

Riverine resurgence: technology boosts brownwater operations

Riverine warfare capabilities look set to feature again in navies' strategic calculus as militaries consider ways to project power further inland to support operations.

Andrew White and **Kelvin Wong** explore some of the new developments

The contemporary and future operating environments for naval forces are likely to feature greater emphasis on littoral and riverine operations. With brownwater to bluewater operations arguably becoming a continuum, rather than distinct mission sets, navies around the world are increasingly finding themselves tasked with performing patrol and

counter-insurgency operations in coastal waters, estuaries and inland waterways.

A US Naval War College professor has asserted that bluewater navies are now facing "much greater and more diverse threats in the littorals than in the past". According to Milan Vego, this challenge is especially salient in enclosed and semi-enclosed waters, such as the Persian Gulf and international straits such as Hormuz and Malacca, where a weaker defending side may already possess an effective multi-layered defence comprising integrated air and coastal systems, ground and naval assets, and special operations forces (SOF).

In light of this trend, the US Navy (USN) resumed brownwater operations in 2006 with the formation of riverine squadrons

(RIVRONs) under the newly stood up Naval Expeditionary Combat Command (NECC). Each squadron is equipped with specially designed watercraft capable of sustaining near-continuous operations in hostile environments, while offering lift capacity and fire support for a small tactical unit.

In 2012, the Navy Riverine Force and Maritime Expeditionary Security Force were merged to form the Coastal Riverine Force (CRF), creating a flexible, general-purpose unit capable of conducting missions from the sea to shore and inland operating environments.

"The CRF delivers near-shore littoral sea control of the coastal and riverine environment, effectively bridging bluewater and landward operations and denying the use of these areas to hostile forces," Lieutenant Commander Jennifer Cragg, public affairs officer at NECC, told *IHS Jane's*. "There are a variety of missions [that] the CRF performs, such as high value unit [HVVU] protection; Sea Port of Debarkation and Aerial Port of Debarkation security; intelligence, surveillance and reconnaissance [ISR] patrols; visit, board, search and seizure [VBSS] missions; [and] airfield and aircraft security.

"CRF units were deployed worldwide in 2015 across all geographic combatant commanders' area of responsibilities [AORs], providing maritime security for aircraft carriers and submarines in ports and restricted waterways, and as Embarked Security Teams [ESTs] on board Military Sealift Command [MSC] vessels, including the navy's Expeditionary Fast Transport vessel and other high-value merchant ships," Lt Cdr Cragg added.

Special operations

With special missions conducted by nature in the

Swiftships: 1645896

Swiftships is developing an unmanned version of its 11 m Anaconda SOC-R riverine assault craft, in partnership with the University of Louisiana at Lafayette.

littoral and riverine environments, interoperability with bluewater navies and ground force elements remains critical to their successful execution. These tasks can range from offensive action and surveillance/reconnaissance through to hostage rescue/personnel recovery and non-combatant evacuation operations (NEOs). This diversity necessitates a range of waterborne craft capable of efficiently inserting, extracting, and supporting SOF teams.

As the nature of operations shifts away from longer-term campaigns – such as those in Afghanistan and Iraq – international SOF units are continuing to seek compatibility with bluewater fleets, with system commonality, improved tactical ISR capabilities, and enhanced command and control (C2) top of the agenda, one NATO SOF source highlighted to *IHS Jane's*.

For a maritime SOF unit seeking to infiltrate such an area of operation (AO), any number of threats can reduce the courses of action available to commanders for troop insertion. However, there remains a series of options that have changed little over time, ranging from larger waterborne craft such as the rigid hull inflatable boat (RHIB), capable of carrying mounted heavy weaponry and greater numbers of personnel, through to more discreet platforms like the collapsible military inflatable boat (MIB), jet skis, and unmanned surface boards, as well as basic insertion tactics such as on foot and swimming/diving.

According to US Special Operations Command (USSOCOM), a RHIB is defined as a system capable of performing short-range insertion and extraction of SOF, limited coastal patrol, and interdiction and reconnaissance missions. It must also be air transportable and air droppable by C-5 Galaxy, C-17 Globemaster, and C-130 Hercules aircraft.

Arguably the most recognisable RHIB currently operated by SOF units remains the US Marine-manufactured Special Operations Craft-Riverine (SOC-R), which is operated by three special warfare combatant-craft crewmen (SWCC) and is able to carry a team of eight fully equipped operators.

The 10 m SOC-R vessel displaces 9 tons and is powered by two Yanmar 6LY2AM-STP diesel engines with Hamilton Jet HJ292 waterjets.

According to the US Marine Corps (USMC), the craft are utilised for riverine assault; reconnaissance; enforcement; asset, zone and perimeter protection; surveys; water sampling; and emergency response duties.

The craft are also fitted with infrared (IR) headlights and strobe lights, and an integrated

radar arch with a compass and electronic navigation package, as well as a communications suite including AN/PRC-117G tactical radios and a Defense Advanced GPS Receiver (DAGR) unit.

With a top speed of 40 kt, the SOC-R has a maximum range of 125 n miles (231.5 km) and has been tested to perform in air temperatures up to 50°C.

