Fact Sheet: Smart Defence Initiatives by the Republic of Singapore Navy

OTHERS | 02 Mar 2018 21:05 (GMT+8)

The security environment is becoming more complex and uncertain, and we now face a wider spectrum of threats. This is particularly true for Singapore, a maritime nation situated amongst many small islands, and having to deal with a porous maritime security environment. In addition, as a maritime trade hub, the waters that the Republic of Singapore Navy (RSN) protects are extremely congested with both large merchant vessels and small craft transiting through the narrow Singapore Strait.

The RSN is constantly looking at how we can harness the latest technological developments, such as robotics, artificial intelligence and data analytics, to enhance our capabilities and operational effectiveness.

Building The Next Generation Navy

Revolutionary Ship Design -- Littoral Mission Vessel (LMV). The RSN's newest class of ships, developed in partnership with the Defence Science and Technology Agency (DSTA) and Singapore Technologies Marine, features many innovative design concepts for both operations and engineering support. The design process adopted a novel "design the support" approach, where key downstream engineering and logistics support considerations were factored upfront in the vessel's design. Its stacked mast maximises sensor coverage while allowing maintenance to be carried out more efficiently, and has led to the reduction of time spent at dock for mast-related defects. In addition, the LMVs are designed to be more capable than the Patrol Vessels (PVs) they replaced. Key features include (i) the co-location of the Bridge, Combat Information Centre and Machinery Control Room in the Integrated Command Centre for more effective and efficient maritime security operations; and (ii) automation, sense-making and decision support systems for both combat and platform systems. This has enabled the multi-mission capable LMVs to be operated with a leaner baseline crew of 23 personnel, as compared to the 30-man PVs, even though the LMVs are larger and more complex vessels. The innovative design solutions to our LMVs will save us at least $65 million across the 30-year life span of the platform, when compared to the PVs.

Unmanned Vessels to Enhance Maritime Security and Homeland Defence. Currently, the RSN operates manned ships to patrol the Singapore Strait and scan the seabed for mines to keep our shipping lanes safe for navigation. The RSN is developing three types of Unmanned Surface Vessels (USVs), namely the Coastal Defence USV to conduct coastal patrols, the Mine Countermeasure USV with Towed Synthetic Aperture Sonar (TSAS) to conduct underwater scans of the seabed to detect mines, and the Mine Countermeasure USV with Expendable Mine Disposal System to conduct mine disposals (refer to Table 1 below for more details on their technical specifications). DSTA worked closely with the RSN to achieve semi-autonomous operation of the TSAS, through an automatic Launch and Recovery System that allows the operator to remotely launch the sonar as well as recover the sonar upon completion of survey operations. In addition, the fully automated detection and classification system on board the USV is able to rapidly detect and classify mines, reducing the time required by more than 50%.

Equipped with advanced sensors and software, all three types of USVs will provide comprehensive maritime security for Singapore. When operational, the USVs can perform their tasks at much lower cost and with less manpower than manned platforms. The Coastal Defence USVs will eventually take over the role of patrols in the Singapore Strait, which is currently undertaken by the PVs and LMVs. This will allow our manned warships, like the LMVs, to be deployed at further ranges from Singapore, and more strategically for complex missions. As overall programme manager for the USVs, DSTA ensures that the USVs meet design objectives through rigorous technical assessments and feasibility studies. The key features of the USVs include:

a. High Speed and Better Manoeuvrability. The USVs are designed for high speed and manoeuvrability for its operations. The USV's hull also enables good sea-keeping, allowing the USVs to operate in the Singapore Strait even during monsoon seasons.

b. Autonomous Navigation with Collision Avoidance. The USVs can navigate safely and operate autonomously in proximity with other vessels with the in-built Collision Detection and Collision Avoidance system. The USVs are also able to manoeuvre autonomously by waypoint navigation and maintain its position relative to other vessels. This reduces the workload and frees up the capacity of the operator remotely controlling the

USV in the Singapore Strait, which is the busiest shipping lane in the world, to have increased situational awareness and ability to detect suspicious activity.

c. Low Manning. With the high level of autonomy and integrated Command and Control systems aboard, the Operator Control Station located ashore or on board platforms at sea, can control the movement and payload of the USV with minimal manpower required.

