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1. Maritime Security – Super Swift series

NEW

Super Swift 17 (ACH)
Ultra Fast Interceptor / Patrol Craft

Super Swift 26 (ACH)
Special Operations Craft / Coastal Security Craft

Super Swift 35 (ACH)
Ultra Fast Patrol Vessel

Super Swift 18
High Speed Interceptor

Super Swift 23
Fast Patrol Boat

The Super Swift series is a range of ultra-high speed Fast Patrol Boats (FPB) designed for interdiction, interception and patrolling. Customised for military and law enforcement applications, each FPB features an air cavity hull that enables the craft to reach high speeds of up to 70 knots, depending on the craft size. The Super Swift series has exceptionally high seakeeping and maneuvering abilities and is best suited for very high speed activities such as pursuit and arrest, search and rescue, offshore patrolling and escort, surveillance and covert surveillance, as well as border patrol. Significant improvements in ride and crew comfort levels are key characteristics of Super Swift – ACH series with reduced ship motions and accelerations.

1. Maritime Security – The Vanguard series

Vanguard 130
Multi-Role Combatant

The Vanguard series design concept focuses on “One Design” which can be applied across “Multiple Classes” with “Modular Capabilities”. The concept also allows for commonalities (e.g. scalable hull form, machinery & equipment, system & layout designs, standards for outfitting and installation) across the different classes of vessels such as the new Vanguard 130 Multi-role Combatant, combatants such as frigate, light frigate, corvette, as well as offshore patrol vessel, and naval research and support vessel. Under its multi-role capability profile, the Vanguard series offers a highly operable platform in high states for the stowage and operation of unmanned vessels and vehicles for enhanced reach and visibility. Proven sub-systems, such as ST Engineering’s patented Q-LARS 2.0 for handling a wide range of small crafts and USVs, can be easily adapted for use in every Vanguard series vessels.

Vanguard 80
Patrol Vessel

Vanguard 95
Naval Research & Support Vessel

Vanguard 105
Offshore Patrol Vessel

Vanguard 120
Frigate

Vanguard 130
Multi-Role Combatant

The advantages are:

- Reduction of non-recurring engineering cost
- Fast track project execution using proven and scalable design
- Greater focus on the development of mission systems
- Reduced acquisition and through-lifecycle costs through commonality in equipment and systems.

1. Maritime Security – Independence class Littoral Mission Vessel

Independence class Littoral Mission Vessel

The Independence class Littoral Mission Vessel (LMV) is designed to undertake a wide spectrum of maritime security operations and safeguard sea lines of communications.

A medium-lift helicopter can land on its helideck and has a launch-and-recovery system at the stern to accommodate two rigid hull inflatable boats (RHIBs) or the Protector class unmanned surface vessels (USVs).

To maximise its versatility, the LMV can be configured to deploy a range of containerised mission packages such as a medical module to support humanitarian assistance and disaster relief (HADR) operations. The platform can also deploy unmanned systems for surveillance and mine countermeasures (MCM) operations.

2. Specialised Vessels – Fire-fighting vessels

Heavy Fire Vessel
Red Sailfish

It is the world's first dedicated firefighting vessel classed to Fi-Fi III with Dynamic Positioning by the American Bureau of Shipping (ABS) which is testament to its outstanding firefighting capacity. The HFV which is named Red Sailfish, has a total pumping capacity of 14,400 m3/h, boasts 12 water/foam monitors with a combined capacity of 16,200 m3/hr, exceeding ABS classification. A typical Fi-Fi III class firefighting vessel requires a total water capacity of 9,600 m^3/h, with monitors that can be remotely controlled from the wheelhouse.

Red Sailfish is a highly versatile vessel designed to operate in different firefighting modes under a wide range of operational scenarios. The Dynamic Positioning Error Force Modelling system is coupled with two bow thrusters to enable the crew to fight fires at angles while maintaining the vessel's position. In the 'pump station operation' mode, the HFV can supply seawater to the shore at berth, and in the 'maximum firefighting operation' mode, its four powerful engines can drive the four firefighting pumps on board as well as the propulsion system at the same time.

