 Q & A

12:10-13:00 Break

Non-military Threats to Maritime Security

13:00-13:30 Cyber Attacks: Growing Threat to Naval Operations

- Commander (S.G.) Dr. Robert Koch, German Navy

13:30-14:00 Still Threatening Sea Trade: Maritime Piracy and Armed Robbery

- Michael Howlett, International Maritime Bureau (IMB) – ICC Commercial Crime Service

14:00-14:30 The NATO Shipping Centre (NSC) - Link between NATO and Commercial Shipping

- Commander (S.G.) Øystein Smaaberg, MARCOM NATO Shipping Centre

14:30-15:00 Contagious Diseases – Threatening Operational Readiness of Naval Vessels

- Rear Admiral (MC) Dr Stephan Apel, German Navy

15:00 – 15:15 Q & A

Littoral Operations

15:15-15:45 Confined and Shallow Waters – Prospective Operations in a Challenging Operational Environment

- Rear Admiral Christian Bock, COE CSW

Regional Maritime Security

15:45-16:15 U.S. SIXTH Fleet - Adding Stability to the Eastern Mediterranean and the Black Sea

- Rear Admiral Michael W. Baze, U.S. SIXTH Fleet

16:15 -16:45 The Changing Shape of Arctic Security

- Professor Dr Marc Lanteigne, UiT The Arctic University of Norway

16:45 – 17:00 Q & A

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05 February 2021

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Technological Cooperation European Defence Fund (EDF)

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- Vice Admiral Carsten Stawitzki,
Federal German Ministry of Defence
- 10:00-10:30** Opportunities and Options for the Naval Industry
- Dr. Hans Christoph Atzpodien,
Federation of German Security &
Defence Industries (BDSV)
- 10:30-10:45** Q & A
- ##### Technological Developments
- 10:45-11:15** Electromagnetic Railgun –
European Cutting Edge Technology
for Naval Applications
- Dr. Markus Schneider,
French-German Research Institute
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in the Maritime Domain
- Dr. Sarah Kirchberger,
Institute for Security Policy, Kiel University (ISPK)
- 11:45-12:15** How to Unlock the Full Potential of Immersive
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Security Training
- Jenna Tuck,
Modest Tree Company, Canada

- 12:15-12:45** Combined Digital Solutions for
Advanced Propulsion Systems
- Christoph Fenske,
RENK AG, Germany
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- 14:00- 14:30** Integrated Platform Management Systems (IPMS):
Enhancing Operational Effectiveness
throughout the Life Cycle of Naval Vessels
- Rangesh Kasturi,
Maritime International, L3 MAPPS Inc., Canada
- 14:30-15:00** Additive Manufacturing in Naval Shipbuilding
- Dr Jannis Kranz and Corinna Bischof,
thyssenkrupp Marine Systems
- 15:00-15:30** The SeaSpider Anti-Torpedo Torpedo
- Thorsten Bochentin,
ATLAS ELEKTRONIK
- 15:30-15:45** Q & A
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- Jan Wiedemann,
Publisher NAVAL FORCES, Chairman MS&D 2021
- 16:00** Closing Remarks
- Bernd Aufderheide,
President and CEO Hamburg Messe und Congress

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Cover: Flag parade on German Navy Frigate Hamburg.
 In the background is German Navy Frigate Augsburg.
 (Photo: Bundeswehr / Marcel Kroencke)

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Dear Conference Participant,

Pandemics will not prevent navies from carrying out their duty, nor will they prevent naval architects and engineers from developing and constructing new platforms, sensors and weapon systems needed for the protection and defence of sea lines of communication, Exclusive Economic Zones, territorial waters and naval infrastructure. And certainly pandemics will not prevent us from holding MS&D conferences.

Of course we would have preferred to meet and network with you in Hamburg.

Unfortunately this is not possible for known reasons. But modern Information Technology allows us to communicate even in times of Corona. MS&D 2021 will be a virtual conference.

But it will follow MS&D's proven and logical concept of evaluating global and regional maritime security situations, deriving from there which capabilities navies need to fulfil their missions and tasks and what kind of platforms and systems have to be developed or upgraded to fulfil operational requirements.

Technological demands on naval vessels are rising steadily and so are costs for developing and constructing them, forcing navies to consolidate their shipbuilding projects to a greater extent than in the past.

MS&D 2021 therefore dedicates a whole day to issues like technological cooperation, the weaponization of Artificial Intelligence, Virtual and Augmented Reality, Additive Manufacturing, Integrated Platform Management Systems and enhanced weapon systems such as Electromagnetic Railguns and Anti-torpedo torpedoes.

Holding a conference of the size of MS&D virtually means new challenges. But it also offers new opportunities. So let us meet in the spirit of the Latin word *conferre*, which means "get together" even though this can only happen online this time.

I thank the German Navy for supporting MS&D 2021 and the speakers for their high-class lectures, which – I am sure – we will all enjoy.

Jan Wiedemann
Chairman MS&D 2021

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Meeting Digitally instead of Face to Face

Welcome to the first digital edition of MS&D, the International Conference on Maritime Security and Defence during SMM DIGITAL! The coronavirus pandemic continues to keep the world on tenterhooks, and it has changed all of our lives significantly. The same applies to international trade fairs and conferences, which cannot be held in the traditional form under the given circumstances. After close consultations with the authorities and our partners we have therefore decided to hold SMM as an exclusively digital event. The backbone of this digital edition of the leading international maritime trade fair are the specialist conferences. This applies especially to the voluminous agenda of MS&D, which will be streamed live for two conference days. I would like to express my thanks to Naval Forces, our media partner of many years, for working with us once again in arranging a number of discussion panels with highly distinguished participants for our industry audience.

The first day, Thursday 4 February, will be dedicated to maritime security. Whether operating in the eastern Mediterranean or in Arctic waters, geostrategic challenges and threats can emerge in many places. High-ranking naval officers and defence experts will explore current scenarios and future developments. In this context, our sessions will discuss where piracy is threatening world trade, how naval forces can fend off cyber attacks, and how pandemics can pose a danger for the operational readiness of navies. Especially the latter topic has been on our minds in recent times. Experts agree it will remain highly relevant in future, as well.

On Friday, maritime security technologies will be the focal topic of our speakers. New developments in the fields of Artificial Intelligence and Augmented Reality, along with additive manufacturing technology, could revolutionise ships and weapon systems. The leitmotif of SMM DIGITAL, "Driving the maritime transition", will come to bear in a very direct way in these sessions.

I am sure you will be able to take away new insights and plenty of inspiration from this digital conference.

Stay healthy and confident!

Sincerely yours,

Bernd Aufderheide
President and CEO,
Hamburg Messe und Congress
Commander (S.G.)
German Navy Reserve



Abstracts of Presentations

The Worldwide Maritime Security Situation and Expected Future Challenges

Increasing instability of the global security environment and growing numbers of regional conflicts and crises require joint efforts at all levels to counter the complex threats of today and tomorrow. Germany and its Allies in NATO and the European Union depend on free and secure sea lines of communication. Therefore, access to the maritime domain and the employment of our navies are of vital importance in security and defence policy to safeguard our nations, their territories and interests within Alliance territory and beyond.

For over two decades, international crisis and conflict management operations kept German and European security interests primarily focused on Europe's southern flank and the western Indian Ocean. However, with the resurgence of global geopolitical competition to NATO's eastern flank, the North Atlantic sea lines of communication – to include the adjacent areas of the English Channel, the North and Baltic Sea – regain once again highest significance. Beyond their importance as indispensable economic lifelines to all of Western Europe, these areas are of decisive strategic importance to both our national and collective defence.

Apart from the current challenges of illegal migration and proliferation of weapons, new security challenges such as unilateral claims for exclusive economic zones and related access to natural resources arise. Increasing accessibility of the subsurface and seabed adds a new aspect to maritime security and will become even more important in the near future. The fielding of new critical communication and energy infrastructure in the maritime domain, which currently remains widely unprotected to the latest technological advances in submarine and unmanned systems, introduces additional risks and challenges to our nations' security that parallel the civil and economic benefits of this infrastructure.

Therefore, the German Navy needs to tackle these new challenges and adjust its capabilities accordingly in order to counter these dawning threats successfully.

Vice Admiral Andreas Krause,
Chief of the German Navy

The Past Predicts the Future – Reviewing 40 Decisive Years for Maritime Security as the Basis for Future Developments

„The Future: if you look for a new idea, read an old book“.

Designing a naval asset - floating or flying over the sea, submarines, surface ships, aircraft or drones - takes time. It takes between 12 and 15 years from an idea to full operational capability. Refits are happening two or three times in a life cycle and the average lifetime of today's naval assets is 30 years. This gives a feeling for the 40 years, which will be covered here.

It is obvious that the impact of technology on warfare as a whole and on the three levels of warfare: strategic, operational and tactical in particular, has changed the way to wage wars. But it seems explicit as well, that the role of the soldier, officer and serviceman, has become an even more important factor: training and education are much more challenging and the responsibility of an officer and a serviceman has increased.

The most influential change in technology is the big step from the industrial era to the information era: this process is ongoing and has an influence on all parts of our life. The beginning in the eighties was rather smooth, but the change of thinking and mindset in order to understand the magnitude of information technology is a permanent process and will change military planning and operations in the future.

NATO was, and still is, the benchmark for the European and allied naval forces. Or should we rather say: it is the Royal Navy or the US Navy?

In this lecture the impact on naval and maritime forces by five paradigm changes of global magnitude will be considered: German Unification in 1990, the collapse of the Warsaw Treaty and the disintegration of the Soviet Union, the attack by Islamic terrorists on the USA in 2001, the attack by Russian forces against Georgia and Ukraine in 2014 and the growing importance of climate change since the beginning of 1972.

