



## Annex A

### **Launch of Next Generation Vessel Traffic Management System (NGVTMS) Lab**

ST Engineering and Kongsberg Norcontrol have launched the Next Generation Vessel Traffic Management System (NGVTMS) Lab today. Supported by MPA's Maritime Innovation and Technology (MINT) Fund under the MPA Living Lab initiative, the S\$9.9 million lab was set up to develop digital technologies and decision-making tools used by maritime operators, such as the analysis of vessels routes, traffic hotspots prediction, and detection of potential collision situations. Smart algorithms will predict traffic hotspots and anticipate potential collisions. An array of sensors and decision support tools will provide port authorities with comprehensive real-time traffic situation and assist them in planning an optimal route to avoid congestion.

When fully completed by 2021, it will realise the development of new capabilities that help maritime authorities further enhance navigational safety; handle higher vessel traffic volumes within crowded shipping lanes with increased safety, security and efficiency; and enable the seamless and autonomous exchange of information across unmanned vessels.

With the digital transformation of Singapore's port services and operations, and advent of smart shipping and autonomous technology, the next generation VTMS will play a mission-critical role in ensuring the navigation safety and efficiency of Singapore port waters and the Singapore Strait. To ensure that the VTMS continues to be at the forefront of the industry, the NGVTMS Lab will focus on research, discovery, conceptualisation and validation of new operating concepts, processes, business rules and technology relating to vessel traffic management.

At the launch, ST Engineering and Kongsberg Norcontrol will demonstrate a suite of digital technology and advanced data communications system for the automated and electronic information exchange between ships and port authorities, in support of the e-Navigation initiatives by the International Maritime Organisation. These tools will strengthen accurate and comprehensive maritime situational awareness, enabling ship operators to make timely and efficient decisions for enhanced operational efficiency and safety.

**ST Engineering, PSA Marine and MPA to develop and trial Remotely Assisted Pilotage**

ST Engineering, PSA Marine (PSAM) and MPA are collaborating to design and develop a remotely assisted pilotage system, an initiative under the MPA Living Lab. The system, which combines the use of Internet-of-Things sensors and communications systems, will allow on-shore pilots to remotely guide vessels for safe berthing, unberthing, and movement within the domestic waterways to the port of call.

Today, port regulations require large vessels to engage the service of authorised pilots when navigating in the port. The remote, shore-based pilotage system will help to free up about 40% of time spent by authorised pilots, alleviating their need to physically board the vessel from the port of call. This will enable more efficient manpower allocation, and the pilots can be redeployed for other critical tasks. Remote pilotage operations from a shore-based station, supported by enhanced situation awareness coupled with real time imagery and data, will also deliver operation and fuel cost savings.

PSAM will provide their rich pilotage experience in validating and trialling the system within the Port of Singapore. ST Engineering will deliver its proven expertise and capabilities in Unmanned Surface Vessels and autonomous technologies. MPA will study the feasibility of pilotage operations enhancement that will support future pilotage demand without compromising navigation safety.

## **MPA sets up Steering Committee to study Autonomous Ships**

MPA has set up a cross agency Steering Committee (CMASS) to develop Singapore into a future-ready port that is able to receive Maritime Autonomous Surface Ships (MASS). Singapore also wants to be the preferred location for companies to operate their autonomous vessels remotely.

The committee would:

- Formulate an implementation roadmap of autonomous maritime operations in our port waters
- Undertake MASS pilot trials to evaluate how best for vessels of differing levels of autonomy to co-exist in port
- Set up regulatory sandboxes to facilitate test-bedding projects and trials
- Undertake R&D projects to build deep technical capabilities to provide reception services to ocean-going MASS that call at port

Test-bedding projects. MPA has initiated five autonomous vessel projects with Wartsila, ST Engineering (Autonomous Ship Intelligence, Smart Maritime Autonomous Vessel and Autonomous Flotsam Clearance Vessel), and Keppel Singmarine (Design and Development of Semi-Autonomous Harbour Craft) amounting to S\$7.2M. These projects aim to enable harbour craft operators such as PSA Marine, POSH and Keppel Smit Towage to leverage autonomous technologies to enhance their productivity and navigational safety in port. Furthermore, the projects would allow MPA to evolve the port infrastructure and regulations to support such autonomous operations.

*Mr Steen Lund, Chair, Technical Committee, Singapore Shipping Association (SSA) said, “Autonomous navigation has the potential to increase productivity and enhance navigational safety. CMASS will enable Singapore and the industry to move forward collectively to become a MASS-ready port. As a partner in nation building, SSA is pleased to be a key partner in this endeavour.”*

## **ST Engineering, POSH, M1 and ABS to jointly develop Smart Maritime Autonomous Tug**

ST Engineering, together with PACC Offshore Services Holdings (POSH), American Bureau of Shipping (ABS) and M1 Limited will convert an existing manned tugboat into a smart autonomous vessel. The project provides an opportunity for technology providers to work closely with ship owner, classification society and port authority to explore boundaries in autonomous shipping and shape the rules and regulations for the future Maritime Autonomous Surface Ship (MASS).

This is the Group's first foray into integrating its in-house NERVA Ship Management System and Sensemaking System (SMS<sup>2</sup>) with an autonomous vessel to provide the Hull, Mechanical & Electrical (HM&E) autonomy, another critical component of an ocean-going MASS in addition to the navigation autonomy.

The NERVA SMS<sup>2</sup> provides real time, centralised control and monitoring of the shipboard systems and grants ship operators the much-needed visibility and confidence for the operation of the MASS, while out in the ocean. In the event of operational exceptions, corrective actions can be planned more effectively and deployed more efficiently.

