



TOWARDS VISION IMC 2030

03/2017 no.40



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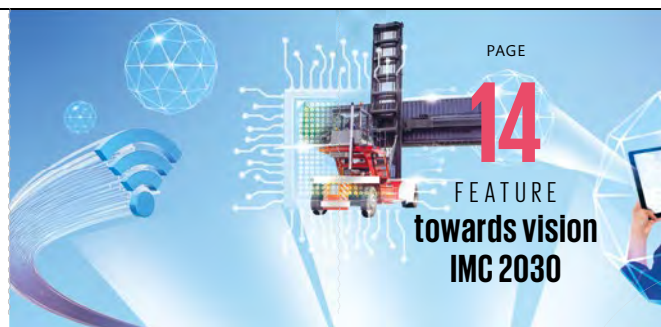
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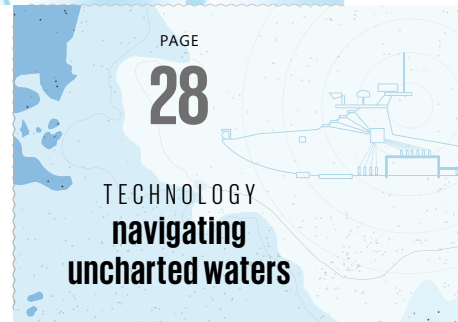
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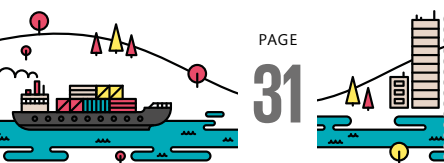
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project SAFER

publisher



MPA
SINGAPORE

**MARITIME AND
PORT AUTHORITY
OF SINGAPORE**

460 Alexandra Road
#19-00 PSA Building
Singapore 119963
Tel: +65 6375 1600
Fax: +65 6275 9247
www.mpa.gov.sg

executive board

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Tan Beng Tee
M Segar Abdullah

executive editor

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advisory committee

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FOREWORD

The International Maritime Centre (IMC) 2030 Advisory Committee's vision for Singapore's next phase of growth is for the nation-state to take firm strides towards becoming the global maritime hub for connectivity, innovation and talent. Our Feature story on the IMC 2030 vision presents the strategies to make this a reality. Development in this sector needs to take place in a sustainable manner for the long-term good of the broader community.

With the Maritime and Port Authority of Singapore's (MPA) Safety@Sea campaign launched three years ago to raise awareness of and inculcate a safety-first maritime culture in the waters within our

influence, three seasoned Captains share insights on safety standards, measures and trends in the maritime industry. In the Commentary section, IPIECA sheds light on the need for all stakeholders in the maritime industry to work together to promote safe sea transportation and protect the environment.

Find out more about autonomous crafts in our Technology section, as well as how and why they are likely to be a reality within the next decade. In Community Talk, we hear from four maritime professionals on what's next on the R & D horizon, and the latest shipping-related opportunities and trends with regard to digital transformation and analytics.

This issue's Personality section features Captain Khong Shen Ping, a local maritime veteran, who shares how the local bunkering scene has evolved and how Singapore has always been a trailblazer in implementing new technologies. We also have Dr Stefan Micallef, Director of the Marine Environment Division at the International Maritime Organization, sharing insights about increased global scrutiny in the face of worsening climate change, and sustainability in future-ready shipping.

We hope this issue of *Singapore Nautilus* inspires you to actively support us in ensuring safe passages as well as future-ready development in Maritime Singapore.

safety first

Singapore's waters are some of the busiest in the world. MPA is committed not only to being an example of a safe and efficient port, but also a sharing hub for safety-related best practices.



CAITLIN FUA
EXECUTIVE EDITOR



SMART PORT CHALLENGE KICKS OFF EFFORTS TO DEVELOP INNOVATION

The Maritime and Port Authority of Singapore (MPA) launched the inaugural Smart Port Challenge (SPC 2017) on June 5 this year.

This six-month programme – aimed at identifying challenges related to technologies such as the Internet of Things, data analytics, machine learning, and blockchain, and translating ideas into commercial solutions – encourages collaboration between organisations and start-ups to drive digital transformation in the maritime industry.

The challenge drew more than 190 participants from the technology, start-up and venture capital (VC) communities.

Twelve high-potential start-ups have now made the final shortlist from an initial list of 81 proposals, after a series of evaluations by MPA and its SPC co-creators. These are Gleematic (1st prize), T-mining (2nd prize), and XjeraLabs (3rd prize); SGST, Simplus and SideFX garnered Honourable Mentions.

"It is clear that the start-ups and various co-creators have worked very hard in the past few months to identify possible technological solutions to tackle the challenge statements through the use of new technologies," said Mr Andrew Tan, Chief Executive of MPA.

MPA and PSA unboxed will provide seed funding support of up to S\$50,000 for each selected start-up to develop full prototypes, with the possibility of implementation for business operations. The start-ups can also receive seed funding support from other VCs.

SPC 2017 partners include Batam Fast, CMA CGM, Hong Lam Marine, Jurong Port, Kanlian, NYK Line, Pacific International Lines, Port of Rotterdam, PSA Marine, PSA unboxed, Symphony Creative Solutions, and Synergy Marine Group.



SINGAPORE MARITIME DIALOGUE ENGAGES STUDENTS



The 2017 Singapore Maritime Dialogue, now in its fourth annual edition, was held on July 5. Running with the theme, "Navigating through Challenging Times", Dr Lam Pin Min, Senior Minister of State for Transport and Health, engaged about 160 students from high schools, junior colleges, polytechnics, the Institute of Technical Education, and universities in a panel-driven discussion on how the public and private sectors can overcome challenges faced by the maritime industry. The discussion was prefaced by a short sharing session by two maritime professionals.

Through the discussion, which consisted of questions sent in through Pigeonhole Technology and gathered from the Economics Essay Competition organised by the Maritime and Port Authority of Singapore (MPA) from April to June 2017, students gained a better understanding of the maritime ecosystem, and the wide range of education and job opportunities available should they wish to join the maritime industry.

As part of the programme,

the students were taken on an exclusive port tour hosted by PSA Singapore. They were also introduced to the new Maritime Singapore Connect website (www.maritimesgconnect.com), which carries a wealth of information ranging from education options to maritime careers and internship opportunities. Students can submit their resumes to potential hiring companies via the website.

A revised Economics Resource Package, a collaboration between MPA and the Ministry of Education, was also launched at the event. This edition is one that is aligned with the latest GCE A-Level Economics syllabus, and features recent case studies to ensure relevance and enhance students' learning. Dr Lam said, "The Government is committed to helping you take up the many rewarding career opportunities Maritime Singapore has to offer. Together with industry partners, MPA offers various internships, attachments, management associate programmes, and scholarships for you to experience a career in Maritime Singapore."

2ND INTERNATIONAL SAFETY@SEA CONFERENCE

The 2017 International Safety@Sea Conference was officially opened on Aug 22 by Mr Niam Chiang Meng, Chairman of the Maritime and Port Authority of Singapore (MPA). Organised by MPA as part of Safety@Sea Week, the conference hosted over 250 maritime professionals who had gathered to share best practices for safety at sea.

Mr Andrew Tan, Chief Executive of MPA, said: "Maritime safety remains a key topic that we cannot ignore. The International Safety@Sea Conference, held

for the first time last year, seeks to be a useful platform for stakeholders to come together to learn more about the various maritime-safety issues. This year, we convened the first Community of Practice Forum on maritime safety, where 26 maritime administrations, Classification Societies, and non-governmental organisations shared best practices on the topic of ferry safety. We hope participants will draw lessons from these sharing sessions to prevent future incidents."

MPA AND IBM COMPLETE PILOT TRIAL FOR PROJECT SAFER

The first day of the International Safety@Sea Conference welcomed an announcement by the Maritime and Port Authority of Singapore (MPA) and IBM that they have jointly completed the pilot trial of three modules under the MPA-IBM SAFER project, which have been rolling out since September 2017.

Project SAFER (Sense-Making Analytics For Maritime Event Recognition) is a collaboration between MPA and IBM to develop and test new analytics-based technologies, aimed at improving maritime and port operations to support Singapore's increasing growth in vessel traffic.

"We will continue to develop our digital strategies

through the use of data analytics and machine-learning technologies to optimise our port operations and enforcement to meet existing as well as future demands," said Mr Andrew Tan, Chief Executive of MPA.

"Artificial intelligence (AI) is transforming every industry. The marine domain is no exception. The SAFER solution is an example of how IBM's AI research for business is supplementing and increasing human capacity by making our waterways and sea lanes safer and more efficient," said Mr Robert Morris, then Vice-President of Global Labs at IBM Research.

Seven modules under the SAFER programme have been completed. The rest will be rolled out by January 2018.

SUPPORTING THE DEVELOPMENT OF MARITIME OFFICIALS



The Port Management Programme (PMP), developed and organised by the MPA Academy for port masters, harbour masters and middle managers from maritime and port authorities, kicked off its fourth run on Aug 21 this year. "The PMP, along with MPA Academy's other flagship programmes, aims to provide an enriching platform for the leaders of port and marine administration to exchange ideas and best practices across government, industry and academia," said Mr Andrew Tan, Chief Executive, Maritime and Port Authority of Singapore (MPA).

The five-day programme, delivered by professionals, practitioners, and senior officers from MPA, was attended by 16 officials from Africa, Asia, the Caribbean, Europe, and Oceania. Topics covered included important aspects of port management, such as safety, port planning, and security. Participants attended the International Safety@Sea Conference and Ferry Rescue Exercise, both of which were organised by MPA as part of Safety@Sea Week. They also attended a session on "Strategic Communications in an Emergency", and visited local maritime facilities such as PSA's terminals, MPA's Port Operations Control Centre, and the Integrated Simulation Centre.



NEW SATELLITE TECHNOLOGY ENHANCES SEARCH AND RESCUE CAPABILITIES

To improve Singapore's maritime and aeronautical search and rescue capabilities, the Civil Aviation Authority of Singapore (CAAS) and the Maritime and Port Authority of Singapore (MPA) have invested in a new medium-altitude earth orbit search and rescue (MEOSAR) ground system, which costs S\$8.4million.

Comprising both ground and space segments, the system uses medium-altitude earth orbit (MEO) satellites to detect distress signals emitted from the emergency beacons activated by aircraft, ships or people in distress. The satellites will then relay the

information to the ground.

Mr Andrew Tan, Chief Executive of MPA, said: "In any search and rescue mission, time is of the essence. The new MEOSAR system will allow us to detect and locate a distressed party more accurately, for the expeditious deployment of assets to save lives."

Expected to be fully operational in 2018, the MEOSAR ground system is an initiative under the humanitarian Cospas-Sarsat programme, an international satellite-based search and rescue alert programme for aviation, maritime and land users in distress.

STRENGTHENING OF THE LNG BUNKERING PORT NETWORK

With growing interest to supply liquefied natural gas (LNG) as a marine fuel to meet the future demands of the shipping industry, the Maritime and Port Authority of Singapore (MPA) announced on July 10 that the Port of Ningbo-Zhoushan, the Port of Marseille Fos, and the Port of Vancouver have joined an international LNG bunkering port focus group that Singapore helped set up.

The network now comprises eleven ports and maritime administrations across Asia, Europe, and North America, who will work together through a Memorandum of

Understanding signed in October 2016 to deepen cooperation and information sharing in relation to LNG bunkering, and develop a network of LNG bunker-ready ports across the East, West and Trans-Pacific trade routes.

Formed in 2014 with MPA, the Antwerp Port Authority, the Port of Rotterdam and the Port of Zeebrugge as founding members, the group was joined by the Norwegian Maritime Authority and port of Jacksonville (represented by JAX Chambers) in 2015, and Japan's Ministry of Land, Infrastructure, Transport and Tourism, and South Korea's Ulsan Port Authority, in 2016.

JOINT FEASIBILITY STUDY FOR LNG-FUELLED CAR CARRIERS

The Maritime and Port Authority of Singapore (MPA) and the Ports and Harbours Bureau of the Ministry of Land, Infrastructure, Transport, and Tourism of Japan (MLIT) will jointly lead a working group to conduct a feasibility study on liquefied natural gas (LNG) bunkering for car carriers plying between Japan and Singapore, with the aim of promoting LNG bunkering in Asia.

The study, which was announced at the inaugural Singapore and Japan Port Seminar 2017 held in Singapore on Aug 28, will focus on technical details such as fuel-tank capacities and refuelling requirements to assess the feasibility of running LNG-fuelled car carriers between Japan and Singapore. The working group will include Japan's big three shippers – Kawasaki Kisen Kaisha (K Line), Nippon Yusen Kaisha (NYK), and Mitsui O.S.K. Lines (MOL).

Singapore's Minister for Transport Mr Khaw Boon Wan said, "Shipping can be less pollutive and the International Maritime Organization has introduced a 0.5 per cent global sulphur cap by 2020. This is an opportunity for Singapore and Japan to co-lead in a global search for solutions to make shipping greener."