Vice Admiral (rttd.) Lutz Feldt, Wise Pens International

The European Union's Contribution to Maritime Security

Based on strategic interests of the EU defined in the European Union Maritime Security Strategy (EUMSS) the EU acts in full respect to international rules and principles, pursuing these interests with a comprehensive and cross-sectoral approach. A revised action plan adopted in 2018 facilitates the implementation of the EUMSS. It strengthens collaboration between all stakeholders across sectors and borders to promote stability, the rule of law and good maritime governance at the global level.

More specifically, the action plan sets activities in five cross-cutting areas and in key geographical areas of importance for the EU's maritime security interests. DGEUMS will briefly illustrate these key areas and provide examples on the specific progress and achievements in these areas with a focus on current security political challenges to EU maritime security and operational aspects of on-going missions and operations. One example will be to outline the progress with the Coordinated Maritime Presences Concept, Pilot Case in the Gulf of Guinea. The following five key areas will be addressed in the presentation:

First of all, International cooperation with strategic partners around the world has been instrumental in improving maritime security at a global level and has helped to deepen cooperation with the UN in the fight against maritime crime, terrorism and piracy. The EU has also consolidated its long-standing cooperation with NATO in a number of maritime security-related activities.

Naval missions and operations launched under the European Common Security and Defence Policy have contributed in the fight against migrant smuggling and human trafficking in the Mediterranean Sea and piracy off the Somali coast in the Indian Ocean.

The second key area aims to strengthen interoperability and interconnectivity of national and EU-level maritime surveillance systems. This aims to enable improved maritime awareness by facilitating direct, reliable, and real-time sharing of information. A proper recognized maritime picture, in naval terminology, is key to any efficient decision-making and operational performance at sea.

A third key area is the work on European maritime capability development, research and innovation including national and European projects and programmes, EU defence initiatives, notably the Coordinated Annual Review on Defence (CARD), Permanent Structured Cooperation (PESCO) and the European Defence Fund (EDF).

The fourth key area in the focus of EU activities relates to Risk Awareness and management: Key activities focussed on increasing the resilience of critical maritime infrastructure, the security of the supply chain, and the protection of external maritime borders.

A fifth key area identified in the EUMSS Action plan addresses education and training on EU maritime security continues to be promoted through a wide range of education and training courses at national and regional level.

Based on the state of play, DGEUMS will provide an outlook and proposals for the way ahead in the pursuit of EU maritime security interests.

Vice Admiral Hervé Bléjean,
Director General, Military Staff of the European Union

Cyber Attacks: Growing Threat to Naval Operations

Increasing interconnection and digitalization does not stop at the sea. On the contrary, from the control of propulsion systems, electronic sea charts, autopilots to satellite communication, more and more systems have become an integral part of everyday life on board over the decades. On land, too, IT optimizes and controls logistics and processes in ports, for example. The increasing system complexity not only extends the attack surface, but also the methods of the attackers become more and more sophisticated. On the other hand, technologies are available and in the starting blocks, which raise the hurdle for cyber attacks significantly. The talk gives an overview of the on-board and landside attack possibilities, discusses their complexity and presents possibilities and limits for the detection and defence of corresponding cyber attacks.

**Commander (S.G.) Dr Robert Koch,
Federal German Ministry of Defence**

Still Threatening Sea Trade: Maritime Piracy and Armed Robbery

The presentation commences with an introduction to the role of the IMB Piracy Reporting Centre (PRC), based in Kuala Lumpur, Malaysia. The IMB PRC remains the only manned, non-governmental, 24-hour centre capable of receiving reports of attacks wherever the vessel is worldwide. The Centre promptly promulgates and disseminates this information for the benefit of seafarers and for necessary response by law enforcement.

The IMB 2020 Annual Piracy Report will be introduced along with an analysis of the worldwide numbers, the global hotspots and types of attacks. Specific attention will be made to recent trends in relation to the more serious and violent incidents reported to the PRC in regions such as the Gulf of Guinea, South East Asia and elsewhere. Somali piracy will also be covered with particular emphasis on the importance of international naval cooperation as one of the contributing factors in tackling this phenomenon.

The presentation will conclude by looking at how the response to piracy actually works – what is required to initiate the response and who can effectively respond.

**Michael Howlett, International Maritime Bureau,
ICC Commercial Crime Services**

The NATO Shipping Centre (NSC) – Link between NATO and Commercial Shipping

The NATO Shipping Centre (NSC) is the link between NATO and the merchant shipping community. It is part of Allied Maritime Command (MARCOM). Permanently manned by NATO, the NSC is the primary point of contact for the exchange of merchant shipping information between NATO's military authorities and the international shipping community, contributing to maritime security and freedom of navigation.

Maritime security is high on NATO's agenda. Operation Sea Guardian (OSG) was established in 2016. It is a flexible operation that potentially can cover the full range of NATO's maritime security operation (MSO) tasks. At present, it is focused at carrying out maritime security capacity building, and providing support to maritime situational awareness and to maritime counter-terrorism in the Mediterranean Area. Through Operation Sea Guardian, NATO is contributing to the maintenance of a secure and safe maritime environment. OSG is under the operational command of MARCOM.

This lecture will focus on the NSC's mission and give an update on Operation Sea Guardian.

Commander (S.G.) Øystein Smaaberg, NATO Shipping Centre

Contagious Diseases – A Persisting Threat to Naval Vessels today?

Since the beginning of seafaring contagious diseases pose a high threat for seamen. In all times losses because of diseases were much higher than losses in real combat. In the 20th century this changed due to progress in availability of anti-infective drugs and improvements in general hygiene. Still naval forces are in danger of infectious diseases like the British Royal Navy had to experience during the Falkland campaign 1982, when they had a Norovirus outbreak on board some of their vessels. In addition, this year we had to realize that SARS-CoVirus 2 was able to render two aircraft carriers non-operational within only three weeks.

The only safe way to keep human infections away from ships is to have no human beings onboard! As long as sailors have to eat and drink there will be contact to others outside the crew and there is no real chance to prevent each contact to sources of infectious diseases. Besides further improvement of basic hygiene for the crew, water- and food hygiene, there are only few and limited technical or organizational solutions capable of reducing the danger and the effects of an outbreak situation onboard. Sophisticated ventilation systems, better sanitary systems and isolation means for ill persons are part of these solutions. Organizational methods like separation of crewmembers have limitations because of psychological but as well of technical reasons.

If there is no chance to avoid these contagious agents, there is a need for faster detection and reaction to them. More and higher qualified medical attendance and resources like easily accessible diagnostic systems, for example PCR, antigen tests and microbiological rapid test systems as well as tele-medical assistance may provide additional help and are at time the only way to face this problem. Moreover, a different operational approach towards the risk and results of an epidemic onboard is necessary as well.

Rear Admiral (MC) Dr Stephan Apel, German Navy

Confined and Shallow Waters – Prospective Operations in a Challenging Operational Environment

The presentation aims at furthering the understanding of the specifics of Confined and Shallow Waters (CSW) as an operational environment, and on the impacts on maritime and joint operations to be expected. Based on a generic view on CSW and important environmental factors, the presentation will include key threat aspects and military factors. Casting an explicit view on the Baltic Sea region as a well-suited example for CSW, including legal aspects, economic and traffic patterns, infrastructural conditions and others, this will shed light on areas of concern and exemplary consistent relevance in CSW from a military perspective. This will include, inter alia, aspects of accelerating technological developments and their impact on modern warfare as well as command and control issues in light of a growing number of stakeholders in an increasingly complex networked environment. Finally the presentation will draw conclusions and offer key takeaways regarding future developments.

**Rear Admiral Christian Bock,
CENTRE OF EXCELLENCE FOR OPERATIONS
IN CONFINED AND SHALLOW WATERS (COE CSW)**

U.S. SIXTH Fleet – Adding Stability to the Eastern Mediterranean and the Black Sea

Admiral Michael W. Baze, Director, Maritime Operations, U.S. Naval Forces Europe / U.S. SIXTH Fleet, will provide insight into the challenges facing the NATO Alliance in both the Black Sea and Eastern Mediterranean. From the perspective of U.S. Naval Forces Europe / U.S.

SIXTH Fleet, Admiral Baze will highlight the U.S. Navy's commitment to maritime security along with NATO Allies and partners in both regions, and identify ways to increase and promote interoperability, capability, and capacity building across the maritime domain.

Rear Admiral Michael W. Baze, U.S. SIXTH Fleet

The Changing Shape of Arctic Security

There has been the conventional wisdom of late that security has 're-turned' to the Arctic, as a result of climate change opening the far north to greater international interest, especially in regards to economic opportunities. Arctic governments, and a growing number of non-Arctic actors, have also begun to view the region through a lens of strategy, suggesting that the post-cold war era of Arctic exceptionalism may be quickly drawing to a close. In reality, however, the situation is far more complex, as many security concerns, including the realm of environmental threats, development challenges, and related areas of human security never truly left the Arctic. What is changing however is the growing visibility of 'hard politics', as regional great powers Russia and the United States seek to deepen their security presence in the Arctic, with concerns about access to resources and emerging sea lanes, while China is quietly developing an Arctic presence despite a lack of regional geography. The real question therefore is which 'securities' will ultimately prevail as the Arctic moves from peripheral concern to a more central role in many states' strategic thinking.

Dr Marc Lanteigne, UiT The Arctic University of Norway

European Defence Fund (EDF) – The Political Dimension

The European Defence Fund will provide a key contribution to Europe's strategic autonomy. It will promote defence cooperation among companies and between EU countries to foster innovation and develop state-of-the-art defence technology and products. This, in turn, will lead to cost-savings for EU countries. The fund will coordinate, supplement and amplify national investments in defence.