The Sensemaking System also provides prognosis and Condition-Based Maintenance (CBM) to critical shipboard systems by monitoring critical operating parameters and warn the operators of impending failures upfront so that critical fixes can be planned and deployed in a timely manner. The Sensemaking System is able to reduce unplanned downtime and extend uptime to bring about cost-savings and enhanced operational and productivity efficiencies.

## **ST Engineering, Mitsui & Co. Ltd, MPA and Lloyd's Register to develop Autonomous Ocean-Going Vessels**

ST Engineering, Mitsui & Co. Ltd, MPA and Lloyd's Register have embarked on the world's largest ocean-going **Autonomous Vessel Programme**. This steers the sail of a largest and first-of-its-kind commercial vessel in the high seas autonomously, providing a transformational wave to global maritime operations.

ST Engineering will develop and install sophisticated "perception and navigation modules" on a Singapore-flagged, ocean-going 8000-CEU car carrier, owned by MV Themis and operated by Mitsui & Co. Ltd. Leveraging its electronics-arm's expertise in developing autonomous capabilities for coastal applications, this extension allows all three companies to develop autonomous technology that spans a wide range of scenarios as the ship traverses round the world.

The project will model ship dynamics and emulate the ship's hardware to realistically model dynamic responses of the vessel, as the information is piped back to a shore control station for analysis and development of navigation intelligence. Maritime situation awareness, object detection, localisation and recognition by artificial intelligence, manoeuvre strategies and path-generation are modules developed to hone the skills of an experience navigator.

*Mr Ravinder Singh, President, Electronics, ST Engineering said, "Leveraging our deep engineering expertise and indigenous talent with digital core competency, we have adopted an innovative approach to offer autonomous navigation capabilities that are leading-edge and world-class. Together with our partners, we aim to develop smart systems to save manpower and to raise safety standards and operational efficiency for MPA and port authorities. This will not only benefit global maritime operations but also address long-standing challenges of the maritime industry."*

In addition to providing the vessel, Mitsui & Co. Ltd will also provide insights to shipping operations and route planning. Classification society Lloyd's Register will provide safety cases for intervention, monitoring, and the eventual certification of the autonomous navigation system.

*Mr. Tatsuya Okamoto, Chief Operating Officer of Mitsui & Co. Ltd (Mobility Business Unit II) said, "We are very excited to participate in this project with great partners. We hope our project will contribute to MPA and Singaporean maritime industry, and also hope to expand to further innovative projects with good partners in this Maritime Innovation Lab."*

*Andy McKeran, Lloyd's Register, Commercial Director Marine & Offshore said, "Our involvement in this project builds on the capability and experience we have already gained from our partnership in other industry-leading and world first autonomous projects. However, this project as the world's first where autonomous navigational technology will be deployed to an ocean-going marine vessel to develop the technology for commercial operations pushes the boundaries of autonomous technology and moves the industry towards deployment of autonomous navigation systems onboard vessels for enhanced performance and critically, safety."*

The vessel is expected to sail along a global route which includes locations such as Suez Canal, Panama Canal, Strait of Malacca and Singapore that will provide vast amount of data, knowledge and test scenarios that can serve as the benchmark for future autonomous shipping programmes. As the maritime industry moves towards leveraging technology to develop autonomous vessels and enhance operations in a safer, faster, and more cost-effective manner, autonomous ship technology can be transited to other vessel types, with potential applications in the regional harbour fleet of crafts including tug boats, pilot boats and ferries.

### Launch of the Singapore Maritime Data Hub (SG-MDH)

As part of supporting Maritime Singapore's ongoing digital transformation, the Maritime and Port Authority of Singapore (MPA) has launched the Singapore Maritime Data Hub (SG-MDH) under the MPA Living Lab to promote data sharing and innovation.

Through promoting the SG-MDH as a common data sharing platform, MPA aims to encourage the co-development and test-bedding of innovative digital applications and data-driven services that will enhance navigational safety, operations efficiency, and overall port productivity. MPA will also look to develop SG-MDH as a global collaborative platform to enable cross-border digital connectivity and data sharing leading to the creation of innovative solutions for the maritime industry.

#### A Catalyst for industry innovation

Data to enable efficient launch boat operations. SG Smart Tech Pte Ltd, a Singapore start-up, taps on SG-MDH's vessel position data to enable efficient deployment of launch boats through their SeaCabbie platform. By knowing the precise location of its fleet, SeaCabbie application can assign the nearest boat from its pool of launches. SG-MDH also enables users to book a boat by simply giving the vessel name, without waiting for the vessel to anchor. It reduces waiting time for passengers, enables passengers to get to their destinations faster and enhances the efficiency of launch boat operations by increasing fuel savings and reducing carbon footprint.

Another Singapore start-up, Claritecs Pte Ltd, also taps on SG-MDH's data to monitor vessel arrivals and locations for refuelling, in order to schedule bunker deliveries on a just-in-time basis. BunkerMaestro, a PIER71 award-winning SaaS platform developed by Claritecs, will leverage SG-MDH data to optimise bunker tanker operations, with a target to enhance fleet utilisation by up to 30% and increase work efficiencies by up to 50%.

*"It's very encouraging to see many innovative solutions and new ideas coming from start-ups as we embrace new technologies and promote data sharing to enable co-creation in the maritime sector. The vibrant start-up ecosystem will play a crucial role in accelerating the digital transformation of Singapore's maritime industry and creating exciting opportunities for growth," said Mr Koh Chin Yong, Chief Information Officer of MPA.*