"I believe that Singapore, the world's top bunkering port, and Japan, the world's top LNG importer, have the responsibility to contribute to the development of global shipping through jointly promoting the use of LNG as a marine fuel," added Mr Keiichi Ishii, Japan's Minister for Land, Infrastructure, Transport and Tourism.

Today, both countries are ready to provide LNG bunkering operations using trucks and are now looking into the next phase of LNG bunkering for ocean-going vessels.



DAVID FOO JOINS MPA AS DIRECTOR OF PORT SYSTEMS



Mr David Foo joined the Maritime and Port Authority of Singapore (MPA) as Director of Port Systems on July 10. His role entails supporting MPA's mission of developing and promoting Singapore as a global hub port by ensuring that the Port of Singapore remains safe and secure, while maintaining a high level of readiness to deal with maritime contingencies. He also ensures that vital port systems like the Vessel Traffic Information System are functioning optimally, and upgraded when necessary so that they will be future-ready for the next-generation port.

Mr Foo believes that with technological advancements, rules-based processes will eventually be fully automated while Artificial Intelligence can deal with more complex tasks, creating capacity and opportunity for people to do higher-value work. One example is using drones mounted with live video feeds in Search and Rescue

operations. "This would help us keep track of and direct response assets to the exact locations where people need to be rescued, saving time and improving accuracy in directing by providing better situation awareness."

Similar set-ups have lots of potential: Mr Foo gives the example of surveillance – of oil pollution and hazardous substances – as a key enabler to keeping the maritime environment safe.

"A longer-term goal is to get new-generation port systems in place for the Tuas port. We anticipate an increase in the number of ship visits to our port in the future, so this is something we need to get right," he says, adding that being nimble is critical to staying ahead. "It's important to see what's available and what we can co-create or partner with industry and public agencies to develop better systems for our port, so that we can continue to a safe, secure and efficient port."

KENNETH LIM APPOINTED AS CTO AT MPA

Mr Kenneth Lim joined the Maritime and Port Authority of Singapore (MPA) as Director of Research & Technology and Industry Development (RTID), and Chief Technology Officer, on Aug 1.

Upon coming on board, he saw three key roles that he and his team need to perform: First, to work closely with the Singapore Maritime Institute to develop maritime research centres in the areas of energy and sustainable development, operations simulation and optimisation, and safety and security. Second, to drive maritime innovation through relevant technologies and nurturing a maritime start-up ecosystem. Third, he and his team would need to support the maritime sector's overall digitalisation strategy.

It's a balancing act between supply and demand, says Mr Lim. Supply entails cultivating sustainable research with higher institutes of learning, tracking and piloting new technologies, and nurturing start-ups for potential new ideas and solutions.

Says Mr Lim: "We need to engage the maritime industry as demand drivers too. That way, we can co-create a conducive environment to experiment with digitalisation opportunities, or resolve industry-level problem statements using technologies in a different way. With the right balance, we can continue to make Singapore a relevant maritime centre and port to the world.

"It's not just about suggesting new and fancy technology. More importantly, it's about bringing forward relevant technology, and nurturing the community to be more embracing and open about incorporating them."



SHIP'S LOG HAPPENINGS

17TH ASIAN CONFERENCE ON MARITIME SYSTEM AND SAFETY RESEARCH (ACMSSR)



The ACMSSR, an annual conference where like-minded experts and practitioners in the maritime system and safety research sector discuss industry developments, exchange knowledge, and share ideas and experiences, was held in Singapore for the first time this year. This 17th edition, organised and hosted by Singapore Polytechnic on Aug 17 and 18, was supported by the Singapore Maritime Institute.

BRITISH MINISTER VISITS PORT OPERATIONS CONTROL CENTRE (POCC)



Lord Martin John Callanan of Low Fell, Parliamentary Under-Secretary of State for the Department for Transport, United Kingdom, paid a visit to the POCC on Aug 18. He was hosted by Mr Andrew Tan, Chief Executive of the Maritime and Port Authority of Singapore (MPA).

TALK ON CONTAINER TERMINAL PLANNING



MPA Academy invited Mr Tan Puay Hin, Senior Advisor for Group Port Design & Connectivity at PSA International Pte Ltd, and a Senior Adjunct Fellow of the Academy, to give a talk on container terminal planning on May 31 at the MPA Academy Auditorium.

SHIP'S LOG HAPPENINGS

COURTESY CALL BY U.S. COAST GUARD REAR ADMIRAL JOHN P. NADEAU



On Aug 18, Rear Admiral John P. Nadeau, Assistant Commandant for Capability, U.S. Coast Guard, paid a courtesy call on MPA Chief Executive Mr Andrew Tan and was given a tour of the POCC.

FERRY EMERGENCY EXERCISE (FEREX)



To test and showcase various agencies' response readiness to ferry mishaps in the Port of Singapore, MPA held its annual FEREX on Aug 25 at the Eastern Anchorage. Observers included representatives and participants from MPA's Port Management Programme.

SHIP'S LOG HAPPENINGS

LECTURE AND PANEL DISCUSSION ON E-COMMERCE IN SHIPPING



On June 28, as part of the MPA Academy Insight Series, Mr Pierre Poignant, Group Chief Operating Officer of the Lazada Group, gave a well-received lecture at Hilton Hotel Singapore that touched on how shipping and e-commerce can work together in this time when both industries are experiencing rapid change.

6TH FORUM OF SMALL STATES (FOSS) FELLOWSHIP VISITS MPA



On July 24, Permanent Representatives to the United Nations visited MPA under the 6th FOSS Fellowship Programme, and were briefed on Singapore's approach towards sustainable development in maritime affairs. Chaired by Singapore since its inception in 1992, the FOSS brings together small states with populations under 10 million to exchange views on issues of common interest.

LECTURE AND PANEL DISCUSSION ON CYBER THREATS AND CHALLENGES



As part of the MPA Academy Insight Series, Mr Tan Tong Hai, CEO of StarHub, gave a lecture titled Cyber Threats And Challenges Facing Singapore at the PSA Building Auditorium on June 9, where he shared about the cyber threats and challenges facing Singapore from a telco's perspective.

prioritising safe y

AJ Leow gets three experienced captains to share their thoughts and expertise on current standards, measures and trends in maritime safety

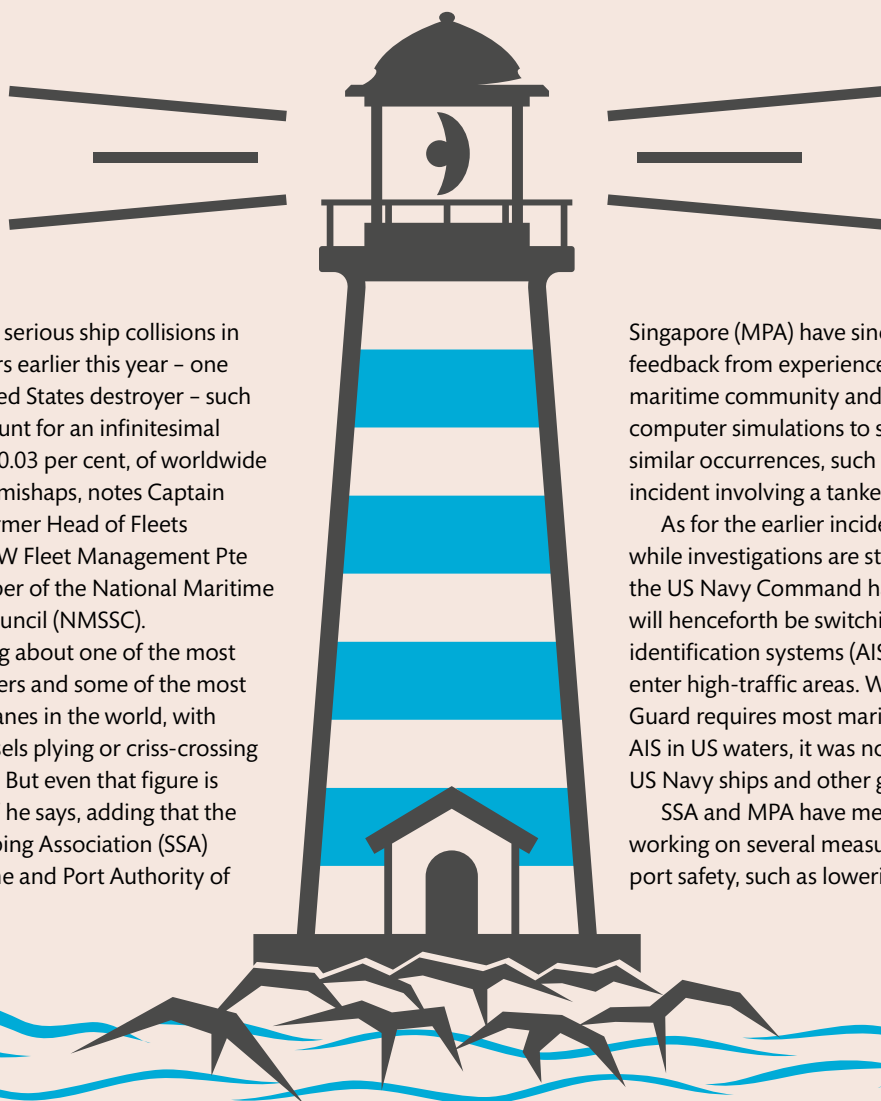
Despite the two serious ship collisions in Singapore waters earlier this year – one involving a United States destroyer – such incidences account for an infinitesimal fraction, or just 0.03 per cent, of worldwide marine-related mishaps, notes Captain Vibhas Garg, former Head of Fleets (Singapore) at BW Fleet Management Pte Ltd and a member of the National Maritime Safety at Sea Council (NMSSC).

“We’re talking about one of the most challenging waters and some of the most congested sea lanes in the world, with some 1,000 vessels plying or criss-crossing the waters here. But even that figure is not acceptable,” he says, adding that the Singapore Shipping Association (SSA) and the Maritime and Port Authority of

Singapore (MPA) have since been gathering feedback from experienced hands in the maritime community and have carried out computer simulations to study ways to avoid similar occurrences, such as the second incident involving a tanker and dredger.

As for the earlier incident on Aug 21, while investigations are still in progress, the US Navy Command has since said it will henceforth be switching on automatic identification systems (AIS) when its vessels enter high-traffic areas. While the US Coast Guard requires most maritime traffic to use AIS in US waters, it was not mandatory for US Navy ships and other government vessels.

SSA and MPA have meanwhile been working on several measures to improve port safety, such as lowering vessel density at



PORT & STARBOARD

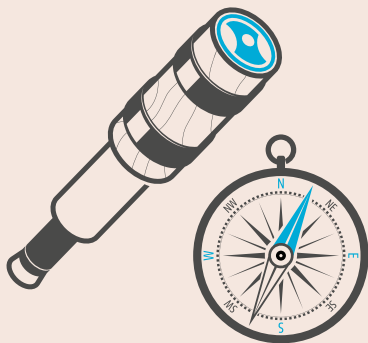


anchorages, and sequencing pilot boarding at the Eastern Petroleum Anchorage (AEPA).

Captain Atul Vatsa, Head of Compliance at Thome Ship Management, and a member of both the MPA-SSA Safety of Navigation Working Group and the NMSSC, says, "Boarding times for pilots are now given in advance to vessels. Also, a gap of a nautical mile (NM) has to be maintained between vessels when picking up a pilot."

Capt Garg adds, "We've split the EPA's Bravo point into two pilot-boarding points, with the sequencing of vessels at 15-minute intervals so that they don't criss-cross, to make the sea lanes a lot more safe." A 1NM distance is maintained at the Pilot Eastern Boarding Ground Bravo (PEBGB) and Pilot Eastern Boarding Ground Charlie (PEBGC).

He notes that technology and the issuance of more regulations has been a boon to maritime safety in the century since the Titanic era, which saw one in every 100 ships lost to collisions or grounding; that statistic is now one in 700. "Over the last eight years, collisions have dropped by 60 per cent, according to the Japan Transport Safety Board, and grounding incidents, by 70 per cent. Environmental pollution has also seen a sharp downward trend after the introduction of the International Safety Management Code and Guidelines by the International Maritime Organization in the 1990s."



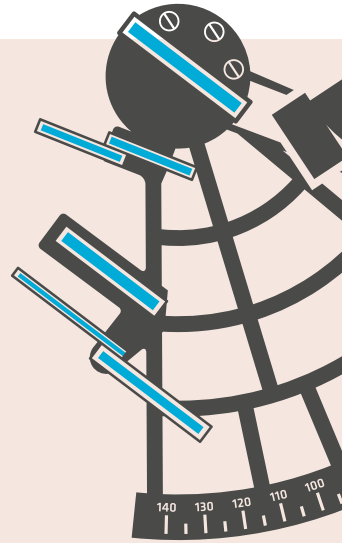
Captain Yves Vandeborn, Director of Loss Prevention at The Standard Club, however, notes that while there has been a worldwide decline in major incidents, the severity of individual incidents has increased. "Some would attribute the decline of incidents to higher-quality ship managers. Others would say that the economic downturn and higher number of laid-up ships mean that there are less major incidents. We believe it to be a combination of these factors and that more can still be done to further reduce regrettable incidents."