3. Humanitarian Assistance and Disaster Relief (HADR) – Endurance & Brave series

Landing Ship Tank built for the Republic of Singapore Navy

		
Endurance 140	*Endurance 160*	*Endurance 170*
+	*+*	*+*
2 x Brave 4 and 2 x Brave 18	*2 x Brave 4 and 4 x Brave 36 or 2 x Brave 4 and 2 x Brave 75*	*2 x Brave 4 and 4 x Brave 36 or 2 x Brave 4 and 2 x Brave 75*

The Endurance class Landing Platform Dock is a well-proven multi-purpose and multi-role ship designed and built by ST Engineering. Capable of both vertical (helicopters) and surface (such as Brave class Ship-to-Shore Connectors) lift operations, and coupled with their great endurance, these vessels can provide an afloat command and logistic hub capability besides being able to project both men and equipment to areas including those stricken by natural disasters. The larger variants are multi-purpose and multi-role ships which will have five spots on deck for helicopters with a hangar deck below for more helicopter assets. Incorporating an extensive hospital, these vessels are well-suited for naval and civilian operations including humanitarian assistance and disaster relief, peacekeeping missions and counter-piracy operations.

The Brave class Ship-to-Shore Connector is based on a proven range of shore connectors designed and built by ST Engineering. Utilising a proprietary air lubricated hull form and constructed entirely of lightweight marine grade aluminum alloy, these vessels are able to carry great payloads, including personnel to wheeled and tracked vehicles while proceeding at 25 knots. Well-tested and proven during disaster relief operations for the transporting of both personnel and heavy equipment between a landing platform dock and shore, these waterjet-propelled vessels are capable of beaching and retracting fully laden on suitable shores, and complements the Endurance class landing platform dock.

Variants of these vessels are currently in operations with the Republic of Singapore Navy and Royal Thai Navy.

1. Ship Management System – NERVA Ship Management & Sensemaking System

NERVA Ship Management System (SMS) is designed and developed by ST Engineering to provide centralised alarm, control and monitoring of platform sensors and systems. The smart system offers state of the art ship management system solution suitable for most vessel types by integrating technological advancements in process automation with ship building expertise.
NERVA SMS has been designed to meet the requirements of International Maritime Organisation (IMO) and major classification societies. The quality of this solution is assured through the use of reliable marine graded and type approved commercial-off-the-shelves (COTS) products and software. Ship owners have full flexibility to customise the user friendly and intuitive human-machine interface (HMI) to meet their needs.

Leveraging on the data that can be collected from the NERVA SMS, ST Engineering has developed a Sensemaking system which can be part of the NERVA system. Known as the SMS^2, the solution incorporates data and predictive analytics software to perform condition-based-monitoring and predictive diagnostics on platform systems. The SMS^2 also comes with a Decision Support System which provides ship operators with possible solutions to the commander and crew of the vessel for better decision making.

2. Mission Modularity

VANGUARD DESIGN

The concept of mission modularity is based on the ability of a purposefully built naval platform being able to carry out different missions through the use of modular payloads. ST Engineering has designed the Vanguard series to achieve this capability. The Vanguard series will be a mission modular platform with the ability to integrate modular containerized payloads to counter different scenarios, with a cost and resource lean objective during peacetime, troubled peace and wartime continuum.

MISSION MODULARITY ECO SYSTEM

To operationalise the concept of mission modularity, it is also important that we have the infrastructure and shore support facilities as it forms the backbone of mission modularity.

MISSION PAYLOADS

The mission payloads are available in COTS form to execute tasks like Humanitarian Assistance and Disaster Relief (HADR) and in weapon payload form for the execution of Operations-Other-Than-War (OOTW) and Warfighting.