The European Defence Fund supports the cross-border cooperation between EU countries and between enterprises, research centres, national administrations, international organisations and universities. This applies to the research phase and in the development phase of defence products and technologies. It has two strands. Under the Research Strand, the EU budget will provide funding for collaborative defence research projects. Under the Capability Strand, the EU will create incentives for companies and EU countries to collaborate on the joint development of defence products and technologies through co-financing from the EU budget. The European Commission will also offer practical support and advice on cost-saving financial arrangements, providing terms and framework agreements and ownership structures for joint acquisition of defence capabilities by EU countries.

The lecture highlights EDF's political dimension.

**Vice Admiral Carsten Stawitzki,
Federal German Ministry of Defence**

European Defence Fund (EDF) – Opportunities and Options for the Naval Industry

Cooperation in armament programmes has been the „name of game“ for several years already, underpinned by initiatives like „pooling & sharing“, Permanent Structured Cooperation (PESCO) as well as the more recent European Defence Industrial Development Programme (EDIDP). Now all attention focuses on the European Defence Fund, which – allocated with a budget of around 7 billion Euros – starts in 2021. The logic behind these initiatives is that a harmonization of demands across European

nations could potentially save taxpayers substantial amounts of money and simultaneously enhance military interoperability as well as industrial efficiency. This, however, requires a real “Level Playing Field” from which we seem to be quite far away.

Whilst true European sovereignty remains a rather distant goal, PESCO and EDIDP have started to generate specific cooperative projects in the areas of military cooperation as well as R&D, development and even procurement of armaments. However, it has already become clear that the success of any cooperation plans strongly depend on the political determination of the nations involved, particularly of their governments, MoDs and armed forces. Without a harmonised need and corresponding political support, an industrial cooperation will not be successful. Insofar harmonized NATO- and Frontex-needs might help as well as a better support of naval topics under EDIDP and the soon to be launched EDF-projects.

One reason as to why the European naval industry is still rather fragmented is that the demand for naval products has been equally fragmented across Europe thus far. This again goes back to an obvious lack of naval interoperability and/or respective political determination. Even in an area like conventional submarines, in which the German naval industry has maintained a leading role for a family of users (Germany, Italy, Norway, Greece and Portugal) over multiple decades, politicians are willing to accept France and Sweden suddenly becoming first time competitors in various European markets. In the field of surface vessels, there is even less preparedness among the European navies to accept common designs and to give up their own traditional requirements and standards. Therefore, cooperation remains an option, though one without a likelihood to materialise very soon.

**Dr Hans C. Atzpodien,
Federation of German Security and Defence Industries**

Electromagnetic Railgun – European Cutting Edge Technology for Naval Applications

The electromagnetic railgun is able to launch projectiles to considerably higher velocities ($v > 2500\text{m/s}$) than conventional powder guns. Moreover, experimental studies carried out at the French-German Research Institute of Saint-Louis (ISL) have shown that fire rates in excess of 200Hz can be realized using a single barrel. A weapon system with these performances would dominate future battlefield scenarios.

The presentation will give a “state of the art” overview on European technology. It will comprise experimental results showing that projectiles with masses of 1kg can be accelerated to more than 2500m/s. The ISL has realized launch efficiencies higher than 60%, a unique result with direct consequences for the size and the weight of a corresponding power supply.

System aspects will be a second important topic of the presentation. In recent years, the ISL has made progress in this field. With regard to future ammunition, it could be shown that projectiles launched by railguns may be equipped with electronics and/or explosives. The challenges for a power supply can be characterized by two numbers: it has to deliver pulsed currents with amplitudes in the range of MA (106Amps) corresponding to power levels of GW (109W). The ISL has developed generators based on magnetic storage, which meet the task but outclass commercially available capacitors. The installation of railgun technology demands efforts in the field of Electromagnetic Compatibility (EMC), some ISL-findings in this field will be reported.

Railguns will in future be able to launch intelligent hypersonic projectiles. This will considerably improve both the offensive and defensive capabilities of combat ships. Recently, the European Defence Agency has awarded a PADR-project concerning railgun technology to ISL and partners. This is considered to be an important step towards a European technology demonstrator.

**Dr Markus Schneider,
French-German Research Institute of Saint-Louis (ISL)**

Weaponization of Artificial Intelligence (AI) in the Maritime Domain

Artificial intelligence (AI) has several possible applications in the maritime domain that could have an impact on future naval operations. The areas most likely to be influenced by breakthroughs in AI are unmanned systems development and maritime domain awareness. What changes to naval operations could these new AI-enhanced maritime technologies bring; what technical solutions are different countries currently developing, and where are we going to see the biggest impact? What technological bottlenecks still need to be overcome? This talk will discuss these and further questions by focusing on some Western and Chinese developments that aim to combine AI with other emerging technologies in the maritime domain.

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

How to Unlock the Full Potential of Immersive (AR & VR) Technologies for Maritime Defence and Security Training

Maritime security and defence industries face a unique set of challenges when it comes to implementing accessible, affordable, and productive training programmes. From training that needs to adapt to keep pace with operational requirements for continuous seafarer training to a delivery model that can defy communication (and cost) barriers, finding a training solution that can be adaptive, scalable, and delivered broadly enough across working locations can pose a significant challenge—one that has been amplified by today's additional requirement of meeting a remote working condition.

Immersive technologies can help make training accessible across spatial barriers while helping to “train the untrainable” on-site experiences, but can the creation of immersive training be made quickly and adaptable enough to keep pace with operational requirements—and operating budgets? As this presentation will explain, immersive technology on its own may not be the answer, but immersive training that is platform agnostic and which also includes an adaptive and scalable modular training creation model can help the maritime defence and security industries access training that can reduce development costs, shorten the time-to-field, and adapt to meet continuing seafarer training requirements, allowing you to turn an immersive training solution into a cost-effective, adaptive, and reusable training content strategy.

Jenna Tuck, Modest Tree

Combined Digital Solutions for Advanced Propulsion Systems – Decisive Advantages in Operation, Safety and Efficiency

Sophisticated propulsion systems, as essential parts of maritime supremacy, nowadays already benefit from single digital solutions. Safety-related challenges like continuous availability, a perfectly skilled crew during dynamic situations or global real-time support by technical experts however set enhanced requirements. Combined digital solutions have the potential leveraging full technical, operational and commercial synergies, covering the complete life cycle of a drive – starting from the design phase until the toughest operation on sea. Resulting competitive advantages include vital aspects like further increased availability and maximised safety for the crew, but also optimised total costs of ownership as well as training and service efficiency.

For example, the detailed VR-model of a complex drive is a key for high efficient training. Repeatable and on-demand (e.g. for emergency-cases

or upcoming maintenance tasks). Supported by a leading condition monitoring system, it has the potential to display also the health-level of the drive's functional components. Embedding this connected VR-model into an online environment, it creates the basis for precise next-level communication in a global network e.g. between the crew and technical experts.

The propulsion system will be available, exactly when required. The crew will have the time and skill advantage in decisive moments. The worldwide support will reach a new level in accuracy and speed. Connecting already available solutions has the capability redefining the value of our digital drive environment, equipment-health-management, modern service and tomorrow's propulsion systems as a whole.

Christoph Fenske, RENK AG

Integrated Platform Management Systems (IPMS) – Enhancing Operational Effectiveness

Today's warships have comprehensive platform automation capabilities that allow them to achieve unprecedented levels of ship survivability and operational effectiveness. Integrating these capabilities at the platform level can optimize operational effectiveness and contribute to crewing reductions. The L3 MAPPS Integrated Platform Management System (IPMS) provides integrated monitoring and control of ship propulsion, electrical functions, auxiliaries and damage control machinery and systems.

In addition to the automation of these platform systems, the following features can be integrated in the IPMS: On-Board Training System (OBTS), Battle Damage Control System (BDCS), Digital Closed Circuit Television (CCTV) System and Condition-Based Maintenance (CBM) systems.

The presentation will explain how IPMS works and how it can enhance the operational effectiveness of naval vessels.

Rangesh Kasturi, Maritime International, L3 MAPPS

Additive Manufacturing in the Maritime Defence Industry – Challenges and Chances

In the recent years, additive manufacturing technologies more and more established themselves in the field of industrial applications. Compared to conventional manufacturing technologies especially its layerwise build up process leads to an increased geometrical freedom and new possibilities for product development. Complex geometries and lightweight structures inspired by biomimetics, highly compact as well as functionally integrated systems and optimized assembly processes can be the result of an adequate design for additive manufacturing in product development. The manufacturing of products of high geometrical complexity and the economical manufacturing of low lot sizes can benefit from additive manufacturing as well. Amongst others, these aspects cause that these manufacturing technologies are given a high potential for product as well as value chain innovations in the field of the maritime industry.

Yet, even though the technologies potential, there are still technical as well as organizational challenges to overcome in order to establish the additive manufacturing technologies as commonly accepted manufacturing processes in industrial environments.

The presentation gives an overview of the view and approaches of thyssenkrupp Marine Systems GmbH (tkMS) on these topics. Besides a presentation of already successfully realized projects and especially certification needs, a view on the service portfolio of tkMS in the field of additive manufacturing will also be given.

Dr Jannis Kranz and Corinna Bischof, tkms Marine Systems

SeaSpider Anti-Torpedo Effector System

Today the underwater threat is qualitatively more dangerous than ever before and its quantitative growth accelerates by year. Submarines and, especially, heavyweight torpedoes (HWT) have grown tremendously in “power” (speed, endurance, effectiveness) and “intelligence” (sensor performance, mission algorithms, incipient AI). In effect we are just now beginning to recoup a twenty-year technological advantage of the sub-versus the surface side of the ASW paradigm that was caused by the uneven effects of the “peace dividend”, not just on naval procurement but also on R&D funding.

