MARITIME

SEA TRADE • SECURITY • ENVIRONMENT

2021



Global Maritime Britain?

Bristol Port Company

MARITIME 2021

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Published October 2021 by
the Maritime Foundation
Charity No. 286784
HQS *Wellington*, Temple Stairs,
Victoria Embankment,
London WC2R 2PN
www.maritimefoundation.uk

Managing editor: Anthony Harvey
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Andrew Linington
Copy editor: Caroline Petherick
Designer: Louis Mackay /
www.louismackaydesign.co.uk
Advertising: SDB Marketing
Printed by Pensord Group, Wales

Front cover photo of cars awaiting export at Avonmouth, by courtesy of the Bristol Port Company.
Back cover photo of the O2 tidal stream turbines, by courtesy of Orbital Marine.

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Independence brings fresh opportunity as Maritime Britain goes Global

Richard Clayton, the Maritime Foundation

The United Kingdom left the European Union on 31 January 2021, bringing 47 years of membership to an end. Brexit opened the way for an independent trade policy for the first time since 1973. But this is not the first time the UK has sought a global role with maritime at its heart: there have been various iterations of this theme over several centuries.

The question now is, how will Global Maritime Britain develop in the modern era? What lessons can be taken from the past into the future, and how well equipped is the UK to fight its independent corner on the world stage? Crucially, what support does Britain's maritime sector require from national government and, conversely, what backing can the maritime sector offer a government striving to build new bridges and forge new trade alliances?

The UK has entered a very different trading environment. When negotiating a trade deal alongside 27 partners, compromises inevitably had to be made. No longer. This should offer real advantage when negotiating with Japan, Australia, New Zealand, Canada, India, and Mexico. In fact, deals are currently in fledgling form with 69 countries, aggregating about £744 billion.

Looking further ahead, with the centre of economic and demographic gravity likely to tilt even further towards Asia, it makes sense for the UK government to focus more attention there. Negotiations are under way to link with the Comprehensive and Progressive Agreement for Transpacific Partnership, which includes Singapore and Vietnam.

The UK did not lose its appetite for export trade even when its biggest market was on the doorstep. According to the Department for International Trade (DIT), the UK ranks sixth in the world for exports, which account for 6.5 million jobs. However, only one in ten companies exports overseas. DIT would like that to be closer to one company in three.



The biomass terminal in the port of Liverpool, one of several ports selected to act as freeports and regional hubs.

However, it's one thing to negotiate the bare bones of a trade agreement, it's quite another to reach consensus on the fine detail. Prospective partners often erect barriers to protect their own businesses, and these can be hard to break down. Indeed, the UK's preference for trade liberalisation often meets stiff resistance.

Fresh impetus was provided this year in an announcement from HM government of eight new freeports to act as regional hubs for global trade and investment, promote regional regeneration and job creation, and be 'hotbeds of innovation.' These include the ports of Felixstowe/Harwich, Humber region, Liverpool City region, Plymouth, the Solent, the Thames, and Teesside.

The Maritime Foundation has a simple aim: to promote awareness of the UK's dependence on the sea and seafarers. As this edition of Maritime magazine shows, there's a great deal of business to be done by British shipping, indeed most of it will be done on the world stage. So, understanding trade policy is vital to investment.

The Integrated Review of Security,

The UK ranks sixth in the world for exports, which account for 6.5 million jobs



Orbital Marine's SR2000 floating tidal turbine after launch in Dundee.

Defence, Development and Foreign Policy, which was unveiled by HM government in April this year, reveals the depth and breadth of the UK's maritime capability. It focuses on marine environment protection and sustainable exploitation of marine resources, and stresses the importance of, among others, the fishing sector and environmental NGOs in securing a sustainable ocean. The review also identifies the role to be played by the Royal Navy in proactively defending progressive values around the globe as being key to the UK's security and prosperity.

Meanwhile, shorter-term developments have been keeping maritime leaders awake at night. Speaking on behalf of the fishers, Jim Portus of the South Western Fish Producers' Organisation, calls in this magazine for a government willing to tackle head-on the thorny issue of abuse of the British flag by quota-hoppers 'and ensure that British fish is caught by British fishermen on vessels proudly flying the Red Ensign.' Elsewhere, Prof Basil Germond of Lancaster University writes: 'Global Britain can only succeed if enough resources are devoted to its maritime dimension, from the Royal Navy to civilian seapower assets.'

'Global Britain can only succeed if enough resources are devoted to its maritime dimension'

In November, the UK hosts the COP26 climate change conference in Glasgow. Among the many events taking place on the sidelines of the main conference is the International Chamber of Shipping's 'Shaping the future of shipping' discussion. This aims to seek the high-level political support needed to ensure progress of shipping's decarbonisation activities. Maritime magazine contributes to this discussion with an exploration of some of the opportunities presented by British and British-linked businesses in hydrogen, tidal energy, and wind energy.

Cadets at Warsash Maritime School.



Greening shipping – the UK firm Anemoi's Flettner rotors helping to propel the Ultramax bulk carrier *Afros*.



Human and climatic sustainability

But we mustn't overlook the human element, at sea and onshore. Recruitment, training, and career development for a changing maritime world has risen up the agenda. Developing clean energy will require physicists, chemists, biologists, data analysts, and systems engineers, as well as mariners. Global Maritime Britain will inevitably borrow skills and capabilities from across the sectors, from fishing and yachting to coastal security, safety, and environmental protection.

None of the issues touched on here are unique. Wind propulsion is not new, rivalry has been a feature of fishing for centuries, geopolitical challenge was an inevitable consequence of having an empire. Britain's maritime heritage teaches that this sector is dynamic. It calls for resolutions to immediate problems and convinces us that tomorrow's concerns will need fresh solutions.

Climate change, however, is of an altogether different dimension. Maritime is part of the problem and it is part of the solution, just as it is a solution to tackling geopolitical challenges, to protecting the ocean, safeguarding workers, and achieving a more sustainable world. If it is to be successful, Global Maritime Britain will leverage the sea and seafaring to keep the lights on around the world, to keep people fed, to keep them safe, and to generate prosperity in a way that respects the oceans and natural habitats. ■

Harnessing the power of our ocean

Chris Tuckett, Director of Programmes at the Marine Conservation Society, urges the government to rewild the UK's waters

It has never been more critical for the UK to deliver an ambitious strategy to tackle the climate crisis. With Glasgow hosting COP26 in November, the time is now for UK governments to heed environmentalists' advice and look to nature for solutions to the climate crisis.

The Marine Conservation Society's recent report, *Blue carbon: Ocean-based solutions to fight the climate crisis,* published in partnership with Rewilding Britain, explores the merits of ocean-based solutions to the climate crisis. The report outlines how vital 'blue carbon' solutions are an effective strategy for hitting net zero by 2050.

Marine ecosystems like seagrass meadows, saltmarshes and mangroves are blue carbon habitats. This means that they can capture and store carbon from the atmosphere just like plants and trees on land. Blue carbon can be stored: in marine plants like seaweed and seagrass; in seafloor sediment where plants are rooted; and in the animals who live in the water, including seabirds, fish and larger mammals, such as whales.

Alongside their blue carbon powers, these marine habitats also provide numerous other benefits to people and planet. When healthy, they generate oxygen, help protect coastal communities from rising sea levels and remove pollutants from the water. They act as nursery grounds for commercial fish and shellfish species, and as wildlife havens.

As we face interlinked climate, health and ecological emergencies, we must consider the numerous and varied benefits that the ocean and its habitats can provide.

In 2020, as part of the UK's commitment to the Paris Climate Agreement and to keeping global temperature rises to below 1.5°C, the UK government laid out its plans to cut carbon emissions: a reduction of 68 per cent compared with 1990 levels over the next decade, and to meet net zero greenhouse gas emissions by 2050.



Thongweed, which grows up to 2 metres, is common around British coasts, except in the south east.

We cannot achieve these targets without considering nature-based solutions – and, crucially, ocean-based solutions.

The potential of blue carbon

Reducing net carbon emissions by increasing the quantity of carbon dioxide taken out of the atmosphere and stored in long-term natural solutions like marine ecosystems can also serve to protect these ecosystems and help them recover. Research on the scale of the potential of blue carbon has revealed the following:

- Globally, saltmarshes and seagrass – blue carbon sinks – draw down and store between them 235–450 million tonnes of carbon a year; almost half the emissions from the entire global transport sector.
- Scientists estimate that saltmarsh and seagrass habitats fix carbon at two to four times the rate of mature tropical forests. **This means the UK's saltmarshes and seagrass beds have the carbon storage potential of between 1,000 and 2,000 km² of tropical forests.**

Seagrass meadows, saltmarshes and mangroves are blue carbon habitats



Carrageen, a reddish seaweed used commercially in the food industry.

Rewilding seeks to reinstate natural processes and, where appropriate, missing species

- The UK's shelf seas cover some 500,000 km2 and are estimated to store 205 million tonnes of carbon in seabed sediments – approximately 50 million tonnes more than held within our entire stock of standing forests – along with coastal seagrass and saltmarsh habitats, UK marine ecosystems store about 220 million tonnes of carbon.

The significant role of the world's forests in reducing carbon emissions has been formally recognised through numerous initiatives and reforesting projects intended to keep carbon locked into the world's forests on land. Unfortunately, the equivalent solutions in the ocean are often overlooked. If the UK is to reach its goal of net zero by 2050, blue carbon solutions must be considered in tandem with those on land. That's why, at the Marine Conservation Society, we're calling on UK governments to **#RewildOurWaters**.

What marine rewilding means

Rewilding Britain defines the concept of rewilding as: 'The large-scale restoration of ecosystems to the point where nature is allowed to take care of itself. Rewilding seeks to reinstate natural processes and, where appropriate, missing species – allowing them to shape the land and sea and the habitats within.



Whales, as well as fish, seabirds and marine vegetation, help to store blue carbon.

'Rewilding encourages a balance between people and the rest of nature so that we thrive together. It can provide opportunities for communities to diversify and create nature-based economies; for living systems to provide the ecological functions on which we all depend; and for people to reconnect with wild nature.'

Marine rewilding is the same idea applied to a marine environment. This could mean ceasing all harmful activity in badly affected areas – including the damaging commercial bottom trawling, aggregate extraction, dredging or oil or gas exploitation – and allowing the ecosystem to recover. In others, it may mean giving recovery a helping hand through active restoration: reseeding an area with seagrass or returning lost species such as oysters.

Over the next decade harmful fishing practices such as bottom trawling and other activities such as dredging disturb seabed sediments and have the potential to result in the loss of 13 million tonnes of carbon from vital blue carbon stores, including shellfish beds and kelp forests. Action must be taken to protect and recover these vital habitats.

The Marine Conservation Society has made a start by being involved in numerous restoration projects across the UK, including European oyster restoration in the Dornoch Firth, replanting and protecting seagrass meadows on the south coast of England, and protecting kelp forests off the Sussex coast, working with the local community to introduce byelaws.

Globally, the rewilding of key blue carbon securing marine and coastal ecosystems such as seagrass beds, saltmarshes and mangroves could deliver carbon dioxide mitigation amounting to 1.83 billion tonnes. This figure doesn't include the enormous quantities of carbon stored in fish and other marine life; in marine ecosystems such as coral reefs, seaweeds and shellfish beds; or the vast stores of carbon in our seabed sediments.


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Saltmarshes are coastal wetlands that are periodically flooded and drained by the tides from the sea. They're populated by plants and animals uniquely adapted to living there. They can play a pivotal role in fighting climate change, as they are remarkably efficient at locking away carbon.

Investment in protecting our marine ecosystems is vital for both biodiversity and blue carbon storage.

Nature-based solutions could provide a third of climate change mitigations required to address the climate crisis, but currently they attract less than 3 per cent of funds invested globally in addressing climate change.

Internationally, the UK is leading the way by committing to significantly increase its spending on nature-based solutions, including those offered by the ocean. This must be matched with equally ambitious actions at home.

Action areas

The report makes the case for the development of a four-nation Blue Carbon Strategy, focusing on three key action areas:

1. Scaling up marine rewilding for biodiversity and blue carbon benefits

- By 2030, extractive activities such as damaging fishing methods, and other impacts should be minimised in at least 30 per cent of UK seas. No extractive or destructive activity should be allowed in 10 per cent of our seas. In addition, designating zones around the UK coastline which are free from bottom-towed fishing gear would also give blue carbon habitats a chance to recover and thrive.
- Alongside protection, we want to see investment in restoration projects including seagrass, saltmarsh, oyster reefs and kelp forests.

2. Integrating blue carbon protection and recovery into climate mitigation and environmental management policies

- As part of a Blue Carbon Strategy, UK governments should commit to specific and ambitious blue carbon habitat recovery, restoration and protection targets within the UK's next Nationally Determined Contribution to the Paris Climate Agreement. The UK must fully account for blue carbon in future carbon budgeting.
- A comprehensive Ocean Charter should be developed which integrates nature recovery plans with climate change mitigation and adaptation policies, including those for blue carbon.

3. Working with the private sector to develop and support sustainable and innovative low-carbon commercial fisheries and aquaculture

- UK governments and the fisheries industry should commit to fully sustainable management of UK commercial fish and shellfish stocks, applying an ecosystem-based approach and halving fisheries-related carbon emissions by 2030 to deliver climate and nature-positive fishing.
- There should be investment in development of innovative low-carbon aquaculture technologies and best practice, including processing and feed production, to halve UK aquaculture carbon emissions by 2030.
- UK governments and business should support and invest in the development of UK markets for sustainable, low-carbon wild caught fish and innovative aquaculture products, with a roadmap for delivery produced by 2022/23.

By recognising and harnessing the power of our seas to fight the climate crisis, UK governments will be able to make huge strides towards achieving net-zero by 2050. At the Marine Conservation Society, we're pushing for policy changes and working with industry to encourage innovation. Only through greater investment, modernisation and recognition of our ocean's capabilities will humanity be able to tackle the climate crisis effectively. ■

UK governments should commit to specific and ambitious blue carbon habitat recovery, restoration and protection targets

Global Britain and seapower

Basil Germond *surveys the message promulgated worldwide by the government's* Integrated Review of Security, Defence, Development and Foreign Policy

The *'Integrated Review'.*



The Royal Navy is a national symbol. In collective imaginaries, the Navy has been represented as a cornerstone of British power in the world, and it has traditionally benefited from the support of public opinion, even though the connection between national identity and the Royal Navy is not as strong as it once was. The dissolution of the Mediterranean Fleet in the late 1960s, the decisions in 1981 to primarily assign the Royal Navy with an anti-submarine warfare role within NATO, and the post-Cold War budgetary cuts are but three examples that illustrate the recent erosion of British global naval power as well as political decision makers' sea blindness.

Against this backdrop, in April 2021, the government published its vision: *Global Britain in a Competitive Age: The Integrated Review of Security, Defence, Development and Foreign Policy*, which stressed that proactively defending progressive values around the globe is key to the UK's security and prosperity. The concept of Global Britain hints that the Royal Navy is going to be increasingly solicited as an instrument of Britain's hard and soft power, which means, according to the MoD's 2021 *Defence in a Competitive Age*:

> safeguarding our homeland, Overseas Territories and Crown Dependencies, protecting the maritime environment, including our fisheries, projecting global influence, boosting UK trade and prosperity, and upholding our values and International law.

Soft power, prestige and diplomacy are as important as hard and military power, if not more so

The current deployment of Carrier Strike Group (CSG) 21, led by Britain's new flagship, HMS *Queen Elizabeth*, to the Indo-Pacific region illustrates very well the new maritime orientation of Global Britain. The UK is proactively assuming its global responsibilities, and naval power is both a symbol and an operationalisation of the government's vision, which puts the sea at the forefront of British defence, security and foreign policy.

Global Britain and seapower

Global Britain infers that the security and prosperity of the UK depends on its active and sustained engagement in world affairs. Two underlying principles guide this vision: first, it is intended that the UK will openly and proactively promote and defend progressive, liberal values across the globe and oppose reactionary forces. Secondly, in a multipolar world order, rather than relying on unilateralism, Global Britain rests on an effective cooperation with like-minded states, while the UK will demonstrate leadership whenever possible. The success of Global Britain depends on the successful representation, hence the perception, of the UK as a force for good. Thus, soft power, prestige and diplomacy are as important as hard and military power, if not more so.

The Royal Navy is key to the successful operationalisation of Global Britain via the exercise of traditional naval power: projection, global reach, forward presence, commitment to NATO and other allies and partners, participation in multilateral maritime security operations, and securing sea lanes of communications vital to Britain's trade and energy security. But the Navy is also crucial as an enabler of soft power: this includes demonstrating interoperability with allies, reassuring partners and asserting the freedom of the seas. In other words, the Royal Navy is instrumental in demonstrating that the UK is ready to lead by example and to defend progressive values around the globe. For example, confidence-building measures and symbolic actions are instrumental in


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CSG21 ships, carrier HMS *Queen Elizabeth* together with RFA *Fort Victoria* and USS *The Sullivans* pass through the Suez Canal on 6 July 2021 en route to deployment in the Indian Ocean and the Pacific.

cementing a positive image of Britain as a liberal maritime nation. This was recently demonstrated by the HMS *Defender* incident in the waters off Crimea, which illustrates Britain's willingness to defend the freedom of the seas as well as to reassure Ukraine as a partner. Similarly, between June and December 2021 CSG21 is participating in operations and exercises with various allies and partners, including France, the US, India, Japan and Australia.

In fact, beyond the return of the Royal Navy to the forefront of British defence and foreign policy, Global Britain demonstrates that sea blindness is losing ground, creating expectations and opportunities for the resurgence of British seapower. Seapower, popularised by the writings of US Navy Captain Alfred Thayer Mahan at the end of the nineteenth century, goes beyond naval power since it rests on the economic use of the sea at least as much as on the military use of it, and it is relevant in peace as well as in war. Maritime trade generates the nation's wealth, and the navy protects the nation's interests at and from the sea. A successful seapower politics relies on the maritime awareness of decision makers as well as citizens and economic agents. Indeed, seapower has a civilian dimension; the prosperity of the UK depends on the achievements and commitment of civilian maritime stakeholders across sectors, including shipping companies, the shipbuilding industry, commercial ports and marine insurances. These actors have economic objectives and are mainly profit-driven, but the *Integrated Review* stresses that marine environment protection and a sustainable exploitation of marine resources is key to a healthy and 'resilient ocean' that will in turn contribute to the UK's prosperity. Thus, engagement with the fishing sector and environmental NGOs is also crucial to the achievement of the goal of a sustainable ocean.

The collective dimension

Many of today's challenges are global and can only be dealt with multilaterally, especially in the maritime domain where actors and issues are interconnected, e.g. marine environmental protection (which includes dealing with illegal fishing), maritime security (which includes counter-piracy and counter-terrorism), addressing the current migration crisis in the Mediterranean, and opposing geopolitical competitors. Allies must be reassured and partners secured, which calls for a practice of global presence as well as targeted support and engagement. Seapower is not a zero-sum game and there is a collective dimension to it; by cooperating with like-minded states the UK will be in a position to achieve the objectives set up in the Integrated Review.

(Below) Type 45 destroyer HMS *Defender* at Batumi, Georgia, after taking part in a well-publicised 'freedom of navigation' exercise in disputed waters off the Crimea in July 2021, following a visit to Odessa for the signing of a Anglo-Ukrainian naval co-operation agreement. The incident prompted Russian complaints and claims, denied by Britain, that Russian forces had fired warning shots and dropped bombs near the destroyer. (Bottom) *Defender's* Bridge Team dressed in anti-flash gear during this incident.


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Billboard on the Chinese coast facing Taiwan-administered islands: 'Peacefully reunify: one country, two systems' – slogans that for many years promised Taiwan a degree of economic autonomy in return for accepting incorporation into the People's Republic of China. Both slogans have worn thin in recent years. The risk that the PRC may use military force to regain Taiwan is widely considered to be rising, together with the risk that US and allied naval forces could become involved in the resulting conflict.



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The Type 23 frigate HMS *Lancaster* returning to Portsmouth from NATO exercises in the Baltic. Some commentators have been concerned that the share of resources taken by the Carrier Strike Group in the Indo-Pacific region has left too little to support lower-level and more local needs of the Royal Navy – a 'frigate gap'.

The challenges of seapower politics

The success of Global Britain will depend on the extent to which seapower will be nurtured and enacted. The main challenge consists in dedicating enough financial and material resources to sustain the vision elaborated in the *Integrated Review*. Navies are resource-intensive, and decision makers have to prioritise missions and/or platforms due to budgetary constraints. In summer 2021 commentators claimed that the Royal Navy was facing a 'frigate gap', stressing the potential lack of capabilities to fulfil the lower spectrum of missions assigned to the Navy in the short- to medium-term future as a result of the prioritisation of the CSG. Cyber-resilience is another challenge. Indeed, major UK competitors (challenging the preponderance of maritime nations) are likely to favour the use of asymmetrical warfare, especially in space and cyberspace.

Geopolitical challenges should not be underestimated, either. As demonstrated by the HMS *Defender* incident, we can expect a growing opposition by the UK's named competitors, Russia and China. Their behaviour indicates that they tend to conceptualise the world as a zero-sum game, and they strongly defend and assert their rights over resources and certain marine areas. Britain's championing of the freedom of the seas is clearly seen by them as an infringement of their sovereignty and is likely to be opposed. This is why the collective dimension of seapower is essential; Global Britain is a project that will succeed as part of the collective effort of all liberal maritime nations, as illustrated by the AUKUS partnership between Australia, the UK and the US. Seapower has been central to Britain's rise to power since the Elizabethan era, and Global Britain will frame the UK's ambitions in a way that highlights the UK's maritime leadership in a constructive way: flying the flag of liberal values, building a community of like-minded states, and engaging with maritime communities at large, with the aim of securing the prosperity of the UK and its allies, its partners and beyond.

We can expect a growing opposition by the UK's named competitors, Russia and China

Towards a Global Maritime Britain

Global Britain is a starting point for the resurgence of a positive British seapower politics. Over the past half-century, never has decision makers' awareness of the importance of the sea for the UK's prosperity and security been as high as it is today. Last year, in this very magazine, Chris Parry wished for the government 'to make a conscious decision to turn to the sea as a means of economic growth and political influence'. In 2021 the *Integrated Review* brings us a step closer to Global Maritime Britain.

However, resources are scarce, and competition for them is intense. Global Britain can only succeed if enough resources are devoted to its maritime dimension, from the Royal Navy to civilian seapower assets. Eventually, collective seapower is key to sharing the financial and operational burden of Britain's objectives at and from the sea. ■

Dr Basil Germond *SFHEA FRGS is Director of Research Training for the Faculty of Arts and Social Sciences at Lancaster University.*

The Royal Navy in a competitive age

James Rogers *examines the role of a stronger Royal Navy in relation to hostile states and systemic competitors*

If the geopolitics of the 20th century was primarily continental and European, the geopolitics of the 21st century appears to be increasingly maritime and global. The rise of Germany and Russia (later the Soviet Union) forced the United Kingdom to concentrate its naval and military resources on Europe, the focus of three major conflicts. The first two were waged to subdue a Germany that was geopolitically 'revisionist' – seeking a fundamental change in the world order. The third was pursued to contain the Soviet Union by means of a 'continental commitment' to Europe manifested through a treaty-based alliance: NATO.

Despite the continuing threat to British interests from Russia's authoritarian kleptocracy, the Kremlin's power base is far weaker than that of the Soviet empire. Likewise, the democratic reconstruction of Germany has been so successful that the UK now urges Berlin to spend more on defence, not less. And although Britain has played a vital role in NATO's Enhanced Forward Presence, with more troops deployed to more NATO allies than any other ally, it is still a relatively small commitment – just 1,200 British troops in total, compared to the 55,000 in West Germany at the height of the Cold War.

Today, with the rise of the Indo-Pacific region, the geopolitical environment is increasingly maritime. What is more, the strategic centre of gravity is now further away from Britain than it was in the past. The emergence of the People's Republic of China (PRC) as a great regional power with revisionist intent has forced the United States, unchallenged for two decades after the Cold War, as well as Japan, Australia, France and many other countries, to review their geostrategic postures. Insofar as the Chinese Communist Party (CCP) aims to revise many of the rules that gained broad international acceptance following the Cold War, the very foundations of the open international order are coming under threat.



The Chinese frigate *Hengshui*. China's navy has approximately 500 ships in its active fleet, including 49 frigates.