INTELLIGENT SOFTWARE AND INSTRUMENTS SYSTEMS

The complexity of multi-mission modularity will require intelligent management and instruments system to endure the operational readiness of the platform and the payloads. Automation and data analytics will serve as key thrusts in the development of the intelligent systems. The smart solutions employed in mission modularity are:

2. Mission Modularity – Availability Integrated Management System (AiMS)

With the increasing demand of operations and manning reduction, the desire for a comprehensive systems' availability situation awareness for optimisation of logistics operations and maintenance is key to a successful deployment. Automation and data analytics become a key thrust to achieve this. ST Engineering's AiMS complements the Fleet Management System in assisting ship crew in combat and logistics process optimisation. AiMS is a maintenance management system which provides users with a single glance overall engineering and logistics situation awareness. Equipped with data analytics to predict systems' availability, ST Engineering's AiMS further provides the users with the power of forward planning both in operational logistics support. AiMS consists of modules deployed on-board and shore based stations, using the SuperneT2 SICS to exchange the information. The various operational modules that will be deployed are: a) Trending Management Module (TMM); b) Central Knowledge Management Module (CKMM): c) Fault Management Module (FMM); and d) Operational Support Management Module (OSMM). These modules will interoperate to provide the necessary processing, analysis, management and process automation to support the shipboard engineering and logistics operations.

2. Mission Modularity – Intelligent Safety/Security Monitoring, Alert Responding & Tracking System (iSMARTS)

iSMARTS is a modular and scalable system consisting of 3 modules: a) iSecurity; b) iSafety; and c) iTracking. It uses smart analytics to design for lean manning, enhance situation awareness, improved efficiency and response time, governing the areas of safety, security and resource management**.**

2. Mission Modularity – Universal Guard (uGuard)

For the rapid deployment of modular payloads onboard the platform, a Universal Interface Guard (uGuard) is needed to have to link the various containerised payloads to the platform combat systems to realise a plug and use concept.

3. Comprehensive Awareness – SERIS Maritime Information Portal

Developed with smart analytics and sense-making capabilities, the SERIS Maritime Information Portal identifies anomalies that can be converted to contextual insights and actionable intelligence for users. This offers an early warning system for naval and maritime security authorities who monitor maritime activities on a continuous basis.

Key features:
- Customisable and modula
- Sophisticated algorithms for sense-making
- Geo-spatial services for in-depth and comprehensive analysis

3. Comprehensive Awareness – AgilTrack

a) AgilTrack Maritime Anti-Piracy System (MAPS):
24x7 All-Weather Surveillance Against Piracy Threats

Maritime piracy and hijacking have been the bane of the shipping industry for years, leading to direct economic losses and endangering the lives of crew on-board. The AgilTrack Maritime Anti-Piracy System (MAPS) addresses these concerns by providing early warnings on suspicious vessels and attempted boardings via an automatic detection and alert triggering system. Equipped with advanced signal processing and behaviour analysis capabilities, MAPS extends the performance of on-board navigation radar in tracking all vessels, down to small fishing boats and yachts, identifying and alerting crews to potential suspects well before they are close enough to mount an attack. Relevant information is captured automatically to help identify suspects for subsequent enforcement action by the authorities. MAPS is user-friendly with an intuitive touchscreen-enabled, graphical user interface, and it supports remote dial-in diagnostics to ensure reliable system operations.

a) AgilTrack Maritime Enforcement Radar System (MERS):
Maritime Surveillance Solution for Anti-Smuggling and Counter-Trafficking

The AgilTrack Maritime Enforcement Radar System (MERS) enhances the performance of coastal and shipborne radars with smart mobility tracking of all vessels operating in the territorial waters. Equipped with behavioural analytics, it can automatically identify suspicious vessels that may be engaged in smuggling or trafficking of humans and illicit goods. It is a scalable solution with an open architecture and offers an integrated platform to support coastal and shipborne surveillance, as well as vessel traffic management operations. It enhances maritime situational awareness, protecting the safety of coastal and sensitive sites.

The AgilTrack MERS transforms commercial navigation radars into surveillance-capable radars, and offers a comprehensive range of tracking, detection and surveillance capabilities. Key applications of the AgilTrack MERS include anti-smuggling and counter-trafficking enforcement operations, protection of off-shore oil rigs and production vessels, wind farms, petrol chemical complexes etc. and counter-terrorism activities.