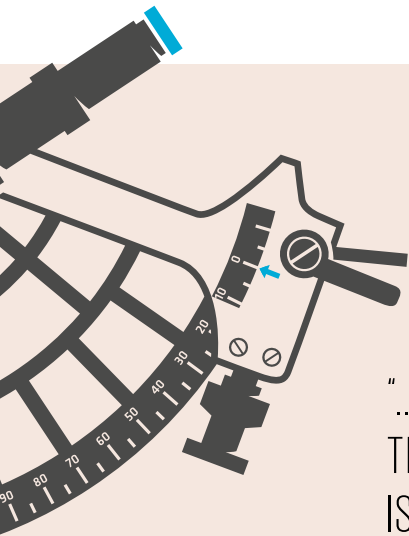
He emphasises that the key to ensuring safety at sea lies with adequate crew training. "Seafarers may be considered competent by the flag state upon receiving their Certificates of Competence, but they are not experts yet and require a long period of on-the-job training. Ship crews should build up resilience in various scenarios so that they feel confident to tackle the challenges they will encounter."

"It is no secret that most accidents are due to the human factor, as a result of mistakes or a series of small errors brought about by fatigue, stress or miscommunication between crew members," says Capt Vatsa. "The way to minimise these risks is with proper crew training, so that each seafarer is aware of his role on board, and can carry out his duties competently and safely."

One of the challenges, notes Capt Garg, is that the transient nature of the marine workforce can lead to a lack of a sense of belonging and ownership. This lack of continuity can impact the safety culture, which is why BW makes it a point to maintain a crew with seniority and experience, such as a Master and a Chief Engineer, on its vessels.

Capt Vandeborn adds that "it is rare for mechanical failure to be the cause of an incident. In most cases, the root cause is a human error, which is why we recently published *Being Human in Safety-critical Organisations*, which explains in





"... WITH PROPER CREW TRAINING...EACH SEAFARER IS AWARE OF HIS ROLE...AND CAN CARRY OUT HIS DUTIES COMPETENTLY AND SAFELY."

CAPTAIN ATUL VATSA

detail how root-cause investigations should go further than merely pointing out human errors. It explains in great detail how humans make decisions and how to reduce the factors that lead to such errors."

All three experts also caution against the over-reliance on technology. "Although electronic charts are wonderful aids, they should not be used to the exclusion of all other methods of navigation," says Capt Vatsa. "Simply keeping watch to check for likely obstructions in the sea or other approaching vessels should not be underestimated."

Capt Vandeborn adds, "In general, with navigational incidents, there is an over-reliance on a single electronic means of navigation. It is easy to think that because a computer tells you where you are, it must be correct, and we do not verify or cross-check with another means of navigation."

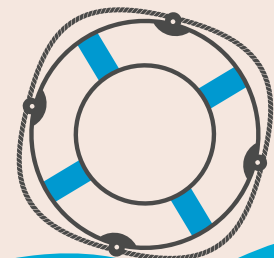
"We regularly find navigators discussing manoeuvres over very-high-frequency (VHF) radio communication, often in contradiction to the International Regulations for Preventing Collisions at Sea (COLREGs). It cannot be emphasised sufficiently that VHF should not be used as a tool

to avoid collisions. For example, it is much easier to determine whether or not there is a risk of collision by visually checking through a window and observing the relative bearing of a ship. We will always emphasise at our seminars the importance of cross-checking multiple means of navigation and simply looking out the window."

Nevertheless, the trio notes that technology can be a great tool for communications and training, especially in the Internet age – even through social media channels such as WhatsApp, Facebook at Work, and YouTube.

"These are popular with the younger generation," says Capt Garg, "and information shared on these platforms is quickly absorbed, which makes learning from incidents easier. We create videos and animations about noteworthy incidents and use them for educational purposes."

"We use downloadable video clips on YouTube to spread our loss-prevention messages to our members and seafarers," adds Capt Vandeborn. "There is also a real and increasing threat from cyber hacking, perhaps not yet to the extent that a ship's navigation systems can be taken over, but certainly in ways that can pose a serious risk to the ship. We have produced a video that explains the most common means of cyber hacking, from phishing e-mails to the sharing of sensitive data on social media and the danger of plugging personal devices into sensitive equipment. We highly recommend that everyone watch the six-minute clip to be aware of the risks involved."





towards vision IMC

Rahita Elias explores the various aspects of Maritime Singapore that will be developed in the ongoing drive to make Singapore a global maritime hub for connectivity, innovation and talent



A global maritime hub for connectivity, innovation and talent – that is the vision for Maritime Singapore, proposed by the International Maritime Centre (IMC) 2030 Advisory Committee.

The Committee, established by the Maritime and Port Authority of Singapore (MPA) in August 2016, recently completed its strategic review and submitted a report to the Singapore Government. The review dovetails with Singapore's economic restructuring efforts driven by the Committee on the Future Economy, whose strategies include developing and implementing Industry Transformation Maps (ITMs). The ITM for Sea Transport, spearheaded by MPA, serves as a key platform to implement some of the IMC 2030 Advisory Committee's recommendations.

SHARING A COMMON GOAL

The Committee's Chairman, Mr Andreas Sohmen-Pao, says in the report published in September: "All countries and industries will face new uncertainties in the coming decades, brought about by changes in important fields like energy, and by advances in technology that will change the way jobs are performed and assets are managed.

"It is therefore timely to review the strategy for the maritime sector, to consider what skills will be needed for the future and how to participate in digital opportunities, while taking care not to discard elements that have contributed to past success and will continue to be important in future."

Mr Sohmen-Pao, who is also the Chairman of BW Group, adds that the Committee hopes that its recommendations will enable Singapore to continue its leading role in the global maritime sector.

THREE AREAS OF FOCUS

According to the IMC 2030 report, as a Global Maritime Hub, Maritime Singapore will be a centre of excellence for shipping, port, offshore, and maritime-related businesses.

In terms of connectivity, the Committee points to the need for Singapore's IMC to go beyond expanding and deepening itself as a maritime centre. It also has to create value, and help reinforce the network effects that Singapore can offer – across related industries as well as within complementary maritime clusters.

FEATURE

On the innovation front, Singapore's IMC must continue to scale the innovation ladder, and build future capabilities in response to new and emerging technologies such as autonomous systems, robotics, data analytics, and artificial intelligence.

Talent-wise, Singapore will have to build a competent, future-ready workforce with relevant skills as well as a global mindset and outlook. Such traits are needed to successfully propel Maritime Singapore in its next phase of development.

As a Global Maritime Hub for Connectivity, Innovation and Talent, "Maritime Singapore will be 'the place to be' for global maritime businesses to access multiple opportunities within an innovative and interconnected maritime cluster," says the Committee in its report.

FIVE STRATEGIES RECOMMENDED

To realise this vision, the Committee is recommending five strategies, namely:

1. Expand and deepen the maritime cluster

The Committee notes that shipowners and operators form the core of Singapore's diverse IMC. Shipping giants such as Maersk already call Singapore their second home; CMA CGM established its regional headquarters here; other major players such as China COSCO Shipping Group and the Ocean Network Express have partnered with Singapore to expand their presence in South-east Asia and beyond. This shipping core is supported by a comprehensive ecosystem of technical and commercial maritime service providers, and complemented by an established pool of international trading, commodity and logistics players.

To grow the maritime ecosystem here, the Committee says that the Singapore IMC's shipping core must be further strengthened as shipowners and operators are the key demand drivers.

It also recommends that Singapore works to strengthen its position as a leading shipbroking hub. It should grow the local broking talent pool to support a broader range of shipbroking activities while encouraging international shipping groups and commodity traders to undertake key decisions on chartering, sale and purchase, and the commissioning of newbuildings in the Republic.

At the same time, the Committee points to the need to elevate Singapore's standing as an Asian insurance hub. Singapore should continue to strengthen expertise in traditional classes of marine insurance, and also support the development of new insurance products focusing on emerging risks such as cyber-security risks. At the same time, marine mutuals should be encouraged to offer a full range of services.





2. Strengthen interlinkages and network effects

The Singapore IMC's tightly integrated ecosystem already has dynamic business linkages that have deepened into partnerships. For example, shipping companies and port-terminal operators have teamed up to jointly operate terminals, which include COSCO-PSA Terminal and CMA CGM-PSA Lion Terminal.

The Committee suggests reinforcing these linkages, pointing out that Singapore should explore the feasibility of increased physical co-location of maritime companies, including forming other clusters of maritime activities away from the Central Business District area, and creating new physical maritime clusters.

In addition, there exists potential areas to enhance interlinkages between Singapore's maritime cluster and adjacent industries – such as logistics and commodity trading – to create new value propositions amid shifting business paradigms (e.g. rise of e-commerce).

The Committee also calls on Singapore's IMC to strengthen partnerships with complementary maritime clusters in areas such as business linkages, research and education, as well as develop and implement new international standards.






3. Develop a vibrant maritime innovation ecosystem and promote digitalisation

To develop an innovative and future-ready maritime ecosystem, the Committee recommends that Singapore build on its existing research and development base, and develop a vibrant maritime innovation cluster.

One measure recommended is for the Singapore Government to accelerate the development of maritime technological capabilities by leveraging on strategic projects and joint research programmes with the maritime industry. In particular, Singapore could enhance its position as a global maritime “living lab” to pilot front-end concepts, and serve as a launch pad for exportable products and solutions.

Singapore has already kick-started its “living lab” initiatives. In June 2016, PSA International, with the support of MPA and the Singapore Economic Development Board, committed close to S\$100 million to establish the PSA Living Lab, a living laboratory for the port and logistics industry. In March 2017, MPA announced the plan for a MPA Living Lab to provide a platform for technology providers and industry players to co-develop and pilot innovative solutions.

The Committee further urges the Government to promote the digitalisation of the maritime



industry by leveraging on big data, the Internet of Things, as well as intelligent systems. For instance, the Singapore Government could encourage greater participation in national-level initiatives such as the National Trade Platform and the Maritime Single Window to enhance digital connectivity of the maritime community with the wider trade and logistics ecosystem.

4. Develop a multi-skilled maritime workforce with a global mindset

A skilled workforce is essential in ensuring that maritime companies continue to deliver high-quality services, and sustaining Singapore's competitiveness. The Committee therefore recommends that the quality of maritime education and training here be improved further. It adds that strengthening the existing partnerships among MPA, industry stakeholders, the institutes of higher learning, and commercial training service providers ensures that maritime curricula stay flexible and up-to-date.

On the manpower front, the Committee also recommends enhancing the industry's standards of professionalism, and raising its profile to attract talent more easily.

5. Establish Singapore as a global maritime standard bearer

To establish itself as an industry standard bearer, Singapore could position itself as a leader in existing and new areas of excellence such as port management, risk management, and safety, security and sustainability. It could also promote a conducive regulatory environment that supports new innovation and standards.

PRIMED FOR THE NEXT PHASE OF GROWTH

With these robust strategies, Maritime Singapore is setting sail towards a bright future. In the report, the Committee expresses its confidence in Singapore being able to stay adaptive and nimble, and maintain its position as a world-leading maritime hub.

"We believe the strategies proposed in this report will complement Singapore's key strengths, and place it in a strong position to seize emerging opportunities in the years ahead," the report states.

Dr Lam Pin Min, Senior Minister of State for Health and Transport, lauds the Committee's efforts, saying, "It is a call for Maritime Singapore to take bold steps to embrace technology and innovation, invest in developing people, and seek new ventures in a more connected world.