Table 1: Technical Specifications of the Three USVs

Specification	Coastal Defence USV	Mine Countermeasure USV with Towed Synthetic Aperture Sonar	Mine Countermeasure USV with Expendable Mine Disposal System
	Artist Impression		
Function	Coastal patrol	Detection of mines	Neutralisation of mines
Length	Approximately 16 metres	16 metres	16 metres
Beam	Approximately 5 metres	5 metres	5 metres
Weight/ Displacement	Approximately 30 tonnes	30 tonnes	30 tonnes
Speed	> 25 knots	> 25 knots	> 25 knots
Endurance	> 36 hours	> 36 hours	> 36 hours
Operators (when operating remotely)	2	2	2
Equipment	• Strobe Light & Siren • Advanced Sensors and Weapons Systems • Navigation Radar • Global Positioning System	• Towed Synthetic Aperture Sonar • Automatic Launch and Recovery System • Navigation Radar • Global Positioning System	• Expendable Mine Disposable System • Automatic Launch and Recovery System • Navigation Radar • Global Positioning System

Enhancing Operational Effectiveness

Leveraging Data Analytics for Predictive Maintenance. Equipment maintenance on board the ship is currently conducted according to pre-planned schedules. Defects are rectified as and when they occur, which impacts readiness and increases costs. The RSN is conducting trials to use data analytics on key equipment parameters such as engine health, vibration and temperature data on critical systems to predict when defects may occur. Ship crew will then be triggered to take pre-emptive steps to prevent defects and avoid costly repairs. Currently, trials for predictive maintenance of the frigate's diesel generators are being conducted and the resultant cost savings are projected to be $1 million per year, with the potential to adapt it for other systems.

Smart Base Access. Currently, the base security screening process is labour-intensive and time-consuming. The RSN has started a Smart Base Access project that utilises a combination of facial recognition and digital identification to simplify the process while maintaining high security standards. Without the need for laborious verification methods, the Smart Base Access project will reduce the number of security personnel required and could generate savings of $160,000 per year in Changi Naval Base alone. The trial for Smart Base Access will start at the end of February 2018.

Enhancing Maritime Security

Leveraging Data Analytics to Enhance Maritime Security. As the national lead for the Whole-of-Government (WoG) Maritime Security (MARSEC) efforts, the RSN is continually refining the system and leveraging data analytics improve detection of anomalies and its sense-making capabilities.

a. Improving Anomaly Detection with Video Analytics. The RSN has a comprehensive network of coastal surveillance sensors to detect any maritime threats in the Singapore Strait. The RSN is collaborating with DSTA and DSO National Laboratories to develop video analytics to automatically classify vessels and flag out anomalies, in order to increase situational awareness and reduce human error. This will increase the RSN's operational efficiency and translate to manpower savings of about 30%, as personnel who were previously conducting manual scanning of video screens can now focus on higher-end tasks.

b. Improving Sense-making Capabilities. The RSN-led Singapore Maritime Crisis Centre (SMCC) is developing a sense-making system that collates and fuses information from Whole-of-Government agencies and open

sources, and applies data analytics to uncover MARSEC threats and activate operational responses to deal with possible terrorist plots. For example, the National Maritime Sense-Making Group (NMSG) within the SMCC analyses data from a vessel's voyage and its crew's "pattern of life" to assess potential threats. This information has been used to cue other national agencies to check suspicious vessels and even deny specific crew members from entering Singapore. NSMG has also worked with the Police Coast Guard (PCG) to analyse parameters of previous smuggling incidents to obtain the vessel types that has a higher probability of being involved in smuggling activities. This has allowed the PCG to be more targeted in the vessels they inspect.