3. Comprehensive Awareness – Geo-Insights

Maritime safety and security is key for commercial shipping lanes. Geo-Insights delivers satellite analytics to maritime users, providing near real-time and responsive information and analysis for maritime applications such as anti-piracy, illegal immigration, illegal fishing,

maritime pollution monitoring, search and rescue operations, vessel monitoring and collision prevention. It also features a high revisit rate and high resolution images.

3. Comprehensive Awareness – Navigation Multi-Touch Table

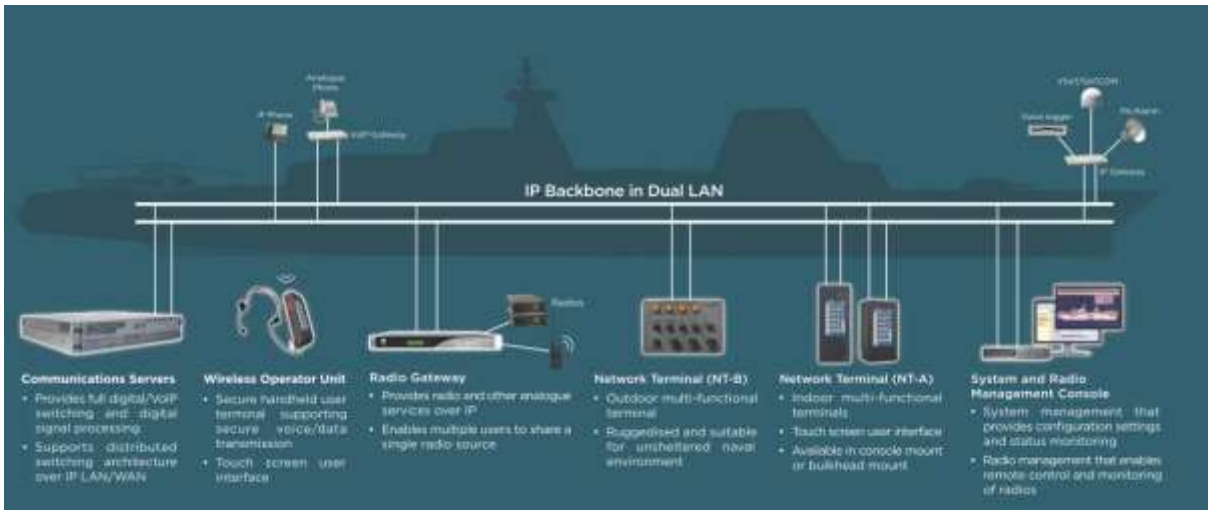
The drip-proof Navigation Multi-Touch Table is designed for rugged use that can withstand extreme heat and shock, meeting military standards of MIL-STD-810G. Incorporating an interactive digital signage with an uncompromised touch, the table provides greater control and flexibility that meets the high demands of today's multiple mission requirements.

With an anti-glare, dual 4K, ultra-high-definition display, the table delivers a very clear display even in harsh lighting conditions. The highly versatile table supports a wide array of applications and management systems, and can also be integrated and configured with different input or output systems such as a communications unit, trackball and joystick.

Key features:

- Multiple input/output ports to allow flexible configuration for integration into different devices
- Flexible locations for multi-touch table processors (local or remote)
- Direct video input to the operator to enhance situation awareness
- A powerful Xeon-based processor with a dedicated graphics processing unit and solid-state drive for massive storage

4. Communications System – SuperneT Shipboard Integrated Communications System



The SuperneT Shipboard Integrated Communications System (SICS) is a state-of-the-art Internet Protocol-based communications solution, designed and built for the mission-critical needs of today's navies. The system integrates a variety of communications systems to offer feature-rich voice and data services that are easily accessible by users from fixed and wireless user terminals.

4. Communications System – SuperneT Multimedia Mobile Communications

The SuperneT Multimedia Mobile Communications solution provides a single secure access to multiple broadband communications services, ensuring seamless operational efficiency and enhanced incident response. Using a mobile device, first responders or any field officers can inter-operate with other team members who are on narrowband radio communications. In addition, workgroups can be set up to facilitate fast and effective dissemination and sharing of critical information, enabling swifter response and optimised workflow management.