China's rapid industrialisation has given it considerable geoeconomic heft and geopolitical leverage. It is now the world's largest producer of such products as steel, cars and computer parts which it is prepared to use strategically to secure its interests. The PRC is also engaged in a sweeping modernisation of the People's Liberation Army, including its naval arm. Although the Chinese navy still trails behind the US Navy, the Japanese Maritime Self-Defence Force and the Royal Navy in technological sophistication and projectability, more warships have been added to the Chinese fleet in recent years than have been added to the fleets of the US, UK and Japan.

If the task for British strategists in the 20th century was to marshal British power to deal with the rise of Germany and the Soviet Union in Central and Eastern Europe, their task today is to deter the Kremlin from destabilising Eastern Europe while helping Indo-Pacific allies and partners uphold a regional order that is open and free. In some ways, this new agenda makes British strategy more complex; in others, it plays to the UK's strengths as a maritime power.

With the rise of the Indo-Pacific region, the geopolitical environment is increasingly maritime

Arise, 'Global Britain'

The British government plans to meet the challenge of growing geopolitical competition



Vladimir Putin signing the treaty on the 'adoption' of the Crimea and the 'Federal City' of Sevastopol to Russia on 18 March 2014 – an illegal annexation of Ukrainian territory and territorial waters in the eyes of Britain, NATO, the EU and the United Nations.



Two Russian missile corvettes of the Black Sea Fleet off Sevastopol – the Fleet's base ever since 1783, leased by Russia from the Ukraine between 1997 and 2014, now illegally annexed.

through Global Britain. Although there was much squabbling over the meaning of this term when it emerged in the aftermath of the EU membership referendum in 2016, the concept of Global Britain has been gradually fleshed out, and it has taken on an official form with the completion of the 'Integrated Review'. This review, undertaken throughout 2020 and published in March 2021, comprises two documents: firstly, *Global Britain in a Competitive Age*, which identifies how the UK should respond to the threats and opportunities of the mid-21st century; secondly, *Defence in a Competitive Age*, which establishes how the British armed forces should shape the evolving strategic landscape.

The Integrated Review identifies 'hostile states' (Russia) and 'systemic competitors' (the PRC) as the greatest challenge facing the UK. It is particularly concerned by the attempts of these two powers to close off or claim special legal rights over specific maritime spaces, such as parts of the Black Sea and the South China Sea. The United Nations Convention on the Law of the Sea (UNCLOS), which governs international maritime law, has come under direct threat. Without freedom of navigation, an open international order could not exist in any meaningful form. For an archipelagic country such as the UK, whose prosperity depends on free trade and navigation, this is a particularly concerning development. In the Integrated Review's words: 'Much of the UK's trade with Asia depends on shipping that goes through a range of Indo-Pacific choke points. Preserving freedom of navigation is therefore essential to the UK's national interests.'

The UK's ambition to play a more significant role in collective security is at the heart of the Integrated Review. Without solid alliances and partnerships, Britain cannot project power effectively because it lacks the mass to back up its punch. Therefore, Global Britain intends to underpin its existing alliances and security groupings, such as NATO and the Five Power Defence Arrangements (FPDA), while also, importantly, developing new ones, such as 'AUKUS'. This new pact involving Australia, the UK and the United States is designed to provide the Royal Australian Navy with nuclear-propulsion technology, as well as long-throw cruise missiles for the next generation of its attack submarines.

In this sense, Global Britain is about more than merely responding to Brexit or embracing a global perspective; it is also designed to stitch the UK into alliances and partnerships in geostrategically important regions. By empowering groups of free and open countries, the UK aims to ensure a more favourable balance of power, both in the Euro-Atlantic and the Indo-Pacific, which will help keep the international order open.

The Taiwan Strait, seen from space – a potential trouble spot.





The River class patrol vessels HMS *Spey* and HMS *Tamar* leaving Portsmouth for a 5-year deployment in Southeast Asia.

The Royal Navy: extending Global Britain

Although the Royal Navy had always been considered the 'Senior Service', the counter-terrorism and counter-insurgency operations in Afghanistan and Iraq during the 2000s and 2010s focused military resources on the British Army and Royal Air Force. However, the Integrated Review's focus on geopolitical competition and upholding freedom of navigation has put the Royal Navy back in the driving seat.

Countering the geopolitical intrigues of revisionist powers such as the PRC and Russia – and even regional rogues like Iran – requires a more strategic set of instruments, for which the Royal Navy fits the bill. The British fleet will grow in size in the 2020s and 2030s as new generations of frigates are built, taking the size of the escort fleet from 19 to 24 vessels. New generations of submarines and destroyers will also be developed.

These new vessels are required because a Global Britain has to do more than merely empower allies and partners with advanced technology. Given the areas of contention, the Integrated Review foresees more persistent engagement in the Euro-Atlantic and the Indo-Pacific for the UK. 'Active' or 'forward' deterrence is therefore central to the Integrated Review.

The British government has already provided a taste of things to come. In April, the Royal Navy's Carrier Strike Group – led by HMS *Queen Elizabeth* – began its maiden deployment to the Indo-Pacific region to demonstrate the geostrategic reach of Global Britain, develop interoperability with Indo-Pacific allies and partners, and uphold freedom of navigation. Indeed, as the group passed through the Mediterranean in June, HMS *Defender* broke away to challenge Russia's illegitimate claim to Ukraine's territorial waters around Crimea. Meanwhile, in late September, HMS *Richmond* separated from the group and steamed through the Taiwan Strait. The same month, the Ministry of Defence also announced that two River class patrol vessels – HMS *Spey* and HMS *Tamar* – would be sent to Southeast Asia on a five-year mission to uphold freedom of navigation and deter aggression.

Conclusion

If the British government seeks to influence international affairs – even European affairs – during a new age of geopolitical competition, the UK's insular nature means that it must be able to extend its power over long distances. Therefore, it is of no surprise that the Royal Navy has done relatively well out of the Integrated Review. It has suffered few capability cuts and looks set to grow in terms of both displacement tonnage and surface combatants. A rising defence budget underpins this ambition, which the British government – through the personal intervention of the prime minister – approved in late November 2020. Even greater resources may eventually be required, but this £24.1 billion hike over the next four years should provide the Royal Navy with the means to begin realising the Integrated Review's ambition – that of a Global Britain, stitched into the fabric of an open international order, and ready to deter threats from geopolitical revisionists. ■

***James Rogers** is Co-founder and Director of Research at the Council on Geostrategy, a think tank founded in March 2021 to help make the United Kingdom, as well as other free and open countries, more united, stronger and greener.*

Global Britain has to do more than merely empower allies and partners with advanced technology

Optimism on Merseyside

***Simon Eardley** of Mersey Maritime, sets out the regional cluster organisation's strategy for the Liverpool City Region and the Greater North West*

With a long track record of driving job creation, business growth and strong representation for the maritime industry since its founding in 2003, Mersey Maritime is looking forward with optimism to its ongoing work in the Liverpool City Region. The importance of regional clusters and the organisations that run them has never been more central to the future of the local, regional and national economy than now as we emerge from the challenge of the Covid-19 pandemic and look towards the opportunities that a post-Brexit environment presents. That's the verdict of Chris Shirling-Rooke, CEO of Mersey Maritime, the organisation responsible for representing the maritime sector across the region – a sector worth £4.2 billion, which employs 52,000 people and benefits the wider economy by £2.64 for every £1 generated within it.


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Liverpool's waterfront and the River Mersey.

Each project has jobs, growth, innovation and business opportunity at its core

There's an appetite and recognition from government and from industry that regional bodies like Mersey Maritime, with their ear to the ground amongst businesses and organisations within the sector, have a vital role to play in driving forward future opportunities as we respond to the big and systemic challenges of our time: from the drive towards decarbonisation to pushing forward international trade opportunities right across the globe. And it's no surprise that Mersey Maritime is now responsible for delivering key projects both within its own region and on a national scale as the Department for Transport and other government bodies look towards the cluster organisation to deliver agreed strategies and sector priorities.

Coastal communities, and the strength of their regional economy, are often heavily bound up with the maritime sector, not least because it offers good quality jobs, skills and career opportunities for people looking to get involved in a range of diverse subsectors. Mersey Maritime sits at the heart of this work in the Liverpool City Region with a driving ambition to be a catalyst for growth, have a direct impact on policy, and help drive change for the good of the sector. It has come a long way in the last 20 years and has worked hard to build a genuine ecosystem which champions and supports one of the most diverse regions in the United Kingdom. The business was created as a not-for-profit organisation, and it now has over 200 active members which span the 33 sub-sectors of maritime and its related supply chain, including ports, shipping, offshore energy, engineering, professional services, logistics, manufacturing and academia.


Niels Johannes CC-BY-SA 4.0

Bulk carriers in Liverpool's Gladstone Dock.

Maritime 2050

Central to the work of Mersey Maritime is its support for the delivery of the key strategic document Maritime 2050, into which it had direct input. Maritime 2050, launched in 2019, is the first long-term strategy for the sector and was developed in close partnership with industry to highlight the government's recognition of the importance of maritime to Britain's future success. The report comprises seven key themes – Environment, Infrastructure, People, Security, Technology,



Wirral Waters, the Birkenhead site of the projected Maritime Knowledge Hub.

Snowdrop, the Mersey ferry, in dazzle paint.



Trade and Competitive Advantage – and firmly sets out a vision for an industry responsible for facilitating 95 per cent of the UK's trade and worth overall some £46 billion to the economy.

The essential nature of its work has been very apparent during the Covid-19 pandemic, with Mersey Maritime businesses playing a critical role in keeping the country fed, fuelled and supplied – and this despite the wider challenge of the UK's departure from the European Union, which was also rumbling on for much of 2020. Organisations such as Mersey Maritime have a crucial role to play in translating a specific regional context to a national level and helping to make sure that policy drivers fully understand the needs of individual companies within an area.

As the lead partner for the delivery of the Regional Growth element of Maritime 2050, supporting the rollout of similar regional cluster organisations right around the coastline of the UK, Mersey Maritime is recognised as the best in class both by the UK government and further afield, including the European Commission's DG MARE. The third iteration of Mersey Maritime's Maritime Exchange Conference, delivered in late June both in person and remote, saw major thought leaders, national politicians (including the Maritime Minister, Robert Courts MP) and industry specialists come together to review progress and plan the next stage of delivery. Mersey Maritime is fully committed to being at the forefront of the future delivery of many aspects of the strategy. The future truly is optimistic for the sector across the whole country.

More recent regional developments and activity have further underlined the core principles of the organisation and its priorities, from support for the successful Liverpool City Region Freeport bid to the ongoing prioritisation of the £23 million Maritime Knowledge Hub project and embarking on the next round of its bi-annual economic impact study in conjunction with the Centre for Economics and Business Research (Cebr). Each project has jobs, growth, innovation and business opportunity at its core. Take the Freeport bid, which Mersey Maritime put its full weight behind from an early stage in helping draw together key industry partners and identify a realistic plan to deliver what has the potential to be transformative.



The Cammell Laird shipyard in Birkenhead: with RFA *Fort Victoria* in for servicing.

Freeports

Freeports are designated zones where normal tax and customs rules do not apply. These can be airports or other hubs as well as maritime ports. At a freeport, imports can enter with simplified customs documentation and without paying tariffs. We know that Liverpool is already regarded as the UK's principal west coast and Atlantic-facing port area, and with the prospects of a UK–US international trade deal firmly on the agenda, the Freeport status confirmed by the Chancellor of the Exchequer in his March Budget has the potential to unleash a major economic shot in the arm for the region. Early projections suggest that the status could see the creation of some 14,000 jobs and provide an £850 million economic boost.

Freeport status has the potential to unleash a major economic shot in the arm for the region



The container ship *Atlantic Sail* entering Liverpool docks.



Visualisation of the projected Maritime Knowledge Hub, centred on the renovated Victorian hydraulic tower. The tower was originally modelled on the Palazzo Vecchio in Florence.

To achieve net zero by 2050, the sector simply must be radically changed

Mersey Maritime was one of the key industry bodies at the heart of drawing together the bid. It will see the Liverpool City Region Freeport covering multiple locations stretching as far as Port Salford at the other end of the Manchester Ship Canal, taking in the Port of Liverpool, Wirral Waters, Liverpool John Lennon Airport, plus logistics sites in Knowsley, Sefton, St Helens and West Lancs, and the Stobart rail freight terminal in Halton. There was no question that a cluster organisation like Mersey Maritime wouldn't be a key player in this work, and it was proud to be so.

The Maritime Knowledge Hub

Underlining the Mersey Maritime commitment to accelerating jobs and growth in the region has been its driving ambition to deliver the planned Maritime Knowledge Hub Project at Wirral Waters within Birkenhead docks. This major regeneration project, delivered in partnership with Peel Land & Property and key regional/local government stakeholders, will see the transformation of an iconic but derelict nineteenth-century hydraulic tower into a centre of maritime excellence and innovation of national significance. With the drive towards decarbonisation, digitisation and the need for highly qualified jobs and future maritime skills of crucial importance in the years ahead, Mersey Maritime has been pushing this transformative vision at the highest levels of government for a number of years. At its heart will be a drive to support and encourage SMEs to engage with innovation as we collectively address the key grand challenges faced as the economy transitions to a low-carbon, net-zero future. The challenge is very acute within maritime, the reality being that to achieve net zero by 2050 the sector simply must be radically changed. In 2018 alone, the UK's domestic shipping produced more greenhouse gas emissions than its rail and buses combined, putting into stark relief the scale of the difficulty to be overcome – but also the ambition that might sit behind innovative solutions to deliver decarbonisation. Mersey Maritime's vision is that the Maritime Knowledge Hub will be the vehicle that does just that, by bringing the brightest and best together to lead the way.



The cruise ship *Virtuosa* eclipsing the Liver Building.



Three Smit tugs passing through Liverpool docks.

Much of the work of Mersey Maritime is strongly focused on the delivery of its key strategic projects and priorities, as outlined in this article. But at its heart are the members that make the organisation what it is. Driven by the motto 'Stronger Together', this principle sits at the heart of all the activity engaged in. The calendar of events is relentlessly busy, with the London International Shipping Week in September and Mersey Maritime's engagement in key seminars focused on regional growth during the biggest week in the UK maritime calendar. Fittingly, the week will conclude with the seventh Mersey Maritime Industry Awards, #MMIA21. Regarded as the country's largest and leading maritime-focused awards, after a year of unprecedented challenge the theme will be 'Building Back Better', marking a real and tangible celebration of the dynamism, resilience and prospects for the industry in the years ahead. The celebration will show precisely how valuable the work of Mersey Maritime is, putting a major spotlight on the many businesses, individuals, charities and stakeholders who make it what it is. ■

***Simon Eardley** is Mersey Maritime's Partnerships and Policy Co-ordinator.*

A tale of shattered dreams

***Jim Portus** exposes the government's betrayal of the fishing industry*

The UK's fishing industry was almost universally ecstatic about the referendum vote to leave the European Union in June 2016. Meanwhile, United Kingdom Independence Party leader Nigel Farage stated at the time that the way the UK would deal with its fisheries would be the acid test for the whole of Brexit.

The industry was under no illusion that the vote to leave the EU would be the start, not the end, of a process that could take a decade to complete. Many feared that the UK's fisheries would yet again be used as a bargaining chip by the government, with EU access to Britain's waters traded away for a favourable deal on trade, exports, finance or access to EU markets.

The Fisheries Bill, however, included the welcome announcement that once the UK had withdrawn from the European Union we would proceed with plans to take back control of our own waters and set our own quotas for fisheries. This reassurance was reinforced by the announcement that the UK would also be withdrawing from the London Fisheries Convention, the legislation that allows foreign vessels to operate inside the 12-mile zone.

The Fisheries Bill received Royal Assent in November 2020. For the fishing industry, very little changed legalistically between June 2016 and December 2020, when the Brexit Trade and Cooperation Agreement was announced. The UK left the EU on 31 January 2020, and the final transition period ended on 31 December that year.

But 2020 had proved to be a very frustrating year for the fishing industry. The Covid-19 pandemic meant that travel was curtailed from early March, so Zoom and Teams became the norms of communication. David Frost, appointed as the UK's chief negotiator, began formal face-to-face negotiations with EU officials in April. Within



Galatea of Fowey.

weeks, however, the scale and severity of the Covid-19 pandemic became clear, and the planned negotiations could not continue. The talks were therefore placed on hold and the agreement on fisheries was pushed back from July to December, to align with the wider trade deal. Although DEFRA kept the fishing industry updated as Lord Frost negotiated, fears were rife of a sell-out repeating that by Prime Minister Edward Heath in the 1970s.

At last, on Christmas Eve 2020, the fishing



A haul of sprats comes aboard the Brixham trawler *Constant Friend*.

Many feared that the UK's fisheries would yet again be used as a bargaining chip by the government





Sorting catch on *Ocean Spirit*'s shelter deck.

The question is whether or not fishing had become a lasting symbol of political failure

industry saw the details of the withdrawal terms. The industry had been given assurances by the top levels of government – the Prime Minister, senior cabinet ministers and the chief negotiator – that the industry would not be sold out in negotiations with the European Union. But in the event, any trust our industry's members might have had in the government was shattered. UK fishing rights had indeed been sacrificed to secure the trade deal. The UK gained only a very modest increase in quotas for our fishing boats over a five-and-a-half-year adjustment period; the increase was equivalent to around 25 per cent of the value of fish previously caught by the EU fleet from UK waters. In the first year, just 15 per cent would be added.

In the end, our industry was duped.

The question is whether or not fishing, having exhausted its status as the Brexit poster-child, had become an embarrassment for the government – to become a lasting symbol of political failure to secure for the UK what is considered by many to be our finest national asset.

Brixham fishing vessels: (left) trawler *Ocean Spirit* and (below) beam trawler *Barentszee*.



The first eight months of 2021 were as testing as most of 2020, because of Covid-19. As infections increased and restrictions remained, it was a period of uncertainty and volatility for many UK seafood businesses. New requirements to trade with the EU came into effect. Many exporting businesses experienced major disruptions early in the year, with increased transit times and costs still being an issue at the end of March.

Resilience

But by summer 2021 the situation for the catching sector had become much calmer. As hospitality businesses re-opened, the trade in fresh fish products improved markedly with prices rising to levels last seen in 2019. All the saleable fish that was caught went at good prices. However, nothing could replace the income lost throughout 2020 due to Covid-19, and many smaller businesses were on the brink of collapse.

Nobody would have wished for a combination of Covid-19 and Brexit impacting the fishing and processing sectors at the same time, but it happened. The resilience of the industry has been tested and its survival is proof that seafood is a much-valued commodity.



Beam trawler *Albion*, of Dumfries, scallop dredging.



The trawler *Spanish Eyes* of Lyme Regis and (right and below right) her owners and crew, Paul and Luke Wason, at work.



The UK has some of the best fishing grounds in its Exclusive Economic Zone, but sadly far too much is taken away from it by foreign fishing boats. Even so, fish stocks have been steadily recovering and rising in biomass since about 2008, when the last decommissioning took place. There is optimism for the future of the stocks and therefore for the UK fleet prospects post-Brexit.

As the UK is about to enter negotiations for 2022, all of these factors will be in play, along with the mother of all headaches on how to manage non-quota species. The Specialised Committee for Fisheries and associated annual negotiations will be of central importance, but we have yet to see how this novel process will function in practice.

Some doubt that the UK industry will ever get back what was ceded by Edward Heath when he signed the Treaty of Accession to join the European Economic Community (EEC) in January 1972, but access rights probably go back to 1964 and the London Fisheries Convention, so we cannot blame all the wrongs of the Common Fisheries Policy on the EEC / EU. The UK government has had its eyes open all the time, even while it has shrouded the facts from the eyes of the fishing industry.

Fraudulent flagging

Another scandal has always been the abuse of the Red Ensign by foreign-owned fishing companies masquerading as British to reap our fish resources for their reward. There have been attempts, such as the Merchant Shipping Act 1988, to rid the UK Register of flags of convenience and quota-hoppers. But this is the realm of the Department for Transport, which has bigger fish to fry in the form of the commercial shipping register. The Fishing Vessel Register should have different rules of establishment and much stronger economic links to the flag state. Now that the UK is no longer subservient to the rulings of the European Court of Justice, a government is needed that is willing to tackle this thorny issue head on, and ensure that British fish is caught by British fishermen on vessels proudly and legitimately flying the Red Ensign.



In 2016, Nigel Farage happily associated himself with Fishing for Leave, a campaign group that became the public face of the fishing industry when Save Britain's Fish, which had tried to unite the industry to force change, was disbanded. When, a week before the Referendum, I stood on the bridge of the *Atlantic Challenge PD197* with her owner-skipper, John Buchan, in the Pool of London, eating grilled kippers with Mr Farage, none of us had any idea that history would be made.

And no idea how frustrated the industry would feel five years later. ■

***Jim Portus** MBE FIMarEST CMarTech BSc AFNI, spent more than ten years as an officer in the Merchant Navy, then worked for MAFF as a fisheries enforcement officer out of Brixham, ensuring that the local fishermen would abide by the Blue Book. Finally, he moved to the South Western Fish Producers' Organisation, of which he is now CEO. Thanks to **Phil Lockley** for the use of all photographs in this article.*

Tidal stream energy – poised to start full commercial operations

***Rob Stevens** hails the potential of a now-proven, abundant and indigenous source of green energy. All it needs is the kind of government backing Denmark gave to wind power*

The realisation of that power source would fulfil an immediate strategic need

When Britannia ruled the waves, it was geography that played a big part. Today, that same geographical position offers Britain another – and very different – opportunity for a maritime lead: the development of tidal stream energy.

The tidal streams around our coast have the potential to provide a continuous source of green energy to the UK. The realisation of that power source would also fulfil an immediate strategic need to boost our indigenous supply of electricity as we shift away from fossil fuels and nuclear power in the run into Net Zero by 2050.

We are on the cusp of realising that industrial potential. A hitherto unsung group of British companies have developed tidal technology to the brink of full commercial operations and, with the right backing, are poised to take a global lead in this sector.



Colin Keldie

A mooring buoy heels in the strong tidal flow at EMEC's Fall of Warness test site, Orkney.

British tidal turbine companies such as Simec-Atlantis, Orbital Marine Power, Nova Innovation, Sustainable Marine Energy and others have between them invested over £500m in developing operational tidal turbines. This investment, along with government innovation grants, sees them poised to start full commercial production with their now-proven tidal turbines, the most capable in the world.

These companies have delivered over 35GWh of power to the grid in Scotland. They are also exploring export opportunities in Japan, Canada, France and Indonesia.

EMEC

At the heart of the development is another British company, the European Marine Energy Centre (EMEC) in Orkney, which has provided a global test bed for over 30 tidal and wave technologies from all around the world. These all feed into what has become an almost wholly renewable-energy grid in Orkney, the excess power being used to make hydrogen used locally in a variety of fuel, power and heat applications. At the same time they are boosting the local and UK economies to the tune of £306.3m gross



Nova Innovation

Nova Innovation's new direct-drive tidal turbine T4, a new addition to an existing array, awaiting installation in Bluemull Sound, Shetland. Nova's turbines, along with Tesla batteries ashore, have been powering homes and businesses in Shetland since 2016. A £30m export order of 15 turbines will be installed in Nova Scotia, Canada, the first being deployed this year, 2021.



value added (GVA) and 452 jobs. All for an initial investment of £36m, as reported in the BiGGAR Economic Assessment of EMEC of January 2021.

On the back of this progress in Scotland, commercial tidal energy sites in the Isle of Wight (Perpetuus Tidal Energy Centre, of which I am chairman) and Wales (Morlais) are on the cusp of gaining environmental consent to start operations, with a view to generating electricity into the grid, some as early as 2025.

They are underpinned by over 20 supply chain companies around the UK, all chafing at the bit to move into full commercialisation in the next round of government energy auctions. The intentions are to deliver the at-scale turbine deployments that will consolidate the UK's technological lead, continue to reduce the price of tidal energy, and put Britain at the forefront of commercial development.

Once again, the source of this advantageous positioning is our geography. The tidal flows in and out of our coastal regions are sufficiently strong and numerous enough to provide Britain with 50 per cent of Europe's tidal stream energy capacity, or 10 to 15 per cent of the global resource.

But why is this such an exciting proposition? It gives Britain a new renewable energy industry, where 80 per cent of the manufacturing capability is British, providing new jobs and global export opportunities. All in the very coastal port areas that we are seeking to rejuvenate.

Environmental credentials

Environmentally too, the credentials of tidal stream energy are almost unassailable. This energy source is powered by the gravitational pull of the moon and sun on the waters of our seas, an inexhaustible source of energy for humans.

Water being over 800 times denser than air, tidal streams have a significantly more powerful energy generation capability than that of wind. This gives the system the added advantage of a site ⅛th the size of a wind farm for the same generation capacity. Also, it is at sea, taking up no space on our already overutilised land mass.