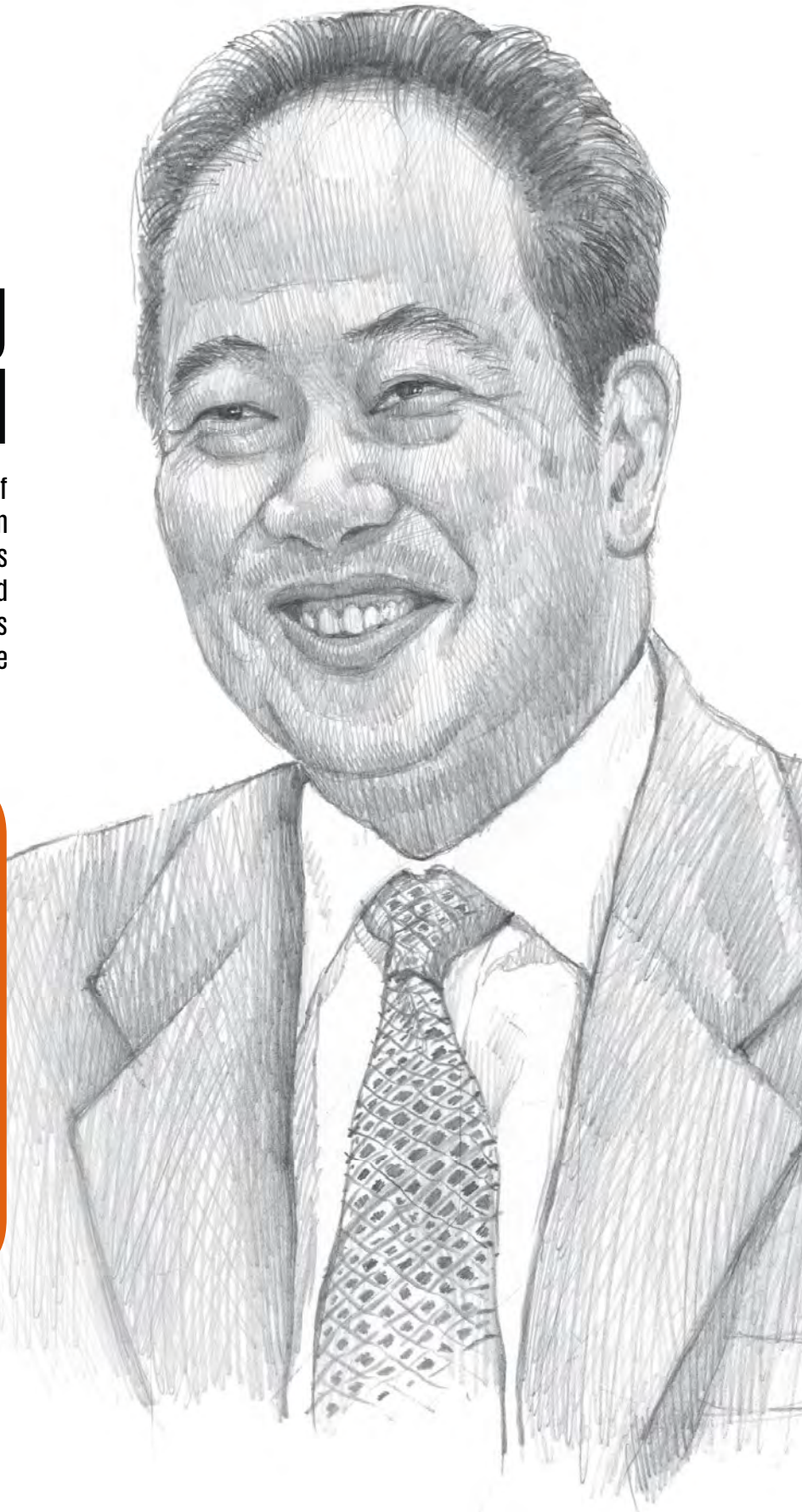
"I thank Mr Sohmen-Pao and the committee members for their dedication and hard work. We will study the recommendations and work with the industry to implement them."



staying ahead

Drawing from his wealth of career experience, Captain Khong Shen Ping shares insights on bunkering and the use of new technologies in the Port of Singapore

Maritime veteran Captain Khong Shen Ping has held several high-level positions in the course of his career. These include being Dean of the Maritime and Port Authority of Singapore's (MPA) MPA Academy from 2012 to 2017, Assistant Chief Executive of MPA from 2008 to 2012, and Group Director of the Hub Port Cluster at MPA from 2007 to 2008. From his unique position and perspective, he tells Singapore Nautilus how bunkering in Singapore has evolved over the years and how the country has always been a trailblazer in putting new technology to use.



HOW DID THE SINGAPORE INTERNATIONAL BUNKERING CONFERENCE (SIBCON) REACH ITS CURRENT STATURE, AND WHY IS IT IMPORTANT TO THE BUNKERING INDUSTRY HERE?

SIBCON was one of the earliest bunker-focused conferences to be organised. Singapore has always presented itself as a quality bunkering port, and this became more and more important as we grew to become the largest bunkering port in the world. Having a big bunkering conference here helps us maintain a high profile; in fact, SIBCON is now the world's largest bunkering conference.

We invite government ministers to be guests of honour. We invite knowledgeable, high-profile people from various sectors in the industry to speak, and we tell them they will get to meet all their customers in one place. Shipowners come to see what's going on; they bring their bunkering purchase managers, so bunker suppliers want to take part, and so on. It's an "Everybody is here, so come and attend" situation, a one-stop shop for networking, business opportunities, everything – and we are improving on it all the time.

Being known as a hub for discussion and the sharing of best practices, on top of delivering quality bunker in an efficient way, is important to keeping us ahead in the industry.

HOW HAS BUNKERING IN SINGAPORE EVOLVED UNDER MPA?

When MPA was formed, it took on the port's bunkering function and implemented several measures to promote it. These included organising conferences such as SIBCON, and creating dedicated bunkering anchorage slots at the outer fringes of the port to make things more convenient for bulk carriers and large tankers. We also introduced cheaper port dues for the large ships that were coming in just to take bunkers, and introduced first-in-the-world bunkering standards to regulate the industry. Volume went up significantly.

Bunker is actually the residue of refined crude oil. Poor-quality bunker can cause operational issues such as engine misfires, resulting in financial and commercial setbacks. MPA's aim is for Singapore to be a safe, trusted and competitive bunkering port. So, to safeguard the integrity and reputation of our port, we worked with SPRING Singapore to introduce standards and guidelines. We adopted the Code of Practice for Bunkering (CP60) in 1997 as part of our licensing scheme, and introduced a standard set of guidelines that

became the SS600, the Singapore Standard Code of Practice for Bunkering, in 2008. SS600 was used by other port authorities as a reference document for some years and went on to become the first global ISO standard for the international bunkering industry in 2010. Now, we have other measures too, such as the Mass Flow Meter, which is a better instrument for measuring volume.

We have also developed and implemented other measures, such as the Singapore Standard for Quality Management for Bunker Supply Chain (SS 524), to ensure that we have consistent high standards, from procurement at our terminals all the way to the point where a ship receives its oil.

SINGAPORE IS USUALLY ONE OF THE FIRST PORTS TO ADOPT NEW TECHNOLOGIES. PLEASE SHARE THE STRATEGIC THINKING BEHIND THIS TENDENCY.

There is our reputation as a cutting-edge player to consider, as well as the fact that we are the world's largest bunker supplier. That means other countries often look to us. Of course, in some cases, it's more of a "You go ahead and try it first while we watch and see" situation, but we are brave and determined enough to trailblaze.

Sometimes, it's a necessity. Everybody wants to catch up with us, and there are always going to be lower prices elsewhere – land, manpower, etc – so we have to leverage technology to keep our advantage.

But we don't take up every new development. You have to find the right technologies to apply, and consider manpower training, productivity and human resource. I'll give you past examples.

We have a lot of foreigners manning Singapore ships, so I introduced the use of double-screen computers. Instead of our staff having to keep switching around laboriously to check applications against the mariner databank, they could, for example, receive an application for manning a Singapore flag ship from a shipowner on one screen and immediately verify on the second screen that the officer is properly certified.

When new tugboats with centralised bridge control and mechanised winches were being introduced, around 1980, there was no more need for each tug to have eight engineering and navigational crew. I reduced the number to five, got them trained, and redeployed the others. Productivity went up. You see, both then and now, manpower shortage is more of an issue than overstaffing. The current drive towards digitalisation is both necessary and strategic.

a greener sector

Dr Stefan Micallef, Director of the Marine Environment Division at the International Maritime Organization, talks shop with Stephanie Yeong



As a man who is passionate about the environment, Dr Stefan Micallef, who holds a doctorate in marine toxicology, has long championed the green agenda in shipping. Here, he speaks candidly about industry challenges - including increased global scrutiny in the face of worsening climate change - and sustainability in future-ready shipping.

IT HAS BEEN SAID THAT SHIPPING IS ONE OF THE MAJOR CONTRIBUTORS TO CLIMATE CHANGE. WHAT'S YOUR TAKE ON THAT?

The figures show that international shipping contributed just 2.2 per cent of global carbon dioxide emissions in 2012, so it can't be said it's one of the major contributors. However, shipping is still primarily powered by fossil fuels, and it should be recognised that if such emissions were left unchecked, they could increase further. (They are forecast to rise to nearly 17 per cent of the world's total by 2050 if left unregulated.) And since shipping will most certainly remain the prime mover of goods and commodities for the foreseeable future – it is the most economical way to transport goods – we need to strive for ever-improving energy efficiency and look towards decarbonising shipping in the long run.

THE INDUSTRY IS FACED WITH MOUNTING PRESSURE TO CONTRIBUTE TO THE GLOBAL IMPERATIVE TO TACKLE CLIMATE CHANGE. WHAT ARE SOME OF ITS RESPONSES?

We're working hard to support awareness and instil a green culture in the industry. The "business as usual" scenario, I would say, has been overtaken. You'll find a raft of mandatory measures – all aimed at cutting greenhouse gas (GHG) emissions from ships – in place globally. Energy-efficiency measures developed and adopted by the International Maritime Organization (IMO) include requirements to meet an increasingly stricter Energy Efficiency Design Index for new ships, and the need for a Ship Energy Efficiency Management Plan to be in place for both new and existing ships.

From 2019, all ships (over 5,000 gross tons) will also be required to collect and report their fuel oil consumption data, which will provide a firm statistical basis for an objective, transparent and inclusive policy debate at IMO on any further measures that may be needed.

Transitioning shipping towards a low-carbon future is an ambitious goal, one that requires support through regulations – which can drive technology – as well as investment in capacity-building so that no country is left behind. Two IMO-headed projects geared towards that are the GEF-UNDP-IMO Global Maritime Energy Efficiency Partnerships (GloMEEP) Project and the

EU-IMO Global Maritime Technology Cooperation Centres (MTCCs) Network Project (GMN Project).

These are exciting times as we continue to work with the industry and others to implement the regulations already adopted. And IMO, through its Member Governments, is looking ahead, towards adopting a GHG strategy that will set out the vision for the future.

LET'S BE HONEST HERE: ARE SUCH GREEN EFFORTS SUSTAINABLE?

I think it's fair to say yes. Over the years, shipping has become steadily greener and more sustainable in the broadest sense. IMO measures adopted since the 1960s have cut oil pollution from oil tankers, limited harmful air pollutants from ships, and prohibited the discharge of plastics from ships – to name but a few regulations requiring ongoing action from the shipping industry. Shipowners are now also required to implement the Ballast Water Management Convention, which entered into force on Sept 8 this year, to prevent the spread of potentially harmful aquatic organism and pathogens in ballast water.

There will be a natural move towards ever more energy-efficient new ships, due in part to regulatory requirements and the response to those requirements, as well as an increased awareness and desire by the industry to take responsibility for its contribution to climate-change mitigation and sustainable development.

When it comes to existing ships, there may be greater challenges ahead, but there are and will be ways for them to become more energy-efficient. These range from operational measures – such as trim optimisation, and ensuring the hull is clean to limit frictional drag and increase fuel efficiency – to potentially more radical ideas for energy saving, such as the use of solar and wind power.

IMO'S MARINE ENVIRONMENT PROTECTION COMMITTEE (MEPC) HAS APPROVED A ROADMAP (2017-2023) FOR THE DEVELOPMENT OF A SOUND GREENHOUSE-GAS REDUCTION STRATEGY. COULD YOU SHARE SOME DETAILS?

IMO Member States have pledged to come up with a comprehensive strategy for reducing GHG emissions from ships, beginning with an initial strategy to be adopted in 2018. An updated strategy will be adopted in 2023. By then, we

PERSONALITY

would have collected three full years of data on the industry's fuel oil consumption, which will put IMO in a good position to make informed decisions on the next steps.

The initial strategy is expected to include sections on levels of ambition; guiding principles; candidate short-, mid- and long-term further measures, with possible timelines and their impacts on Member States; potential barriers and supportive measures; capacity building and technical cooperation; and research and development. A key element will be a vision for the industry, proposed to focus on the decarbonisation of the sector in the second half of this century.

Two intersessional working groups on GHG emissions – one in October 2017 and another in April 2018, just before the next MEPC session – will be devoted to developing the strategy ready for adoption.

CONVERSELY, CLIMATE CHANGE NEGATIVELY IMPACTS THE SHIPPING SECTOR. ARE THERE ANY COUNTERMEASURES IN PLACE? HOW ARE THESE HOLDING UP?

Phenomena such as more extreme weather events can make shipping more challenging. This is especially true for low-lying countries dependent on seaborne trade, as they have to adapt to, among other things, the potential for increased sea levels.

With climate change, there's also the likelihood of increased shipping in the polar regions, as certain sea routes become ice-free – but still arduous – for longer periods. IMO has already addressed this specific issue with the development of the Polar Code, which stipulates additional requirements for ships that may trade into those harsh environments. The Code has been in force since the beginning of 2017, so we're still in the experience-building phase.

TELL US MORE ABOUT THE GLOMEEP AND GMN PROJECTS.

The GloMEEP Project is a joint project of the Global Environment Facility (GEF), the United Nations Development Programme and IMO. Executed by IMO, the GloMEEP Project aims to create global, regional and national partnerships

to build capacity to address maritime energy efficiency, and for countries to bring this into the mainstream within their own development policies, programmes and dialogues.

Working with 10 Lead Pilot Countries, the GloMEEP Project has developed technical training packages and the Energy Efficiency Technologies Information Portal, which outlines ways to potentially reduce ships' fuel consumption. These range from engine waste heat recovery to energy efficient lighting systems – already available – and the use of kites or wind sails, currently in the experimental stage.