Faced with ever more “brilliant” HWT with unprecedented range, speed and endurance the legacy “softkill” torpedo defence paradigm is becoming redundant. The paradigm needs to be changed by introduction of “hardkill” capability. The SeaSpider Anti-Torpedo Torpedo (ATT) will be this game changer. This presentation will introduce our concept of effector onboard system architecture, its configuration and general interfaces, as well as the surface vessel launcher and provide an update on the progress of SeaSpider product development.

Thorsten Bochentini,
ATLAS ELEKTRONIK

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Navies seek to introduce laser weapons aboard naval platforms to boost combat efficiency.
(Photo: MBDA Deutschland)



Stefan Nitschke

Naval Technologies Not to Forget in the 2020s

The objective of the present assessment is to look beyond what naval services might need in five or six years. New technologies arising from current research and development activities are set to play a pivotal role in maritime defence operations in the course of the 2020s and 2030s, primarily in the littorals. Most of which are intended to transition to the fleets rapidly, but this process suffered in recent months for various reasons, including: wrong decision-making by governments and defence contractor management; shrinking defence spending in new ships and equipment; and slow increases in research, development, test and evaluation spending, all of which will have effects on major procurement programmes in the 2020s.

About to Change

Naval services were additionally faced with the COVID-19 pandemic throughout 2020. Mapping the impact of the pandemic on operations, availability of personnel and defence procurement is a major challenge, as spending in new technology, in particular, was collectively down in 2020. Battle planners, analysts and industry expect similar figures this year. To be sure, naval fleets in many parts of the planet were faced with severe deficiencies in materiel and personnel since about the mid-2000s, in addition to budget realities and increasingly complex procurement procedures that “rocked” the community in recent years.

When looking at NATO as the world’s largest defence organization, this process goes even back to the mid-1990s. Over the past three decades, which have seen NATO’s involvement in expeditionary missions, some of its naval/maritime capabilities were substantially eroded – similarly to air power that suffered from immense reductions of capabilities. To make up for lost ground, some of the efforts currently undertaken by naval fleets might well translate into new programmes and will explain how they will act in future conflicts.



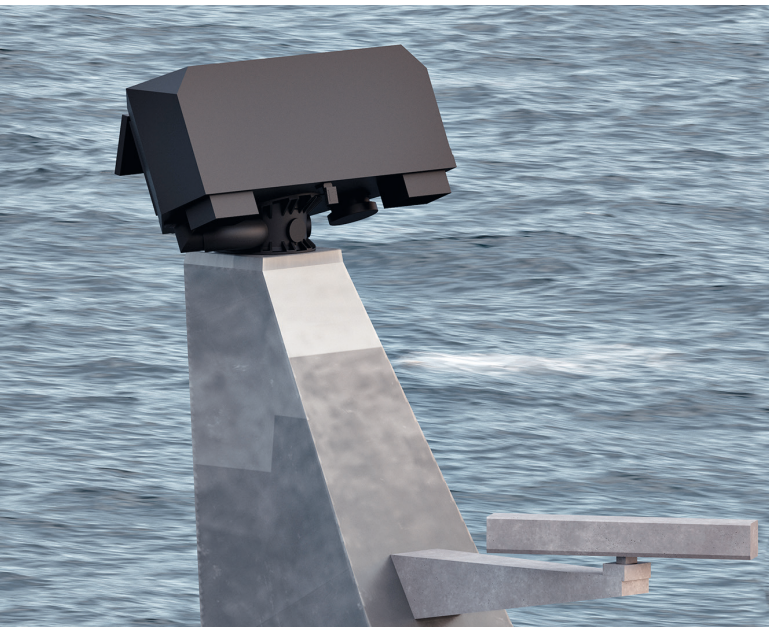
Navies Have Not Launched Enough

Now, at the turn of the year, there are first new clues about a rapidly changing situation where naval fleets will refocus their interest in the wake of emerging threats. The annexation of Crimea in March 2014 brought a completely new threat to the table – hybrid warfare. In Ukraine, Moscow has provided a “textbook example” of this new evolving threat consisting of: the rapid concentration of regular forces at Ukraine’s eastern border; the employment of unmarked special forces on the Crimean peninsula; the support for separatists in eastern Ukraine; an increase in the gas price; and a massive propaganda campaign that sought to obscure the events on the ground. Hybrid warfare can affect the naval/maritime security environment in particular. Momentarily, NATO will not be able to respond to such threats by deterrence, meaning that responding to hybrid war will require other means, such as increased resilience of cyber networks, diversification of energy and raw (strategic) material supplies and strategic communications. The latter can rapidly correct false information spread by an opponent.

As the Alliance stepped from Article 5 Defence to Counter-Insurgency and Counter-Terrorism in the 1990s and 2000s, more and more uncertainties have been emerging from symmetric warfare scenarios, confronting today’s naval forces with “new old” threats that must be taken into consideration when it comes to the modernisation of naval fleets. NATO military strategy and planning is beginning to recognise the imminent threat posed by the rapid emergence of Anti-Access/Area Denial (A2/AD) ‘bubbles’ mainly in the Baltic Sea, in the Black Sea region and adjacent Polar regions but also in Asia. A2/AD in particular raises the question of how navies will react in the future.

To counter missile salvos and other A2/AD threats, new technology is being researched and tested, including: significantly improved EW

The author **Dr Stefan Nitschke** is Editor-in-Chief of the German defence magazines **NAVAL FORCES** and *wehrtechnik*.



Gallium nitride (GaN) semiconductor technology used in the S-and X-band classes of the GIRAFFE surface radar allows for a much higher output level, providing them with a longer range and a capability to detect and track very small objects in the air over large distances.
 (Photo: Saab Group)

elements fitted to existing shipborne architectures and specialised aviation; longer-range precision strike missiles; 'navalization' 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' (shaped-charge) warheads; electromagnetic railguns or electric guns; laser weapons; and

'weaponized' drones. Surface ship- and submarine-based systems will play a major role to put A2/AD activities at risk.

New Clues For New Naval Technology

To be clear, completely new forms or combinations of threats will influence the character of naval warfare in the 2020s. As in the past, the missile threat will certainly influence naval operations in littoral waters. Longer-range anti-ship missiles or even more sophisticated anti-ship cruise missiles, some of which with a land attack capability, will influence littoral warfare in the future.

Besides the new generation of Close-in-Weapon Systems (CIWS), which provide the 'last ditch' defence of naval ships, there is need for completely new ship self-defence concepts.

This scheme includes solid state electric lasers and electric weapons currently under development by national and industrial Research & Development (R&D) facilities and industry in the United States and Europe. Especially laser technology is evolving rapidly. The key operational use of high-energy lasers (HELs) will be defending surface ships against low-cost missiles and unmanned aircraft (drones).

In light of recent advances in the United States, the US Navy (USN) is progressing towards a powerful prototype system, the Laser Weapon System Demonstrator (LWSD). Its development arose under a Solid State Laser Technology Maturation programme initiated in 2012, building on expertise derived from the Laser Weapon System (LaWS) and Northrop Grumman's Maritime Laser Demonstrator (MLD), of which the latter is a 15kW Slab Solid State Laser (SSSL) scalable initially to 300kW and eventually up to 600kW. The notional system arrangement, envisaged for a possible Arleigh Burke class (DDG-51) application, will be composed of a 150kW HEL, operating at 1,064µm; a track and targeting module; a counter-sensor laser module (lower power); and a green non-lethal laser module operating at 512µm.

In Europe, Germany and the UK are actively working towards their own deployable HELs, some of which are believed to be targeting 2021 or 2022 for deployment of the first operational units. A prototype from



The construction of five 121.6m long FDI frigates with an expected full displacement of 4,500 tonnes brings in extra capability for the French Navy, which is needed to more effectively respond to high threat scenarios in the 2020s and early 2030s. Mission-capable equipment includes the Aquilon integrated digital communications system and the Thales' SEA FIRE all-digital, multi-function radar with four fixed antennas.



The Projekt 20381 corvette Steregushchy (530; left) and the Projekt 22350 frigate Admiral Gorshkov (417) possess latest Russian naval technology. Note the latter's four-face Poliment 5P-20K multifunction S-band Active Electronically Scanned Array (AESA) radar. Both ships are pictured here together with the 1980-era Sovremennyy class destroyer Nastoychivyy (610) in the Kaliningrad region. (Photo: Russian Navy)

Rheinmetall Defence was tested aboard a German Navy ship in 2015, using a 10kW module coaxial to an MLG27 gun mount. MBDA Deutschland developed the Laser Demonstrator-Next Generation, a containerised system consisting of a 360-degree beam director with a single aperture for a 50kW effector. In the UK, the Ministry of Defence assigned a £30M contract to the UK Dragonfire consortium, led by MBDA UK, to develop the Laser Directed Energy Weapon (LDEW) capability demonstrator. The consortium also consists of QinetiQ (delivering laser components), Leonardo (electro-optical components), BAE Systems, GKN, Arke and Marshall ADG.

Weapon systems based on electromagnetic railgun technology are novel means for delivering disruptive or destructive energy to a target. The French-German Research Institute of Saint-Louis (ISL), which was established on the basis of a bi-national treaty between France and Germany in June 1959, has become the leading European actor in these technologies. In an experiment, 1.1MJ (Megajoule) of kinetic energy was delivered by a projectile weighing 460g at an impact velocity of 2,200m per second. Compared to conventional, explosively driven naval gun systems, electrical guns or railguns make use of superior muzzle velocity. Following more than 15 years research work done in the United States and Europe, this technology is now recognised for its capability to reach

very high velocities ($v_0 > 2,000\text{m/s}$) with overall efficiencies over 30 percent. A long-range electromagnetic railgun can achieve ranges up to 215nm (nautical miles) or 400km, accelerating a heavy projectile with a mass of up to 60kg with a muzzle velocity of 2,500 metres per second. Alternatively, railgun technology can be employed to accelerate lighter projectiles in rapid succession to defeat incoming anti-ship missile threats in a last-line-of-defence scenario.