(Top) Orbital Marine's SR2000 floating tidal turbine on test at EMEC's Fall of Warness site in Orkney in 2017. (Above) Orbital"s latest and more powerful O2 turbine, built in Dundee. (Below) graphic showing the O2's rotor legs in the operating position.

Encouragingly, and importantly, it has been shown that the slow-turning tidal turbines do not harm fish or large mammals. In fact, it has been postulated that the tidal sites could even create an artificial reef to protect and enhance the sea life in and around those areas.

The system's grid credentials are impressive too. The tidal energy flow is predictable out to 100 years ahead, a characteristic which could reduce grid intermittency and wide fluctuations in the renewable energy market price during

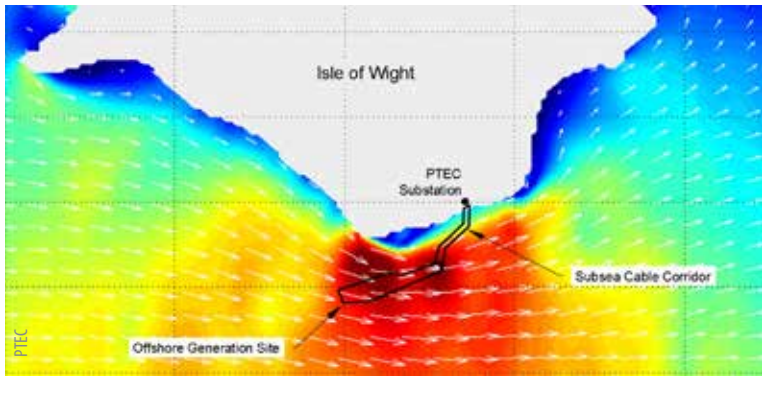


Chart showing the spectrum of tidal energy off the south coast of the Isle of Wight, and the projected locations of the Perpetuus (PTEC) offshore generation site and shore substation.





(Above) Simec Atlantis Energy's AR1500 turbine being installed at the MeyGen tidal energy plant on the Pentland Firth, between the north coast of Caithness and the island of Stroma. (Above right) The same company's AR500 turbine ready for installation in the Goto Islands, Japan, showing the export potential of British tidal generation plant.

UKHO chart of the MeyGen site, with a notice that underwater turbines are under construction (2017–2025).



The next step could place Britain at the forefront of the tidal industry

those cold, cloudy and windless days in winter. All of which could reduce the overall cost of energy.

Going one step further, exploiting the differing times between key tidal locations could provide continuous power to deliver a small but potentially significant element of base load, thus further reducing the need for fossil-fuel-generated reserve power stations.

Strategic advantages

There are some compelling strategic advantages too. Britain today is not self-sufficient in electricity. We import around 10 per cent of our electricity through the intercontinental interconnectors, a figure that is likely to increase as we reduce the number of fossil fuel and nuclear power stations over the next few years. But our European counterparts are of course also decarbonising their electrical supplies, and some of them are reducing their reliance on nuclear power. At the same time, we are all seeking to electrify cars and heating, creating a significantly higher demand on the grids. The consequent increase in demand could, as we have seen recently, cause price increases, or supply shortages: an unattractive scenario for the UK, because our gas reserves are amongst the smallest in Europe and we already pay heavily for grid-balancing services to meet winter demand. All of these factors make us vulnerable to political and economic pressures of the kind that France threatened Jersey with recently.

If each of these sites has the same wider potential as is emerging on the PTEC site (300+ MW) then I estimate that the 10 known tidal stream sites would offer an additional generating capacity of 6–17GW per year (and more as technology improves) which is around 20 per cent increase in our indigenous generating capacity. The same amount as we imported last year. It would certainly help to restore grid self-sufficiency.

So why hasn't the potential value of tidal stream energy been developed earlier? The reason is that up until now it has been too expensive. But the now-proven turbines and the potential environmental and economic advantages have persuaded the government to 'have another look at tidal', to quote Kwasi Kwarteng, the Secretary of State for Business.




EMEC

(Left and below) CS *Sovereign* laying cable off the EMEC test site


Mike Brookes-Roper / EMEC

The Danish example

The decision that we at Perpetuus hope the government will come to is that the wider economic value of tidal stream energy outweighs the short-term cost to the consumer – an argument evidenced by the success of the Danish government investment in wind energy; the £690m they invested in wind energy between 1980 and 2000 had by 2014 generated a turnover of £10.64bn, with exports of £6.4bn, and the creation of 29,000 jobs. By 2016 Denmark's wind energy exports were higher in value than the UK's defence industry exports.

The British companies that recognised that potential and have had the tenacity and financial backing to remain in business are now well positioned to capture a significant proportion of the global market share. The cost reductions they have eked out of their small-scale developmental deployments have added a granularity to the Offshore Renewable Energy Catapult (OREC) study of 2018, which predicted that at-scale turbine deployments would make tidal cost competitive by 2030. The next step could place Britain at the forefront of the tidal industry, presenting an industrial opportunity similar to that of the offshore oil industry in the 1970s and wind in 2000s.

Industrial renewal

It would breathe new life into the post-industrial ports around our coasts, bringing opportunities in the manufacture of turbines, underwater structures, moorings and power cables as well as boosting the ports' maritime support elements. According to the OREC study, UK tidal stream industry could generate a cumulative benefit to the UK by 2030 of £1.4bn and support a total of almost 4,000 jobs. All of this in a marine energy global market with an estimated value of £76bn in 2050.

This is a huge opportunity for Britain: we are ideally placed, by history, geography, experience and a technological lead, to become the international market leaders in marine energy. ■


Mike Brookes-Roper / EMEC

In one of the *Sovereign*'s four cable tanks.



Fitting EMEC's purpose-built cable ends.

It would breathe new life into the post-industrial ports around our coasts

***Rear Admiral Rob Stevens** CB, Chairman of Perpetuus, joined the Royal Navy in 1966 and moved up rapidly, eventually becoming Head of the UK Submarine Service as well as Chief of Staff to the Commander of Naval Forces South. In 2005 he retired from the Navy and became chief executive of the British Marine Federation.*

Hydrogen for marine power

***Paul Turner** examines the progress and potential of hydrogen propulsion in shipping and port operations, and the beginnings of the required infrastructure*



A mobile hydrogen storage unit coming off the Shapinsay ferry *Thorsvoe* in Kirkwall, Orkney. The ferry itself has 'dual fuel' engines that run on hydrogen generated locally using Orkney's abundant wind and tidal power.

Hydrogen will form the basis for the de-carbonisation of shipping

CMB.TECH, the cleantech division of diversified Belgian shipping and logistics group CMB, has investigated a range of future fuel options comprising battery systems, LNG/CNG, synthetic fuels, biofuels, hydrogen, and ammonia.

In *Maritime 2020* it was explained why CMB believed hydrogen was the best solution to meeting shipping's zero-carbon goals. Hydrogen will form the basis for the decarbonisation of shipping, allowing renewable energy to be used far from shore. The renewable electricity from solar, tidal or wind is used to produce hydrogen (H_2) by electrolysis, which can be stored under pressure, liquefied or combined with another chemical carrier, and used in a traditional engine to provide propulsion.

The company has been working on a roadmap to decarbonisation not only for its ships but also for the supporting port and logistic operations. There are three stages: dual-fuel engines, zero-emission monofuel engines, and fuel cells.

Step 1: Dual fuel

The programme developing hydrogen/diesel dual-fuel engines is well under way. The system is based on existing combustion engines which, with minor modifications, will be able to use hydrogen, thus reducing CO_2 emissions by up to 98 per cent. It also reduces the particulate matter and NOx emissions to near zero.

However, this technology is not a magic bullet – the best results occur below half load, and reduce significantly at full load. Nevertheless, it provides a means for existing marine propulsion engines and equipment to reduce CO_2 emissions well in advance of the net-zero 2050 target.



Locally generated hydrogen storage at the European Marine Energy Centre (EMEC) in Orkney.

Dual-fuel technology will allow existing vessels with a 20–30-year life to meet the International Maritime Organization's CO_2 emission reduction requirements. Importantly, the technology will allow assets to work while the infrastructure is in its infancy, while providing



CMB's hydrogen-powered passenger shuttle *Hydroville* at the hydrogen refuelling station in the Port of Antwerp. The vessel has been operating since 2016. The refuelling station also provides hydrogen for CMB vehicles and port equipment.

infrastructure providers with a market.

CMB.TECH is working with four marine engine makers, and has engines available from 300 kW through to 2.7 MW. Three new vessels have been launched incorporating hydrogen technology, and a fourth is under construction.

The Hydroville, a passenger shuttle running between Kruibeke and Antwerp, has been in continual operation since 2016. CMB has invested in a multi-modal hydrogen refuelling station in the Port of Antwerp which provides hydrogen for this vessel and also for our logistics trucks, for our fuel cell cars and for port equipment.

The second vessel, the HydroBingo, an 80-person passenger ferry with two 13-litre diesel engines running on hydrogen, went into service in Japan this year, timed for the Tokyo Olympics. This vessel has received full Japanese approvals.

The third vessel, the Hydrocat crew transfer vessel, is undergoing sea trials. This vessel has been built by the CMB.TECH subsidiary Windcat Workboats to service offshore wind farms. The Hydrocat carries 200 kg of useable hydrogen, which will reduce diesel consumption by 600 litres a day, equating to 60–70 per cent of the vessel's fuel requirements and 550 tons of CO_2 a year. Further hydrogen-fuelled crew transfer vessels are being prepared, and the possibility of retrofitting existing vessels currently in service is being evaluated.

The Hydrocat will be UK-flagged, and CMB.TECH is working with the Maritime and Coastguard Agency for the approval of both the vessel and the bunkering process. Once sea trials are completed, the vessel will transfer to the UK register. CMB.TECH has also been working closely with Lloyd's Register to obtain the classification approvals for the engine and hydrogen storage systems.



Focus on the Hydrocat

The Hydrocat is a 25-metre catamaran designed to support crew transfer to turbines at offshore wind farms. Hydrocats carry construction and maintenance staff out to the turbines, and by pushing against the turbine base they provide a stable and safe platform to transfer personnel to the turbine. The vessels will typically remain at the wind farm for a full day until the maintenance tasks are complete, then bring the crew back to shore.

On a typical day the vessel can be expected to consume about 800–1,000 litres of diesel depending on the distance travelled and the work carried out in the wind farm. Hydrogen is stored behind the bridge in three storage stillages, and the vessel holds about 200 kg of compressed hydrogen, allowing about 600 litres of diesel to be displaced with hydrogen every day.

The hydrogen is stored in pressurised vessels at 350 bar and fed to the engines via a series of regulators at around 6 bar. The hydrogen is then injected into the air stream proportionally to the demand of the helm. Careful mapping allows the perfect amount of hydrogen to be used at any given speed or load of the engine, and with dedicated diesel injection events to ignite the hydrogen we create a smooth combustion with ultra-low NOx, CO_2 and particulates emissions.

The engines are the latest IMO Tier 3 units and already reduce NOx emissions to very low levels when running on diesel with full SCR (Selective Catalyst Reduction) control. When in hydrogen mode the SCR dosing is substantially reduced, helping to reduce the overall operating costs of this new fuel.

As dedicated hydrogen refuelling stations are not yet widely available, the hydrogen is delivered to the vessel via dedicated tube trailers. These store 950 kg of hydrogen at 500 bar, and via careful operation of the refuelling process the trailers can bunker up to four vessels at 350 bar.

Willem van der Wel



CMB's Hydrobingo passenger ferry which began operating in Japan during 2021 – in time for the Tokyo Olympics.

Vessels on the drawing board include pilot vessels, inland water vessels, coasters and large support vessels

A fourth vessel, the Hydrotug, is under construction in Spain. It will go into service with the Port of Antwerp. This vessel will be fitted with two BeHydro engines, each with 2 MW of power. The vessel will carry 400 kg of hydrogen sufficient for daily operation at 80 per cent hydrogen.

Other vessels on the drawing board include pilot vessels, inland water vessels, coasters and large support vessels. Meanwhile, CMB.TECH has also engaged ports to develop service vehicles such as tractors, excavators, straddle carriers and even shunting trains.

Step 2: Zero emissions monofuel hydrogen

Dual-fuel technology will reduce CO_2 and help build an infrastructure where hydrogen is available end to end. As soon as this infrastructure is up and running, the transition to the next step can take place. Operating a monofuel hydrogen engine at the correct air-to-fuel ratio will enable engines to generate power needs while producing no harmful emissions.

Hydrogen has no carbon elements within the fuel, so it produces no CO_2 or particulate matter when burnt. If it is not managed carefully, however, it can produce NOx – and at rich mixtures, many times the NOx of traditional diesel engines. However, CMB.TECH has already developed strategies to operate the engines in a way that allows the power to be produced without producing any measurable NOx emissions.

CMB.TECH is currently providing small generators using hydrogen as the only fuel with no measurable engine-out emissions. As with any internal combustion engine, we do burn very small quantities of lubrication oil. With the hydrogen engine and the almost complete removal of combustion deposits combined with the lower peak pressure, CMB.TECH runs engines on bio-oil, thereby avoiding any CO_2 impact by the oil consumption.

The initial introduction of the Zero Emissions hydrogen engines has been restricted to this lower power level because of the hydrogen supplies available. As the infrastructure for hydrogen supply builds, larger engines will be released.

The technology still requires more development to be able to service the wider applications that the diesel engine powers today. However, the science is well known,



A visualisation of CMB's Hydrotug, currently under construction in Spain for use in the port of Antwerp. It will be powered by two BeHydro engines.



CMB.TECH's hydrogen refuelling station in Antwerp.



A mobile refueller unit.



The BeHydro dual fuel engine.

and wider roll-out only requires application rather than new research. What limits the zero emissions engines is the lack of infrastructure for the supply of hydrogen.

Step 3: Hydrogen fuel cell

The hydrogen fuel cell offers great potential for a silent and zero-emissions propulsion system. However, its development is seriously compromised by its cost and complexity, and by the need for both high-purity hydrogen and an established end-to-end infrastructure. Even so, much can already be achieved using proven technology.

A solution for larger ships

Gaseous hydrogen will not be useable for larger oceangoing ships, so we are exploring the use of hydrogen carried by ammonia. This fuel avoids the problems generated by carbon-based fuels while benefiting from similar storage volumes of carbon-based e-fuels such as methanol. Ammonia is the combination of hydrogen with nitrogen, the nitrogen being extracted from the air; as nitrogen makes up the bulk of our atmosphere, its extraction is much easier and less energy intensive than that of CO_2. The development of ammonia engines is ongoing.

What's next?

CMB.TECH is working to consolidate the developments achieved to date. The dual-fuel technology is not fully zero, but with CO_2 reductions at 70–80 per cent it is a significant improvement, and it comes at an affordable price. The technology is simple and safe, and is based on current operations.

Classification societies and government regulators must embrace innovation rather than resist change. It is essential that the risk-based design approach is used, as has been successfully managed to date.

Safety should always come first; however, restriction and control should be based on science and not on ignorance or myth. The rules around recertification of engines above 130 kW, if modified, need to be updated, in order to allow conversion 'type approval'. This would allow existing ships to be retrofitted instead of waiting 20 years to rotate them out of service.

Above all, the dangerous application of LNG standards to gaseous hydrogen must be stopped because the basic principles of the gases are very different. These two examples demonstrate the need for legislation to be updated to accord with progress. ■

As the infra-structure for hydrogen supply builds, larger engines will be released



CMB.TECH's dual fuel powered truck.



CMB.TECH's new 50kw, 100% hydrogen-powered, zero-emissions 'genset', which is undergoing testing at the company's works in Brentwood, Essex.

***Paul Turner** is Managing Director of CMB.TECH. **Willem van der Wel** is Chief Executive of Windcat Workboats (part of CMB Group).*

The answer is blowin' in the wind

Gavin Allwright, *Secretary-General of the International Windship Association, takes stock of promising developments in wind-powered shipping*



Traditional wind power – the Seychelles-flagged schooner *Avontuur*, built in the Netherlands in 1920 and still carrying cargo under sail a century later.

Shipping has always navigated its own unique route. It was the first truly globalised industry, and the ships that sailed the oceans through the ages forged the world we know today, for better or worse, through trade, migration and the projection of military power.

For millennia the world fleet was powered almost exclusively by the potent power of wind (with a sprinkling of muscle power) and wind only finally relinquished that crown in the early 20th century. Fast forward 100 years and we find that the use of direct wind propulsion is experiencing quite a renaissance. An abundant, free, zero-emissions energy source, it is being recognised and rediscovered by many industries; but it is clear that with the use of modern materials, a high level of automation, and integration with other forms of propulsion, things have moved on significantly.

The future of shipping propulsion is hybrid

Looking forward

As an industry we are now faced with our third major energy transition. The transition from sail to coal took over a century. Coal to oil took half that time. But if we are to avoid the worst ravages of climate change the transition to Shipping 4.0 must be effectively completed within the next two decades. To achieve this transition in an orderly and affordable manner, wind has to be incorporated at the heart of decarbonisation efforts. The future of shipping propulsion is hybrid.

The development of wind-assisted and primary wind propulsion solutions has been gaining significant momentum since the release of the IMO GHG initial strategy in April 2018. While wind has not yet become a mainstream energy option, we are seeing the involvement of many mainstream shipping and non-shipping stakeholders, ranging from MOL to Cargill, Louis Dreyfus Armateurs, K-Line, Oldendorff, Scandlines, Wallenius Willemson, Vale and other shipowners, along with such major shipbuilders as Chantiers de l'Atlantique, DCIS and Oshima Shipyards, as well as all of the major classification societies. Non-shipping players are also increasingly engaging with wind propulsion projects and technology providers. These include the Renault group, the European Space Agency, Drax, Hennessy and Michelin, to name just a few. The International Windship Association (IWSA) itself has grown over the past seven years, from 12 founding members to over 130 active members from across the industry.

Wind propulsion solutions (sails, rotors, kites and so on) offer a near-term opportunity for significant reductions in fuel consumption



The Dutch-registered general cargo ship *Frisian Sea*, equipped with two retrofitted, foldable Econowind ventifoils of the suction wing type.



E-Ship 1 – a German RoRo vessel with four Flettner rotors, used for transporting offshore wind farm components.

and associated emissions. As a retrofit option, with no change in vessel operational profiles, they can deliver 5–20 per cent savings, and have the potential to reach 30 per cent as the systems' increased size, improved design and operational changes are factored in. Systems integrated into optimised new builds and used for primary propulsion will naturally offer substantially higher savings. Support technologies such as sophisticated weather routeing systems, satellite forecasting and even LiDAR are also being developed to fully utilise the wind energy available at any given time on any given route.

Wind propulsion systems

- **Soft sails** – both traditional sails and new designs, such as the DynaRig
- **Hard sails** – wingsails, foils and JAMDA-style rigs. Some rigs have solar panels for ancillary power generation
- **Flettner rotor or rotor sails** – rotating cylinders operated by low-power motors that use the Magnus effect (the difference in air pressure on the different sides of a spinning object) to generate thrust
- **Suction wings** (Ventifoil, Turbosail) – non-rotating wings with vents and internal fan (or other device) that use boundary layer suction for maximum effect
- **Kites** – dynamic or passive kites deployed off the bow of the vessel to boost propulsion or to generate a mixture of thrust and electrical energy
- **Turbines** – marine-adapted wind turbines to generate either electrical energy or a combination of electrical energy and thrust
- **Hull Form** – the redesign of ship's hulls in order to capture the power of the wind to generate thrust.



One of the larger ships using wind power: the Greek operated 64,000 dwt Ultramax bulk carrier *Afros*, fitted with Flettner rotors from the British company Anemoi. *Afros* was named ship of the year by *Lloyd's List* in 2018.

In the face of increased pressure to limit power on vessels or reduce their speed, wind also provides the ability to maintain speed along with a reduction in the amount of expensive alternative fuels consumed and the increased storage space they require. Range can be extended, and currently uneconomical trading routes could be revitalised.



Scandlines' ferry *Copenhagen* being fitted with a Flettner unit in Rostock in May 2020 – one of a fleet of six hybrid vessels the line runs between Danish ports and the German Baltic coast.

The present

A variety of wind propulsion technologies are increasingly available today, with a growing number of demonstrator vessels already in commercial operation, sea trialling or in late-stage R&D. These systems are fully automated and will be integrated into the energy management systems of the vessels. There are seven main categories of wind propulsion technology: rotors, hard or rigid sails, suction wings, kites, soft sails, turbines and hull form. There are substantial technical variations within these categories, with over 30 technology providers and developers currently operating across the categories. Each system has its particular strengths, and is best suited to particular vessel types and sizes.

At the time of writing, there are in operation 16 large commercial ocean-going vessels with wind-assist systems that augment the

Ankie – another Dutch cargo vessel retrofitted with ventifoils from Econowind, also a Dutch company.





Concept illustration of the Ariane Group's wind-assisted, 'open top' cargo vessel *Canopée*, designed for the transport of payloads and launchers between French and other European ports and the Ariane launch site in Kourou, French Guiana. The vessel, which has four automated and reefable 30-metre high sails with a total sail area of 1,500 m^2, is under construction in Dutch and Polish shipyards, with delivery scheduled for late 2022.



'Vindskip' – a concept developed by the Norwegian company Lade AS. Here it is the aerodynamic properties of the hull form that provide additional motive power. The company hopes to sign a construction contract in late 2021.

main propulsion system. These range from large tankers (VLCC) and large bulk carriers (VLOC) through to roll-on/roll-off (RoRo) vessels, ferries, cruise vessels, general cargo ships and fishing vessels. This number is supplemented by over 20 sail-driven small cargo and traditionally-rigged cruise vessels. The large vessels use a variety of mechanical sail types. These include Flettner rotors or rotor sails with electric motor rotated cylinders developed initially in the 1920s, which use the Magnus effect of pressure differentials to generate thrust; various rigid sails or foils more familiar to racing enthusiasts (many of these are in late stage R&D); and suction wings – stubby aerated wing sails with an internal suction device to draw in the boundary layer for additional thrust, developed by a team for Jacques Cousteau's Alcyone research vessel in the 1980s. Kites are also returning after a brief period of initial deployment while oil prices were high a decade ago, along with developments in turbines and hull forms that harness the wind. All of these systems have incorporated the need to stow, move or furl the rigs for operations in port, and to accommodate air draught considerations or extreme weather conditions.

Back to the future

Where is wind propulsion going? To answer that question, we should take a look at third-party projections. A report published by the EU in 2016, well before the adoption of the IMO GHG initial strategy in April 2018, stated that, should some wind propulsion technologies for ships reach marketability in 2020 then the market potential for their installation in bulk carriers, tankers and container vessels was estimated to be up to 10,700 installed systems by 2030. We are currently on track: there is roughly a doubling of installations each year, with 2021 likely to end with installations on a total of 20 ships, equalling over 30 installed rigs. There is also the trend developing for larger or multiple rigs, and the pipeline indicates that this trend will

(Right and below) The 'UT Wind Challenger' concept, from the University of Tokyo – an 84,000 dwt Panamax bulker fitted with four retractable rigid sails.





There is roughly a doubling of installations each year



Seawing, an 'automated kite that tows ships', from Airseas, an offshoot of Airbus. Up to 20 percent savings on fuel consumption and emissions are claimed for such kites.

continue, doubling again by early 2023.

Another important market projection can be found in the UK Government's Clean Maritime Plan (July 2019), which assessed the global market for wind propulsion systems and estimated it to grow from a (conservative) £300 million per year in the 2020s to around £2 billion per year by the 2050s: approximately a quarter of the size of the market for alternative fuels. The research backing those forecasts expected to see wind propulsion installed on 37,000–40,000 vessels by the 2050s – roughly 40–45 per cent of the global fleet.

With all of this potential comes the need to create a level playing field in regulatory, economic and financial approaches. Work is under way on a number of projects to improve that situation. We have the EU-backed Wind Assisted Ship Propulsion (WASP) project, which features five retrofitted rig installations on existing vessels, and is working on testing, validation and business case development around these systems. The separate WiSP joint industry project is working on standard prediction models, and regulatory issues such as improvements to EEDI/EEXI (energy efficiency indexes respectively for newbuilds and existing vessels), while IWSA itself is initiating an international multi-stakeholder working group on wind propulsion to tackle the outstanding issues. The association also has a wind propulsion accelerator program under development that will assist R&D and wind system optimisation, using a test fleet and support programs. All of these initiatives are helping to create a more 'primary renewable friendly' environment in the industry.