Its current strategic partners include The International Association of Ports and Harbors (IAPH); The Institute of Marine Engineering, Science & Technology (IMarEST); and the Maritime and Port Authority of Singapore (MPA). The Project has also established a public-private sector partnership: the Global Industry Alliance to Support Low Carbon Shipping. This initiative brings together like-minded industry champions in the private sector (including shipowners and operators, classification societies, technology manufacturers and providers, big data providers, oil companies and ports) to collectively identify and develop innovative solutions that can support overcoming barriers, as well as the uptake of energy-efficiency technologies and operational measures.

Meanwhile, the GMN Project, formally titled Capacity Building For Climate Mitigation In The Maritime Shipping Industry, a four-year project funded by the European Union (EU), unites technology centres – Maritime Technology Cooperation Centres (MTCCs) – in targeted regions (Africa, Asia, the Caribbean, Latin America and the Pacific) into a global network.

Together, the MTCCs act as regional focal points for a wide range of activities to improve compliance with existing and future international energy-efficiency regulations, help participating countries develop national energy-efficiency policies and measures for their maritime sectors, promote uptake of low-carbon technologies and operations in maritime transport, as well as establish voluntary pilot data-collection and reporting systems to feed back into the global regulatory process.

COMPANY SPOTLIGHT

Headquartered in Singapore, The China Navigation Company (CNCo) is the 145-year-old shipping arm of the Swire group, which owns and manages a fleet of over 100 vessels.

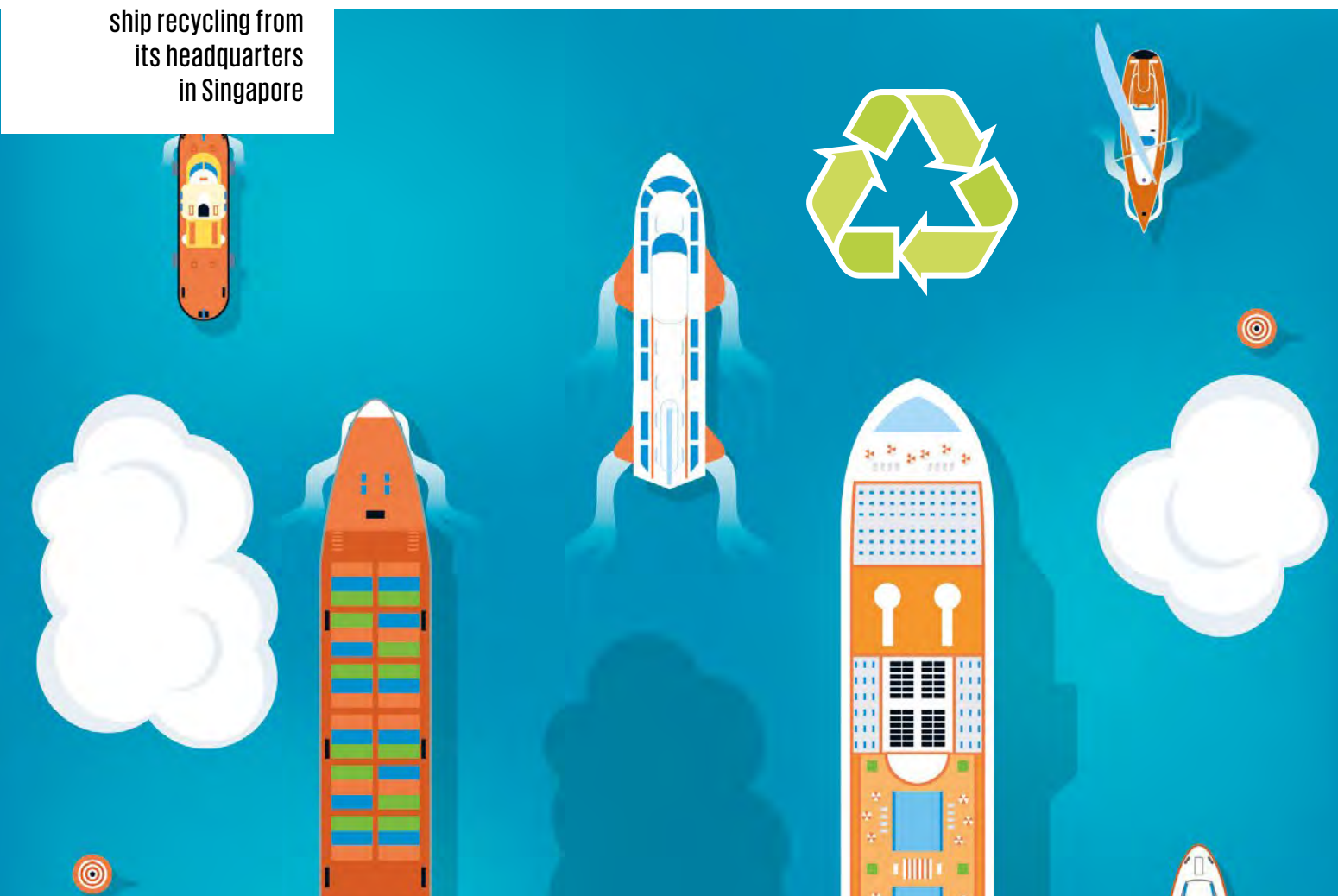
The company has been in business since 1872. It has stood the test of time by always looking ahead and making decisions based on long-term sustainability. Its vision – to be the leading provider of sustainable shipping solutions and its customers' partner of choice – serves as the framework for its strategy, and prescribes what the company needs to achieve in order to grow and develop along sustainable lines.

James Woodrow, Managing Director at CNCo, says, "We do not see our business as separate from the world; we depend on it, and wish to help shape it positively. In building our business, we seek to build communities. When we employ people, we provide them with a safe and healthy working environment and help fulfil their potential. When we use resources, we seek to protect the environments that provide them. Because when the world in which we operate thrives, so do we."

CNCo recently completed a four-year energy-efficient fleet renewal and expansion programme that delivered 12 multipurpose liner vessels,

spearheading sustainability

AJ Leow finds out how The China Navigation Company (CNCo) is blazing a trail in sustainable ship recycling from its headquarters in Singapore





31 handysize bulk carriers, and one dedicated cement carrier for its three business divisions – Swire Shipping (multipurpose liner arm), Swire Bulk (handysize dry bulk division), and Swire Bulk Logistics (marine supply chain operation) – a testament to CNCo's determination to provide safe, sustainable, cost-effective operations and to be its customers' partner of choice for the long term.

In lockstep with this is the sustainable retirement of tonnage that has reached the end of its economic life. The most environmentally efficient solution to this is the responsible and environmentally sound recycling of ships, through which over 99 per cent of each ship, by weight, is reused, either as is or in a reconstituted form.

CNCo was one of the founding members of the Sustainable Shipping Initiative (SSI), which was launched in 2012, and the company has since been an advocate of, and been working towards, the implementation of sustainable practices in the global shipping industry. As a lead member of SSI's Sustainable Ship Recycling Working Group,

it has also been spearheading efforts to promote sustainable ship recycling. Over the past five years, it has been deploying best practices, which include working closely with various stakeholders to improve safety, health, social, and environmental conditions at its ship recycling facilities across the globe and to build capacity.

PURSuing SAFETY EXCELLENCE

CNCo strives to provide a safe and healthy working environment and to cultivate a safety mindset in its employees and stakeholders alike. Safety leadership is driven from the top – senior leaders deliver safety briefings and take safety walks, both at sea and in its offices ashore, on a regular basis to drive safety excellence. Communication on safety issues is the first item in the managing director's weekly message to all employees. For CNCo to remain sustainable and fit for business through the next century, the safety of all its stakeholders, and avoidance of harm to the environment, is crucial.



COMPANY SPOTLIGHT

GROOMING TALENT

As CNCo's multinational workforce is at the core of its business operations, the company actively promotes an inclusive and diverse workplace. It is also committed to providing a continuous learning environment where employees are empowered to reach their highest potential. As of December 2016, CNCo employed 2,391 people from 33 countries around the world.

Having an inclusive, cohesive and supportive culture is a key strategy to its sustainability. CNCo's goal is to build a winning team through good job matching, and to develop an aligned and engaged workforce. Its Singapore Management Trainee programme has now been fully in place for three years, with support from the Maritime and Port Authority of Singapore.

Trainees in the programme are rotated through CNCo's various operating divisions and participate in developmental training. The aim of the programme is that, upon completion, the young Singaporean talents will be competent and ready to take on full management responsibilities, and contribute towards their chosen area of expertise in the maritime industry.

ENVIRONMENTAL SUSTAINABILITY

CNCo continues to seek innovative ways to minimise the impact of its business activities on the environment and biodiversity in the regions in which it operates. It has made significant progress towards environmental sustainability by adopting a proactive approach towards sustainable shipping, expanding its eco-efficient fleet, and implementing a number of operational initiatives.

The company's Environmental Policy includes its overarching commitment to a target of zero pollution incidents, and its ultimate long-term

goal is for its operations to have a net-zero impact on the environment and biodiversity. CNCo is committed to radical decarbonisation and helping to move the dial in this crucial area, notwithstanding that shipping (and aviation) are excluded from the Kyoto Protocol/2015 Paris Agreement, by developing a viable alternative fuel technology suitable for this sector.

CNCo believes that biofuel oil – derived from waste product feedstock – such as that produced by its sister company Argent Energy is a candidate with great potential to achieve its necessary decarbonisation goal, and will ultimately be helpful to the whole deep-sea sector. The company started work with Argent Energy on an R & D project funded by the John Swire & Sons SD Fund to prove the feasibility of this technology as a drop-in fuel in a marine context.

NURTURING REWARDING PARTNERSHIPS

CNCo also actively supports charities and community organisations. Its support focuses on education, health, youth, and the environment and biodiversity in the regions in which it operates, in turn establishing long-term, mutually rewarding partnerships with its global communities.

"CNCo recognises that its sustainable development strategy – encompassing four key areas: safety, people, community, and the environment – is fundamental to its continuing to grow successfully in the future. We are keen to work with stakeholders to determine a range of solutions that will assist our industry to be ever more environmentally and socially responsible, while simultaneously driving increases in our economic efficiency," says Woodrow.

"We'd like to think we will still be sailing the Swire flag in another 150 years."

"CNCO RECOGNISES THAT ITS SUSTAINABLE DEVELOPMENT STRATEGY...IS FUNDAMENTAL TO ITS CONTINUING TO GROW SUCCESSFULLY IN THE FUTURE."

JAMES WOODROW, MANAGING DIRECTOR AT CNCO



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The likelihood of unmanned vessels – also known as unmanned surface vehicles or USVs – initially plying within port limits will probably become a reality before the end of the decade, says Andrew Yue, Director of USV Intelligence & Autonomous Operations at ST Electronics, a leading homegrown solutions provider for intelligent transportation, safety and security, smart Info-Communications Technology (ICT) infrastructure, cyber security and defence systems.

“The technology is already here,” he says, sharing that ST Electronics had been experimenting and conducting periodic tests with prototypes over the past eight years. It had started with smaller models of 9m configurations, and has now progressed to 16m USVs.

“An actual craft will be bigger, probably in the 35m to 60m range. All we need now is to find the business case for commercial deployment. That is why we are constantly working with the Maritime and Port Authority of Singapore (MPA) and other regulatory bodies, as well as potential

