

In for the long run: Vigilant IUSV expands its mission flexibility

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The Vigilant-class IUSV has undertaken long-endurance missions since its launch eight years ago. With basic engineering work now complete, its developer is looking to expand its mission set. *Kelvin Wong* examines the latest on-board advances

Singapore's Zycraft, which specialises in designing and manufacturing unmanned surface vessels (USVs) for commercial and government applications, continues to evolve its Vigilant-class Independent Unmanned Surface Vessel (IUSV) prototype, known as USV *Longrunner*, with new capabilities.

In March Zycraft installed a remote-controlled fire monitor and an electrically driven fire pump – along with ancillary equipment and software – to trial unmanned marine firefighting concepts. The self-contained firefighting payload has demonstrated its ability to spray water out to a maximum distance of 40 m, although the company plans to fine-tune the system to extend the range further.



The lead Vigilant-class IUSV, Longrunner, performing high-speed manoeuvres in Singapore waters. (Jane's/Kelvin Wong)

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The unmanned firefighting platform is one of several concepts being explored using USV *Longrunner*, Zycraft's president James Soon told *Jane's*, with other mission-specific variants such as anti-submarine warfare (ASW); maritime intelligence, surveillance, and reconnaissance (ISR); mine countermeasures (MCM); and search-and-rescue (SAR) operations, all of which are under various stages of design or implementation.

"Smaller USVs depend on a mothership, and associated launch and recovery methods and systems are still being developed and will remain challenging to use especially [in higher sea states]. Furthermore, the LR [long-range] capabilities take away payload for the USV and adds costs to the mothership," Soon said. "With the IUSV concept, navies also do not need to build bigger ships simply to carry small USVs but instead can rely on the size of the bigger IUSV [and their inherent] high endurance to carry the required payloads ... warships should focus on where the enemy ships are and not be burdened by small USV management.

"Once launched from its base, the IUSV can transit to the area of operations and then remain on station for extended periods, requiring only infrequent refuelling at sea to extend its endurance for as long as needed," he added.

Design and propulsion

According to Zycraft, the Vigilant IUSV was designed to be an unmanned platform, as opposed to adapting an existing conventional boat or surface craft, to ensure the final product can be optimised for a range of missions. However, it can also be optionally manned, with a tandem cockpit accommodating up to two operators seated on military grade SHOXS shock mitigation suspension seats.

Construction commenced in early 2010 with the lead vessel, *Longrunner*, launched in October 2011. The design centres on a lightweight hull measuring 16.5 m long and 3.6 m wide, with an empty weight of approximately 8,500 kg and full-load displacement of 16,000 kg, inclusive of payload and 7,000 kg of fuel.

USV *Longrunner's* hull features a high length-to-beam ratio that is designed to reduce hydrodynamic drag and is constructed from a proprietary carbon nanotube (CNT)-strengthened carbon fibre composite material called Arovex – which Zycraft claims to be up to 40% stronger and 75% lighter than a similarly sized vessel derived from traditional aluminium or marine glass fibre – that enables the USV to achieve higher speeds without requiring large and heavy engines to be fitted. When taken together, the combination of the lightweight hull material and small-displacement engines enables it to carry more payload and fuel for increased operational utility and range.

According to company specifications, the Vigilant IUSV offers a top speed and endurance in excess of 40 kt and 30 days, respectively, with a range of up to 1,500 n miles when cruising at 12 kt in its standard configuration.

“[We believe] that endurance is a key attribute for a USV because we expect it to conduct surveillance at slow speeds over extended periods of time when deployed,” Soon noted. “A top speed of 40 kt is adequate for the USV since a higher speed cannot be used effectively for a vessel of this size when conditions exceed Sea State 3.”

The USV is powered by a pair of 5.8 litre Yanmar 6LY3-ETP turbocharged marine diesel engines – with a dry weight of 640 kg each – that generate a combined output of 960hp. The engines are coupled with a ZF Marine ZF 280-1 gearbox to Konrad Marine 680 stern drives with contra-rotating propellers that have been specifically selected for their ability to provide optimal efficiency in the 40 kt speed range.

“We also have experience using the Arneson ASD10 direct-drive system equipped with five-blade Rolla propellers on this hull form,” Soon explained. “Both configurations provide good fuel endurance especially for slow-speed patrol operations, which is what most USVs are supposed to do when on surveillance.”

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