While there are still market and non-market barriers to overcome, the zero-emissions energy from wind is there to be harvested and directly applied to propulsion, not only as a secondary source of renewable energy after the production of fuels. The price of fuel is on the





'Neoliner', a French project – a primary wind RoRo ship, projected to enter service in 2024.

Windship's triple vertical aerofoils – a system that in 2021 received approval in principle from the shipping classification society DNV and will form the key part of a zero-emissions 80,000 dwt ship design for transoceanic routes.

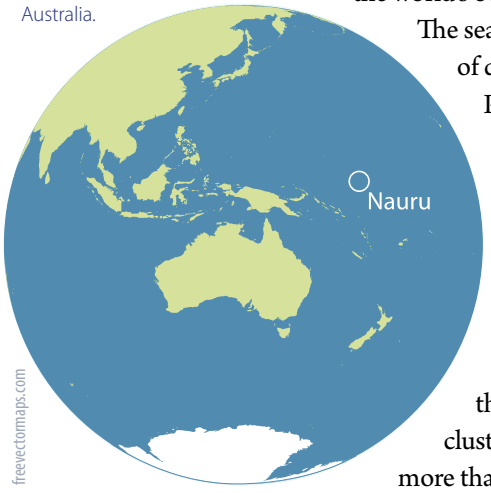
rise, with carbon pricing on the horizon and expensive alternatives coming onto the market. The wind propulsion technologies coming to market are sound, viable and fully certified. As they are adopted on more and more vessels over the next couple of years, costs will start to come down. Wind has the potential to turn a supposedly 'hard-to-abate' sector into a decarbonisation pioneer. The choice we face is simply 'blowin' in the wind'! ■

Gavin Allwright**, Secretary-General of the International Windship Association (IWSA), sits on the IMO's MTCC advisory committee, is a non-executive board member for the World Wind Energy Association (WWEA) and is a leading participant in the EU Wind Assisted Ship Propulsion project. He has a master's degree in Sustainable Development, and is a guest lecturer at the World Maritime University. **IWSA** is a not-for-profit organisation promoting wind propulsion in commercial shipping. For more information, see: **www.wind-ship.org** and **www.decadeofwindpropulsion.org

The zero emissions energy from wind is there to be harvested and directly applied to propulsion

Dredging the depths for metal

Marta Montogo *and* ***Ian Urbina*** *of The Outlaw Ocean Project* *describe the portents of a deep sea Klondike – lucre for some; further destruction for the marine environment*



Nauru's location in equatorial Micronesia, north east of Australia.

Few people have ever heard of the tiny country of Nauru. Even fewer ever think about what happens at the bottom of the world's oceans. But that may soon change.

The seafloor is thought to hold trillions of dollars' worth of metals, and this Pacific-island nation is making bold moves to get a jump on the global competition to plumb these depths.

Its target is potato-sized rocks, polymetallic nodules. Sitting on the ocean floor, these prized clusters can take more than 3 million years to form. They are valuable because they are rich in the manganese, copper, nickel and cobalt that are claimed to be essential for electrifying transport and decarbonising the economy.



The seafloor is thought to hold trillions of dollars' worth of metals

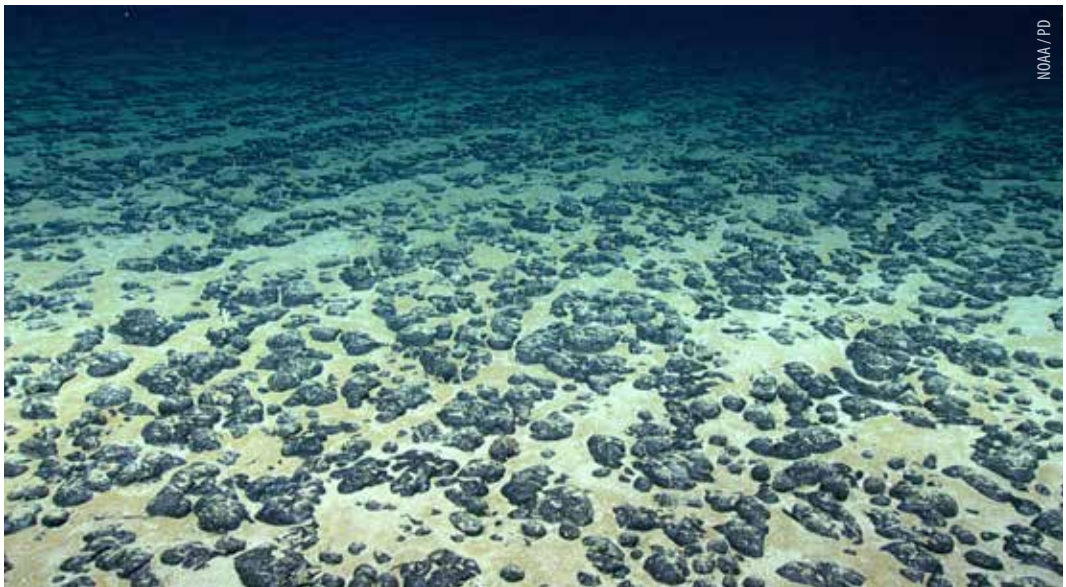
The process

To vacuum up these treasured chunks requires massive excavators. Typically 30 times the weight of regular bulldozers, these machines are dropped underwater where they drive along the seafloor 4,000–6,000 metres deep, suctioning up the rocks, crushing them and piping a slurry of crushed nodules and seabed sediments to the vessel above. After the minerals have been separated out, the processed water, sediment and mining 'fines' (small particles of the ground-up nodule ore) are piped overboard.

The concerns

But a growing number of marine biologists, ocean conservationists, government regulators and environmentally-conscious companies are sounding the alarm about a variety of environmental, food security, financial and biodiversity concerns associated with seabed mining. They are concerned that the ships will dump back into the sea the huge amounts of toxic waste and sediments produced by the process, impacting fish and contaminating the global seafood supply chain.

They also worry that the mining may diminish the ocean floor's distinct carbon sequestration capacity, in that by stirring up the ocean floor the mining companies will release carbon into the environment, undercutting some of the benefits intended by the switch to electric cars, wind turbines and long-life batteries. Douglas McCauley, director of the Benioff Ocean Institute at the University of California Santa Barbara, warned against trying to counter the climate crisis with solutions that



Polymetallic nodules on the deep seafloor.


US Department of Energy / PD

Nauru's 21 square kilometres, seen from the air.

rely on a 'paradigm of just ripping up a new part of the planet'. If the goal is to slow climate change, he said, it makes little sense to obliterate the deep sea ecosystems and marine life that presently play a role in capturing and storing more carbon than all the world's forests.

The law

The deep seabed outside national waters is a realm subject to a unique regime under international law, which deems the international seabed area and its resources to be managed by the International Seabed Authority (ISA) on behalf of humankind as whole. 'But who benefits and how from this new rush to seabed mining remains unclear,' said Kristina Gjerde, high seas policy advisor for the IUCN Global Marine Programme. 'And what constitutes benefits to humankind is also unclear, as the deep seafloor is filled with untold biodiversity, much of it vitally important to the survival of our planet.'

The hopefuls

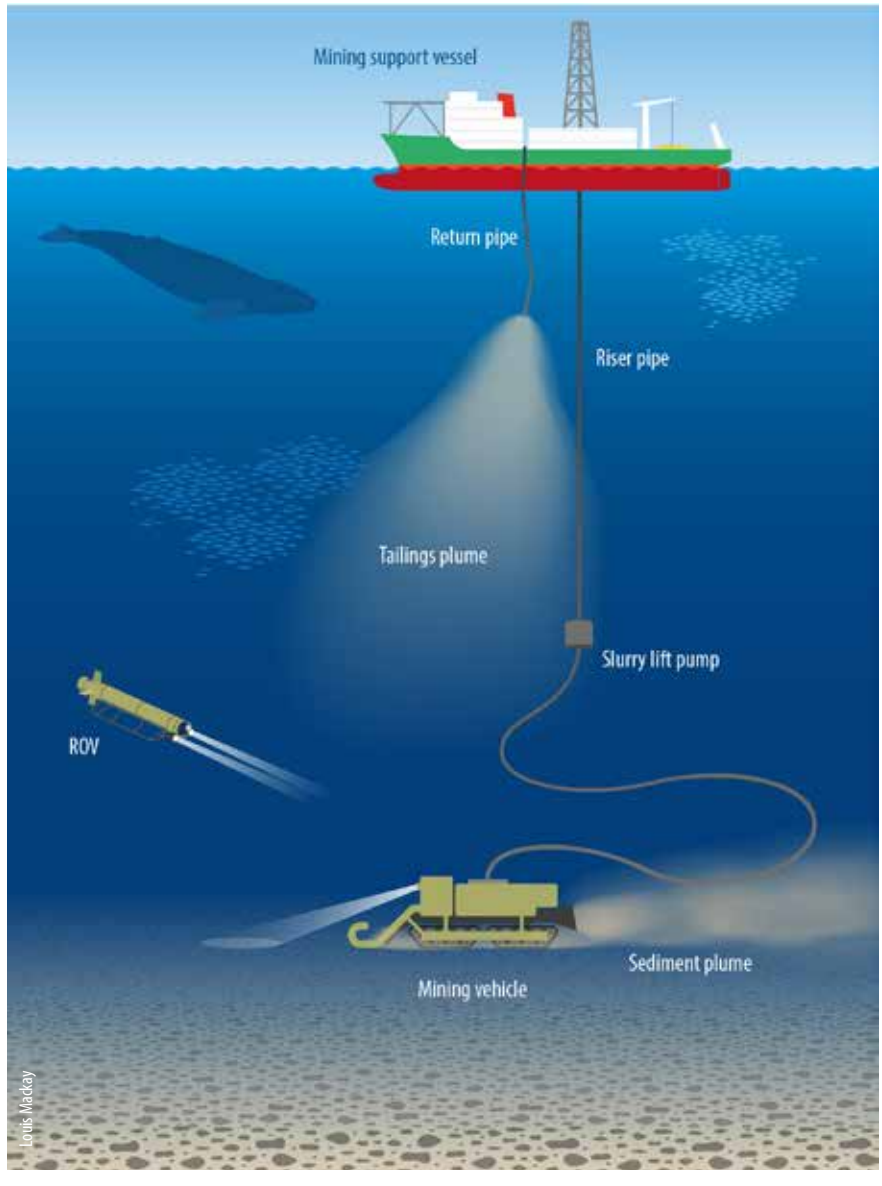
Nauru hopes nevertheless to forge ahead with seabed mining. This tiny, cash-strapped developing nation hopes to get an early edge on a potentially multi-billion-dollar market, even though Nauru itself is likely to receive only a small fraction of the financial benefits of the mining from Nauru Ocean Resources Inc. (NORI), the Canadian company it is sponsoring. In June 2021, Nauru took the first step in launching the industry: it announced plans to submit an application for commercial extraction on behalf of its sponsored entity, as early as 2023 to the ISA. Such an application will be judged against whatever the deep sea mining rules are at that time – finalised or otherwise.

Over a dozen other countries, including Russia, the UK, India and China, have 15-year exploration contracts. The government of India has recently set aside $544 million to stoke private sector investments and technological research in this industry.

The timing

International interest in seabed mining has been stimulated partly by new advances in robotics, computer mapping and underwater drilling, combined with high commodities prices. The metals the mining companies seek are commonly found on land, but some raise

The process of mining the seabed for polymetallic nodules.





Massive subsea mining machines from Nautilus Minerals. The Toronto-based company is the first to explore the seafloor for massive sulfide systems, a potential source of high grade copper, gold, zinc and silver.

Each mining licence will permit direct strip mining of some 8,000 square kilometres of seabed

concerns that these may not be enough.

'With dwindling resources on land, with exponential growth of demand, and a shortage in circulation (recycling), there is a need to find alternative sources of critical metals needed to allow the energy transition to zero-net carbon economies,' said Bramley Murton, a marine researcher at the UK's National Oceanography Centre. It has been estimated that the nodules on the bottom of the ocean collectively contain six times as much cobalt, three times as much nickel, and four times as much of the rare earth metal yttrium as there is on land. Mining companies and states have set their eyes on the Clarion-Clipperton Zone, an area stretching from Hawaii to Mexico: it is estimated to contain metals valued at between $8 trillion and $16 trillion.

The problem

Scientists have conservatively estimated that each mining licence will permit direct strip mining of some 8,000 square kilometres of seabed over the course of a 20-year mining licence from the ISA, and that the sediment plumes generated by the mining the ocean floor will 'easily' impact a further 8,000–24,000 square kilometres of surrounding seabed life. They estimate that the 'nodule obligate species' – the animals living on the nodules or which, like deep sea octopuses, need the nodules to survive – will take millions of years to recover, and even the animals living in the surrounding sediment may take hundreds to thousands of years to recover from the impact of mining.

A deep sea cerianthid or tube anemone.

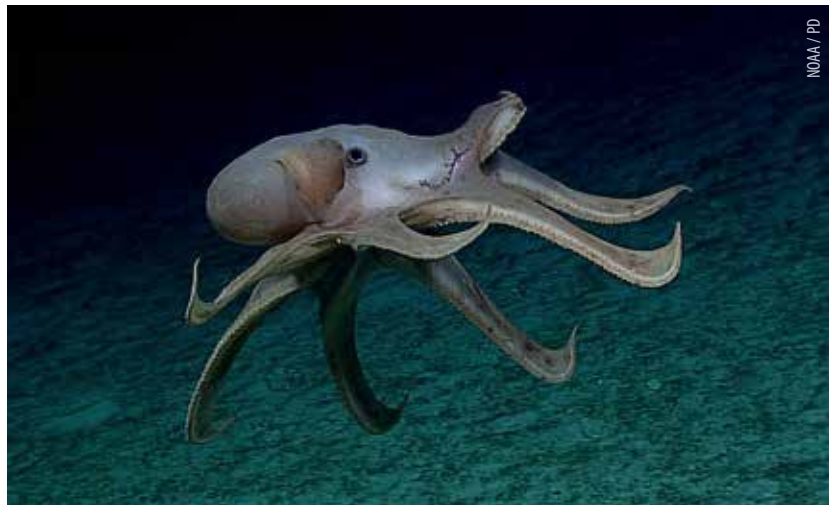


The scepticism

In March, BMW and Volvo Group, along with Samsung and Google, pledged to abstain from sourcing deep sea minerals. In its most recent global report, the International Energy Agency, a global body that advises countries on policy, concluded that seabed mining machines, 'often cause seafloor disturbance, which could alter deep sea habitats and release pollutants … stirring up fine sediments, [and] could also affect ecosystems, which take a long time to recover.' In June, the European Parliament also asked the executive branch of the European Union to stop financing deep sea mining technology, and called for a delay in more exploration operations.

The UK House of Commons Environment Audit Committee in 2019 concluded that: deep sea mining would have 'catastrophic impacts on the seafloor'; the ISA benefiting from revenues from issuing mining licences is 'a clear conflict of interest'; and that 'the case for deep sea mining has not yet been made'.

'We need much more time for research to be carried out, not by mining companies, but



A deep sea octopus. The destructive effects of ocean floor mining operations pose a threat to marine biodiversity, as well as to the livelihoods and the food security of vulnerable fishing communities.

by independent seabed ecologists,' said Kelvin Passfield, who runs the Te Ipukarea Society in the Cook Islands and is part of a group of non-profit organisations in Fiji, Vanuatu and other Pacific islands concerned about the impacts of mining's residue plumes on local fishermen and food security.

Other critics see the mining as a Ponzi scheme of sorts intended to attract venture capital investment but which has little real chance to make money in the long term. Matthew Gianni, co-founder of the Deep Sea Conservation Coalition, said that when sea-bed mining companies claim we need 100s of millions of tons of these metals to build batteries for electric vehicles and other renewable energy storage technologies they are trying to peddle a false choice between having to mine cobalt and nickel on land or in the deep sea. 'We don't need to build batteries with either nickel or cobalt. Tesla and BYD, the world's second-largest EV manufacturer, are making cars with Lithium Iron Phosphate (LFP) batteries, with little to no nickel or cobalt, which are selling unexpectedly well,' he said. 'There is massive investment now being put into developing batteries that don't use these metals at all. Better product design, recycling and reuse of metals already in circulation, urban mining, and other "circular" economy initiatives can vastly reduce the need for new sources of metals.'

The sealife

Once thought to be relatively lifeless, the deep sea is now seen by most scientists as a species-rich environment populated by creatures that thrive under conditions that seem impossibly extreme. And yet, much of its biodiversity on the seafloor is distinctly vulnerable to change because their habitat is so far removed and thus rarely disturbed. The oceans already face a daunting list of threats ranging from overfishing, sonar testing, oil dumping and plastic pollution, to sea level and temperature rise, acidification, oxygen depletion, algal blooms and ghost nets. Add to those the additional strains faced by deep sea marine life on the seafloor: internet cables, bottom trawling, treasure hunting, oil and gas drilling, coral bleaching, the sinking of retired drilling rigs. In 2019 the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) issued its Global Assessment report which estimated that unless we reverse the drivers of biodiversity loss a million species are at risk of extinction, many within the next several decades.

The invisibility

One of the biggest challenges in stoking concern about this type of mining is that the seabed is so far removed – geographically, emotionally and intellectually – from the public that benefits from it. Most of the world's seafloor is not even mapped, let alone properly or fully understood or robustly governed. Deep below the waterline it is always dark, and many of its inhabitants defy categorisation into the traditional animal–plant–mineral taxonomy.

No solution to a problem as complex as the climate crisis will come without difficult decisions and heavy costs, especially as the global public tries to wean itself from fossil fuels. The hard part, though, is figuring out how to take one step forward without also moving three steps back. ■

The Outlaw Ocean Project *is a journalistic non-profit organisation based in Washington DC that focuses on environmental and human rights concerns at sea.* ***Marta Montogo*** *is the project's foreign editor,* ***Ian Urbina*** *its executive editor. For more information see:* ***www.theoutlawocean.com***

'Better product design, recycling and reuse of metals already in circulation, urban mining, and other "circular" economy initiatives can vastly reduce the need for new sources of metals'

Guiding Star passing St Anthony's Lighthouse. Built in Looe in 1907, she worked for many years as a fishing lugger.





(Above) former Bristol pilot cutter *Mascotte II* (foreground) and the yawl *Bonita* (built 1888).



Danish-built Gaff cutter and former North Sea trawler *Eda Frandsen*, with *Mascotte II*.



A parade of old gaffers.



The schooner *Anny* of Charlestown.



Gaff cutter *Hester*.



Kathleen.





Swan 55 class yawl *Lulotte*.

'Falmouth' type gaff cutter *Susan J*.

Eda Frandsen off St Mawes.

The Falmouth Classics 2021

Photographs by Kathy Mansfield

This year's Falmouth Classics, held over the weekend of 11–13 June, was the first big classic boat regatta since the start of the Covid-19 pandemic. 150 boats, four of them built in the late 19th century, made it to Cornwall for the occasion, coming from as far as Kent and Wales. It was healthily outdoors with sea and sun, beautiful historic boats, of which Britain is so fortunate to have many, and crew absolutely thirsting to reconnect with other people after the long lockdown. The regatta has been going for over 30 years and in normal years combines with a sea shanty festival, a much loved maritime event.





The yawl *Bonita*.



Pilot gig *Penarrow*.

A vision for UK shipbuilding

***Ian Waddell**, General Secretary of the CSEU, calls for an integrated and collaborative approach to shipbuilding and defence procurement*

Visualisation of one of the Royal Navy's projected Fleet Solid Support ships.



Over the past three years the Confederation of Shipbuilding and Engineering Unions (CSEU) has been campaigning for the UK carrier fleet's three supply ships – the Fleet Solid Support ships (FSS) – to be built in the UK; an order worth £1.6 billion. Our 'Keep Britain Afloat' campaign has elevated a niche industrial issue to a matter of national importance, described by the Prime Minister as a fundamental part of a renaissance of UK shipbuilding. Our ongoing battle for the FSS is part of a much longer campaign by the CSEU and our affiliated unions (Unite, GMB, Prospect and Community) for a comprehensive Defence Industrial Strategy, including a long-term plan for shipbuilding and ship repair. Our position is simple: all UK naval ships, submarines and RFA vessels should be designed, built and maintained in the UK.

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Procurement policy puzzles

Ben Wallace, the Defence Secretary and Shipbuilding Tsar, has announced that he will shortly publish a 30-year plan for UK ship-building which will cover all government-operated vessels. This is ostensibly to provide some certainty for the UK shipbuilding industry and encourage investment. However, the recently published Defence and Security Industrial Strategy (DSIS) sends a contradictory signal, in that it states that future naval ship procurement will be determined by the MoD on a case-by-case basis from a range of options, with single-source provision at one end of the spectrum and full international competition at the other. This could leave UK shipbuilding in a worse situation than before DSIS, as the MoD had previously stated that all Royal Navy ships and submarines would be built in the UK.

For the CSEU and our members in UK shipyards, the twists and turns of naval ship procurement policy are hugely frustrating and potentially represent a missed opportunity. British shipbuilders have just completed two state-of-the-art aircraft carriers: HMS *Queen Elizabeth* and HMS *Prince of Wales* – the biggest ships ever constructed by the UK industry, and a massive success story. At £6 billion for the two, the carriers demonstrate great value for money for the UK taxpayer, with costs well below international comparators'. The project engaged yards across the UK to build blocks that were then assembled at Rosyth in Scotland. The project was overseen by the Aircraft Carrier Alliance, a joint venture including major shipbuilding and engineering firms which worked closely with the MoD procurement team to ensure costs were well managed. It was an extremely robust structure that delivered for all concerned.

It was always anticipated that at the end of the project there would be some shrinkage of the UK labour force. However, Type 26 was on the books and Type 31e was anticipated. Along with the three FSS ships, there was more than enough work to go round all the shipyards, and there was a strong belief in the industry that the government would use the Aircraft Carrier Alliance to continue to manage these projects. However, the government chose a UK competition for Type 31e and an international competition for FSS. The results were predictable: goodwill and collaborative working among UK companies in the Aircraft Carrier Alliance were undermined by having to compete domestically on Type 31e, and time was, and is still being, lost in pursuing a twice-failed international competition route



The Aircraft Carrier Alliance demonstrated the success of collaborative working and the block system. (Left) the aft island of HMS *Queen Elisabeth*, built at Scotstoun on the Clyde, being delivered to Rosyth. (Below) the Rosyth yard with the carrier under construction.

for FSS. Meanwhile, the UK yards that had been essential components of the carrier build ran out of work. Appledore and Harland & Wolff closed, and Cammell Laird embarked on a large-scale redundancy process. The fact that InfraStrata bought Harland & Wolff and Appledore subsequently is to be welcomed, but there is little sign that any government policy initiated that investment.

Brexit has given rise to much talk of a renaissance in UK shipbuilding, but at the sharp end there is little sign of any positive policy change or of the government awarding UK work to UK yards. Ironically, it seems that one piece of EU legislation retained in UK law forces the government to accept lowest price without consideration of social value.

The MoD has also set about restructuring support for the Royal Navy, splitting contracts that were working well into ever smaller pieces, forcing competition in areas where we believe it makes no sense. The new Fleet Management Support Programme (FMSP) divides 'hard facilities' from 'soft' in a way that we believe is artificial and counterproductive. Again, the dogma of more competition makes no sense on the ground; it will simply lead to delays and cost over-runs. In addition, we fear that any savings made for the MoD will be funded not through reduced profits for the successful bidders but by erosion of the hard-won terms and conditions of the sector's skilled workers. One example of this is an attempt to remove workers' pension rights as a measure to meet cost-reduction targets in a bid for hard facilities management by a blue-chip defence company.

Returns and investment

There is a blindingly obvious route for UK shipbuilding and ship repair, and publishing a 30-year pipeline of work is an essential first step; but the investment the government hopes for will not happen unless shareholder-owned companies can expect an RoI. That can only be predicated on an expectation of a share of the work, which is undermined by the government keeping its options open on each new procurement – a recipe for uncertainty, the enemy of investment.

Consider instead a scenario where UK shipyards knew what work they would have for the next 30 years and were encouraged to collaborate and share workload to smooth out any peaks and troughs in demand for skills. This could be managed by a joint industry body, with MoD civil servants and trade unions on the Board to ensure value for money, and vessels delivered on time and on cost. Shipyards would be encouraged to develop specialisms, as at Appledore,



Workers at the Rosyth shipyard during the construction of the two carriers.