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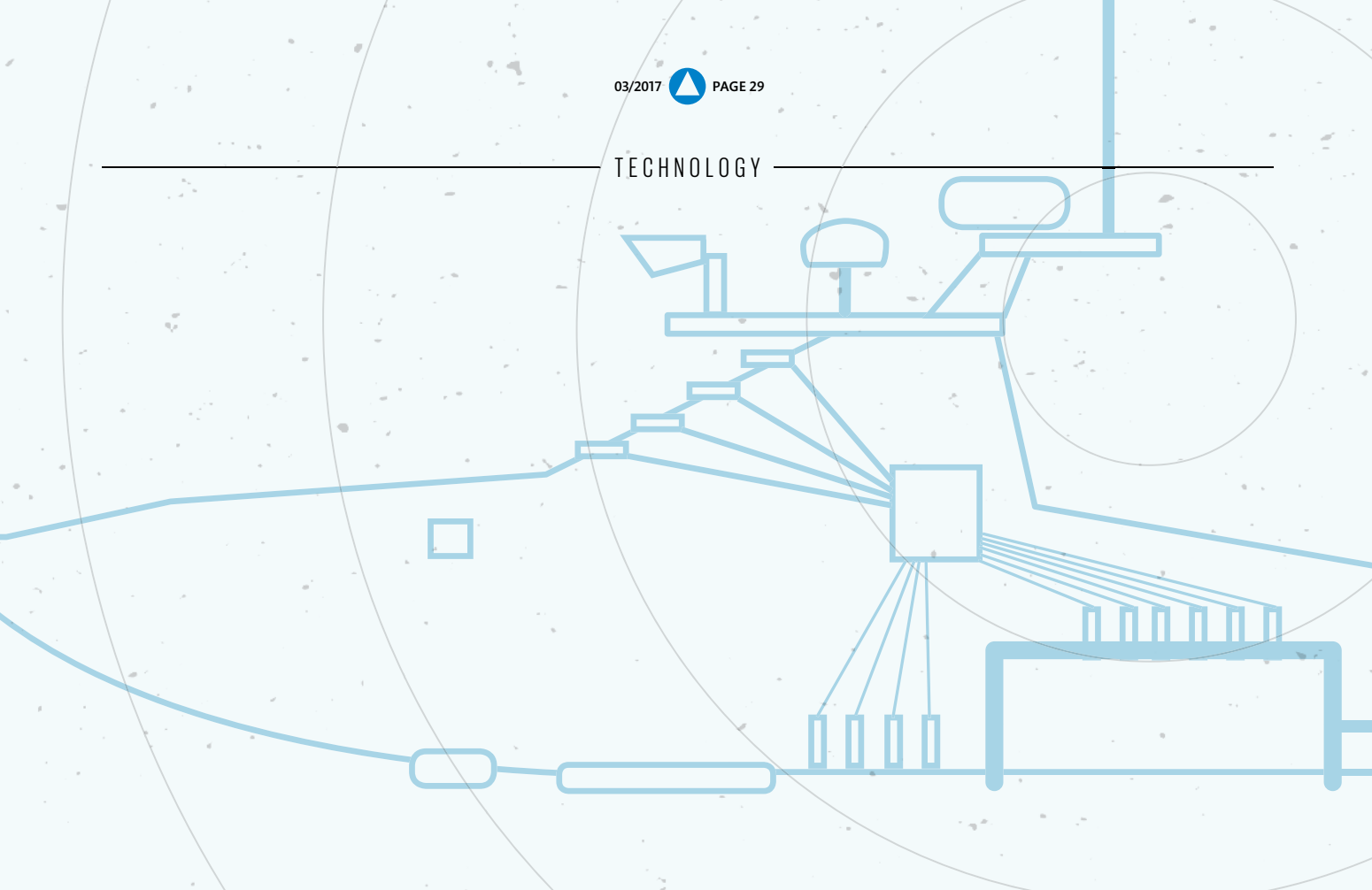
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navigating uncharted waters

Andrew Yue, Director of USV Intelligence & Autonomous Operations at ST Electronics, tells AJ Leow how and why autonomous ships will likely be a reality before the end of the decade, though initially confined to port limits or short point-to-point trips

TECHNOLOGY



shipowners. We are a technology house, not a shipping line, but we do get queries from business owners who need to explore how they can achieve cost savings from long-term operational perspectives," says Yue.

He adds that the initial capital outlay will be higher for a USV than a typical vessel, despite obvious benefits from savings in labour-associated costs such as salaries, accommodation and utilities (which can account for almost half of a vessel's operational costs on a voyage).

From a technological perspective, Yue adds that the easiest way to deploy an autonomous vessel is to have it operate on a fixed schedule, going to and fro between two points, such as a ferry service. He doubts, however, that ferry owners would find the cost justifiable. A good

case where one would find real benefits might be a dredging vessel, which rarely moves more than two knots a day while carrying out boring, mundane repetitive tasks, and for which it is often difficult to source a crew, Yue says.

"We could see the deployment of autonomous vessels within the next two to three years. Initially, perhaps not completely autonomous, as a totally unmanned vessel may take some getting used to," he adds. He notes that navigation, a task normally carried out by three personnel – usually the skipper, coxswain and radar operator – could easily be reduced to a one-man operation with less "task intensity" with the help of technology.

In fact, crew members might not need to be on board a vessel. A captain or navigator might soon find it possible to steer a vessel (or even several

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TECHNOLOGY

ships at a time) remotely, from shore, from a virtual bridge manned by a ship master in a control room, which is likely to look like the inside of an air traffic control tower.

While the prospect of “ghost ships” crossing sea lanes may be unnerving for some, the fact is that automation has real potential to reduce the incidence of human errors. The European Maritime Safety Agency, in its Annual Overview of Marine Casualties and Incidents, for example, found that 62 per cent of the 880 accidents that occurred worldwide between 2011 and 2015 were the results of human error.

“As technology in sensors and navigation matures, human fatigue will be less and less of a factor. Vessel performances will become consistent and reliable, which will enhance operational safety,” Yue says.

He points out, however, that there is still some way to go before completely unmanned ships can become a reality, particularly between distant ports, despite more and more functions becoming automated. This is largely due to the matter of ship and equipment maintenance.

“There will have to be a change in mindset about how vessels are designed and built. Both software and hardware, such as sensors to detect equipment faults, for example, cannot afford to fail. Marine engines and equipment will need to have built-in redundancies, much like how aircraft are now being manufactured to avoid mid-voyage breakdowns. On electronics-driven ships, temperature control will also become more important, though power consumption as a whole will be lower.



“The skill sets needed in maintenance staff at ports of call will also need to be different, which will require changes in education and training, especially in the area of information technology (IT). At the back end, there will be higher usage of artificial intelligence (AI) to complement both the software and hardware skills, and knowledge needed in manning autonomous vessels.”

Then there is also the complex matter of formulating international standards governing the operations of autonomous vessels. The International Maritime Organization (IMO), for one, will have to consider revisions to the International Convention for the Safety of Life at Sea (SOLAS) to allow ships with no captain or crew to travel between countries.

Interestingly, while there will always be concerns over the threat of cyber attacks, Yue notes that the incentives for sea piracy will likely be reduced.

“For a start, there will be no steering mechanism for pirates to take over, nor a crew to threaten for cash and valuables or hold for ransom. If there’s any attempt at hijacking an autonomous ship, the attackers would need to pit themselves against its stringent cyber security systems. Weapons brought into play will not be physical items but specialised cyber security skills to overcome the systems securing the ship. There will be no *Captain Phillips* heroics,” Yue muses, referencing the Hollywood movie about the real-life hijack of the *Maersk Alabama* by Somali pirates in 2009.

IPIECA, the global oil and gas industry association for environmental and social issues, was originally formed at the request of the United Nations (UN), and our key role has always been to build a bridge between the UN system organisations such as the International Maritime Organization (IMO), and the oil and gas industry.

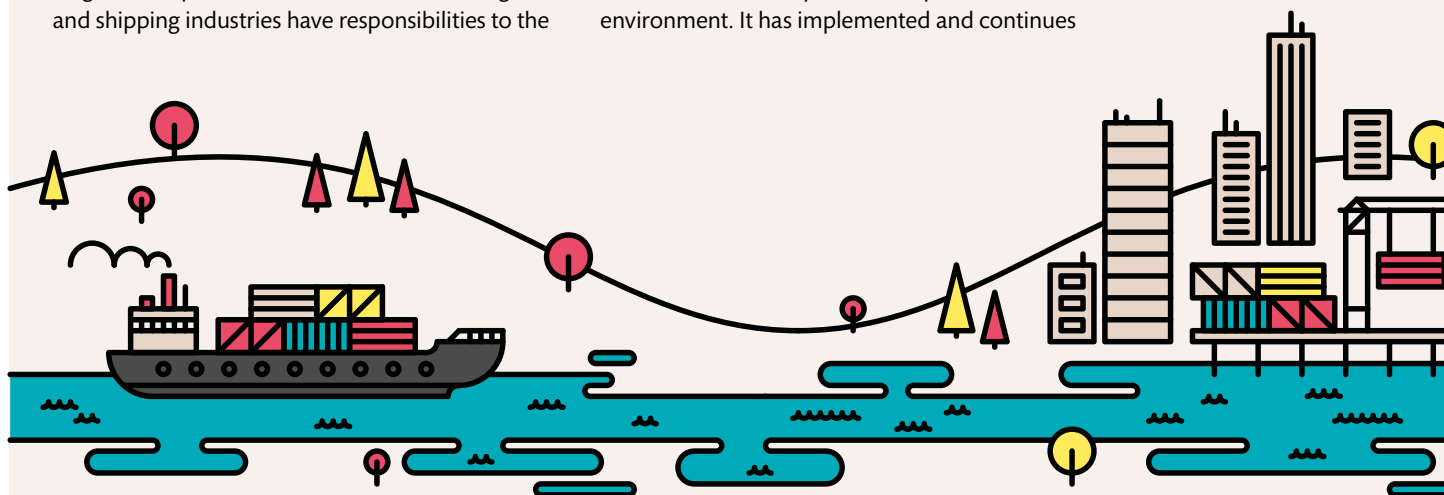
GLOBAL RESPONSIBILITIES

As global corporate citizens, both the oil and gas, and shipping industries have responsibilities to the

communities in which they work, and discharging that responsibility is essential to maintaining a licence to operate.

Increasingly, both industries are being challenged to reduce carbon emissions, to produce and consume cleaner fuels, and to increase energy efficiency. Both industries need to work together to ensure this is done.

The shipping industry has responded to the call to enhance safety at sea and protect the environment. It has implemented and continues



all hands on deck

IPIECA Executive Director Brian Sullivan highlights to Rahita Elias the need for all stakeholders to work together to promote safe sea transportation and protect the environment





to implement bigger-picture and longer-term environmental and safety goals.

The shipping community has also embraced initiatives such as the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, and the International Convention on Oil Pollution Preparedness, Response and Co-operation. Together, these efforts have driven improvements in safety and pollution prevention to new levels.

Flag and port states also have an important role to play in promoting safe sea transportation and protecting the environment. IPIECA encourages all flag and port states to play their part towards these goals.

All in all, I believe there is no better aspiration for shipping than the IMO's vision – "safe, secure, and efficient shipping on clean oceans" – which also describes the role of the industry.

RESPONDING TO RISING EXPECTATIONS

Even as both the oil and gas, and shipping industries are working to discharge our responsibilities to the communities in which we work, pressures continue to mount as stakeholder expectations of our performance increase. We need to continue to respond to these expectations – through improvements in technology and training, and the use of the latest in science.

As it happens, the drive to improve the environmental performance of one industry can be reflected in an environmental penalty in another. A good example of this is greenhouse gas (GHG) emissions from refineries that provide low-sulphur fuels for shipping. The extra processing involved in producing compliant fuels under MARPOL Annex VI for shipping could require more energy and result in an increase in GHG emissions from refineries of up to 5 per cent.

JOINT EFFORTS

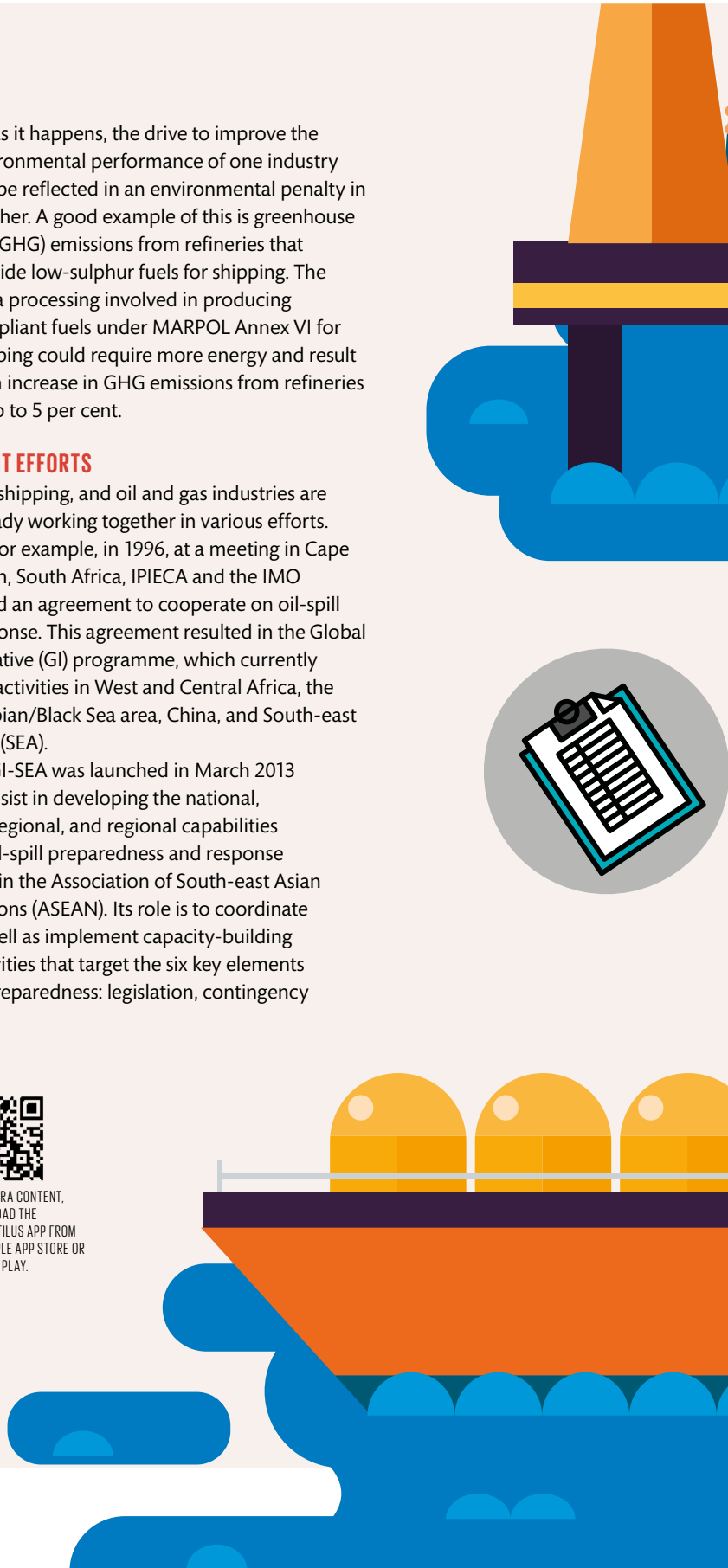
The shipping, and oil and gas industries are already working together in various efforts.