Industrial firms, including BAE Systems, which already reportedly worked on electrical gun technology, remain optimistic. According to them, market conditions for such weapons have been more challenging in recent years. Other manufacturers, also possibly involving Rheinmetall Defence in Germany, were continuing to focus on expanding their activities in this field. Railgun technology could find their way into naval service in Europe as soon as 2029 or 2028, among them the French and German navies.

For comparison, US research institutes like DARPA (Defense Advanced Research Projects Agency) and the Naval Surface Warfare Center, Dahlgren Division, as well as industry (General Atomics) said that electromagnetic railguns could be operationally available for the next generation of large warships between 2020 and 2025. BAE Systems, for instance, began its investments in railgun technology in 2010, following the

company's disclosure, in 2013, that its previous years of massive R&D could "end up in a readily available system by 2022 or early 2023."

Learning What Ballistic Missile Defence is Doing or Not Doing

As shipboard armaments will undergo comprehensive modernisation in the 2020s, there is one reason for a "real" sea-based Ballistic Missile Defence (BMD) capability at sea: potentially hostile or 'rogue' states are continuing to develop medium-range and long-range missiles that can be launched from outside the Euro-Atlantic area, most notably Iran. Naval assets fitted with a BMD capability, are in strong demand to defend against the increasing threat posed by medium-range and long-range ballistic missiles. Technically very impressive, a shipborne BMD capability represents an issue that all major European navies should care about.

Thales Nederland's proposal includes the upgrade of existing shipboard SMART-L radars with a newly developed BMD processing functionality known as SMART-L MM/N (Multi-Mission/Naval), a D-band radar that was formerly known as SMART-L EWC (Early Warning Capability).

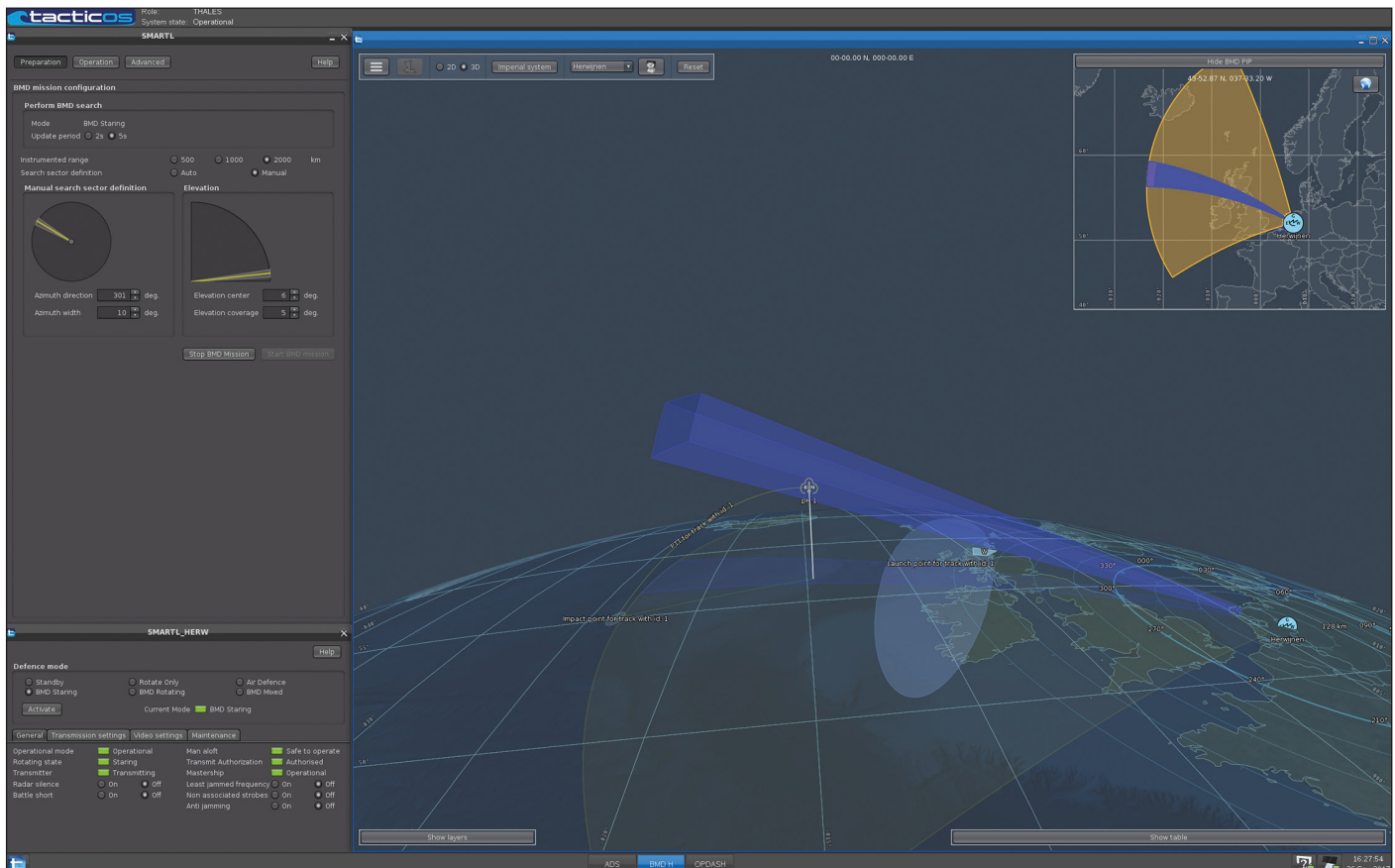
EWC grew out of the SMART-L volume search radar functionalities, offering greater range and a faster response to high-speed, long-range missile threats. There is a "strong requirement for a ship-based early warning system" in both the Royal Netherlands Navy (RNIN) and the German Navy, according to NATO sources, to "complement planned capabilities of other NATO partners."

Lessons from the Mess

New radars, including Active Electronically Scanned Array (AESA) radars, are entering the marketplace, which retain capabilities to track low observable threat missiles at long ranges. With the launching of two new S-and X-band classes of the GIRAFFE surface radar in May 2014, Saab Electronic Defence Systems (Saab EDS) continues to embark on multifunction radar options, providing a unique capability to nearly all military and security missions. Based on gallium nitride (GaN) semiconductor technology, the new radars include the X-band GIRAFFE 1X and S-band GIRAFFE 4A systems, as well as GIRAFFE 8A which is also operating in S-band. With a detection range of 190nm (350km), the latter exceeds twice the detection range of the earlier Sea GIRAFFE system found aboard the Royal Swedish Navy's Visby class corvettes and US Navy's Independence variant Littoral Combat Ship (LCS). Saab EDS quotes this radar's simultaneous detect and classify capacity at more than 1,000 tracks. Saab EDS explained that the GIRAFFE 8A radar is the surface-based variant of the company's ERIEYE Airborne Early Warning & Control (AEW&C) radar system, exceeding a range of over 450 kilometres. It is also suitable for the TBMD role.



*The SMART-L MM/N multibeam AESA radar to be carried by De Zeven Provinciën class LCF frigates of the Royal Netherlands Navy brings particular autonomous ballistic missile search-and-track capabilities over large distances, including independent missile search and increased missile observation time through forward/backward scanning and staring modes.
(Photos: Thales Nederland)*





The multifunction AESA radar based on the indigenously developed Type 346/348 DRAGON EYE active phased array radar fitted to Luyang III class (Type 052D) guided missile destroyers may be as powerful as the US AN/SPY-1 system.
(Photo: PLAN)

Compared to gallium arsenide (GaAs), which is not wideband and robust enough, GaN is extremely useful for detecting very small airborne targets, including RAM (rocket, artillery and mortar) targets, and offers a larger bandwidth, according to Saab EDS. GaN offers smaller chip sizes (12mm²) when compared to GaAs whose chip size is usually greater than 15 square millimetres.

Looking at a Fresh Concept for Unmanned Technology

More than ever before, unmanned systems will enable navies to achieve a continuous in-theatre presence in varying mission scenarios. Maritime forces can choose from a steadily increasing portfolio of mission-proven systems – from Unmanned Underwater Vehicles (UUVs) to miniature or miniaturised Unmanned Aircraft Systems (UAS). Seeking full-scale protection against the spectrum of modern threats, navies draw on robotic technologies fitted to a wide variety of platforms, as found in the Belgian-Dutch minehunter project. The programme calls for the delivery of twelve minehunters fitted with modern drone systems (Toolbox) to the RNIN and the Belgian Naval Component.