Christopher Burns / Unsplash

A welder at work.

where the complex bows were built for the carriers, or Barrow-in-Furness, where the UK's submarines are built. Privately owned companies would have sufficient confidence in a return to make investment in state-of-the-art facilities and techniques. Steady demand signals and a reliable home market would also benefit the UK's beleaguered steel industry.

The UK industry would thus be strongly placed to win export orders for military vessels and to compete in commercial markets, perhaps starting with specialist vessels, then potentially competing in high-value markets. The prosperity that would flow from this renaissance would benefit supply chains and communities across the UK, multiplying wealth and opportunities in a virtuous circle.

A collaborative approach could lead to the sharing of best practice, driving higher standards across the board

A Maritime Technology Institute

Shipbuilders could collaborate to fund a Maritime Technology Institute, much like the Aerospace Technology Institute which was part-funded by government with matched funding from industry. This institute, drawing on our universities and R&D from industry, would become the hub for innovation and push the cutting edge of maritime technologies forward in a way that would benefit the design of our ships. It could be linked to apprentice and graduate training schemes that would equip new entrants into the industry with world-class skills. At a time when industry is facing transformation as a result, on the one hand of automation, digitalisation and artificial intelligence through Industry 4.0, and, on the other, of the global drive to Net Zero carbon emissions, such an institution could make a huge and lasting impact on a foundation industry for the UK.

Integration and collaboration

This integrated and collaborative approach could be extended into ship support and repair. Vessels have a life cycle, and we need more actively to plan and manage each stage of the cycle, from initial concept, through design and build, and in-service support and upgrade, through to final decommissioning, dismantling and recycling. Our industry currently operates in disconnected silos as a deliberate design by government. However, much greater integration would reap manifold rewards: for instance, a feedback loop from ship repairers to ship engineers and designers, helping them build in easier serviceability and more robust designs for systems vulnerable to failure. A collaborative approach across our naval bases could lead to the sharing of best practice, driving higher standards across the board, reducing downtime and increasing turnaround of essential vessels.

None of this need be a pipe dream. The only obstacle is the UK government. If they continue to pursue competition rather than collaboration, then this vision of a transformed shipbuilding and ship repair industry will never be realised. Instead, we will continue to repeat the cycle of boom and bust that has blighted our industry, undermining investment and closing off a brighter future. However, if the government has the courage and the conviction to drive a renaissance of UK shipbuilding, then we are ready, willing and able to deliver it. The UK has a fantastically skilled and experienced workforce, and a proven record of success. The pipeline of work stretching out before that presents a huge opportunity to create the conditions for massive investment, driving employment and prosperity across the UK. This is a once-in-a-generation choice, and I for one hope the right decisions will be made. ■

William Armstrong – the magician of the north

***Henrietta Heald** presents the achievements of a brilliant Victorian engineer and innovator*

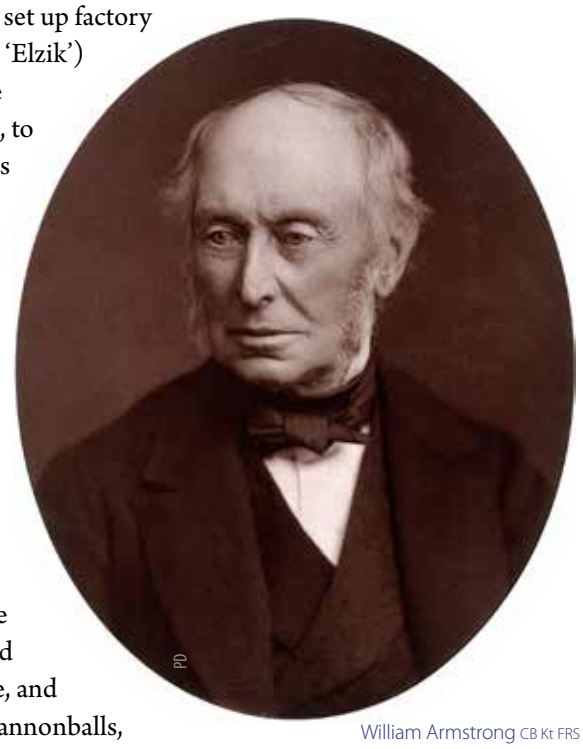
In May 1905 the island nation of Japan – for centuries closed to the outside world – burst onto the global stage with an unexpected victory against the Russians at Tsushima, the decisive naval engagement of the Russo-Japanese War. Half the Japanese ships that took part in the battle had been built on the River Tyne by Armstrong Whitworth, and the entire fleet was armed with Armstrong guns.

Tsushima was a climax in the early history of global maritime Britain, and secured the close industrial relationship between Britain and Japan that has existed ever since.

William Armstrong – the Victorian engineer and industrialist who gave his name to Armstrong Whitworth – is best remembered today as the creator of Cragside in Northumberland, the first house in the world to be lit by hydro-electric power. Armstrong's fascination with harnessing natural resources, especially water, to enhance efficiency and innovation in the service of humanity was evident in everything he did – not least in his revolutionary advances in hydraulics and hydroelectricity. He was also an environmentalist far in advance of his time, planting on his Cragside estate, near Rothbury, an estimated 7 million trees and shrubs.

Early years

In 1847, Armstrong had set up factory at Elswick (pronounced 'Elzik') on the north bank of the Tyne, west of Newcastle, to produce hydraulic cranes and other machinery. He came to national prominence in the 1850s with the invention of an entirely new type of battlefield gun in response to the disaster of the Crimea, when Britain's artillery had been exposed as hopelessly outdated. The Armstrong gun was rifled rather than smooth-bore, and fired shells rather than cannonballs, making its performance far more accurate and long-range than that of any of its predecessors. It secured a knighthood for its inventor, along with his appointment as Engineer for Rifled Ordnance and Superintendent of the Royal Gun Factory at Woolwich. He would go on to design and produce, at Woolwich and



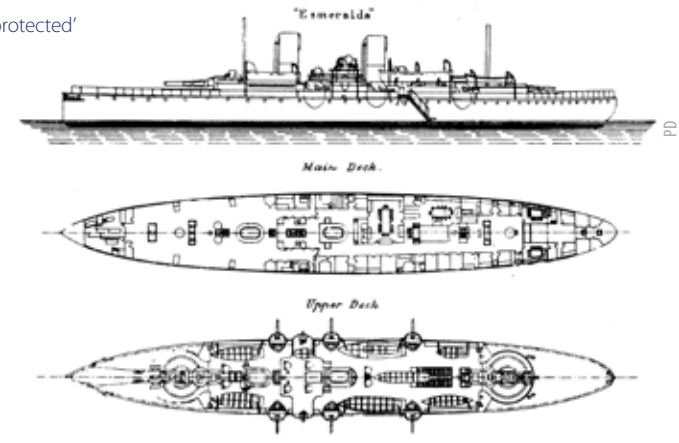
William Armstrong CB Kt FRS (1810–1900).

Armstrong's fascination with harnessing natural resources, especially water, was evident in everything he did

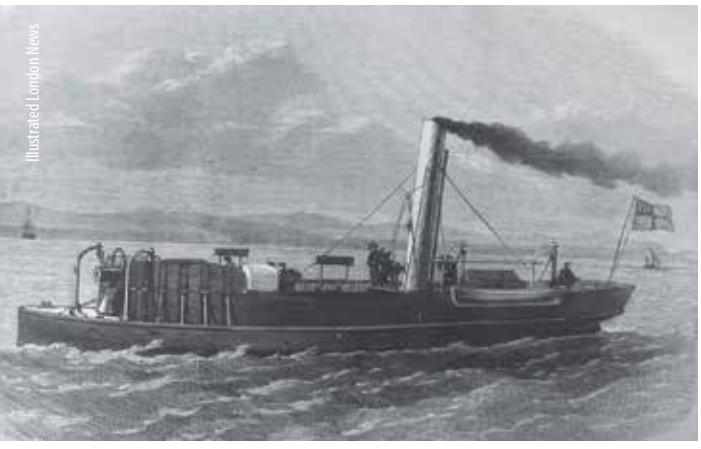


Elswick works in 1887

(Right) drawings of *Esmeralda*, the world's first 'protected' cruiser, completed for the Chilean navy in 1884.



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Illustrated London News

The gunboat HMS *Staunch* (1868).

By 1877, Elswick was shipping dismantled Staunch gunboats in crates to various parts of the world

The battleship HMS *Victoria* passing through Newcastle's hydraulically operated swing bridge. Armstrong's company built the bridge in 1876 to facilitate the opening of a shipyard at Elswick. Launched at Elswick in 1887, *Victoria* was lost in 1893 with 358 lives owing to an admiral's bungle.

Elswick, ever more sophisticated artillery, including heavy guns for use on warships.

After a disputatious interlude with the army establishment, Sir William Armstrong returned to Newcastle to pursue his engineering and business interests, and to capitalise on his inventions. A pivotal moment occurred in 1867, when he signed a deal with Charles Mitchell – a shipbuilder who had built ironclads for the Russian navy – to construct gunboats. The vessels were to be built at Mitchell's yard at Low Walker, six miles downriver from the Elswick Works, while the weapons would be manufactured and fitted at Elswick.

The association with Mitchell derived from the need to test guns at sea, in order to avoid the noise and dangers of land-based testing. It was realised that a squat, barge-like vessel would make an excellent vehicle for mounting guns and, as the business historian Kenneth Warren points out, it was 'a short step from a gun experimentally mounted in a barge to a floating gun usable as a coastal battery'. [1]

The first product of the collaboration was *Staunch*, a 79-foot 'floating gun carriage' ordered by the Admiralty. Carrying a single 'disappearing' 9-in muzzle-loading gun – raised from and lowered into the shallow hold by hydraulic action – *Staunch* had no protective iron cladding, making her lighter, faster and cheaper than a lumbering ironclad, and her low draught made her ideal for patrolling shallow coastal waters.

Staunch was a resounding success for Low Walker. During the 1870s and early 1880s, the yard completed 21 of these vessels, including 3 more for Britain, 2 for the Netherlands, 4 for Australia and 11 for China, and the same basic design was used for orders from Brazil, Chile and Italy. By 1877, Elswick was shipping dismantled Staunch gunboats in crates to various parts of the world and having them reassembled at their destination under the supervision of Elswick engineers.

Hot on the heels of *Staunch* – and coinciding with a formal merger between the Armstrong and Mitchell companies – came a new Elswick warship that had been inspired by the gunboat but was much larger and faster. Introduced in 1882, *Esmeralda* carried two 10-in breech-loading guns and six 6-in guns, and could reach speeds of more than 18 knots – making her, in Armstrong's words, 'the swiftest and most powerfully armed cruiser in the world'. *Esmeralda* had no armour-plating, but her engines, boilers and other vital parts were all contained inside steel decks below the waterline, so that she would be 'almost absolutely secure against the worst effects of projectiles'. This was the first of a group of deadly, well-protected warships that would gain universal fame as 'Elswick cruisers'.



Tyne & Wear Archives

Growth of the business

With the opening of a new shipyard at Elswick in October 1884, Armstrong Mitchell embarked on its period of greatest growth. From that time onwards, warships – including gunboats for the Royal Navy – would be built at Elswick, and all other types of ship at Low Walker. The first vessel launched at



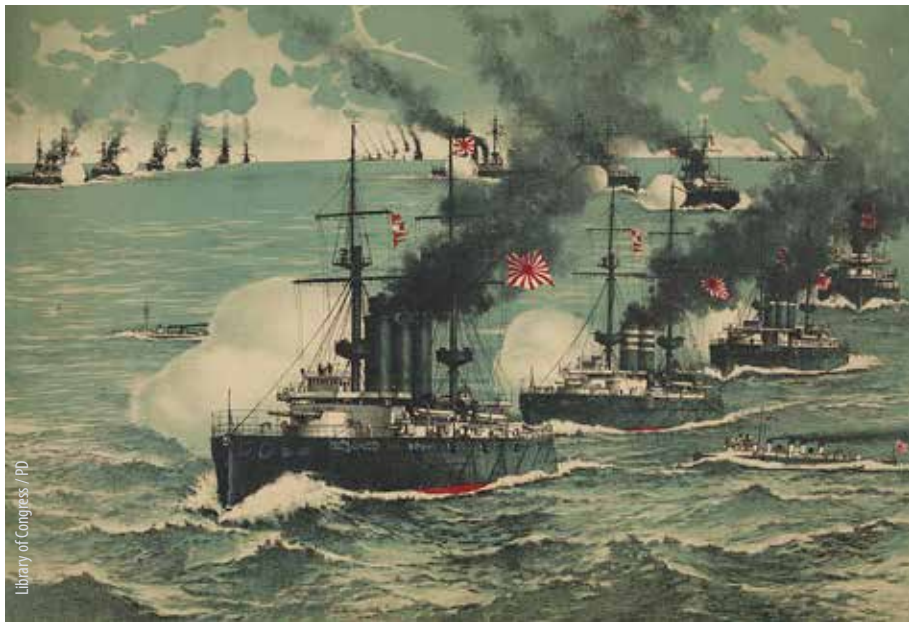
The cruiser *Asama* (launched 1898), one of a series warships built at Elswick for the Imperial Japanese navy, several of which participated in Japan's unexpected naval victory against the Russian fleet at Tsushima in 1905.

the yard, on 13 June 1885, was *Panther*, a torpedo cruiser for the Austro-Hungarian navy. On the same day, work began on the battleship *Renown*, destined to be the heaviest and costliest vessel so far constructed on the Tyne, with a displacement of 11,000 tons. Before her launch in April 1887, *Renown* was renamed *Victoria* in honour of the Queen's golden jubilee year. The first war vessel to be entirely built, armed and fitted out by a single establishment, she cost £724,855 (about £50 million in today's money).

In the following years, the demand for Esmeralda-class cruisers was overwhelming, with orders arriving from Austria, Italy, China, Spain, Romania, Argentina, Norway, Portugal, Turkey, Brazil and the USA. New technological developments meant that the ships' speed of travel was dramatically increased – and they were less than half the price of a battleship.

Politics

Meanwhile, Armstrong was campaigning for a change in Britain's naval defence policy and insisting that enlightened engineering skills could, and should, be used to promote the best interests of the human race, especially in the pursuit of peace. There was no country in the world less inclined to aggression than Great Britain, he said in a speech of 1882 – but, equally, there was none so likely to incite the greed of an assailant: Britain had more than half of the ocean-carrying trade of the whole world in its hands, and its ships, swarming over every sea and conveying merchandise of huge value, would in the event of war inevitably attract the interest of hostile cruisers. Armstrong argued that for the cost of one ironclad the Royal Navy could have three unarmoured ships of far higher speed.

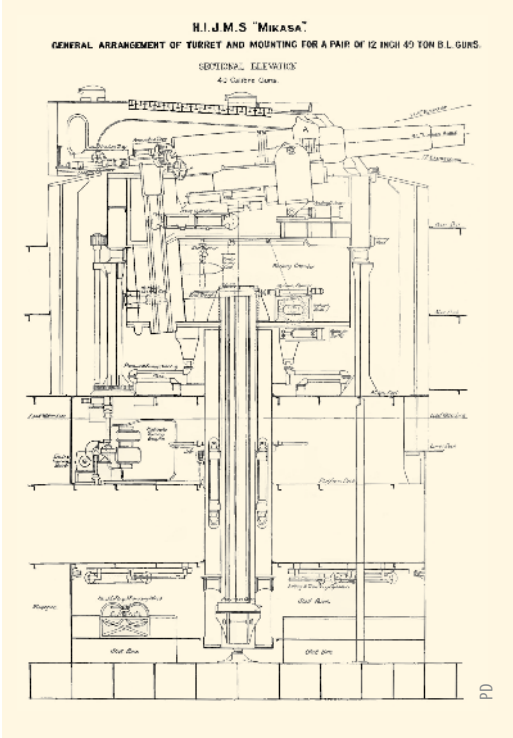


A Japanese lithograph depicting Japan's surprise attack on the Russian fleet off Port Arthur (Lüshun) at the start of the Russo-Japanese war of 1904-5. Elswick-built ships involved in the engagement included the battleship *Yashima* and the cruisers *Asama*, *Izumo*, *Iwate*, *Tokiwa*, *Naniwa*, *Yoshino*, and *Hatsuse*.

His intervention stimulated a debate about Britain's place in the world. In 1884, W T Stead, editor of *Pall Mall Gazette*, published a sensational series of articles arguing that the Royal Navy was falling behind its rivals and required vast public investment. Stead was backed by the naval strategist John Fisher, who understood Britons' fears that their country was in danger of losing its dominant position. Eventually, Prime Minister Gladstone, an erstwhile opponent of increased defence spending, was forced to add



The launch of the cruiser *Iwate* at Elswick on 29 March 1900.



Section of Elswick's 12-inch gun turret for the Japanese battleship *Mikasa*, built by Vickers. Even when Japan's warships were not built at Elswick, their armaments often were.



(Left) External view of Cragside, Armstrong's mansion near Rothbury, Northumberland, and (below) the drawing room, as shown in a tinted postcard of the period.





Armstrong at work in Cragside's electrically lit library – a drawing from the *Daily Graphic*, 1881.

£5 million to the naval estimates. British firms then embarked on a period of rapid expansion, boosted by the Naval Defence Act of 1889, which prompted innovations in the design of warships and weapons. Naval engineering was reinvigorated and, wrote Marshall Bastable, 'national power and status were given their highest expression in the mighty ships and guns which poured out of the dockyards and factories of the world's armaments companies'.[2] It was this surge in investment that made possible the building of the Japanese fleet that triumphed at Tsushima, and which fuelled the success of Armstrong Whitworth (created by a 1897 merger of two leading defence firms), which, along with Vickers, would form the industrial backbone of Britain's fighting forces during the First World War.

A global concern

Baron Armstrong of Cragside (as he had become) died in 1900, aged 90, by which time the small factory he had established on the Tyne half a century earlier had evolved into a dominant global shipbuilding concern. In the early 20th century, Elswick Works occupied a frontage along the Tyne of 1½ miles and covered more than 300 acres, but the shipyard there could not meet requirements and a new one was commissioned at High Walker.

The Armstrong Mitchell hydraulic crane at the Venice Arsenale.

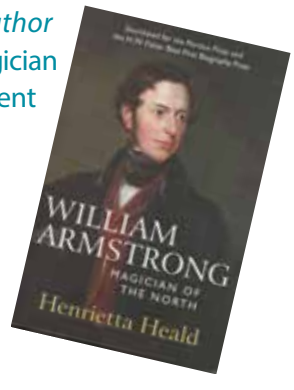


When the Walker Naval Yard opened in 1912, the prosperity and fame of Armstrong Whitworth were legendary. 'The works was one of the sights of Newcastle and the name of Armstrong was used almost as an incantation,' wrote the Elswick historian A R Fairbairn. By 1918 there were 78,000 people on the payroll of Armstrong Whitworth, with a wages bill of £1,000,000 a week. However, when wartime manufacture ceased, swift decline set in, culminating in 1927 in an enforced merger with the firm's erstwhile rival, Vickers.

Armstrong is less well remembered in the 21st century than two other contemporary engineers, Robert Stephenson and Isambard Kingdom Brunel, both of whom acknowledged his genius. Stephenson, a fellow Novocastrian, observed and admired Armstrong's early experiments with electricity; Brunel collaborated with him on the development of his first gun. But the memory of Elswick's founder – 'Newcastle's greatest citizen', as he was hailed in a *Times* obituary – would live on in the name of Vickers-Armstrong until the late 1970s, when the firm ultimately became part of British Aerospace. ■

1. Kenneth Warren (1989), *Armstrongs of Elswick: growth in engineering and armaments to the merger with Vickers.*
2. Marshall J Bastable (2004), *Arms and the State: Sir William Armstrong and the remaking of British naval power 1854–1914.*

Henrietta Heald *is the author of* William Armstrong: Magician of the North *and* Magnificent Women and Their Revolutionary Machines, a centenary history of the Women's Engineering Society.



From *mare liberum* to *mare legitimum*

Steven Haines considers the drawbacks of the freedom of lawless seas

Over 400 years ago, the Dutch lawyer Hugo Grotius maintained that the seas and oceans were not capable of expropriation, could not be placed under the effective control of any sovereign, and should be free for all to use and take advantage of. The 'freedom of the seas' – or *mare liberum* – became the enduring principle shaping the developing law of the sea over the next four centuries.

But since the middle of the 20th century things have changed, and in significant ways. The oceans and seas, in all their many dimensions, have been transformed. The change has been profound and irreversible, and far greater over the past seven decades than it was during the 350 years after Grotius wrote about *mare liberum*. Indeed, so fundamental is the change that it may no longer be reasonable to sustain the case for free seas. A controversial claim, if ever there was one! But we make no apologies; there is a troubling logic behind it.

Until the middle of the 20th century, the oceans were regarded as sparsely populated by humans. Today this is not the case. In 1945 the world's population was 2.5 billion; today it is almost 8 billion. Its maritime population has similarly increased. As you are reading this, there are estimated to be over 30 million men, women and children at sea.

- There are around 1.7 million seafarers employed in merchant ships, but they represent a mere 5 per cent of the total of those working at sea.
- Fishers number an estimated 27 million, with around 20,000 under 18 years of age.
- Before Covid-19, the daily cruise ship capacity was almost half a million passengers; they were cruising in a total of over 300 cruise ships. Post-Covid-19, cruising numbers are bound to increase once more. And let's not forget the millions of passengers carried annually on ferries.
- There are just under 500 oil and gas platforms positioned in coastal waters worldwide, all serviced by numerous support vessels. The size of the offshore oil and gas workforce is probably around 170,000.
- There are recreational sea-goers, including those embarked on, and crewing, yachts of various types and sizes, and the luxury yacht business is growing every year.
- There are those serving in the world's navies and other public vessels, including those deployed by coastguards for law enforcement activities in coastal zones.
- Finally, and certainly not to be forgotten, there are those who fall victim to, or who are themselves engaged in, various forms of criminal activity at sea.

Hugo Grotius – a statue in Delft, the Netherlands.



Watervin CC-BY-SA2.0 Gen

All of these people – men, women and children – have a right to go about their lawful business in a safe and secure environment. Sadly, the oceans are by no means a safe space for them. Evidence of abuse on the seas is accumulating on a daily basis:

- Slavery is still with us – men, women and children are forced to work for years without pay on board fishing vessels thousands of miles away from their homes.

The title page of Grotius's work on the freedom of the seas.



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The Panamanian-registered cruise ship MSC *Divina*, on board which a British girl was raped by an Italian man while the ship was on the High Seas. The case went to court in Spain, but the offence had occurred beyond the reach of any court's jurisdiction, so could not be tried. The victim was left unprotected by any law, national or international.

Far too many men, women and children are being abused and ill-treated, and little is being done to protect them

- Merchant seafarers are subjected to sub-standard working conditions, their physical and mental well-being under constant threat – especially acute during the Covid-19 pandemic (as the aviation hubs closed down an international crew change crisis developed and seafarers' tours of duty were extended, often indefinitely).
- Many seafarers have been abandoned in foreign ports with no pay and no way home, some disappearing without trace – missing persons whose families have no idea what has befallen them.
- People-trafficking and migrant smuggling is a profitable enterprise for unscrupulous criminal gangs.
- Crimes committed on board cruise ships, including sexual assaults, are rarely investigated by competent authorities and, frequently occur in situations that are jurisdictionally confusing. Many victims are denied justice in the wake of the abuse to which they have been subjected.

Human rights abuses are occurring far too frequently, some of them a constant feature of life at sea. Many people at sea are there against their will and are profoundly vulnerable to the whims and unlawful practices of criminal gangs taking advantage of what persists as an almost anarchic environment. It is profoundly disturbing that slavery and piracy, assumed by some to be consigned to history, are still thriving at sea. This is a situation that demands change and the development of an international programme of action to achieve it.

There is an almost complete lack of criminal law enforcement at sea. Coastal states do not adequately enforce law in their coastal zones – and nobody has responsibility for the high seas, except flag states, many of which are simply not interested in anything but the commercial benefit to be gained from their business. Despite exclusive jurisdiction, flag states have no ability to enforce any law on the high seas. That vast expanse is a legal vacuum – an anarchic space in which unscrupulous criminals can act with impunity.

An example of the consequences of a lawless ocean occurred in the Mediterranean in March 2019. It involved a vulnerable British girl on board a Panamanian-registered cruise ship, the MSC *Divina*. She was raped by an Italian man. The vessel put into Valencia, the Spanish police investigated the crime, and the case went before a Spanish court. But the court had no jurisdiction to try the case; the offence had occurred beyond Spanish jurisdiction, in Panamanian exclusive jurisdiction while the vessel was steaming on the high seas. So the accused was released and the victim of his assault was left traumatised and with no effective legal remedy. At present there is no international law that covers this type of situation.