For example, in 1996, at a meeting in Cape Town, South Africa, IPIECA and the IMO inked an agreement to cooperate on oil-spill response. This agreement resulted in the Global Initiative (GI) programme, which currently has activities in West and Central Africa, the Caspian/Black Sea area, China, and South-east Asia (SEA).

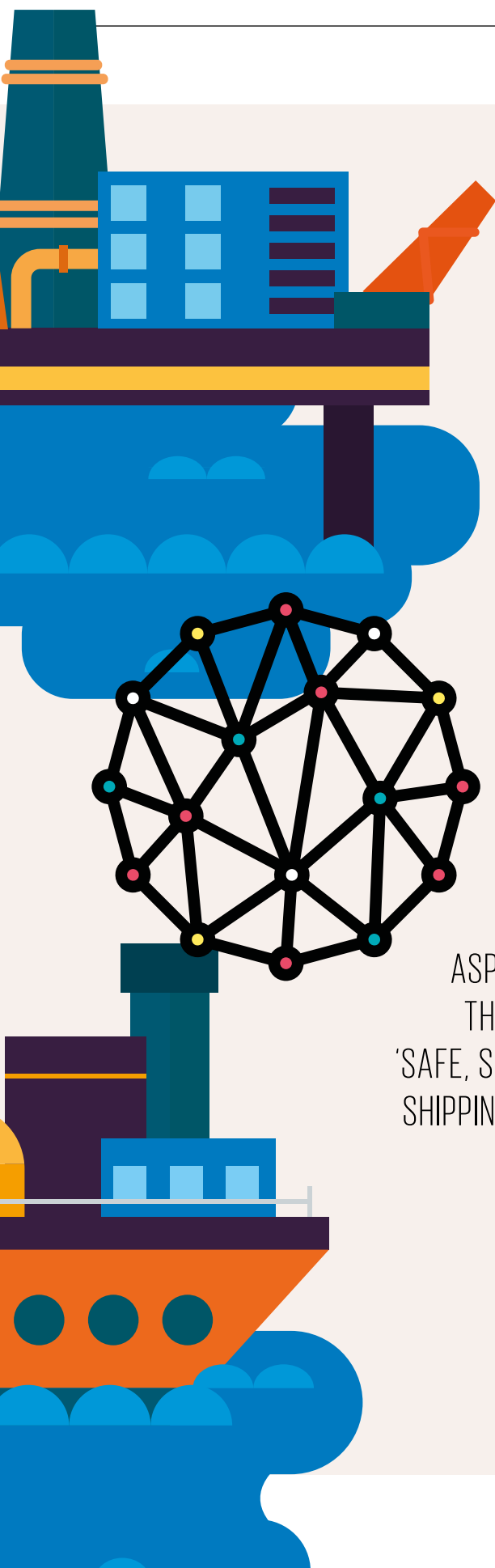
GI-SEA was launched in March 2013 to assist in developing the national, subregional, and regional capabilities in oil-spill preparedness and response within the Association of South-east Asian Nations (ASEAN). Its role is to coordinate as well as implement capacity-building activities that target the six key elements of preparedness: legislation, contingency



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COMMENTARY



planning, equipment, training, exercises, and forces for implementation. This can have benefits in the promotion of safety and environmentally sound approaches to cleaner maritime transportation.

In addition, IPIECA cooperates directly with various technical partners, such as the Oil Companies International Marine Forum, the International Chamber of Shipping, the International Association of Independent Tanker Owners, and the International Tanker Owners Pollution Federation.

TOWARDS SUSTAINABILITY

Ultimately, we all have a part to play in promoting safe sea transportation and protecting the environment. Working in partnership with stakeholders, such as industry and civil societies, can help to increase the impact of such efforts, and produce more sustainable benefits for all concerned.



ABOUT BRIAN SULLIVAN

Brian Sullivan is the Executive Director at IPIECA, the global oil and gas industry association for environmental and social issues; the non-profit is also the industry's principal channel of communication with the United Nations. He joined IPIECA after a 23-year career in BP that spanned a wide range of roles across the company's value chain.

“THERE IS NO BETTER ASPIRATION FOR SHIPPING – ‘SAFE, SECURE, AND EFFICIENT SHIPPING ON CLEAN OCEANS.’”

BRIAN SULLIVAN,
EXECUTIVE DIRECTOR AT IPIECA





transformation through technology

Panellists from the 2nd Singapore Maritime Technology Conference (SMTC) speak with AJ Leow about how technology is transforming the maritime industry

CLOCKWISE FROM TOP LEFT

Joern Springer, Senior Director of Head Fleet Support Center at Hapag-Lloyd AG; Professor Chan Eng Soon, Programme Director of the Marine & Offshore Programme at A*STAR and CEO of Technology Centre for Offshore and Marine; David Tan, Chief Technology Officer at ST Electronics; Professor Kim Yonghwan, Chair of the Department of Naval Architecture & Ocean Engineering at Seoul National University.

One of the aims of the 2nd Singapore Maritime Technology Conference, which was held in April as a part of Singapore Maritime Week 2017, was a demonstration of thought leadership on the latest developments, products and services, and their applications in the maritime industry. The event's Featured Expert Insights series included a panel discussion themed "Enabling Transformation Through Technology – Where are the Possibilities?" Here, the panellists share some of their thoughts on the subject, as well as their outlook for the industry.

SINGAPORE NAUTILUS (SN): THERE IS TALK IN THE MARITIME COMMUNITY THAT THE FUTURE OF THE INDUSTRY IS ALREADY HERE. WHEN DID "THE FUTURE" ARRIVE, AND WHAT ARE THE DRIVERS BEHIND THIS ACCELERATED TRANSFORMATION? HOW MUCH OF IT IS INTERNAL AND/OR EXTERNALLY DRIVEN?

PROFESSOR CHAN ENG SOON (CES): It really depends on what the vision of the future is that one is referring to. Digitalisation, for example, is clearly making an impact in many areas globally, not just the maritime sector. It is driving the development of intelligent systems found in vessels today. It may take a while for autonomous solutions to gain traction and full acceptance by both stakeholders and the community at large, however. In my opinion, this is a journey that will continue to evolve.

JOERN SPRINGER (JS): Driving or pushing factors can be seen externally, in the financing of ship operators and in shifting market pressures. One example is how the German ship management market is experiencing massive capital-related pressure. Internally, you have situations like container liner operators facing increasing speed of consolidation. The need for growth is accompanied by a need for scalable systems and processes, and the latter is the main area for the application of new technologies as well as data-driven decision support.

PROFESSOR KIM YONGHWAN (KY): The maritime industry is already in the midst of transitioning into a "future" phase. Take the shipbuilding business, for example. It boomed from the 1990s to the early 2000s, but since the late 2000s, it has experienced a downturn and stagnation. Some efforts to overcome the slump by looking into offshore projects were made, but sharply declining oil prices added to the list of problems shipbuilders were already facing.

COMMUNITY TALK

Recently, however, there have been strong indications of a pickup in the near future. It is likely that shipbuilding's most salient current and future concerns are cost reductions in ship construction and operations, as well as the development of new technologies.

Over the next decade, the world will be watching to see which companies survive. So it is quite clear that we have already entered a new era in the marine industry – a new period where all stakeholders are playing a game of survival.

Another factor to consider is growing worldwide concern about marine pollution and safety, and the International Maritime Organization's (IMO) recent and soon-to-be-applied regulations that deal with these. The impact of these changes is unavoidable.

We should also be aware that the fourth industrial revolution extends to the marine industry. This is a new driving force for the development of new marine technology.

SN: A DECADE FROM NOW, WHAT ARE SOME OF THE NEW DEVELOPMENTS AND TRANSFORMATIONS WE CAN EXPECT TO SEE IN VESSELS, SHIPPING AND PORT OPERATIONS?

JS: The leading technologies of today, such as high-resolution energy monitoring and real-time communication, will be standard fare in about five years among the more successful participants in highly competitive markets. New business models capitalising on these new and evolving technologies will drive the transformation of the maritime industry.

CES: We should be seeing greater deployment of autonomous or remotely controlled smart vessels within the next 10 years, starting with operations in simpler and more manageable environments. Many will probably start this journey with some crew on board – perhaps a leaner team than the current norm. If this is implemented correctly, there will be immediate gains, including enhanced safety, increased productivity, reduction in costs, and timely interventions in life cycle management.

DAVID TAN (DT): The current wave of technological innovation is pushing maritime industry players to transform themselves with game-changing concepts of operations (CONOPS). Vessel operators, shipowners, terminal port operators and port regulators are investing in digitalisation in an effort to develop

capabilities for operational effectiveness and improved business outcomes.

Within the next decade, newer CONOPS such as Just-in-Time Arrival, Berth-to-Berth and Quay-to-Quay operations, Next-Gen Ships, Smart Ports, Maritime Collaborative Decision-Making (MCDM), Internet-of-Terminals, and MaaS-on-Cloud could become fully operational. These CONOPS will bring about transformational changes in the maritime community, in terms of operational efficiency, improved safety and business growth.

KY: With a focus on the shipbuilding business, two main streams will persist in a decade: environmentally friendly ships and smart ships. The former has garnered great interest in the last several years, and will continue to be key in the next 10 years. The implementation of EEDI (Energy Efficiency Design Index) and EEOI (Energy Efficiency Operational Indicator) regulations will continue until 2025.

The last several years have also seen an increased demand for eco-friendly ships, bringing about big changes in ship design and construction. Ships are now bigger than ever, and the concept of slow steaming has had a significant impact on both shipbuilding and marine trading. The construction of larger-than-22,000 TEU container ships may slow down soon, but the development of eco-friendly technology will definitely continue.

Emerging technology for smart ships is a crucial element of future-ready marine engineering. It is easy to envision the use of unmanned ships in the near future.

Classification societies and port authorities will face a new challenge: how to regulate all these diverse and related parties, from shipbuilders to ship operators. After all, increasing ship size has a big impact on port capacity and maintenance, and the appearance of smart ships will require adjustments in harbour control and port maintenance.

SN: WILL THE RACE TOWARDS THE FUTURE LEAD TO A FLATTER SEASCAPE, OR ONE DOMINATED BY EITHER BIGGER PLAYERS WITH FINANCIAL MUSCLE OR SMALLER, MORE NIMBLE PLAYERS? IS THERE A NEED FOR AN INTERNATIONAL BODY, SUCH AS THE IMO, TO ENSURE A LEVEL PLAYING FIELD?

JS: As seen in other industries, such as the private transportation sector, technology enables



new business models to develop faster than regulation can follow. Future leads will come from outside the maritime industry and they will not be directly connected to company size. Consequently, a regulated playing field is hard to imagine.

CES: Every player should benefit from the broad range of possibilities brought on by development. There are low-hanging fruits requiring relatively low investments that should be achievable. Small and nimble players can expect faster gains, but bigger players will likely still be the ones who can take things further, towards higher levels of sophistication.

KY: Since Asia is growing in importance in marine trading, the economic growth of Asian countries will become more important in global business. Oil price is also a crucial factor. There will be some maritime companies that will not survive the current downturn. Current performance trends among the sector's large companies seem to indicate that becoming a larger player, or coming together to form alliances, promises a better chance of survival.

As new regulations are imposed and new technologies emerge, particularly for smart ships, exchanging or sharing of data will become an increasingly important issue. This is not a particularly welcome shift for many companies, but it is one in which classification societies can play an important role.

SN: WITH THE ADVENT OF ARTIFICIAL INTELLIGENCE (AI), HOW SECURE ARE THE MARITIME JOBS OF TODAY? WHAT WILL THE MARITIME JOBS OF TOMORROW BE?

JS: I expect to see changes in necessary qualifications and employee profiles. I do not think there will be fewer jobs – it is more likely that there will be different ones.

KY: It is obvious that not only AI, but also other emerging and related technologies such as big data analytics, will bring significant change to the marine community. What is hard to foresee is exactly what, how and how much will be changed as a result. Some will make it and some won't. But change is unavoidable; it is a natural process in the development of human technology. We need to do what we can to stay up to date and not be left behind.

CES: I am of the opinion that humans will still be in the loop even if autonomous solutions are

made available. It need not be one or the other. The coupling of human experience and insights derived through AI may offer higher value in ensuring reliability. After all, the complexity of maritime operations does not reduce with the use of AI.

DT: Machine learning in AI has resulted in new technological developments for improvements in the maritime industry. Unmanned vessels and robotics capabilities are two such examples. Such platforms with machine-learning capabilities are increasingly capable of carrying out the dull, dirty and dangerous tasks currently performed by humans on a 24/7 basis.