5. Coastal Surveillance – SkyArcher Counter Drone System

The SkyArcher Counter Drone System detects, identifies and disrupts unauthorised drones, which may pose public safety and security concerns in an urban and radio frequency (RF) dense environment. The SkyArcher comprises an RF and visual detection module, a control and synchronisation module, and an effector module to provide all round RF and visual detection of intruding or unknown flying objects. It is supported by seamless operations and sensor fusion that intelligently collates the detection sensors' data, to classify and identify target flying objects. When necessary, the SkyArcher can electronically disrupt or take control of targeted drones.

NEW

The upgraded version enables the safe takedown of unauthorised drones with the ability to fly it through a safe route and land it at designated safe zone. It is able to mitigate multiple unauthorised drones without affecting legitimate drones. In addition, no clear line-of-sight with the drone is required to carry out mitigating operation. This is the first such feature available in the Singapore market - existing anti-drone solutions in the market counter unauthorised drones by jamming their GPS and communications signals, before taking them down. This may cause unnecessary collateral damages inflicted on an unintended target.

The SkyArcher has been successfully deployed during major events for counter drone operations, and in various extreme environments including countries with sub-zero temperature, strong winds and dry weather conditions.

5. Coastal Surveillance – SPEOS 360

SPEOS 360 is an uncooled Long Wave Infrared (LWIR) high sensitive thermal system capable of covering 360° in less than 3 seconds. This fast revisit rate and wide coverage allows persistent and pervasive surveillance of the surrounding waters. Coupled with a maritime-optimised detection and tracking algorithm, SPEOS is a system capable of automatic target detection and tracking, classification with data analytics, alert and alarm management. It enables enhanced situational awareness of the waters around key installations, coastal perimeters, ports and naval bases.

The advantages of SPEOS are:

- 360º coverage, significantly reducing the number of sensors needed
- High resolution thermal imaging
- High sensitivity, uncooled thermal technology
- Fast revisit rate compared to traditional pan tilt systems
- Optimised detection and tracking software for maritime environment
- Sleek user interface – compass/map, target of interest tracking, digital pan-tilt-zoom (PTZ) panorama, investigative electro-options (EO) PTZ camera control
- Full target information for Command and Control (C2) systems
- Cost effective

6. Digital Defence – AgiLOC NEW

AgilLOC AEC: An integrated anti-jam antenna system with signal processing electronics for Global Navigation Satellite System (GNSS). When an interfering signal is detected, the Controlled Radiation Pattern Antenna algorithm changes the antenna gain pattern on-the-fly by forming nulls in the required direction to provide continuous reception of GNSS signal under jamming conditions.

AgilLOC Resilient Time Source (AgilLOC RTS): A timing source with anti-spoofing algorithm incorporating reception power level, position data and clock consistency checks to mitigate GNSS spoofing attacks. It comprises a GNSS receiver, a chip-based atomic clock and machine learning that locks the clock to the GNSS signal under normal operations. When GNSS signal spoofing is detected, the clock takes over from GNSS as the source to provide uninterrupted timing information to critical networks.

Key features

- Protecting GNSS for critical services against Jamming and Spoofing

Key applications

- Intelligent Traffic Management
- Vessel Safety and Security
- Ship Navigation System for manned and unmanned vessels

6. Digital Defence – Cyber OT

OT Capabilities

Cyberthreats have constantly been evolving over the years and no sector is free from risk. This situation is further compounded by the convergence of Operation Technology (OT) and Information Technology (IT), which aims to achieve a more seamless, effective and productive operational environment. In the military context, this also means the need for more responsive, swift and decisive force when it comes to the conduct of any mission-critical operations. As a result of the increasing cyberthreats, cyber protection has become increasingly important for Industrial Control Systems (ICS) of critical information infrastructure (CII), including naval forces.

In response to the evolving threats, ST Engineering has developed a holistic solution, through security by design to combat these cyberthreats. One example of such a solution involves the integrated deployment of cybersecurity products like iSID, Data Diode, Diskcrypt, AgiLOC and cybersecurity operations solutions.