In theory, human rights apply at sea to the same extent that they apply ashore – but they are not being applied to the same degree. Far too many men, women and children are being abused and ill-treated, and little is being done to protect them. Those who have a legitimate reason to be at sea and who are trying to go about their lawful business have a right to do so in a stable and secure environment. They need to be safe and to feel secure. What they desperately need is not free seas but safe and secure seas. Not *mare liberum* but *mare legitimum*.

The supreme irony is that if Grotius were alive today, knowing what we know of his philosophical approach as the Father of International Law, that is precisely what he would be arguing for himself. ■

***Steven Haines** is Professor of Public International Law, University of Greenwich, and a Trustee of Human Rights at Sea.*

As ashore, so at sea

***David Hammond**, CEO and founder of Human Rights at Sea, examines an emerging and necessary maritime focus beyond the horizon of previous conventions on the law of the sea*

If in early 2013 you had typed "human rights at sea" into a search engine you would have found little other than research papers suggesting that human rights should and could be applied at sea under existing legal instruments. This despite an obvious lack of an explicit mention of the words 'human rights' within the 1982 UN Convention on the Law of the Sea (UNCLOS), or the 2006 Maritime Labour Convention (MLC 2006).

From another perspective, the emerging suggestion that pirates were entitled to human rights protection was met with disbelief in some national quarters and by some former Royal Navy colleagues. Yet in 2014 the European Court of Human Rights found in favour of nine Somali pirates in the cases of Ali Samatar and Others *v*. France, and Hassan and Others *v*. France.

Human rights front and centre

Fast-forward to the onset of the Covid-19 pandemic in early 2020, and you would have found the issue of fundamental human rights for those working at sea, generated by the global publicity about abandoned and extended crew members, being spotlighted in UN agency discussions and resolutions. The Maritime Labour Convention 2006 was clearly being ignored by some states and some commercial shipping interests, leaving many seafarers significantly exposed to human and labour rights abuses.

The emerging humanitarian issues were being talked about not just within the walls of the International Maritime Organization (IMO) and International Labour Organization (ILO), but also the Office of the High Commissioner on Human Rights (OHCHR), the International Chamber of Shipping (ICS), global unions, and even the UN Global Compact, the world's largest corporate sustainability initiative. This was a first under the human rights at sea aegis.



An Indian Navy boarding party from the frigate INS *Trishul* boards a pirate vessel after an Indian merchant ship was threatened in the Gulf of Aden.

The maritime industry responded by issuing the Neptune Declaration on Seafarer Wellbeing and Crew Change, signed by over 800 entities, urging the implementation of four main actions to address the crisis:

1. Recognise seafarers as key workers and give them priority access to Covid-19 vaccines.
2. Establish and implement gold standard health protocols based on existing best practice.
3. Increase collaboration between ship operators and charterers to facilitate crew changes.
4. Ensure air connectivity between key maritime hubs for seafarers.

Nonetheless, at the time of writing there has been little improvement in working conditions at sea for many seafarers.

A humanitarian and safety crisis

On 12 June 2020, UN Secretary General Antonio Guterres unprecedentedly classed the crew-change crisis and consequent effects on essential supply-chain workers as a 'humanitarian and safety crisis'. This came at a time when seafarers globally were fighting to be recognised as key (essential) workers, to be safely repatriated to their families, and not

The suggestion that pirates were entitled to human rights protection was met with disbelief in some quarters



to be subjected to working conditions which sometimes amount to forced labour (their contracts are often extended well in excess of the maximum period under the MLC 2006).

But as yet many crew members have still had little or no option but to continue to work at sea throughout the pandemic.

It is not just about seafarers

The topic of human rights at sea is not all about the 1.6–1.7 million seafarers (equivalent to the population of Glasgow) who keep more than 90 per cent of the world's goods flowing.

It also includes:

- the 35+ million workers in the global fisheries sector and in the offshore oil and gas, renewable energy and cruise line industries
- the global movement of the more than 80 million displaced persons, as reported in June 2021 by the UN High Commissioner for Refugees (UNHCR), including those crossing the Mediterranean fleeing persecution, conflict, violence, human rights violations and events seriously disturbing public order, as well as those seeking a better life
- stowaways seeking the same
- those rescued at sea by commercial vessels, civil society search & rescue organisations and private actors
- individuals pushed by governments – fully aware that they are breaching the internationally recognised rule of non-refoulement – into the control of repressive governments, many of which treat those individuals as though they are sub-human, brutalising men, women and children through systemic rape and exploitation into tied conditions of slavery and trafficking.

This is before we review the egregious abuses endemic in the SE Asian coastal and distant water fishing fleets.

The rogue fishing vessel *STS-50*, which under various names and flags was pursued for illegal fishing by various countries' authorities, as well as by Interpol and the NGO Sea Shepherd. It was finally captured with 600 illegal gill nets aboard in April 2018 by an Indonesian patrol boat in the Strait of Malacca. According to the Environmental Justice Foundation, 'The mostly Indonesian crew lacked any kind of identity documents, had not received any pay, and had worked on board the vessel for an extended period of time – all potential indicators of human trafficking.' The captain and officers turned out to be Russian and Ukrainian, and links to organised crime were discovered in bank accounts.



Sea Shepherd Global

Human Rights at Sea

In September 2013, at the first London International Shipping Week, there arose the concept of an independent civil society organisation focused on advocating for human rights at sea.

As a result, Human Rights at Sea came to fruition in 2014 as a UK-registered independent charitable NGO, working nationally and internationally to end human rights abuses at sea; our founding principle is 'human rights apply at sea, as they do on land'. This principle is central to all our charitable activities, which aim to achieve increased social, policy and legislative change, as exemplified by the amendment in New Zealand's maritime law.

With Lord Teverson of Tregony, a Liberal Democrat Member of the UK House of Lords,



Migrants in inflatable boats approaching the Greek island of Lesbos from Turkey. The world has more than 80 million displaced persons seeking – often by sea – to escape conflict, persecution, human rights violations and economic insecurity.

as our patron, we now have: 11 trustees with wide-ranging international business, academic, legal and civil society experience; a non-executive advisory board of 18 members; and a core staff, with retained consultants: the legal *pro bono* support of five international law firms and a pro bono researcher pool of 10–18 persons. Thus fortified, our charitable NGO is now delivering an objective civil society perspective on issues of human rights abuse throughout the maritime environment.

Research, advocacy, investigations and lobbying (RAIL)

For eight years we have worked diligently to our RAIL model, pursuing continued professional excellence. We are known as an independent and objective organisation, especially when it comes to the issues we cover on a day-to-day basis, which are predominantly victim-focused.

Not satisfied with merely reporting via oral and written advocacy, we have decided to drive social change; we do this by using existing international law frameworks and soft-law pathways as our core foundation.

In March 2019 the Geneva Declaration on Human Rights at Sea was conceived to draw together existing legal regimes and to express in plain English the need and the requirement for explicitly addressing human rights abuses at sea. The Declaration is framed within four core principles:

1. Human rights apply at sea to exactly the same degree and extent that they do on land.
2. All persons at sea, without any distinction, are entitled to their human rights.
3. There are no maritime specific rules allowing derogation from human rights.
4. All human rights established under treaty and customary international law must be respected at sea.

The Declaration is now reflected in the 35th edition of *Brill's Ocean Yearbook*, a leading publication devoted to 'assessing the state of ocean and of coastal governance, knowledge, and its management'. The Declaration's principles are used by numerous entities to frame their position on the subject.



Workers on offshore oil and gas platforms are among over 36 million people across the world whose employment is at sea.

In the same year the charity partnered with the international law firm Shearman and Sterling LLP. The aim of this partnership was to develop a victim-led project repurposing existing systems of arbitration for the benefit of victims and their families, and to introduce another voluntary tool and pathway for achieving effective remedy. This project is under continuing development, including: the drafting of state and commercial consent orders; the development of the rules, policies and regulations required to conduct an ad hoc tribunal; and the innovation of the pathway with interested stakeholders working towards the first tribunal of its kind.

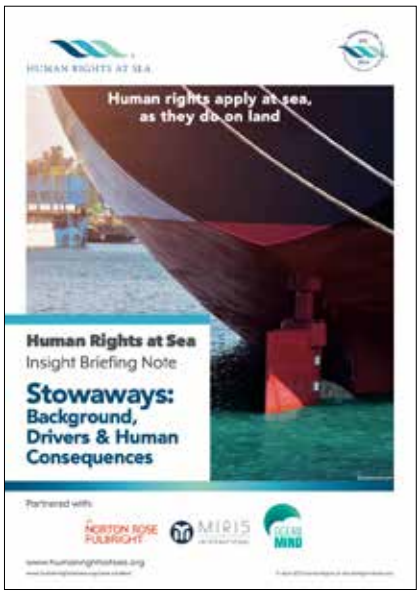
Further, on 22 June 2021 Lord Teverson



Many crew members have had little or no option but to continue to work at sea throughout the pandemic

A cruise ship galley. The cruise industry employs large numbers of people whose rights in law are often uncertain.





Publications from Human Rights at Sea.

The vast majority of maritime workers (and their family members) are often seen by many corporate eyes as just a commodity

asked the House of Lords what Her Majesty's government was doing to protect human rights at sea. This was the first time the topic had been raised in a parliamentary setting, and it was done with the specific intent of both triggering an initial discussion, and furthering the charity's enquiries into what the UK government understood by the term 'human rights at sea' and what the government saw as its associated duties. The charity thus succeeded in getting both the issue and the emerging narrative put onto the public record.

Meantime, our core casework continues, as a wide range of enquirers – victims, families, coastal and flag states, commercial entities and marine insurers – approach us daily, requesting assistance to address cases of abuse at sea. Their need for assistance is not the issue: the issue is the lack of resources to service the need.

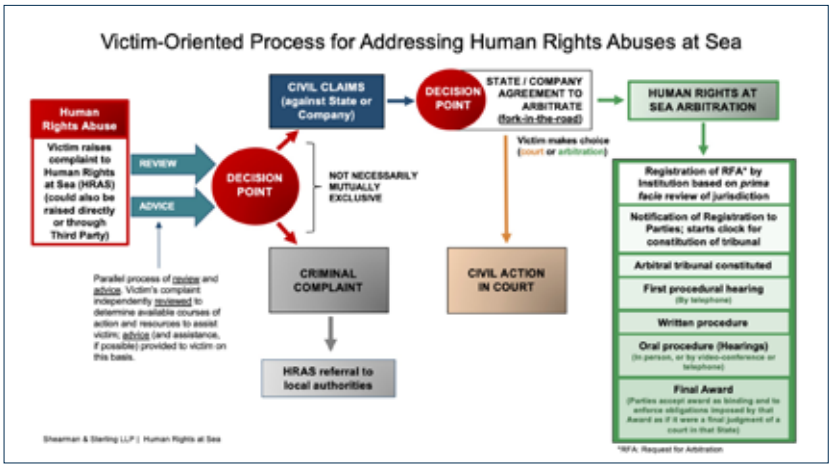
In sum

While you are reading this article the abuses at sea are not stopping. The inconvenient truth of the scope, scale and prevalence of the violations occurring out of sight and out of mind continues to be played out day in and day out. It is the lack of general awareness, the lack of public concern – such seemingly distant issues do not directly affect most people – and simply the ignorance of what is happening beyond the visual horizon that keep our organisation and others like us continuously busy.

It is ironic, therefore, that had it not been for Covid-19 the narrative of human rights at sea would not be on the radar of the multi-trillion-dollar maritime industry, nor in the workflows of ministers of state around the world, nor discussed by international media. Had it not been for the pandemic, it is highly unlikely that the same level of attention, related actions and corporate focus on human rights at sea would have occurred. After all – as some of us have come to begrudgingly understand – the vast majority of maritime workers (and their family members) are often seen by many corporate eyes as just a commodity easily replaced.

So it is time for us all to recognise the need to explicitly protect human rights at sea. It is time to update and amend international maritime conventions to explicitly reference the need to protect human rights at sea. There is an imperative need to convene and deliver genuine non-partisan initiatives such as the development and adoption of the Geneva Declaration on Human Rights at Sea, and an *ad hoc* victim-led international Human Rights at Sea Arbitration Tribunal. ■

The victim-oriented process developed by HRAS and Shearman & Sterling LLP.



***David Hammond** previously served in the Royal Navy, and in the Royal Marines as a naval helicopter pilot, then became the first Royal Marine barrister. He retired early in 2012 to work with the UK government's Stabilisation Unit, practising maritime and human rights law. During this time he conceived and established the 100 Series Rules for the Use of Force and Human Rights at Sea. He holds a BA in Marine Biology and a Post-Graduate Degree in Law, and has practised in defence and prosecution.*

Public relations in the maritime world

Ben Pinnington, *Managing Director of Polaris Media, shines a light on the need for better communication*

Public relations is changing. The era of PR as a tactical tool, communications gloss or an add-on to marketing is over. Astute organisations now use PR to shape their strategic direction. PR today is as much about listening as it is about broadcasting a message. This is the reason that many organisations are now making PR part of their C-suite, to ensure they are in tune with their stakeholders as well as public opinion on issues affecting them. There is an understanding that if organisations reflect their stakeholders' messages they are more likely to receive support from the people that matter most – and that is the ultimate goal of PR: to deepen relationships. However, PR has historically been an Achilles heel of the maritime industry. It is a paradox that, despite having some of the greatest stories to tell of any sector, many maritime companies prefer to stay out of the limelight. The low-profile approach today is in stark contrast to that of figures from maritime's past whose names still reverberate, such as Columbus, Cook or Magellan. In recent times the maritime industry has produced few entrepreneurial figures to match the past or the likes of Musk, Jobs or Branson to inspire the public or fight in the corridors of power when influence is really needed – as with the chronic problem of seafarer welfare. There is an urgent need for the maritime industry to come together like a rising tide to improve the general standards of public relations. While the desire to be discreet may be well intentioned, it is an increasingly untenable approach in today's media-dominated world where social media has given everyone a voice. Organisations now need to have clear, measurable PR plans aligned to their business plan objectives. It sounds like common sense, but in my experience, it is not that common.





(Above left) *Deepwater Horizon* burning in the Gulf of Mexico shortly before it sank, causing the worst oil spill in history, with serious damage to the marine environment and to livelihoods on the US Gulf coast. (Above) Louisiana citizens venting fury after BP's British CEO, Tony Hayward, dismissed the spill as being 'tiny'.

A cautionary lesson in misjudging the mood of a crisis was delivered by BP after the *Deepwater Horizon* blowout in 2010. Its then CEO drew a media backlash when he described the spill as 'tiny' compared to the Gulf of Mexico, and said, 'I'd like my life back', appearing out of tune with the public affected. After the initial communications chaos, BP got its act together and led the way in using social media for the first time to help communicate in a crisis. Earlier this year, the weakness of maritime PR was again exposed by the *Ever Given* incident, which thrust maritime onto front pages worldwide. It was a reminder, as was



The container ship *Ever Given* blocking the Suez Canal, seen from the International Space Station in March 2021. By the time the canal was cleared, after six days, some 369 ships had been delayed, holding up nearly US$10 billion in trade. The ship is registered in Panama, Japanese-owned, but operated by Taiwan's Evergreen Marine, while a German company was responsible for its technical management.


Mahdi Shojaeian CC-BY-SA-4.0 IL

The shattered port of Beirut after the explosion. Another example of a failure to communicate well leading to a loss of public confidence.

the tragic Beirut Port explosion in August 2020, that for many maritime organisations the threat of crisis is constant. A stinging editorial in *Lloyd's List* said the response to the *Ever Given* crisis saw 'faceless' shipping executives 'hide in the shadows', when there 'was a unique opportunity to explain shipping's key role as the economic backbone of world trade'.

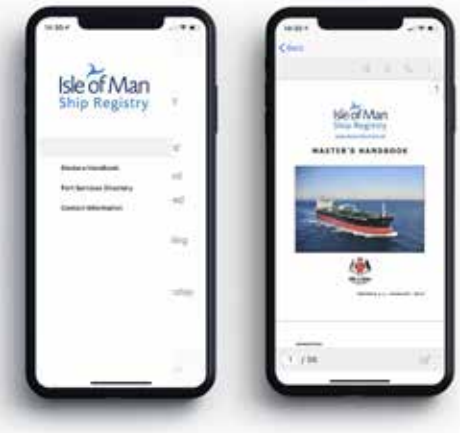
Being prepared

While this was a complex crisis involving many different organisations and cultures, the latest media training says that you need to front up in a crisis. It is in a crisis that a company and its leaders can be seen for what they really stand for. A crisis well-handled should see an organisation's reputation enhanced by an empathetic spokesperson sensitive to the human implications of the incident, giving informed updates and answering difficult questions. Where organisations so often go wrong is in seeming detached, cold or insensitive to the human impact of a crisis. Maritime organisations need to be aware how the low-profile approach can backfire. *Ever Given* was a wakeup call for the maritime sector. The pressure for a planned approach to crises, as well as for proactive PR and being more in touch with stakeholders, is only going to increase. The decarbonisation agenda is dragging the maritime industry out of its bubble into the blinding sunlight of the climate crisis debate. Maritime can now be pulled into the orbit of major influencers such as Sir David Attenborough, the Duke of Cambridge and Greta Thunberg, followed by the legions of intelligent young people inspired by them. A more positive example of maritime reaching the mainstream successfully was the building of the new research ship RRS *Sir David Attenborough* for the British Antarctic Survey. We worked on this project, staging three press calls with Sir David which attracted massive media attention, with the national media descending on Cammell Laird shipyard. The campaign also drew headlines with the *Boaty McBoatface* saga, which saw the naming competition take on a life of its own on social media when the 'joke' name caught the popular imagination. But the National Environmental Research Council, the ship's owner, managed the storm with good humour, enabling the story

If an organisation says it's going green, it has to show it's doing it



Good PR helped rescue the prestige of the British Antarctic Survey's new ship when a 2016 poll to choose its name favoured *Boaty McBoatface*. Imposition of the name *RRS Sir David Attenborough*, honouring a popular and highly respected figure saved the vessel's dignity, while due recognition of the public delight in the silly name was paid by attaching it to one of the ship's autosubs.



The Isle of Man Ship Registry used social media as well as conventional media to promote the August 2021 launch of its special seafarer welfare app, offered for free to around 11,000 seafarers sailing on more than 400 vessels under the Isle of Man flag.

to reach a much bigger audience than could originally have been imagined.

However, decarbonisation puts massive pressure on maritime businesses. This is not the soft world of corporate social responsibility (CSR), where companies did good things, that were not always fundamental to operations, and expected praise. The advent of Environmental, Social and Governance (ESG) criteria in place of CSR creates much a tougher game, particularly in maritime finance, where the Poseidon Principles have been signed up to by lending institutions responsible for $158 billion, roughly half of global ship finance. The signatories demand that shipowners meet the IMO targets for their fleets, or their ships risk not being mortgaged.

New expectations

This kind of measure is squeezing the maritime industry where it hurts – and it shows that the old ways of focusing shareholder value are being replaced by the expectation of a meaningful contribution to society and the planet. Now, having an authentic purpose matters. In this new, harsher climate it is worth remembering the definition of PR: PR is about reputation, the result of what you do, what you say and what others say about you. By far the most important element of this statement is the 'what you do'. If an organisation says it's going green, it has to show it's doing it – the era of purpose-washing and greenwashing is over. With the increasing profile of decarbonisation this could be the epochal moment when maritime throws off its shackles and shines in the mainstream, showing the world it can lead the way in AI, green energy and digitisation. But if maritime does not tell its story boldly it will continue to be eclipsed by the likes of tech. Too many maritime companies are stuck in the past, re-engineering diesel ships when they should be reverse-engineering the future of alternative fuels. Given that the cost of decarbonisation in maritime has been pitched at up to $1.9 trillion there is certainly an incentive.

Social media

One way of highlighting maritime's success stories is via social media. The legendary troubleshooter Sir John Harvey-Jones once said, 'The main activities a company chairman should concern himself with are strategic planning and public relations.' Today that extends business leaders responsibilities to at least overseeing their organisation's social media. However, one of the big problems in maritime is that executives are not embracing social media enough. For example, there are now a staggering 730 million LinkedIn users, with half logging in every day, but fewer than 10 million are sharing content. Building strong relationships with the mainstream media is still vital, too. It is still important to get to know journalists and stage tours to build trust and relationships. If you do not give the media a chance to understand your organisation, there is little point complaining about sea-blindness. With stronger media relationships, when a negative story threatens, the company is more likely to be given a sympathetic hearing.

The world has become a very noisy place, and it has become harder than ever to penetrate that wall of sound. The maritime industry needs to find its voice on the issues that matter most. These are not the times to be quietly hiding, tapping on the doors of government and the media with a sponge. It is time for maritime to find its champions, so the immensity of the sector is heard, appreciated and acted upon. ■

Ben Pinnington's new book **Making Waves: PR Strategies to Transform Your Maritime Business**, *was published by Rethink Press in June 2021.*

Where organisations often go wrong is in seeming detached, cold or insensitive to the human impact of a crisis



Unlocking Davy Jones's locker

***Tim Parker**, Chair of the Trustees of the Nautical Archaeological Society, sets out the Society's aims and activities*

Lebanon 2017 – Students learning how to survey underwater as part of the Lebanon Capacity Building Project.



The Nautical Archaeology Society (NAS) originated in 1964 as the Council for Nautical Archaeology (CNA) whose remit was to communicate divers' discoveries to the appropriate learned bodies. The CNA also played a key part in what became the Protection of Wrecks Act 1973. Our mission now has evolved: it is to research, record and protect our threatened underwater and coastal heritage for the benefit of everyone.

The NAS is represented on the Archaeology Training Form, the Joint Nautical Archaeology Policy Committee, the International Congress on Underwater Archaeology (IKUWA) and the Scientific and Technical Advisory Committee for UNESCO.

In 1972 the CNA established the *International Journal of Nautical Archaeology* (IJNA), which will publish its 50th volume this year (2021) and will feature key investigations and developments in the field of nautical archaeology from the last five decades.

Since 1986, when we ran our first educational events, we have delivered our mission through three core areas of activity:

- **Education**: We believe that when someone learns about their heritage and helps research and record it, they come to understand it, begin to value it, and become the best advocates for further research and protection.
- **Research**: As we were established 'to further research in nautical archaeology and publish the results', we deliver innovative, quality, fit-for-purpose research into all aspects of maritime archaeology.
- **Publication**: Communication to all remains a key component of how we raise awareness, knowledge and support.

Our mission is to research, record and protect our threatened underwater and coastal heritage for the benefit of everyone

Education

Our education offering includes:

- **Introduction and Foundation Courses**: Introductions to underwater and foreshore archaeology, offered in class and via eLearning.
- **Maritime Archaeology Courses**: Specialist skills in particular areas. Members can gain credits towards an NAS qualification.
- **NAS UK Qualifications**: Foundation, Certificate, and Award in Maritime Archaeology. Members can obtain these recognised NAS qualifications, which reflect the archaeological knowledge and skills they will have gained through the NAS Education Programme, partner organisation courses and self-directed fieldwork and research.
- **Skills Days**: These take place on land or under water. Students learn how to record a site through sketching, photography and video, how to complete a 2D survey of a site and how to use a planning frame to produce a scale drawing.
- **Protected Wreck Days**: Every year we take qualified divers on an extraordinary experience visiting and learning about some of the UK's amazing protected wrecks.
- **International Partners**: We have international training partners teaching our courses in Africa, Australia, Canada, China/Hong Kong, Colombia, Croatia, Germany, Ireland, Italy, Japan, Mexico, Portugal, Switzerland, Turkey, Uruguay and the USA. We also have affiliated training partners in the Netherlands and the USA.



Recording cannon on the Normans Bay wreck – a 17th- or 18th-century warship lying off Pevensey, East Sussex.

Education can be undertaken for personal and professional development, or can be tailored to a particular project or archaeological site.