Unmanned vessels are already in operation. Their use ranges from surveillance for safety and security missions to being the first responders to incidents and accidents out at sea. Fitted with smart data analytics engines and machine-learning algorithms, these vessels are quickly becoming capable of operating alone or in teams within designated areas to take over mundane tasks, which are traditionally carried out by manned platforms. Smart visual analytics enable them to detect, identify and classify ships and obstacles in order to operate safely in a mixed manned and unmanned environment with advanced anti-collision capabilities.

Other potential areas of deployment include unmanned surveillance of flotsam; detection of illegal discharges at sea, emission pollution and illegal bunkering; and unmanned pilotage within port limits. Enormous manpower savings can be derived from a wide spectrum of operations if a fleet of unmanned vessels are on call to provide 24/7 surveillance, both from the air and on the surface of the seas. Use of such vessels can also reduce manpower risks, especially in dull and/or dangerous missions and tasks.

In a mixed operational environment, however, a human overview of comprehensive command and control operations is still very much needed. Port Operations Control Centre (POCC) managers, for example, can leverage AI in the form of virtual assistants and persistent sentinels (VAPS) to provide anticipatory knowledge services that are coming to be known as MaaS (Maritime as a Service) and Just-in-Time Maritime Concierge Assistance.

We do have to be mindful, however, that there is no one particular technology to focus



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“...HUMANS WILL STILL BE IN THE LOOP...THE COMPLEXITY OF MARITIME OPERATIONS DOES NOT REDUCE WITH THE INTRODUCTION OF AI.”

PROFESSOR CHAN ENG SOON, CEO AT TECHNOLOGY CENTRE FOR OFFSHORE AND MARINE



on. There is a growing pool of related and interdependent technologies and solutions entering the field, and any combination could become essential to commercial shipping in the near future.

SN: A LOT OF THE BENEFITS OF TECHNOLOGY WILL COME FROM DATA MINING AND ANALYTICS, PARTICULARLY THE SHARING OF SAID DATA. WHAT ARE THE BARRIERS TO SHARING? HOW MUCH ROOM IS THERE FOR COLLABORATION? WHO OWNS THE DATA OR IS RESPONSIBLE FOR ITS DISSEMINATION?

CES: There is no straightforward answer as there are good reasons for the protection of proprietary data, particularly security and risk management. Some level of sharing is clearly beneficial, and this is being pursued by many in the industry.

JS: We need standard methods to anonymise data and so enable more sharing opportunities. For example, collated operational data on container carriers and port information could be used for research and development towards the creation of the smart ports of the future.

DT: Data is the lifeblood of every company and industry. The best data-driven maritime organisations, shipowners and ship operators

are those that constantly operationalise their data, not as a historical tool but as a functional data supply chain, by sending out real-time insights to people who need them.

This, however, is both a blessing and a curse. It is a blessing because you are now able to develop anticipatory capabilities for better operations, as well as share data for maritime collaborative decision-making (MCDM) processes within the cluster. It is also a curse because, now, every one of your movements and operations can be tracked in near-real time, both by operators and owners, and they can stay informed of how well their ships are being optimised and monetised.

Cloud technology, be it private, public or hybrid, is allowing at-source data to be shared across sectors. Such transparency can impinge on data privacy – this is one obvious barrier to sharing.

There are, however two ways to mitigate these barriers. The first is investing in the security and safety of both platform and architecture from the onset of capability development. The second is integrating anonymisation technology into your data warehouse, such that data can be protected from those who, by security policy arrangement, do not have the need nor the authority to access said data.

KY: We are living in an era in which data is property. Most companies want to hold it rather than share it. Although navigational data is an important element of smart-ship-technology development, shipping companies are not willing to share it. We can understand this and respect their rights.

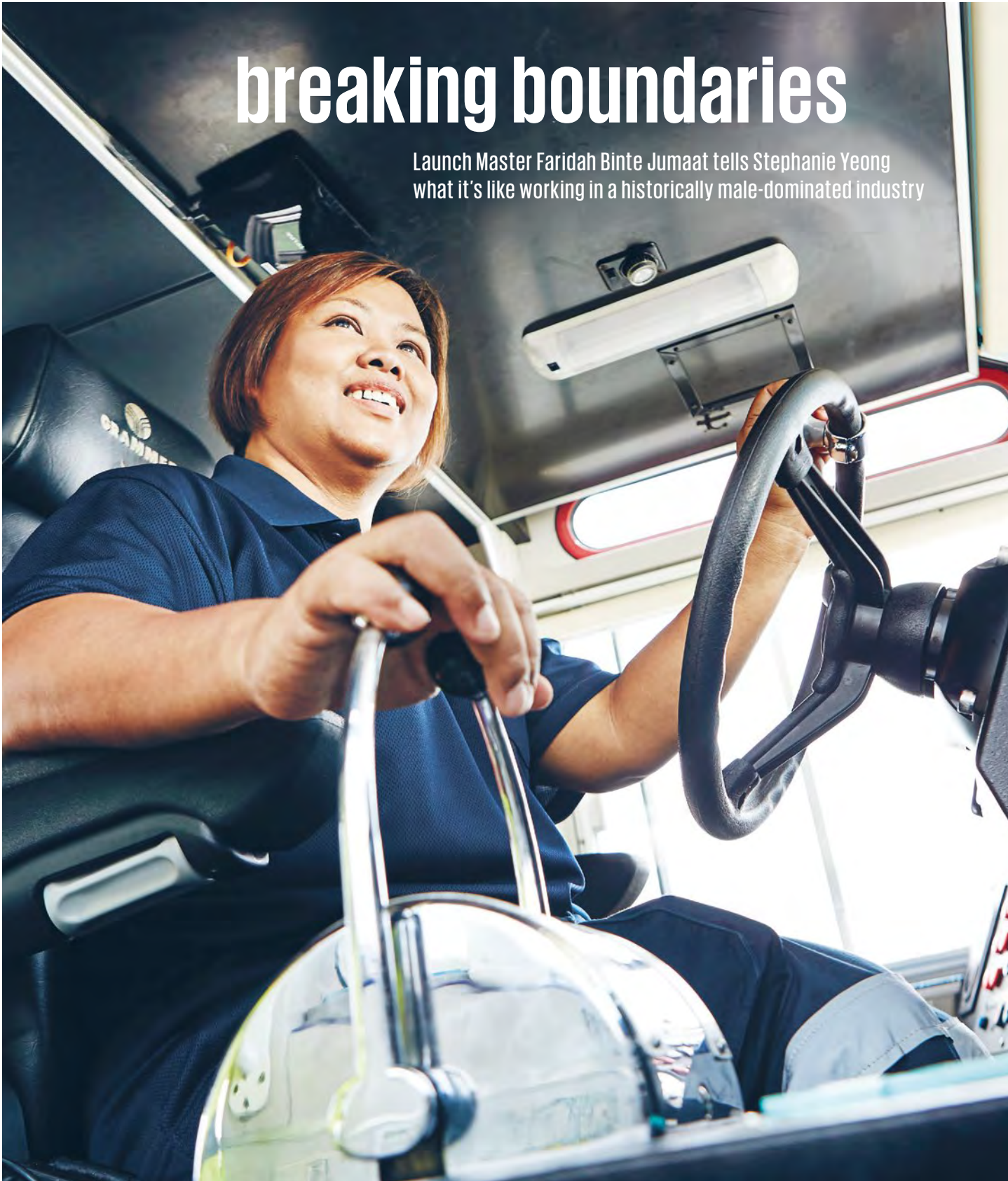
However, to accelerate technological development, we need data. Therefore, we need a broader view. We need to share some information, which can be beneficial for all, but with less impact on individual businesses.

Increased collaboration among multiple parties is one way to approach the issue. Smart-ship technology involves many different fields, so many parties can collaborate in the development of a single system. Sharing data in such contexts is only natural. Another possible solution is to share information via institutes of higher learning.

Announcing and crediting the sources of shared data is also important. We should also define how much, and to what extent, data should be shared.

breaking boundaries

Launch Master Faridah Binte Jumaat tells Stephanie Yeong what it's like working in a historically male-dominated industry



CAREERS

It used to be that seafaring women were unheard of, but the tides are now turning as more women step into one of the world's oldest industries – although females still make up only an estimated 2 per cent of its workforce.

Singapore has a maritime workforce of more than 170,000 employees. Of these, there are only two female Launch Masters at PSA Marine – and one of them is Faridah Binte Jumaat. Introduced to the industry by a friend who worked as a marine crew, and intrigued by the progression opportunities, the former AETOS security officer started her seafaring career in 2014 as a marine assistant at PSA Marine. Her job scope included the upkeep of assigned crafts in terms of ensuring operational readiness (by performing pre-operational checks on the engines and the like), and lookout duties – keeping an eye out for passing-by, head-on and crossing vessels.

Earlier this year, the mother-of-two was promoted to Launch Master – prerequisites for the position include a Port Limit Steersman licence from the Maritime and Port Authority of Singapore (MPA) and good work performance. In her new

role, she takes command of the launch as well as the marine assistant who works alongside her. Her responsibility: ensuring the safe passage of the launch's passengers, the harbour pilots. "We ferry them to their assigned vessels or anchorages safely and promptly," she says, "so they can pilot the vessels – including tankers and container ships – to their assigned berths or terminals when they come into port or direct them out of port, on schedule."

This, she says, is especially important for a port as busy as Singapore. The world's busiest transshipment hub is connected to 600 ports in over 120 countries and has roughly a thousand vessels in its port at any one time. A ship arrives or leaves it every two to three minutes, and more than 130,000 call at it annually.

While the job may sound easy, Faridah shares that it isn't always so. "We work 12-hour shifts, rain or shine," she says, "and bad weather can make it challenging to navigate. We also have to multitask." One also has to constantly be alert to the surroundings, she adds, "especially during night shift, when there's limited light".

As to be expected in any traditionally male-dominated industry, her authority is sometimes challenged by some of her peers. She declares, though, that "with perseverance as well as the skills and knowledge I've acquired, I've managed to overcome it."

What Faridah finds most rewarding about her job is the fact that her passengers arrive safely at their destinations. She recalls an occasion when the sea was very choppy: "Despite that, I worked together with my marine assistant and managed to get alongside a vessel; this allowed the harbour pilot we were ferrying to go up the gangway safely. The compliments we received from the pilot really made my day. This is my responsibility and I'm glad I did it well!"

Her next steps: obtain a Port Limit Helmsman licence, progress to Waterboat Master – taking the helm of a larger vessel that supplies portable water to ships – and then completing the trainee tug master training. "Only then can I realise my dream of being a Tug Master," she says.

To women considering roles in frontline operations in this conventionally masculine industry, Faridah advises, "You must have passion and perseverance, and be mentally and physically prepared." Do not be daunted by the mannish industry; to borrow the words of Andrew Tan, Chief Executive of MPA, "one should not think that seafaring is restricted to a man's world."

**TO BE A
LAUNCH
MASTER
WITH
PSA MARINE,
ONE MUST:**



2.

Obtain a Port
Limit Steersman
licence

1.

POSSESS
AT LEAST
GCE N-LEVEL
CERTIFICATION



3.

Be willing
to perform
shift work

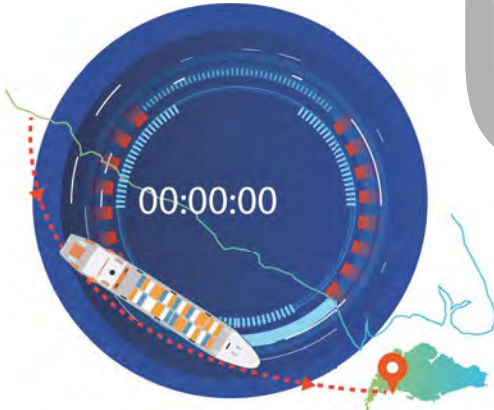
4.

BE PERFORMING WELL
AS A MARINE ASSISTANT
WITH PSA MARINE





IT INVOLVES RESEARCHING, DEVELOPING AND TEST-BEDDING NEW TECHNOLOGIES.



THE PREDICTION OF VESSEL ARRIVAL TIMES AND TRAFFIC DENSITY WILL MAKE UTILISATION PLANNING EASIER.



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SAFER STANDS FOR SENSE-MAKING ANALYTICS FOR MARITIME EVENT RECOGNITION



AUTOMATED DETECTION AND REPORTING OF INFRINGEMENTS AND ILLEGAL BUNKERING ACTIVITY WILL SOON BE POSSIBLE.

project SAFER

This collaboration between the Maritime and Port Authority of Singapore (MPA) and IBM Research is aimed at improving maritime and port operations to cater to increasing vessel traffic. Here are some facts about the project:

IT WILL AUTOMATE AND INCREASE THE ACCURACY OF SEVERAL CRITICAL TASKS.



IT LEVERAGES MACHINE LEARNING CAPABILITIES TO ENHANCE PORT OPERATIONS AND ENFORCEMENTS TO INCREASE SAFETY AND EFFICIENCY.



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