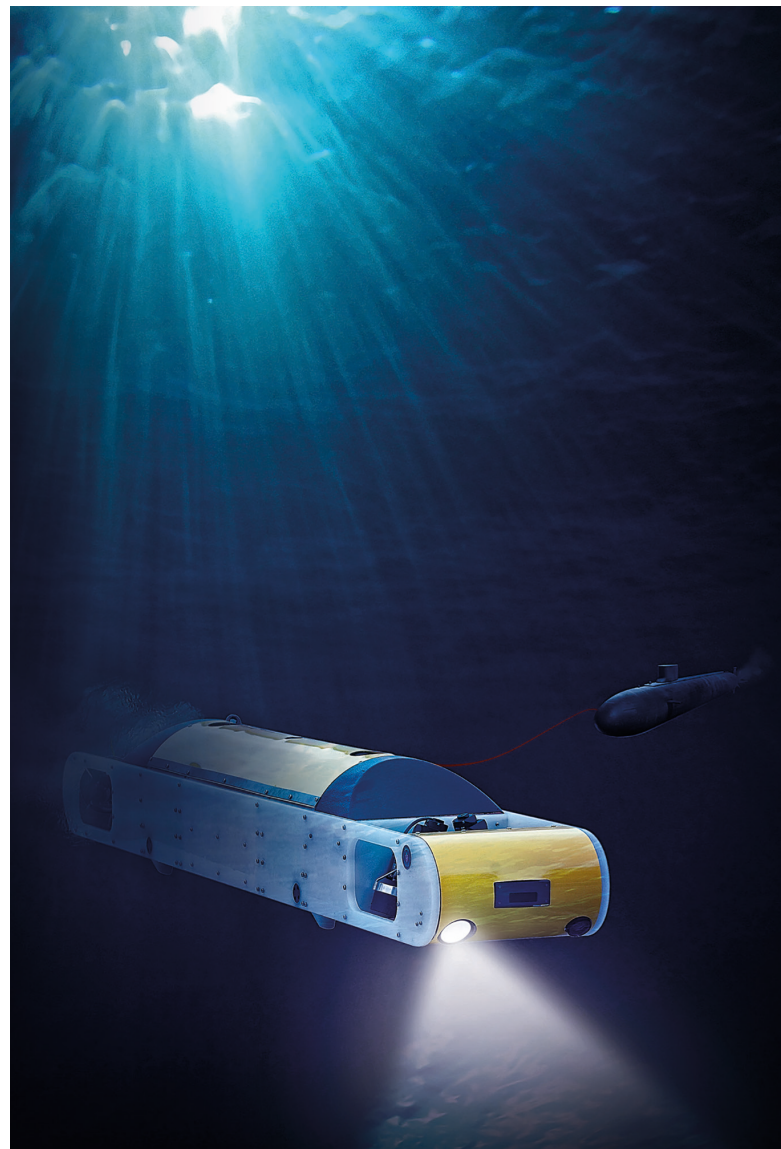
Larger quantities of ROVs/AUVs (Remotely Operated Vehicles/ Autonomous Underwater Vehicles) and UAS will be embraced by most of the world's naval powers. The reason is that many fleets do have a vital requirement of unrestricted and immediate access to sensitive, unfiltered and ISR (Intelligence, Surveillance and Reconnaissance) data in near real-time, for which unmanned platforms – fitted with a wide variety of sensors – represent the ideal platforms. Individual systems or even a combination of systems offer advantages over manned assets: *first*, they

are expendable; *second*, they can be more survivable in high threat environments; *third*, they are scalable; and *fourth*, they are potentially more affordable in terms of lower life cycle costs.

Revisiting naval UAS, the US Naval Research Laboratory (NRL) successfully demonstrated the launch of an electric-powered UAV from a submerged submarine in recent years. Back in 2013, the Experimental Fuel Cell (XFC) UAV was launched from a SEA ROBIN launch vehicle from the Los Angeles class submarine USS Providence (SSN 719), with the launcher fitting neatly into a TOMAHAWK cruise missile launch tube. The launcher is capable of firing off the XFC air vehicle which could then have a mission endurance of “several hours,” according to USN sources, feeding full motion video data back to the submerged submarine via a communications buoy.

Lifting submarine communications into the 2020s

A total of 13 modernisation programmes were announced by European submarine operators in the year 2019, with industry likely to respond to increasing demands in the 2020s. The current trend in submarine



ROVs and other extended standoff ordnance detection methods remain high on the agenda of the modern navies in the 2020s. Pictured is the SUBROV AUV performing inspection, underwater works and acts as a communications platform or docking tool for an AUV.
(Photo: Kongsberg Maritime)

modernization is towards integration of more capable communications equipment, an aspect that is followed by several refit programmes, namely in Asia and Europe. A new development that fits to the modern non-nuclear submarine is a multifunctional submarine antenna system, called TRITON® TMS 1111, which enables communication from HF to L-band. A development of Hagenuk Marinekommunikation GmbH (HMK) in Germany, TRITON grew out of an R&D effort and over the past three years was developed as fitment to both new-built submarines and existing assets. When these lines were written, the antenna went through its first factory acceptance test (FAT); patents are pending.

“It is frankly something we looked at three years ago, and when you look at the market today, the new multifunctional submarine antenna could likely fill-in the gap left by older equipment, and brings additional capability to legacy platforms,” HMK noted last October.

Conclusion


Many of the world’s naval fleets must establish new capabilities or introduce new technology to combat new threats. In the face of emerging threats, naval fleets were struggling in recent decades both techno-

logically and financially, as they pose obsolescence risks and are in part unreliable.

There is much hope that naval/maritime services will return to “normal” levels in 2021. Naval planners are beginning to understand what is needed to combat emerging threats like A2/AD, which is often ignored by the politics – resulting in a constant lack of quick decision-making and money. In the 2020s, A2/AD will have a maritime dimension, however

Completely new technology will shape the navies’ capabilities in the future. Collaboration between manned and unmanned assets is key to further enlarge their spectrum of operations. Maintaining traditional capabilities such as Anti-Submarine Warfare (ASW) and Anti-Air Warfare (AAW) goes in line with the emergence of new abilities – with longer-range anti-surface warfare, land attack, BMD, as well as enhanced Electronic Warfare (EW) and cyber defence widening the envisioned three-dimensionality. As an example, Naval Group’s FDI (*Frégate de Défense et d’Intervention*) frigate will be the first surface combatant in the *Marine Nationale* that will be protected against evolving cyber threats. The ship realises a dedicated platform concept for three-dimensional naval warfare, integrating a bundle of new innovative solutions for a digital ‘front-line’ frigate.

NAFO



The Experimental Fuel Cell (XFC) UAV can be launched from a submerged submarine.
(Photo: US Naval Research Laboratory)

Biographies

Rear Admiral (MC) Dr Stephan APEL

Rear Admiral (Medical Corps) Dr Stephan Apel is Surgeon General, German Navy. He joined the Bundeswehr as a conscript on 1 July 1976 and was transferred to the Navy as a Medical Service officer candidate in October the same year. From October 1976 till October 1982 he studied Human Medicine at *Westfälische Wilhelms-Universität Münster*.



His military career began with a residency at the Bundeswehr Hospital in Kiel. From January 1984 to December 1985 Dr Apel served on board the Federal German Navy Frigate *Bremen*, before taking over as Commander, Medical Centre, and Flight Surgeon, Naval Air Wing 1, Kropp/Jagel. After an assignment as Senior Medical Officer, Destroyer Flotilla, Wilhelmshaven from October 1991 to December 1995, he served at the Federal Ministry of Defence, Office of the Surgeon General, Bundeswehr, II 1 Chief, Situation Centre Bosnia until 30 June 1996, when he became Senior Officer of the Medical Service and Deputy Command Surgeon, Fleet, at Fleet Command, Glücksburg. From September 2000 till March 2002 Dr Apel was Commander, Navy Medical Command East, Rostock, followed by assignments as Chief, Regional Medical Centre 110, Kiel, Regional Medical Command I, Kiel, Chief of Health Affairs Division and the Bundeswehr Medical Service Headquarters, as DCOS, Directorate A. Since 16 March 2016 Dr Apel has been Surgeon General of the Navy at the German Navy Command, Rostock.

Special Missions/Assignments include: six-month observership at Naval Environmental Health Center, Norfolk/VA, USA, including a tropical medicine course in Puerto Rico, Senior Medical Officer, Naval Task Force Somalia, for the evacuation of German Army Contingent Somalia, Senior Medical Officer, National Commander, NATO EX "Strong Resolve 1999" and "Battle Griffin 2000", Commander, Medical Task Force, 8th Contingent KFOR and Commander, Medical Task Force, 27th Contingent KFOR.

Dr Hans Christoph ATZPODIEN

Dr Hans Christoph Atzpodien (born 1955) is Managing Director of the Federation of German Security and Defence Industries (BDSV e.V.). He 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

Bernd Aufderheide was born in Herford, North Rhine-Westphalia, in 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.

Rear Admiral Michael W. BAZE

Rear Admiral Baze is Director, Maritime Headquarters, U.S. Naval Forces Europe/Africa/ U.S. SIXTH Fleet. He is a native of San Antonio, Texas and earned a Bachelor of Arts in Biology from Rice University. He commissioned through Aviation Officer Candidate School in 1990 and was designated a Naval Aviator in 1992. He deployed multiple times flying the SH-60B in support of detachment and carrier operations during Operation Iraqi Freedom and Operation Enduring Freedom – assigned to HSL 45 June 1992-1996 as a first tour pilot and HSL 47 June 2002-Oct. 2004 as a safety and the Naval Air Training and Operating Procedures Standardization (NATOPS) officer, Det. 5 officer in charge, and squadron maintenance officer in San Diego, California. He also served as a flight instructor, operations and administrative officer twice at HSL 41 in San Diego July 1996-March 1998, and Sept. 2001-June 2002.



Rear Admiral Baze was the aide to the President, Board of Inspection and Survey in Norfolk, Virginia April 1998-Aug. 1999. He then earned a Master of Science in National Security Affairs from the Naval Postgraduate School in Monterey, California 1999-2001, serving also as an associate fellow on the Chief of Naval Operations' Strategic Studies Group. His significant staff assignments have included service on the Joint Staff in Washington, D.C. as an action officer in the J-3 Joint Operations Division, and then as an aide to the Chairman of the Joint Chiefs of Staff Jan. 2005-Nov. 2006. He served as deputy director for Aviation Distribution and head air combat placement officer at Navy Personnel Command March 2010-Feb. 2012, and later became the director of Aviation Warfare Distribution (PERS-43) Dec. 2016-July 2019 in Millington, Tennessee. In command, he led the men and women of HSL-45 and USS America (LHA 6). At HSL 45 in San Diego, Aug. 2007-Feb. 2010, his squadron was awarded the Battle "E" twice, the Golden Wrench Award for Maintenance Excellence, and the Commander, Pacific Fleet Retention Excellence Award for three consecutive years. As the executive and then commanding officer of the Navy's newest amphibious assault ship, the USS America (LHA 6), July 2012-Aug. 2016, he shepherded America from the early pre-commissioning phase, a C4F deployment, commissioning, first-in-class tests and trials, RIMPAC 2016 Exercise, and readiness for Joint Strike Fighter Developmental Testing-III. In his current assignment, he is the Director of Maritime Headquarters (N4/5/8/9) supporting naval component theatre engagement development, resource programming and operational planning in support of U.S. European Command and U.S. Africa Command.