Research

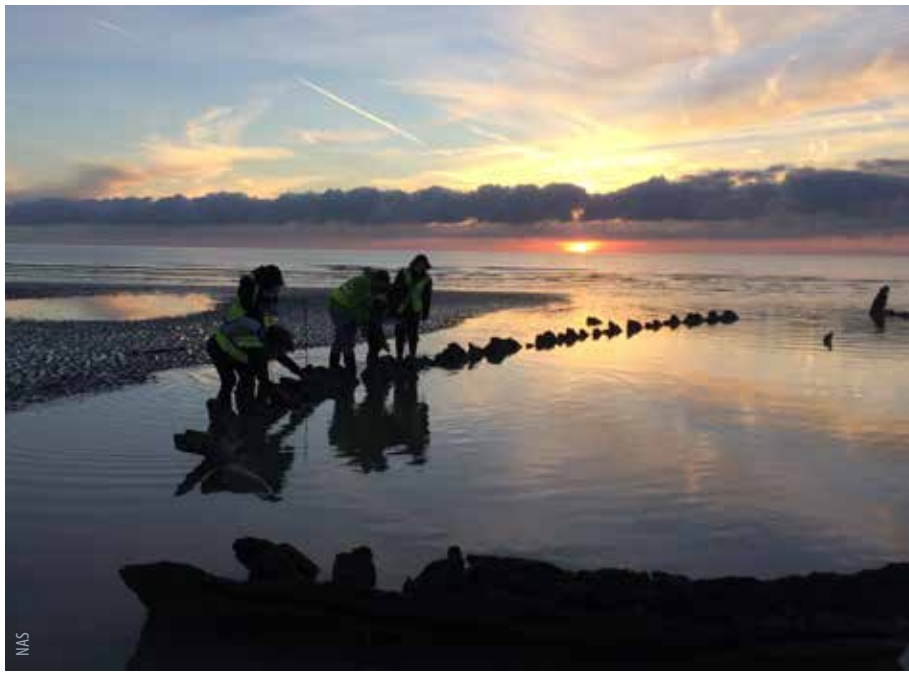
Examples of recent work include:

- **Members' Research Group**: Archaeology has changed from a dry and dusty collection of artefacts in a dim and dusty museum to interpreting and explaining how people lived and worked in a bygone age, bringing it back to life. NAS members gather at the National Archives; some work on their own projects, others photograph documents for NAS members who cannot get to London. High-profile projects such as Parks Canada's *Erebus* and *Terror* have benefited recently from this effort.
- **Local Economic Benefit of a Protected Wreck**: In 2012 the NAS was commissioned by English Heritage to undertake a study looking at the value of a protected wreck to a local economy. This study, published in 2013, looked at the visitor diver trail on the protected wreck of *Coronation* in Plymouth Sound, and it has attracted a large number of visiting divers.

Publication

The NAS having been established to further research in nautical archaeology and disseminate the results, we publish:

- **IJNA**: A forum for the exchange of ideas and research relevant to all aspects of nautical and maritime archaeology.
- **Monograph Series**: The vehicle for the publication of rather more substantial pieces of work than a paper for IJNA or another academic journal.
- **Underwater Archaeology: The NAS Guide**: Outlines the principles and provides practical guidance for undertaking underwater archaeological work responsibly.



NAS volunteers examining the remains of a wreck in the tidal shallows at Sandwich, Kent.

Projects

Our projects, serving as the focal point for many NAS activities, bring together interested parties, volunteers and professional archaeologists. Examples include:

- **Dive Trails**: The UK heritage agencies have supported the development of dive trails around the country to facilitate access to the country's protected wrecks. The NAS has helped establish four of the trails as well as three virtual dives that help non-divers experience the pleasure of exploring a historic wreck.
- ***Holland* No.5 Submarine**: a remarkable piece of our naval heritage. She was the first submarine to actually be commissioned in the Royal Navy, on 19 January 1903, at the same time as Holland No.3. The NAS has been involved in recording and researching the wreck since 2008.
- **Chesil Beach Protected Wrecks**: In 2019 the NAS and the Maritime Archaeology Trust (MAT) ran training activities and series of public events based around the Chesil Beach protected wrecks, off Weymouth.
- **Minesweeper MMS113**: Since 2016 the NAS has been working alongside other

Our projects bring together interested parties, volunteers and professional archaeologists



A bronze cannon with a cuttlefish.



The bow of HMS *Holland* No. 5, the Royal Navy's first submarine, commissioned in 1903 and now a protected wreck lying on the seabed off Eastbourne.

We aim to educate and train officials, developers and students of archaeology and cultural heritage

The former Gosport ferry *Vadne*, on the mudflats at Forton Lake.



interested parties on the remains of what is believed to be a World War II Motor Minesweeper 113. The remains of the vessel lie on the Gosport foreshore, on the western side of Portsmouth Harbour. NAS members are helping to record and research the remains of this piece of military heritage.

Capacity building

In an effort to achieve one of our core aims, we engage in capacity building initiatives to promote maritime archaeology and coastal cultural heritage stewardship all over the world.

We aim to raise awareness of the richness of the underwater and coastal heritage – as well as the threats faced and the actions that can be taken to mitigate the damage. We also aim to educate and train officials, developers and students of archaeology and cultural heritage, and help build capacity to manage, protect and promote maritime culture for future generations. Recent examples include:

- **Cyprus Field Schools**: In 2012 the Honor Frost Foundation provided a grant to the Nautical Archaeology Society to help establish a formal partnership between the NAS and the Archaeological Research Unit of the University of Cyprus. The two parties have taught three international educational field schools in underwater archaeology on Cyprus.
- **Lebanon Training**: Since 2017, with the support of the Honor Frost Foundation, NAS senior tutors have visited Lebanon to undertake training activities with students of archaeology in conjunction with local universities. It is hoped that these short courses will be the start of wider initiatives to support activities and education directed at underwater cultural heritage in Lebanon.



Holland No.5 running on the surface. The vessel sank in the Channel in 1912 while being towed to a scrapyard.

Summary

The Nautical Archaeology Society wants to allow everyone to benefit from the unique and fascinating resource that is the world's maritime heritage. From the UK perspective as an island nation, while much of our landscape is shaped by our enduring relationship with the sea, much of our maritime heritage is unseen or undiscovered and so is at risk of damage, resulting in loss for future generations. The NAS, working together with international organisations, partners, members and volunteers, seeks to protect, research and record our maritime heritage now and for the future. ■

Tim Parker**'s focus is coastal and foreshore archaeology, such as the project at Forton Lake, off Portsmouth Harbour, which contains the wrecks of around 30 vessels. He is also very interested in how technology can contribute to archaeology. NAS is a UK-based charity with strong links to other organisations around the world which work together to promote the cause on a global scale. For further information visit* **www.nauticalarchaeologysociety.org

A Cromwellian shipwreck in the Sound of Mull

Colin Martin *on a project that illustrates the value of nautical archaeology*

On 5 September 1653 four merchant vessels and a small warship dropped anchor off Duart Castle in the Sound of Mull. The transports carried eight companies of soldiers from Cromwell's New Model Army commanded by Colonel Ralph Cobbett, who had gone there to besiege the stronghold of the fiercely Royalist chief of Clan Maclean. The escorting warship *Swan* lay to seaward so her guns could protect the disembarking troops. Her captain was Edward Tarleton, one of Cromwell's 'tarpaulin' officers, chosen for his seafaring experience rather than his social connections. He was a working skipper and head of a Liverpool mercantile family; he subsequently became the city's mayor. The landings went smoothly because the Macleans had prudently decamped to the hills, and the soldiers, having taken the castle, spent the next two weeks strengthening its defences and scouring the neighbourhood for fugitive Royalists, provisions and booty.

But on 23 September disaster struck. A gale drove two of the merchantmen from their moorings and threw them ashore on the fringing beach. *Swan*, further out to sea on the exposed flank, struck Duart Point broadside on and sank. She settled on the seabed heeled to port, and when the upper works collapsed her remains became buried in sand brought in by the strong currents.

The find

By 1979 nothing was visible above the sea floor except eight concreted guns and an anchor. These were spotted by John Dadd, a naval diver on a training exercise. Realising that the site was of historic importance he reported his find to the relevant authorities, and in due course the wreck was protected (it is currently part of a Marine Protected Area and may be visited by divers, although nothing may be disturbed or removed). Some years later erosion revealed wooden structure and artefacts, and in 1992 the Institute of Maritime Archaeology at St Andrews University was invited to undertake a controlled rescue excavation and subsequent restabilisation of the site. All finds have been lodged with the National Museums of Scotland.

Archaeology under water is conducted with the same rigour and methodologies as on land, adapted to the watery environment. A grid framework with accurately positioned datum points is established, and careful surveys are made of all features and finds. These are refined into a detailed three-dimensional map of the wreck and its surroundings. This enables us to understand the wreck as it today, and establish the processes by which it has metamorphosed from the intact and functioning entity it once was. We then work backwards to reconstruct as much as we can about the original ship and its people before it became a wreck.

Shipwrecks are especially rewarding for archaeologists. A living ship is a complex system designed for a purpose – whether war, commerce, transport, fishing, or even pleasure. Its remains can reveal aspects of its design, proportions, how it was built and operated, and the lives of those on board. Much of this evidence comes from the artefacts found on a wreck, which when properly analysed add to our broader knowledge of the period and

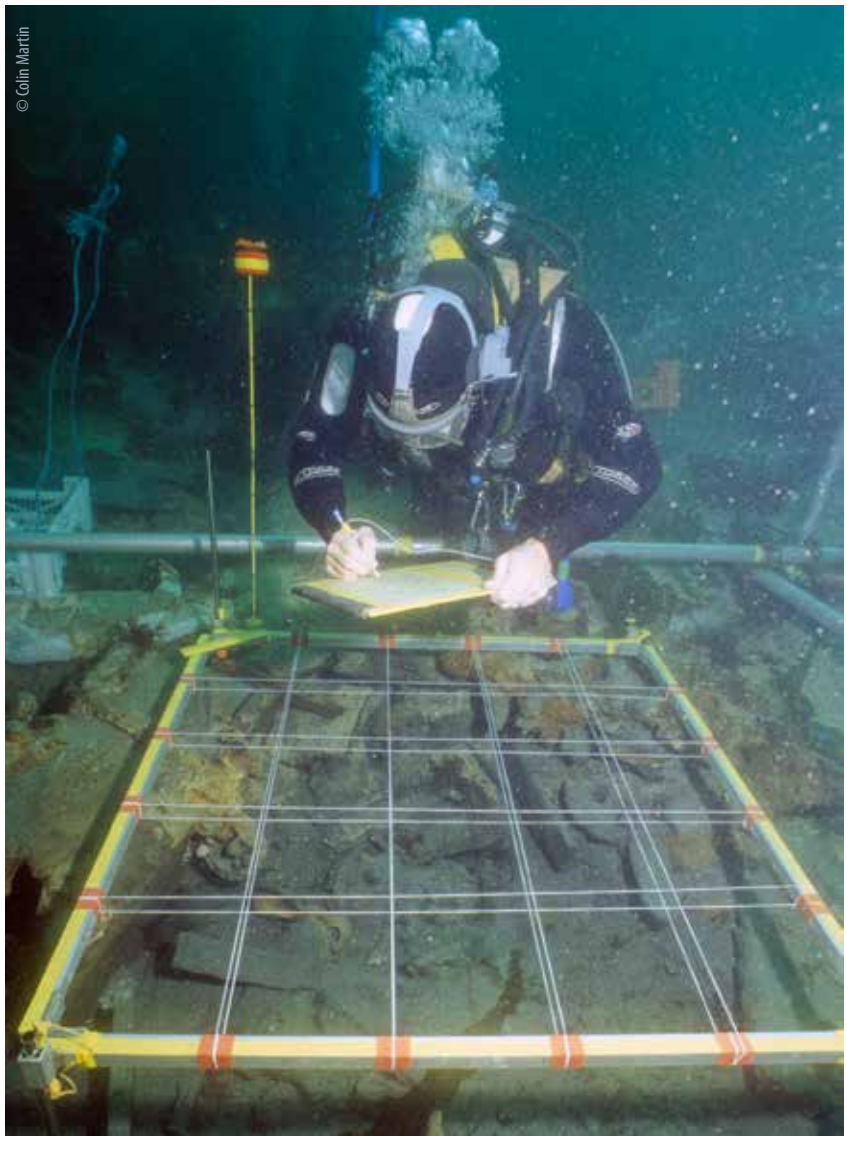


Edward Tarleton (c.1628-1690). The pistol he is holding was once used to quell a mutinous crew.

Archaeology under water is conducted with the same rigour as on land


© Colin Martin

Duart Castle and the anchorage beyond. The wreck lies just off the headland.


© Colin Martin

Recording features in an archaeological grid.

activities in question. These may include such specialisations as the navigation, medicine and craft skills associated with the running of the ship. Personal and domestic artefacts reflect life on board and the material culture of the parent society ashore. And since all items were in use at the moment of sinking it provides a fixed point for the study of how particular artefact types have changed through time. This in turn helps to place finds from other sites whose contexts are not so tightly dated. For example, smoking was one of a seventeenth-century sailor's few comforts, and many of *Swan*'s clay pipes bear the mark of a Newcastle pipemaker. This mark is rare outside Newcastle, and apart from the *Swan* examples it has only been recorded at St Andrews, Orkney and Belfast. We know that Cromwellian troops were active in these places during the 1650s and that Newcastle was their main supply base, so the pipes presumably indicate troop movements at the time. Then again, wreck collections usually provide a much greater variety of items than most land sites. On land, most reusable or valuable objects have been removed: on a wreck, however, the exotic and commonplace go hand in hand, and in terms of the information it holds, a rat skull can be as valuable as a gold coin. Organic materials in particular – wood, leather, cordage, bone and the like – are also usually absent from terrestrial contexts because they dry out and disintegrate; but if waterlogged and buried in sediment they often survive in remarkable condition.

The value

Shipwreck archaeology is often conflated with treasure hunting, but nothing could be further from the truth. Irrespective of its monetary value everything in a wreck is precious, because each find has its own tale to tell; and in combination their individual stories are vastly greater, because all are integral parts of a wider whole – the reality of a ship and its world at a moment in time. This is the real treasure of historic shipwrecks, and it can only be unlocked by careful archaeology.

The *Swan* wreck, even though only partially excavated, tells us much about her purpose and times. The greater part of the lower hull


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(Furthest left) An archaeologist extracts a stoneware bottle with facemask decoration.

(Left) The iron drake cast by John Browne.

A carved wooden cherub from the ship's decoration. In front of it lie the remains of a wooden keg, while a human ulna protrudes from behind.

survives, pinned by the stone ballast carried in the hold. The geological origins of the stones include south-west Scotland (where *Swan* was based), the Inveraray region (where she spent much of her earlier life) and the Hebridean island of Lewis (which she had visited on her final voyage). Within the ship's collapsed aftercastle much of the cabin interior is preserved, together with pieces of decorative carving from the transom. The binnacle and compasses have survived. One of her iron guns has been recovered, with its carriage. The gun bears the initials of John Browne, a leading English gunfounder who worked at Horsmonden in Kent. He cast a specific type of light gun, a drake, which had a tapered chamber and was made of what he termed 'extraordinary' metal whose composition he kept secret – and for which he charged double. This is the only iron drake of his known to survive, and analysis has revealed Browne's secret and explained the gun's remarkable condition: he knew exactly what substances to add to neutralise its corrosive impurities.


© Colin Martin

The bones of one of Edward Tarleton's seamen were scattered among the remains of the aft cabin. We know he was a topman through impact distortions in his thigh joints almost certainly caused by repeatedly dropping onto the deck after working aloft. We also know he was a Yorkshireman because isotope analysis of his teeth reveals the source of water he drank as a child. His remains are now buried in consecrated ground outside Duart Castle, overlooking the wreck of his ship. ■

Everything in a wreck is precious, because each find has its own tale to tell

Further information can be accessed at: ***canmore.org.uk/site/80637****.*

Dr Colin Martin is a retired Reader in Maritime Archaeology, University of St Andrews.


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Three Scottish pewter measures or 'tappit hens'. The middle one is marked with the Mackenzie arms. It is probably loot, for on her way to Duart *Swan* had captured the Royalist Mackenzie stronghold at Eilean Donan.

Fostering the maritime skills Britain needs

Graham Baldwin, Chair of the MSC, explains the organisation's purposes and projects. Photographs by kind permission of Warsash Maritime School, Solent University

Refreshing the seafarer training system will allow the UK maritime training sector to adapt to the pace of change required

Maritime UK and the Department for Transport have established a Maritime Skills Commission (MSC) to lead the sector's work in ensuring that the maritime sector has a pipeline of talented people to serve all parts of the sector. The Commission was first announced in the Department of Transport's Maritime 2050 strategy in January 2019. The Minister's Tasking Letter of 1 July 2020 stated that the Commission's job is to:

- understand the skills needs of the sector, including the effects of technological change, and to make recommendations for action
- ensure that no part of the sector suffers from serious skills shortages or skills gaps
- ensure that the sector has the apprenticeships and qualifications it needs
- ensure the sector has the training provision it needs, (including the use of technology to engage learners and keep costs down)
- provide employers and individuals with clear information about career paths and re-training options
- ensure that employers have good quality recruits for their vacancies through effective promotion of maritime careers
- increase exports of maritime education and training.

The Commission reports jointly to the Maritime Minister and to Maritime UK's National Council. Maritime UK's Diversity in Maritime Taskforce and Careers Taskforce work closely with the MSC to ensure that their work programmes reflect its latest labour market intelligence.

The first task for the Chair was to undertake a detailed mapping exercise to ensure that the MSC had coverage across the five sectors covered by Maritime UK: shipping, ports, professional services, marine engineering and science, and marine leisure. It was imperative that the MSC should have the right balance of geographical coverage, seniority, gender, knowledge of HR and current skills systems, as well as people who understand the impact of technical changes (automation, digitisation, etc.) and fresh perspectives. Programme management of the MSC is provided through a dedicated resource at Maritime UK.

The first meeting of the 18 commissioners plus the Chair was held on 2 July 2020 to discuss the MSC's aims and a proposed Scheme of Work. The Commission released its first Labour Market Intelligence Scoping Report in August 2020, and its first annual report in October.



Studying the operation of derricks.



An introduction to a bridge simulator.

Projects

The Seafarer Cadet Review. Led by commissioner Brian Johnson, CEO of the Maritime and Coastguard Agency, this review was undertaken at the Minister's request in view of the fact that the number of UK Merchant Navy officers being trained and employed has steadily declined over several decades. Refreshing the seafarer training system will allow the well-regarded UK maritime training sector to adapt to the pace of change required and to strengthen its position in the international education arena. The Review's recommendations were released on 24 June 2021.

Digital Learning. Every training provider had to adapt fast to the restrictions imposed because of Covid-19. Most made extensive use of digital technology to keep learners



Engineer cadets learning the art of arc welding.

learning. This emergency response has almost certainly hastened widespread acceptance of the use of digital technology in learning, by providers and by learners. The Commission consolidated the gains by capturing and sharing the lessons learned in an initial report, and through a webinar in December 2020.

Exporting Maritime Education and Training. One of the Commission's objectives is to 'increase exports of maritime education and training'. The project began by convening an initial meeting of organisations which already export, or are keen to do so, with colleagues in the Department for International Trade, whose purpose is to promote exports. This was shortly followed by a webinar to discuss the project in more depth and launch a directory.

Future Ports Workforce. The modern port is significantly different from ports in the past. It is increasingly shaped by forces such as the globalisation of supply chains, automation, digitisation and also by imperatives such as sustainability. We expect these trends not only to continue but to accelerate.

This changing business and organisational environment has important implications for people working in the sector. While there will be important advantages in the port workplace of the future, such as improved safety and greater opportunities to deploy new sources of talent, and while some (perhaps many) future roles are currently unknown, there will undoubtedly be substantial challenges to be faced, in respect of staffing and – crucially – in making the transition in a timely, efficient but also responsible manner.

The major port operators are undertaking new research to explore the three interlinked



Filing practice.



A navigation class.

key dimensions of change [*What, How and Where*], the relationships between these dimensions, and solutions for resolving the problems raised by change. Such solutions are likely to be needed at both sector and company level, and may have implications beyond the sector, for example, for government policy. The main questions are, 'What will the likely future ports workforce and ways of working look like, and how can the sector make the transition from its current position?' The project will include a mixture of desk research and structured interviews.



Engineering cadet at a ship systems console simulator.

Careers into Maritime Ashore. This project has created a new qualification that equips adult re-trainers, as well as school and college leavers, for shore-based maritime roles. The qualification is designed to provide a stepping-stone allowing people to gain a basic understanding of the various roles available and to help them make informed choices about working in the industry.



Cadet under instruction on a bridge simulator.

Future projects will be focused on green skills, soft skills and behaviours, and autonomous vessels, as well as on delivering the recommendations outlined in our current projects. ■

Professor Graham Baldwin** is Vice-Chancellor of the University of Central Lancashire. He was appointed Chair of the Maritime Skills Commission in January 2020. For more information about the MSC, visit: **www.maritimeuk.org

From sailing adventures to maritime apprenticeships

Julia Hutchison *explains what UKSA is all about, and seeks new partners for its workboat apprenticeship programme*



One of UKSA's Jeanneau 449 yachts on the Solent.

We have broadened our remit, to offer professional training endorsed by the Maritime and Coastguard Agency (MCA)

The United Kingdom Sailing Academy (UKSA) is a maritime charity which believes passionately in inspiring and supporting children and young people, encouraging them to broaden their horizons through life-enhancing water-based adventures, education and training for careers at sea.

UKSA, based in Cowes, is the largest RYA training centre in the world. Our original role was to provide training in sailing boats, and each year we provide memorable adventures for around 8,000 children. But in addition to that we have broadened our remit, to offer professional training endorsed by the Maritime and Coastguard Agency (MCA) to maritime students from across the globe. Each year we have trained over 1,500 professional career students to work within the growing global maritime sector. We encourage our students to believe in themselves by providing a hand-up, not a handout. Our professional education, mentoring and training pathways create exciting long-term maritime career opportunities to empower students to succeed for themselves, their communities and society.

At UKSA we believe that all young people have a need, but also that there are some who require greater support. Living through this period of austerity has hit schools and young people in the most disadvantaged areas the hardest, and this has only been exacerbated by the Covid-19 pandemic.

UKSA takes a unique approach to training; we believe that the time a student spends with our organisation is as much about honing interpersonal skills and developing confidence as it is about learning skills and gaining qualifications. Our holistic approach to learning gives students the real skills needed to enter the workplace; we have the resources to support the wellbeing of an individual by considering their emotional, physical, cultural, spiritual and social development in parallel with their learning journey in their career. As part of our commitment to the sustained growth of our students, we have a dedicated welfare officer on site; Kim Fry is professionally trained and offers support tailored to each individual, giving students the space to reflect and create proactive action plans.

UKSA's experience shows that a career at sea can provide a rewarding experience, and we are well placed to support all students with an aspiration for a long-term career in maritime. At



A UKSA Yachtmaster student with instructor on a Jeanneau 449 yacht.

A UKSA yachting student hoisting the mainsail of a Jeanneau 449.



UKSA we work closely with funders and partners to remove the barriers, both financial and social, to enable students from any background to access our programmes. We want our students to achieve their potential, and to gain life-changing experiences, qualifications and careers.

Our new workboat apprenticeship programme

The two-year workboat apprenticeship programme with UKSA is designed to give young people all the skills, knowledge and behaviours to work effectively and safely in the rapidly expanding workboat sector. The apprentices will be able to work on a wide variety of specialist vessels, ranging from tugs and multi-purpose workboats to fast pilot boats and crew transfer vessels taking personnel out to vessels and installations offshore.

To become a crew member they will need to have developed the knowledge, skills and competence to carry out all the core tasks on board with minimal supervision, including the following:

- Communications – including use of VHF and UHF radios, mobile telephone and IT
- Navigation and vessel handling – manoeuvre the workboat and check position using bridge equipment
- Berthing – bring a workboat alongside and handle mooring ropes to secure the vessel
- Towing operations and laying moorings – using winches to handle ropes, wires and chains
- Personnel transfers – ensuring all precautions taken to allow safe transfer to other object
- Cargo handling – assist in slinging loads and in crane operations, and in securing cargo on board the workboat.

The training covers both the underpinning knowledge base and the practical application of the necessary skills to ensure competence and safety on board.



Training for employment

UKSA has two active workboat apprenticeship programmes, one in partnership with Seacat Services and the other with Williams Shipping. Both partners will provide employment opportunities for the apprentices at the end of their training period.



UKSA workboat students with an instructor, learning (top) how to maintain and repair a ship's engine, and (above) how to prepare a load safely for hoisting.

With these schemes, UKSA is building on a fantastic heritage of supplying highly trained crew to support the UK's highly successful offshore wind market. UKSA has recognised the growing demand in the UK workboat sector, and these programmes ensure that young people are able to benefit from this booming industry.

The programme follows the Workboat Crewmember Apprenticeship specification launched by the Workboat Association in 2018 to drive training initiatives for the next generation of workboat crews.

Chris Frisby, Director of Training and Operations at UKSA, said: 'The theme for this

UKSA has recognised the growing demand in the UK workboat sector



Learning how to operate navigation equipment.