The iSID is a detection and analysis platform that enables non-intrusive monitoring of distributed production networks for changes in topology and behaviour. This capability is often lacking in the OT environment, which enables the monitoring of the OT network(s) by mapping assets, and thereafter, to provide situational awareness as well as real-time alerts on any behavioural anomalies. It uses multiple security engines in parallel, each offering a unique capability. These engines detect potential anomalies such as changes in network topology in the session used between devices, use of known exploits, deviations from predefined policies and changes in Programmable Logic Controller (PLC) configurations.

6. Digital Defence – Data Diode

DigiSAFE Data Diode is a unidirectional communications and data transfer gateway that enables organisations to transfer data securely across physically separated networks without the risks of any data leakage. The high-performance solution comes in a compact design that integrates seamlessly with users' operational environments. The security design prevents data leakage and eliminates cyberthreats by enforcing the one-way data transfer at both the physical and protocol layers.

6. Digital Defence – DiskCrypt M10

Designed with the highest security standards, DiskCrypt M10 enables organisations, government agencies and critical infrastructures to protect data with absolute confidence. Coupled with its ultra-slim profile and credit card size, DiskCrypt M10 offers unrivalled mobility and style to the modern workforce. The world's thinnest and first ultra-slim two-factor authentication (2FA) encrypted data storage will help enterprises and governments secure their information assets with enhanced cybersecurity capabilities. With its ergonomic interface, the DiskCrypt M10's storage capacity, ranging from 32GB to 512 GB, can be customised according to the needs of users.

6. Digital Defence – Black Computer

ST Engineering's Black Computer is the first-of-its-kind cybersecurity solution in the industry. Built with a dual operating system, it allows users to safely access secured and unsecured networks at the same time, from a single computer. It leverages hardware-defined network isolation to protect against imported malware from unsecured networks and malicious programmes, filtering out 90% of threats. Even if it gets infected, it reduces the cyberattack surface at the endpoint, targeting the most vulnerable part of the computing environment With a simple reboot of the system, it effectively removes malware from any infected surface.

Integrated Ship Bridge Simulator NEW

From basic ship handling to complex mission rehearsals, the Integrated Ship Bridge Simulator offers a highly realistic and effective training environment for navy crew members to hone their technical and combat skills.

Integrated and Collaborative Training

Designed to replicate an integrated command centre, the ship's bridge, Ship Management & Sensemaking System and Combat Information Centre (CIC) are modelled to promote collaborative training between different operational roles. A variety of challenging scenarios including navigating through congested waters and poor weather conditions, handling engineering malfunctions, or dealing with potential threats can be generated, and the ship's crew is assessed on their training performance as an integrated team.

Virtual Reality for Enhanced Realism

Uniquely, the Integrated Ship Bridge Simulator harnesses Virtual Reality for targeted training needs such as dealing with small vessels and berthing. The VR head-mounted display offers enhanced depth perception over traditional projection systems since they are able to view the environment in 360 degrees. For example, a trainee can better gauge distance to the wharf and issue wheel or engine orders to manoeuvre a ship alongside. Another scenario involves identifying and engaging any small vessel threats approaching the ship.

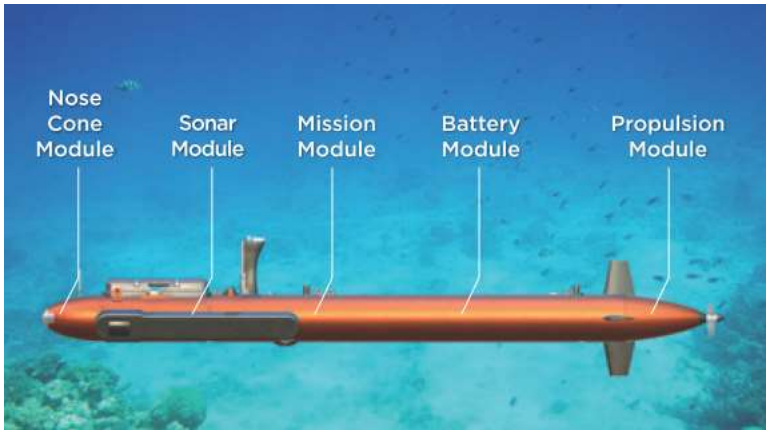
Training Applications:

- Berthing
- Bridge watch-keeping
- Navigation
- Weapon operation
- Machinery operation
- Naval tactics

Benefits:

- Overcomes the traditional constraints of training space and resources
- Complete networked training solution for large-scale exercises
- Enhanced training effectiveness in a safe and controlled environment

1. MERCURY Autonomous Underwater Vehicle (AUV)



The MERCURY Autonomous Underwater Vehicle (AUV) is a mid-weight autonomous underwater vehicle with a modular design that suits different operational requirements. It surveys and provides effective and high quality underwater seabed data for Mine-Counter Measure (MCM) operations. Unlike traditional remotely-operated underwater vehicles, the MERCURY AUV carries out missions autonomously, unlimited by the length of a tether. This allows it to travel longer distances and go deeper in the sea without risking the mother craft when mine hunting. Multiple vehicles can also be deployed to increase the operational effectiveness of missions. The versatile MERCURY AUV is a cost-effective solution and a force multiplier. It is equipped with advanced sensors, navigation and communications features to provide effective seabed surveys, and is engineered to be easily deployed from shore or any Craft of Opportunity (COOP) without the need for costly handling equipment. It can be further configured to suit other applications such as research, commercial and homeland security operations.

2. Venus Unmanned Surface Vehicle (USV)

The Venus Unmanned Surface Vehicle (USV) is a modular USV designed to meet growing interest for configurable USV for multi-missions. The modular approach facilitates the integration of multi-mission modules to the USV which can then be configured for various missions without risking human lives.

Its Deep-V hull with twin engine and water jet allows unconstrained manoeuvres including autonomous berthing or unberthing operations, and execution of complex non-linear waypoint-following manoeuvres ideal for coastal and shallow waters operations.

A repertoire of sensors enables the USV to autonomously navigate in commercial shipping traffic, providing real-time tracking updates and imagery.

It has an endurance of 72 Hours, with 30% @ < 6 knots patrolling, 60% @ virtual anchoring & 10% @ transit/interdiction. This enables long durations of deployment without the need for any vessel crew change.

Key Features

- Autonomous Navigation
- Collision Avoidance
- Dynamic Positioning;
- Line of Sight (LOS) and Very Small Aperture Terminal (VSAT) Communications
- Remote Operations of Payloads
- Virtual Anchor
- Anti-Grounding with Power Assisted Braking and Geo-Fenced Boundaries
- Configurable Payload (Towed Synthetic Aperture Sonar, Expendable Mine Disposable Systems and Force Protection)

Applications

- Mine Countermeasure
- Anti-submarine warfare
- Force Protection
- Maritime Security

3. Swift Unmanned Surface Vehicle (USV) NEW

Swift USV 18

The Swift USV is a variant derived from the proven “Deep-Vee” planing hull form, which can be enhanced by integrating an air cavity on the underside of the hull.

It is designed for various missions such as Maritime Surveillance & Force Protection, Precision Fire, Harbour Patrol & Security, High Value Assets Escort and CBRN detection & identification.

Key features:

- Navigation autonomy system
- Hull, Mechanical and Electrical (HM&E) autonomy system
- Mission autonomy system
- Shore-based monitoring performance
- Equipped with autonomous navigation and collision avoidance

4. Long Endurance Unmanned Surface Vessel NEW

Long Endurance Unmanned Surface Vessel

The Long Endurance USV (LEUSV) is designed to be a lightweight craft with high speed and endurance capability. The craft and the platform systems are operable and survivable at high sea state. The applications of the LEUSV are for anti-submarine warfare, maritime patrol and surveillance.

For long endurance, the LEUSV uses a hybrid combined diesel and electrical propulsion system to achieve high speed sprinting capability and long range operations at cruising speed. It alsouses an electric propulsion system for low loitering speed operations as well as low underwater noise operations. The low radar cross-section signature will keep a low profile within the theatre.

5. Smart Maritime Autonomous Vessel (SMAV) NEW

ST Engineering, together with PACC Offshore Services Holdings (POSH), American Bureau of Shipping (ABS) and M1 Limited have embarked on a project to 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^2) 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^2 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.