Corinna BISCHOF

Corinna Bischof studied Mechanical Engineering and Materials Engineering, followed by several years as a project leader in Additive Manufacturing (research and development). She joined thyssenkrupp in 2017 to help set up the newly established thyssenkrupp TechCenter Additive Manufacturing. With expertise in materials and processes, she prepared the TechCenter's certification as first maritime AM supplier worldwide (DNV GL approval of manufacturer, granted in 2019).



Vice Admiral Hervé BLÉJEAN

Born in 1963, VAdm Bléjean entered the French Naval Academy in 1984. His initial career revolved around operational experience aboard different warships, particularly during the Iraq-Iran War 1987-88 (Operation PROMETHEE), in the field of mine warfare, in the operational management of a destroyer and in training, especially during the first sea trials of the aircraft carrier CHARLES DE GAULLE. After this, he served on board USS NICHOLSON as Assistant Operations Officer, and then further demonstrated his abilities in executive positions in command of the training ship LEOPARD and of the Navigation Training Flotilla. He then served for a period as Aide-de-Camp to the Chief of Naval Staff.



On completion of the Staff Course at the Defence College in 2000, VAdm Bléjean worked in the field of Human Resources Management. Serving successively as the official representative of the Human Resources Director at the Ministry of Defence and then as an executive assistant to the Head of Human Resources Policy of the Navy Headquarters, where he worked on the future status of military personnel. He returned to operations in 2002, successfully taking command of the surveillance frigate FS VENDÉMIAIRE, deploying for six months in Operation ENDURING FREEDOM.

Promoted to the rank of Captain in 2005, he was appointed as the Head of the Naval Operations Department at the Joint Headquarters Operations Centre. In this appointment, he was responsible for the Non-combatant Evacuation Operation in Lebanon, and prepared the groundwork for French policy on counter-piracy around the Horn of Africa. In 2007, he took command of the helicopter carrier JEANNE D'ARC and the associated naval training group, which he led through Operation THALATINE that resulted in the successful liberation of 30 hostages from Somali pirates.

The third part of VAdm Bléjean's career enabled him to acquire outstanding skills in European Union operations and within the NATO command structure.

In 2010, after completing his Advanced Military Studies at the National Defence Institute, he was appointed Deputy Chief of the Military Office of the Prime Minister, specifically in charge of the State Responsibilities at Sea, and of nuclear deterrence. Promoted to Rear Admiral (LH) in September 2013, he assumed duties as Deputy Commander of the French Maritime Force (FRMARFOR). In this position, he took command of the Combined Task Force 150, engaged in anti-terrorist operations in the Indian Ocean, then of the EU Naval Force ATALANTA, the European Union's counter-piracy operation around the coast of Somalia. In 2014, VAdm Bléjean was assigned as Deputy Chief of International Engagement for the French Navy, in charge of improving relationships with allied and partner navies. Between June 2015 and March 2016, he also assumed the

role of First Deputy Commander EUNAVFOR MED for Operation SOPHIA, located in Rome. In 2016, VAdm Bléjean as Deputy Chief of Staff for Operations at Joint Force Command Naples became particularly involved in the certification process of this HQ as it prepared to become the lead for the NATO Response Force (NRF) in January 2017. He conducted operations with the NATO force in Kosovo (KFOR) and the NATO Headquarters in Sarajevo that works in partnership with the European Union operation ALTHEA. In 2017 VAdm Bléjean was the Deputy Commander at the Allied Maritime Command (MARCOM), Northwood, UK. In this position, he took command of the Maritime Component South during Exercise TRIDENT JUNCTURE 2018, the most important NATO LIVEX ever organized since the end of the Cold War.

EU Member State Chiefs of Defence elected VAdm Bléjean in May 2019 as Director General of the EU Military Staff (DGEUMS). He took over this position on the 1st of July 2020.

Thorsten BOCHENTIN

Thorsten Bochentin is Director Sales Anti-Submarine Warfare at ATLAS ELEKTRONIK. Before joining ATLAS ELEKTRONIK in 2010 he served as an active duty officer in the German Navy with surface warfare training and experience on destroyers, frigates and minehunters. His ultimate sea posting was as Principal Warfare Officer for Underwater Warfare on the then newly commissioned first-of-class F124 type frigate "Sachsen". His experience at ATLAS ELEKTRONIK includes heavyweight torpedoes, anti-submarine sonars and, especially, torpedo defence with the SeaSpider Anti-Torpedo-Torpedo. He holds advanced degrees from the German Federal Armed Forces University Hamburg and the University of Wales.



Rear Admiral Christian BOCK

Rear Admiral Christian Bock is Director NATO Centre of Excellence for Operations in Confined and Shallow Waters (COE CSW). He joined the Navy in July 1988, subsequently achieved a Master "Business Administration" and served on minehunting- and support vessels, holding command of a minehunter from 1998 until 2000.

After a period at the German MOD (Naval Staff Plans and Policy) and following the staff course at the German Armed Forces General Staff and Command College in Hamburg, he was seconded to SACT as Military Assistant for the 2* and 3* level in 2003.

Back to sea from 2005 – 2007, he served as the Deputy Squadron Commander of the 3rd Minesweeper Squadron in Kiel, followed by a posting at the German MOD Joint Staff Current Operations Branch. From 2008 to 2010, Commander Bock was appointed Commanding Officer of the 5th Minesweeper Squadron, including a detachment as Commander German contingent UNIFIL. Following a second assignment at the German MOD Joint Staff (conceptual planning), he joined the Federal Chancellery as Deputy Division Head "Military Aspects of Security Policy" in 2011. From 2013 to 2015, promoted to Captain (N), he was responsible for Maritime Operations (Horn of Africa region) at the Bundeswehr Joint Forces Operations Command in Potsdam.

Back to the MoD again, he held a Branch Chief post in the Planning Directorate until 2018, since when Rear Admiral Bock has been serving as Commander Flotilla 1 and Director NATO COE CSW.



Vice Admiral (rtd.) Lutz FELDT

Lutz Feldt joined the German Navy in 1965. He was commissioned in 1968. Sea duty assignments for 13 years with leadership functions on all command levels, including two tours as a commanding officer, provided a wide experience at sea with emphasis on operations, communications and electronic warfare. Shore duty assignments in naval staffs, the Federal Ministry of Defence, in NATO as Assistant Chief of Staff Operations and Logistics. He became Commander Military District Coast, a national joint command, Commander in Chief of the German Fleet and Commander in Chief of Naval Staff in Bonn and Berlin. He retired in 2006, after having served in the Armed Forces for 41 years. Since then, Vice Admiral Feldt has taken over several posts of honour: he was the President of the German Maritime Institute until 2012 and President of EuroDefense Germany until 2017. He has been contracted by the European Commission for the “Instrument for Stability”- Critical Maritime Routes”. From 2009 to 2010 he was contracted by the European Defence Agency (EDA) as a member of the “Wise Pen Team”, working on the topic of maritime surveillance and maritime security. Another Study for EDA about European Naval Capabilities has been completed in June 2012. He is now a Director of “Wise Pens International Limited” and is engaged by the EDA, the European Commission and several other institutions, dealing with the whole spectrum of maritime safety, security and defence matters. In this period he was involved in several Arctic studies and Conferences. Besides these topics he has given several lectures about leadership responsibilities and the interaction between military and political leaders.



Christoph FENSKE

Christoph Fenske is General Manager Marine Special Gears of Renk AG.

After graduating from Technical University of Hamburg in 1999, where he got a degree in Marine Engineering, Christoph Fenske joined MTU Friedrichshafen as Project Engineer for Marine Propulsion Systems working on yacht and fast ferry programmes as well as on various naval projects such as the Littoral Combat Ship programme of the U.S. Navy.

In 2012, Christoph was promoted Director of Naval Application Engineering and was eventually responsible for the mechanical, electrical and automation engineering for MTU's naval projects. In July 2019, he became General Manager Marine Special Gears of Renk AG and thus is responsible for the business unit of marine gearboxes typically used in demanding naval, yacht, fast ferry and special purpose vessels.



Michael HOWLETT

Michael Howlett is CEO of ICC Commercial Crime Services. He joined the ICC International Maritime Bureau (IMB) in May 1994 and closely co-ordinates with the IMB's banking, shipping, insurance and trading company members with regards to loss prevention and advice. He also works closely with the IMB Piracy Reporting Centre (PRC) based in Kuala Lumpur, Malaysia. The IMB PRC is a single point of contact for the shipping community to report acts of piracy and



armed robbery from anywhere in the world. The IMB PRC is regarded as the primary source of information on piracy attacks globally. Michael has travelled on investigations to many countries, spoken at numerous conferences and seminars worldwide and written papers on areas connected with the subject of piracy, fraud and malpractice in trade finance and international trade.

In January 2020, Michael Howlett became the CEO of ICC Commercial Crime Services – the anti-crime unit of the International Chamber of Commerce – of which IMB is a part.

Rangesh KASTURI

Rangesh Kasturi is President of L3Harris Maritime International at its headquarters in Montreal, Canada. With a Bachelor's Degree in Electrical Engineering from Bangalore University, he started his career at CAE in 1984 and has accumulated over 35 years of experience in systems engineering, project engineering, proposals management, strategic planning, business development, contract negotiations, acquisitions, P&L and general management. Maritime International includes the MAPPS, Calzoni, Oceania, and Communications Systems Canada businesses of L3Harris. Rangesh is responsible for the global business of Maritime International comprising four businesses in eight countries on four continents and customers worldwide. He leads the continuing geographic and sectoral diversification & growth strategies of the business through organic growth and acquisitions.