Young participants in a keelboat sailing course on the Solent with a UKSA instructor.

year's National Apprenticeship Week was Build the Future, and this is very much in line with UKSA's ethos of providing training pathways that create exciting, long-term maritime career opportunities. With the backdrop of Covid, never has it been so important to provide opportunities for employment for our young people whose futures have been so severely impacted. Our two workboat apprenticeship programmes represent fantastic opportunities for students. Over the course of the two years, the apprentices will obtain no fewer than ten industry recognised qualifications from STCW Navigational Watch certification through to food preparation and hygiene, ensuring they are fully prepared for an exciting career path. We have a very well established reputation for training superyacht crew. Our move into workboat training was a natural next step for us.'

A navigation class.



Philip Williams, Managing Director – Marine at Williams Shipping, commented: 'We are really proud of these enthusiastic workboat apprentices, who have already shown they have an appetite to work hard, learn new skills and take on the responsibilities of working at sea as part of a skilled vessel crew. We are sure they will be great members of our team, and we look forward to working with them long into the future.'

UKSA yachting students using charts to plot their course



Andy Calderbank-Link, Operations Director at Seacat, said: 'We're proud to be providing new opportunities for homegrown talent to be developed. Our apprentices will be amongst the first generation of truly specialist offshore wind support crews in the UK. Offshore renewables are now a bona fide career choice for young people, and the apprenticeship scheme will train recruits to the highest possible standard, providing a key point of entry into the sector and a clear path for progression.'

Kerrie Forster, Chief Executive Officer at the Workboat Association, added: 'With these schemes, the UKSA, Seacat Services and Williams Shipping are building on a heritage of supplying highly trained crew and specialist vessels to support the UK's hugely successful offshore wind market. This mirrors the picture we're seeing across the country as the UK workboat sector gears up to meet growing demand, and ensures that young people are able to benefit from this booming industry.'

If you would like to partner with UKSA to deliver a workboat apprenticeship programme, please contact Julia Hutchison by email: julia.hutchison@uksa.org. ■



A UKSA student and instructor participating in the RYA Level 2 Powerboat course on the Solent.

Julia Hutchison** is UKSA's Sales and Marketing Director. For more information about UKSA visit: **www.uksa.org

Operation Judgement: the Battle of Taranto

Richard Shuttleworth *recalls the Royal Navy's successful airborne attack on the Italian naval base on 11 November 1940*

By November 1940 the war in Europe had been raging for just over a year. Between 26 May and 4 June the British had been forced to retreat from Europe at Dunkirk; it was fortunate for us that Hitler had not at the time taken advantage of the situation to invade Britain. On 10 June Mussolini declared war, and ten days later France capitulated to the Germans. Britain stood alone.

The outlook was grave, but the Royal Navy possessed a large fleet, even though many ships were elderly – some dating from World War I, including the flagship, HMS *Hood*. Two of the Royal Navy's six aircraft carriers had been sunk, but those of the new Illustrious class were under construction.

However, the loss of the French fleet at Mers-el-Kébir after the French surrender made the situation worse. To secure the western end of the Mediterranean the Admiralty decided to form Force H, based at Gibraltar; this included one carrier, HMS *Eagle*, the only modern vessel in service. The Royal Navy also had a substantial fleet based at the far end of the Mediterranean, in Alexandria.

As early as 1935, when Italy had invaded Abyssinia, Admiral Sir Dudley Pound, Commander-in-Chief Mediterranean Fleet, had identified the southern Italian naval base of Taranto as a future target, and plans had been drawn up to attack it when appropriate. In 1938, Captain Lumley Lyster, RN, of HMS *Glorious*, knew of these plans; by 1940 he was Rear Admiral Aircraft Carriers Mediterranean, under Admiral Sir Andrew Cunningham (known as ABC), Commander-in-Chief of the Mediterranean Fleet – a much-admired officer of the old school, who believed in big ships with big guns. (The closest he came to a pure battleship encounter was off Cape Matapan at the southern tip of Greece, in March 1941.)

The threat

The Italians needed to resupply their troops in Libya, and also to move troops and supplies via Egypt southwards to their colony of Abyssinia (now Ethiopia). In August the Italian fleet, already bigger than the British Mediterranean Fleet, received two new battleships which were not only faster than most ships in the British fleet, but also outgunned them. At the end of that month, however, although the Italians came close to an encounter with the Royal Navy, they withdrew into harbour: unlike the British, the Italian ships had a major disadvantage in not having radar, so there were few actual skirmishes.



RAF reconnaissance photo of Taranto before the attack. Italian warships can be seen at their moorings.

Malta, the British base vital to the interruption of the Italian resupply to Libya, lay very close to the toe of Italy, and was vulnerable to bombardment. So it was seen as imperative that the heavily defended Taranto harbour, inside the 'heel' of Italy, should be attacked and the Italian fleet put out of action. The captain of the newly commissioned carrier HMS *Illustrious*, Captain Denis Boyd, DSC, a very able officer, was a veteran of Jutland who, although not a naval aviator, had a deep understanding of and personal interest in aviation, and had gained a pilot's licence. HMS *Illustrious* and HMS *Eagle* were working up their crews, and night-flying practice played a major part in this. However, a clear moonlit night was needed and 21 October,

Malta, the British base vital to the interruption of the Italian resupply to Libya, was vulnerable to bombardment



Arming a Swordfish with a torpedo on board *Illustrious*.



HMS *Illustrious*.



Reconnaissance photo taken after the raid: Italian warships burning and leaking oil.

with its serendipitous association with Nelson's greatest victory at Trafalgar, was chosen as the best opportunity. Taranto was being regularly reconnoitred by the RAF in Crete, which had received three particularly useful Martin Maryland reconnaissance aircraft from the USA, originally destined for the French until they had surrendered.

Operation MB8 was the code name, and the attack on Taranto was Operation Judgement. However, a serious fire in the hangar of HMS *Illustrious* delayed Operation Judgement. Her Swordfish were fitted with an extra fuel tank in the space where the observer normally sat, and his seat was moved to the telegraphist/air gunner's rear seat, which was likely to be sprayed with fuel if the tank vented. Some of her Swordfish, destroyed in the fire, were replaced by Swordfish from HMS *Eagle* – but *Eagle* had problems herself, as she had been attacked and mined so many times that her aviation fuel system had been seriously damaged. She was removed from Operation Judgement and the attack was postponed.

The attack

On 11 November 1940 HMS *Illustrious* was despatched from the main force, with four cruisers as escorts, to a position 40 miles west of Cephalonia, south of Corfu. Her Fulmar fighters had prevented Italian aircraft from discovering the move. A squadron of destroyers was sent to the mouth of the Adriatic to interdict the supply routes from Italy to Albania.

The final RAF reconnaissance showed that a sixth battleship had arrived in Taranto that day, but it also showed barrage balloons, identified by skilled stereoscopic aerial photograph examination only just in time. These along with some anti-torpedo nets, restricted the approach paths for the attacking aircraft; however, bad weather had removed two-thirds of the barrage balloons, and the nets were not fully in place as the Italian captains considered them a nuisance to ship movement.

In the previous 24 hours, three Swordfish had suffered engine failure; Commander 'Flying' James 'Streamline' Robertson identified the problem and, true to his nickname, got all the fuel systems cleaned in a few hours. This meant that 21 aircraft were available.

The attack was in two waves. The first, departing at 20:00, had twelve aircraft, and the second, at 21:00, nine. In each wave, six aircraft had 18-inch torpedoes, with a secret duplex fuse which could detonate under a ship by sensing its magnetic presence, as well as on contact. The remaining aircraft carried bombs and flares.

As the first wave headed towards Taranto



Conte di Cavour – an Italian Dreadnought battleship, originally built in 1910 and refitted in the late 1930s – largely under water on a sandbank after being holed in the torpedo attack. The ship remained out of action for the rest of the war.

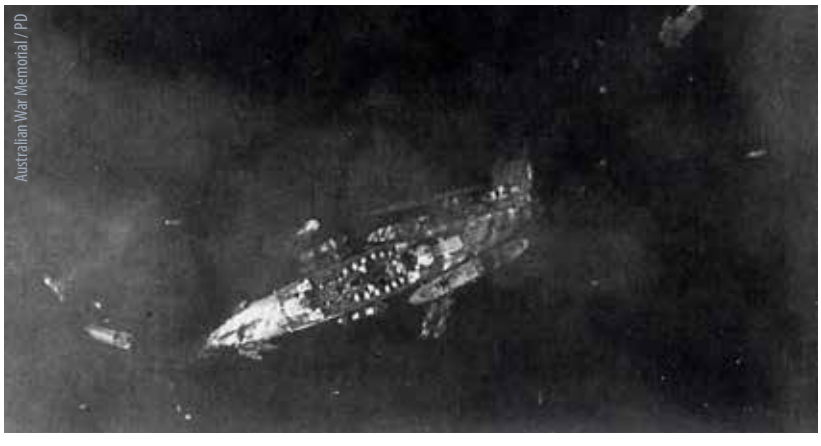
the Italians heard possible aircraft noise on their 'airphonic' sound detectors, but thought they were false alarms or reconnaissance aircraft. At 22:25, however, the sounds were of the attack itself: although the Italians had been ready and waiting, they had, as mentioned earlier, no radar. A serious problem for the Italians was that the attacking aircraft came in so low that their own ships were in the way of their guns.

Flares had been dropped, set to burn at 4,500 feet as the torpedo aircraft descended in the dark to around 50 feet, and passed between barrage balloons on the mole on the south-east side of the outer harbour, dropping their torpedoes seconds later. In the first wave the leader's aircraft was shot down, but its pilot and crew were rescued. By 23:35 the first wave withdrew from what was now a re-creation of Dante's Inferno, and they made their way back to HMS *Illustrious*.

Meanwhile, at 22:20 the second wave had departed HMS *Illustrious*. Two of the Swordfish had collided on deck, but one was repaired, and departed 20 minutes later. On another aircraft the extra fuel tank fell off in flight, and that aircraft returned, narrowly escaping being shot down in the process.

For the second wave, navigation was easy – just head towards the fireworks display – but the Italian defenders were ready. When the seven remaining aircraft arrived at Taranto there was no way they could surprise the defenders, and their reception was fierce. One aircraft attacked so low that a wheel was believed to have touched the water. By 02:50 that wave had returned, having lost one aircraft. Sadly, one of the two crew killed was never found. Despite this, the casualties were far fewer than anyone would have dared to expect.

Not knowing how successful the raid had been, Command decided to send in a further attack while the enemy was in disarray. It was, however, pointed out that 'even at Balaclava the Light Brigade had only been asked to go in once' – and anyhow the weather had deteriorated. The proposed follow-up attack was cancelled.



Battleship *Littorio* with bow under water, attended by tugs after being hit by three torpedoes in the attack.

The aftermath

One Italian dreadnought had been sunk and two battleships put out of action for months. If HMS *Eagle* had been able to join the attack, victory might have been total; but even so, until the Germans turned their attention to the Mediterranean later, this seemingly suicidal attack constituted a major blow to the Axis powers. The pilots and crews were outstandingly brave, and many of them took part in operations later.

Although airborne attacks on battleships by aircraft had been discussed since the mid-1930s, this was one of the earliest successes. The May 1941 sinking of the *Bismarck*, crippled by Swordfish torpedoes, would underline the viability of the tactic, as would the Japanese attack on Pearl Harbor and sinking of *Prince of Wales* and *Repulse*. ■

(Below) The third battleship badly damaged in the attack and put out of service for many months was *Duilio*, seen here undergoing repairs after the event.



Richard Shuttleworth *is a former Fleet Air Arm Wessex 5 pilot, and was also of the Oman Frontier Force and the London Air Ambulance. He is the son of a Swordfish observer and the brother of two other Fleet Air Arm pilots.*

What it took to sink the *Bismarck*

***Sue Eagles** describes the heroic effort it took by Swordfish crews from HMS Victorious and HMS Ark Royal, to defeat Nazi Germany's giant battleship 80 years ago this year*

The last photograph taken of *Hood*, from *Prince of Wales*, as they went into action against *Bismarck* in the Denmark Strait, between Iceland and Greenland, on 24 May 1941.





Bismarck firing at *Hood* – photographed from the German heavy cruiser *Prinz Eugen*.

The word 'epic' is habitually overused today, but the story of the sinking of the *Bismarck* is probably the greatest naval epic of them all.

On 23 May 1941, the German battleship *Bismarck* was on a roll. At the time the largest and most powerful fighting ship afloat, she had broken out into the Atlantic, sunk the battlecruiser HMS *Hood* and badly damaged the battleship HMS *Prince of Wales*. *Bismarck*'s armour-piercing shells had ripped through *Hood*'s upper deck, causing a huge explosion in her ammunition magazine. The ship broke in two and sank in a matter of minutes. Only three of her 1,418 officers and men survived. It was the Royal Navy's largest loss of life ever from a single ship.

The loss of the *Hood* was keenly felt, not just in Britain but around the world, and the prospect of Bismarck roaming the Atlantic unchecked and wreaking havoc on Allied convoys was bleak. She posed a formidable threat to the vital lifeline that kept Britain alive.

Ninety-six hours later, however, Nazi Germany's mightiest battleship lay at the bottom of the North Atlantic. The swift reversal of fortune was the result of a huge effort by the Royal Navy to hunt down and sink the *Bismarck* at all costs in one of the most dramatic chases and battles in naval history.

With every British warship in the Atlantic looking for the *Bismarck* in a pursuit that covered over 2 million square miles, it was the Swordfish squadrons from HMS *Victorious* and HMS *Ark Royal* that were to bring about the battleship's end. Although *Bismarck* outclassed all the heavy capital ships chasing her, naval aviation was another matter.

The Swordfish attacks on the *Bismarck*, at night and in appalling weather, were to prove the full value of the Fleet Air Arm as a striking force at sea, changing the outcome of the war in the Atlantic.

The attack from HMS *Victorious*

The first strike force of Swordfish aircraft was launched on 24 May from *Victorious*. *Bismarck* had not escaped the fierce encounter with *Hood* and *Prince of Wales* unscathed, and oil leaking from a ruptured fuel tank in her bow had given her position away.

It was already dark as Lt Cdr Eugene Esmonde, Commanding Officer 825 Naval Air Squadron, led the formation of Swordfish to the unsuspecting *Bismarck* 120 miles away. As they were swallowed up in the rain squall, everyone in the carrier wondered if they would ever see them again.

The aircraft reached *Bismarck* just before midnight and delivered a courageous attack amid a hail of anti-aircraft fire. The second flight, led by Lt 'Percy' Gick, scored a torpedo hit amidships. Petty Officer Les Sayer, Lt Gick's telegraphist air gunner, described the attack:

> They started throwing everything at us, but we got away with it because the German rangefinders were not calibrated for enemy aircraft approach speeds below 100 knots. We were also flying so low that the German guns could not achieve the necessary depression. We dropped our 'fish' from 500 yards and at a height of 20 feet. They then opened-up with their 15-inch main armament. They did not hit us, but we could not avoid the massive waterspouts thrown up by the shell splashes and when we hit one of



Seen from *Prinz Eugen*, (right horizon) smoke from the exploding HMS *Hood* and the splashes of shells from *Bismarck*'s guns. Smoke from HMS *Norfolk* on the left horizon.

Bismarck seen from *Prinz Eugen* soon after the first engagement in the Denmark Strait, down at the bow owing to the rupture of forward oil tanks by a shell from *Prince of Wales*.



them, the bottom of the aircraft was torn away. It was a draughty trip back! Three of our pilots had never carried out a deck landing at night before but *Victorious* turned on her searchlight and, amazingly, we all got back on board!

Miraculously, not one of the Swordfish was shot down or even badly damaged. Although the torpedo hit did not significantly damage *Bismarck*, owing to her armoured skirt, the evasive action she took in response to the attack ripped apart repairs made in her oil tanks earlier in the day, crucially slowing her down and impeding her escape.

The attack from HMS *Ark Royal*

Two days later, *Bismarck* was sighted 690 miles from Brest, less than 24 hours from the protection of enemy air cover and the sanctuary of port. *Victorious*'s Swordfish had slowed her down, but time was now critical. With an anxious world awaiting the outcome, all the hopes of Britain and the Royal Navy now lay in the second aircraft carrier, *Ark Royal*, and her Swordfish squadrons.

Determined to prevent *Bismarck* from reaching Brest, on the afternoon of 26 May, *Ark Royal* launched a second Swordfish strike, 15 strong. The flying conditions were atrocious: low raincloud, gale-force winds, stormy seas and fading daylight. Not expecting another vessel to be in the area, the Swordfish pilots mistook HMS *Sheffield* for the German battleship and a disaster nearly



Ark Royal and some of her Swordfish.

(Below) *Bismarck* spotted through a gap in the clouds by an attacking Swordfish.



occurred. Fortunately the torpedoes didn't detonate properly. Had those faulty detonators been used to attack *Bismarck* the operation would have failed. The Swordfish returned to *Ark Royal* and re-armed, this time with older detonators known to be reliable.

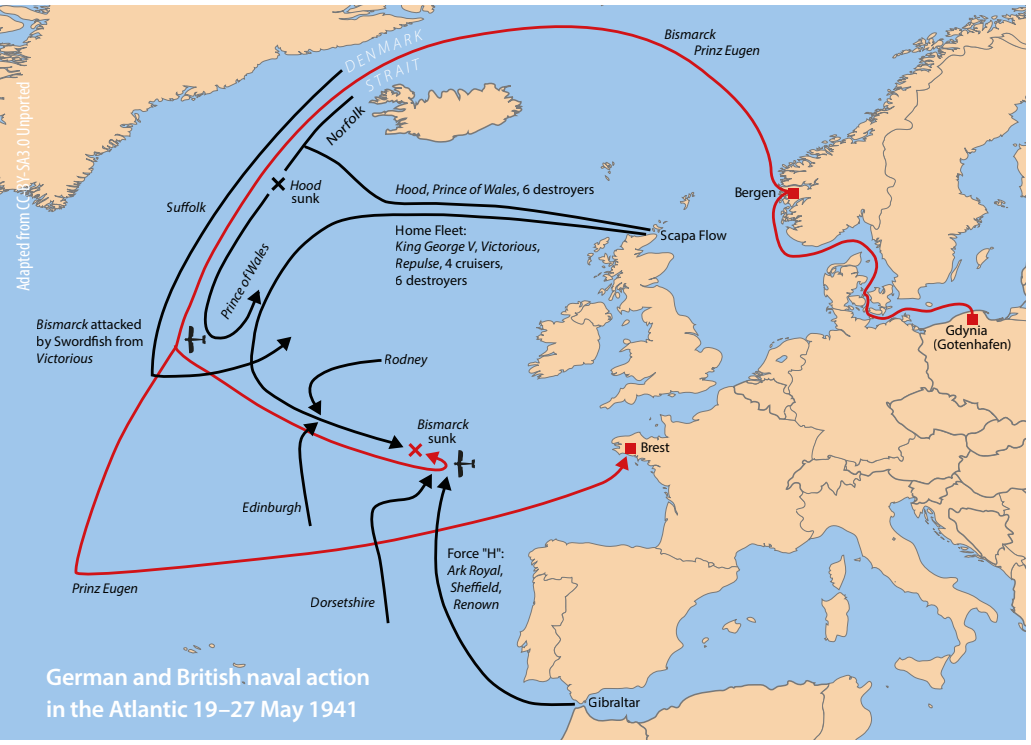
Taking off again in the teeth of the storm, aircraft and crews were both operating at the very edge of what was humanly possible. Conditions had worsened, with *Ark Royal*'s flight deck rising and falling 50 feet, the bows and stern flung from side to side in the angry seas, and driving rain at times blotting out visibility completely.

When the aircraft arrived over *Bismarck* she was sailing under a front – a wall of cloud reaching up beyond 10,000 feet and extending down to almost sea-level. The *Swordfish* dived down through the murk, descending like gnats

The flying conditions were atrocious



Force H: *Renown* and *Ark Royal* seen from *Sheffield*, which thanks to some faulty detonators escaped being sunk in a torpedo attack by aircraft from *Ark Royal*, which had mistaken *Sheffield* for *Bismarck*.



German and British naval action in the Atlantic 19–27 May 1941



A swordfish returning to *Ark Royal* after a torpedo attack on *Bismarck*.



The final act: HMS *Rodney* (right), firing. Smoke on the left horizon marks the position of the damaged *Bismarck*.

An open-cockpit canvas biplane had stopped the most heavily armed battleship in the world

upon Germany's fire-spitting dragon, and pressing home their attack from all quarters in driving rain, low cloud and winds gusting up to 50 mph.

Just two torpedoes found their target, but given the conditions it was an outstanding feat of flying that any hit at all. One of the blows was fatal: it struck the heavily protected ship at her weakest point, the stern, jamming her twin rudders and crippling her steering gear, leaving her wallowing out of control in heavy seas.

Remarkably, all 15 aircraft returned safely. The weather was still abominable; many of the aircraft had been damaged and three crashed on landing, but no one was hurt. It was a David and Goliath story – an open-cockpit canvas biplane had stopped the most heavily armed battleship in the world; the pride of the German Navy was incapable of manoeuvring, surrounded only by the open ocean and the enemy. After days and nights of almost unbearable tension, *Bismarck* had been brought to bay and there was immeasurable relief throughout the Fleet. From this moment *Bismarck*'s end was inevitable.

At daybreak the following morning, 27 May, H Force – HMS *King George V* and HMS *Rodney* – approached the crippled battleship and opened fire. Even though Bismarck was unable to manoeuvre, her massive guns were still intact, and fierce barrages were exchanged over the next 90 minutes as the British ships closed in.

Bismarck fought bravely to the last. When her guns fell silent the heavy cruiser HMS *Dorsetshire* fired three torpedoes into her; *Bismarck* sank on 27 May 1941 at 10.36, her flag still flying.

The Swordfish attacks on *Bismarck* were not only extraordinary endeavours of achievement in themselves but were also a defining moment in the history of naval warfare. Without the vision of the two carrier captains using the strike capability of the Fleet Air Arm as a weapon of war, *Bismarck* would not have been stopped, thus enabling the big guns of H Force to destroy the threat she posed. Together with the Swordfish operation at Taranto six months earlier, the airborne attacks on the Bismarck were the turning point that transferred the title 'capital ship' from battleship to aircraft carrier, where it remains today. ■



Survivors from *Bismarck* are picked up by the cruiser *Dorsetshire*.

Commander Sue Eagles *QVRM RD is Communications Director at Navy Wings. For more information, visit:* ***www.navywings.org.uk***

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KONGSBERG Maritime RAS/FAS and naval deck equipment product range

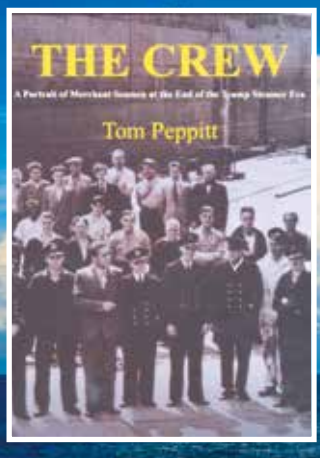
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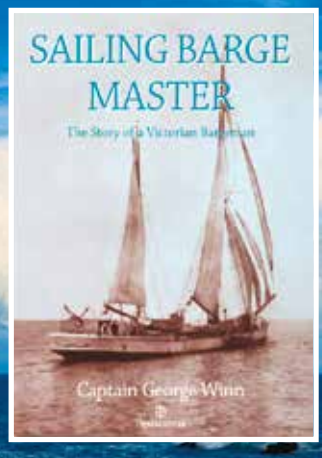
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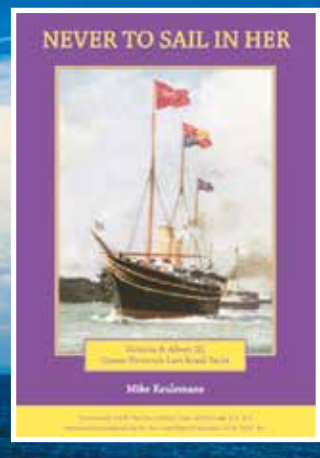
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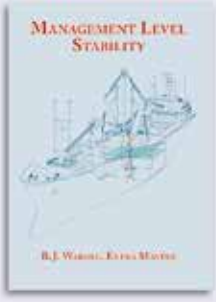
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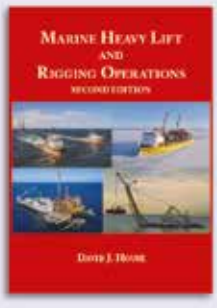




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