L3Harris Maritime International is a global provider of control and simulation solutions for the marine, nuclear power generation and space sectors, naval handling systems, visual landing aids, integrated navigation systems, and maritime domain awareness solutions. Rangesh Kasturi has been President of L3Harris Maritime International since July 2019.



Dr Sarah KIRCHBERGER

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) and Visiting Research Fellow, European Institute for Chinese Studies (EURICS). 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.



Commander (S.G.) Dr Robert KOCH

Commander (S.G.) Dr Robert Koch received his diploma in Computer Science in 2002. After that, he had a comprehensive operational and technical training in the German Navy and built up a broad experience in the design, implementation, and operation of high-security networks and systems while being Deputy Weapon Engineering and Weapon Engineering Officer onboard of German frigates. He received his PhD in 2011, his habilitation in 2017 and his Venia Legendi in 2018. Now Commander Dr Koch is a lecturer in Computer Science at the German Armed Forces University and the Rheinische Friedrich-Wilhelms-Universität Bonn (University of Bonn), and research assistant at the Fraunhofer Institute for Communication, Information Processing and Ergonomics (FKIE). His main areas of research are network and system security with a focus on intrusion detection in encrypted networks, attack detection and identification of manipulations, the security of Commercial off-the Shelf (COTS) products, anonymity in cyberspace, security visualization and the application of machine learning techniques. After building up the penetration testing capability for the Bundeswehr, Robert is now Action Officer for Cyber Policy in the Federal Ministry of Defence.



Dr Jannis KRANZ

Dr Jannis Kranz studied product development and did his PhD on design methods and guidelines for Additive Manufacturing at the Hamburg University of Technology (TUHH) before working several years in the additive manufacturing industry with a focus on engineering and development projects for Additive Manufacturing. He joined the thyssenkrupp TechCenter Additive Manufacturing in 2018 in order to build up the engineering and consultancy services.



Vice Admiral Andreas KRAUSE

Vice Admiral Andreas Krause is Chief of the German Navy.

He joined the then Federal German Navy in 1976. He studied Education at the Bundeswehr University, Hamburg before joining the Submarine Flotilla in 1981.

From 1986 to 1989 he was the Commanding Officer of Submarine U 22.

After Advanced maritime operations training (antisubmarine warfare), he took the 32nd Admiral Staff Officer Course at the Bundeswehr Command and Staff College, Hamburg.

After staff assignments in the Submarine Flotilla and the Ministry of Defence, Vice Admiral Krause was Branch Chief in the Joint Headquarters Northeast, Karup/Denmark from 1999 to 2001, followed by assignments as Branch Chief Naval Staff III 1 (Concept Development and Planning Guidelines, International Cooperation), Assistant Deputy Chief of Staff, Armed Forces Staff V (Joint Operations) and Deputy Chief of Staff, Naval Staff III (Concept Development, Planning and Operations) in the Federal Ministry of Defence.



From 2006 to 2008 he was Commander, Flotilla 1 and Director, Centre of Excellence for Operations in Confined and Shallow Waters (COE CSW) and from 2008 to 2009 Deputy Commander in Chief, German Fleet.

After another assignment in the Ministry of Defence as Director, Joint Operations Staff, Vice Admiral Krause became the Deputy Commander, NATO Allied Maritime Command, Naples (Italy). He was Vice Chief of the German Navy from 2013 until October 2014 when he took over as Chief of the German Navy.

Dr Marc LANTEIGNE

Originally from Montréal, Canada, Dr Marc Lanteigne is an associate professor and researcher in politics, security and international relations at The Arctic University of Norway, Tromsø and an adjunct researcher at the Centre for Arctic Policy Studies at the University of Iceland, Reykjavik as well as at Ruhr University Bochum (Germany). He received his Ph.D. from McGill University, Montréal, Canada. He has conducted research and fieldwork in numerous parts of the Arctic and Northern Europe, including Alaska, Denmark, Finland, Greenland, Iceland, Norway and Sweden as well as Northern Canada, as well as in China, Japan, South Korea and Southeast Asia and has teaching and research experience in Canada, China, New Zealand, Norway, and the United Kingdom. He has taught courses in international relations and comparative politics, including Asia and Europe and guest lectured on Arctic and Antarctic issues in China, Japan, North America and Western Europe, including a regular summer short course at Peking University and a lecture on China's developing polar policies at The Bookworm, Beijing, July 2017.

Dr Lanteigne is the editor of *OtC*, *Over the Circle*, Arctic Politics and Foreign Policy and the author of several articles on Chinese and East Asian politics and foreign policy, as well as the book *Chinese Foreign Policy: An Introduction*, which had its third edition released in 2016, and a fourth edition in July 2019.



Dr Markus SCHNEIDER

Dr Markus Schneider is President of the European Electromagnetic Launch Society (EEMLS).

He received his Ph.D. degree in physics from the University of Jena, Germany, in 1998. Since 1999, he has been with the French-German Research Institute of Saint Louis (ISL) in France, where he was a Project Manager in a multi-disciplinary effort on plasma physics in conventional combustion-driven accelerators and electromagnetic rail guns from 2004 to 2009. Since 2007 he has been Head of the Electromagnetic Acceleration Group at ISL and since 2018 acting Head of the Division Laser and Electromagnetic Technologies. He has authored and co-authored more than 100 scientific publications and reports. He is the holder of three patents. His research interests include pulsed power technologies and innovative metrology.

In 2014 Dr Schneider was awarded the IEEE Peter Mark Medal for outstanding contributions to electromagnetic launch technology. In 2018, he acted as general chair of the 19th IEEE symposium on electromagnetic launch technology (EML) held at Saint-Louis, France. Currently, he serves as the President of the European Electromagnetic Launch Society (EEMLS).



Commander (S.G.) Øystein SMAABERG

Commander (S.G.) Smaaberg has an extensive service record from the Norwegian Coastguard, with 30 years of experience operating in the High North.

During Operation RECSYR (2013), he served as Commanding Officer (CO) on board the Norwegian frigate “Andenes”- providing escort and protection for RORO ships participating in the Operations final phase. The final shipment of chemical substances was removed from Syria by a maritime partnership of Danish, Norwegian, UK, Russian and Chinese warships. Before joining NATO and MARCOM HQ in 2019, Commander Smaaberg served as CO on board the Norwegian Coastguards Flagship “Svalbard”. Svalbard is a purpose-built military icebreaker – focused on operations in the High North and Barents Sea Region on the northeastern flank of NATO's Area of Responsibility.

Nato Shipping Centre (NSC) is embedded in MARCOM, and its ambition is to be a relevant partner for informational exchange between NATO and the shipping industry. Commander (S.G.) Smaaberg is the designated Shipping Industry Liaison, and together with the Engagement Department - responsible for the development and execution of NSC engagement plan. This plan aims at establishing communication and cooperation with all relevant maritime stakeholders. One of the key engagements is the annual Marcom Maritime Security Symposium (MMSS).



Vice Admiral Carsten STAWITZKI

Vice Admiral Carsten Stawitzki studied Electrical Engineering at the Helmut Schmidt - Bundeswehr University in Hamburg and afterwards served on various assignments on board and in staff functions. He took the 40th Admiral Staff Officers Course at the Bundeswehr Command and Staff College, Hamburg and was deployed to Afghanistan as Second-in-Command ISAF Regional Command North in 2013.

From 2013 to 2016 he was Commandant Marineschule Mürwik (Naval Academy) and then led the Bundeswehr Command and Staff College.

Vice Admiral Carsten Stawitzki was appointed National Armaments Director (NAD) and Head of the Directorate-General for Equipment within the Federal Ministry of Defence in April 2018.



Jenna TUCK

Jenna Tuck has recently joined Modest Tree as the Executive Vice President (EVP) of Global Business Development. Jenna leads the company's international market positioning efforts and oversees the company's on-going expansion initiatives into emerging markets. Jenna's goal is to drive the delivery of integrated digitization solutions aligned to changing customer requirements.

Jenna brings to her role a well-established background in training, simulation, business development, and professional services. Jenna has spent the past 12 years acquiring and honing her skills in the training and simulation industry across various phases of project development and delivery. This includes, but is not limited to; content development; production management; programme and installation management; proposal and product development; customer relations; and marketing and sales.

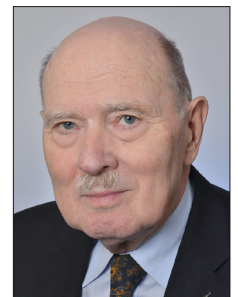
Embracing the core values of innovation, education, and evolution – Jenna is deeply passionate about; technological improvements in education; STEM initiatives; and leveraging emerging technologies to improve learner experiences. Jenna has contributed to numerous initiatives aligned with these passions; this includes serving as a board member for Women in Defense (WID), initiating the central florida Young Professionals Outreach Network (YPON), and participating in various speaking engagements at events to include the Advanced Distributed Learning (ADL) Conference and Interservice/Industry Training Simulation and Education Conference (I/ITSEC).



Jan WIEDEMANN

Jan Wiedemann is the Chairman and Moderator of MS&D 2021. He served in the Federal German Navy, now German Navy, as an officer for 37 years. 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 in Oslo and became the German Defence Attaché in Norway. After staff assignments in MOD, Naval Staff and Joint Forces Staff he attended the Geneva Centre for Security Policy (GCSP) and subsequently became the German Defence Attaché in West Africa. Jan retired from the Navy in 2000 and joined Mönch Publishing Group 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, successfully launched in 2008.



*See you at MS&D 2022,
8 to 9 September 2022.*