Operated by USSOCOM Special Boat Teams (SBTs), SOC-Rs are capable of inserting SOF teams into an AO before standing off and providing mutual support, communications relay, and a rapid reaction capability with significant fire support, should it be required before extracting the teams.

The craft can be underslung CH-47D Chinook helicopters, with crew and operators climbing down ropes to access the boat before it is dropped. A ladder is then used to retrieve crew and operators upon extraction. This enables high levels of interoperability with bluewater fleet platforms and forward operating bases that can deploy rotary-wing aircraft.

The boat itself features a total of five weapon mounts, generally fitted with 7.62 mm M134-series Gatling (rotary) machine guns; 12.7 mm heavy machine guns (HMGs); 40 mm automatic grenade launchers (AGLs); and 7.62 mm coaxial machine guns. Together, these weapons provide a 360° arc of fire.

Elsewhere, other RHIB options include Marine Specialised Technology's Fast Raiding Interception and Special Forces Craft (FRISC), which was first trialled by Belgium's Special

Forces Group (SFG) at the NATO Exercise 'Cold Response' in March 2015 in Norway.

Capable of conducting maritime and littoral interdiction and VBSS operations, the vessel can also undertake riverine tasks involving the insertion, extraction, and resupply of SOF teams, with the addition of bringing significant lethality for fire support missions.

FRISC is a 12 m vessel, powered by two 370 hp engines providing a maximum speed of 80 km/h and a maximum range of 450 km. FRISC is also large enough to carry multiple MIBs, enabling SOF teams to cross-deck onto smaller craft for insertion into areas less accessible to the larger RHIB. The SFG is already operating an undisclosed number of these vessels for counter-piracy, counter-smuggling, and counter-terrorism operations.

The Canadian Special Operations Forces Command (CANSOFCOM) is seeking to procure a 9 m RHIB with a 10-personnel capacity for littoral and riverine operations. The move forms part of a significant procurement drive for CANSOFCOM, which includes the acquisition of tactical ground vehicles.

Unmanned systems

Swiftships, an international ship design and shipbuilding company headquartered in Washington, DC, is pursuing the development of an unmanned variant of its all-aluminium Anaconda SOC-R craft. The company is currently working with the University of Louisiana at Lafayette (UL Lafayette) to develop a technology demonstrator. The base Anaconda SOC-R platform is 11 m long, 2.43 m wide, and features a hard-chine V-hull design that enables it to operate in fresh and saltwater environments, as well as remaining fully operational in Sea State 2 and survivable in Sea State 4. A twin waterjet propulsion system enables the craft to attain a maximum speed in excess of 50 kt.

"The [Anaconda SOC-R] has a low profile suitable for ready concealment along river banks and for camouflage in the vegetation and mangroves," Swiftships' CEO, Shahreze Shah, told *IHS Jane's*. "All masts, staffs, overhead devices, and antennas are hinged for stowage and ease of transport, [and] the craft can be configured for transport in under 30 minutes.

"Vessels operating in a riverine environment may come under unexpected attacks or hit an underwater obstruction or a floating object," Shah added. "To mitigate such challenges, Anaconda is foam filled and will remain afloat even if holed This provides a tremendous capability for close-quarters action [which is] expected in riverine warfare, and also an ability



Dockstavarvet: 0587796

Dockstavarvet's Combatboat 90 design has found success in a number of naval forces as a coastal patrol craft and troop transport. Its shallow draft and precise control enables it to undertake riverine operations.

to withstand battle damage while continuing to perform.”

Enhancements to the unmanned Anaconda-2 also enable the vessel to select its own navigation path in a littoral or riverine environment via remote control or autonomous systems. Additional sensors are being integrated to extend the platform’s C4ISTAR capabilities. *IHS Jane’s* understands that the aim of the self-funded Anaconda-2 programme is to develop an autonomous vehicle that can perform ISR and interception missions that exceed more than eight hours in duration.

“Swiftships, in collaboration with UL Lafayette and other vendors, has implemented Cajun Bot technology on board the Anaconda SOC-R and developed a completely autonomous vessel,” Shah explained. “However, in view of the cost, advanced electronics for remote control operations are not part of the standard package but are available as an option as per user’s preference.”

Nevertheless, unique challenges remain in operating autonomous craft in the brownwater environment. For example, such missions require the craft to be able to detect the differences between wakes and tidal effects, and between river banks and coasts, as well as detecting floating debris, especially when travelling at speed.

Small craft

A more discreet option available for SOF riverine operations is the MIB – a smaller, soft-bottomed and collapsible version of the RHIB.

These boats provide a rapid deployment capability for insertion and assault missions, and can be hidden underwater during covert missions as well as being transported internally by CH-47D helicopter and C-130 aircraft.

One NATO SOF source explained to *IHS Jane’s* how C-130 aircraft could be tasked with Maritime Craft Aerial Delivery System (MCADS) operations, therefore enabling a SOF team to rapidly deploy by parachute into the littoral environment before mounting a MIB to insert into an AO.

MCADS is developed by Airborne Systems North America and features the company’s Platform Rigid Inflatable Boat Aerial Delivery (PRIBAD) and Platform Universal Inflatable Boat Aerial Delivery (PURIBAD) air-drop systems, fitted with an extractor parachute that pulls the load from the cargo bay of the host aircraft.

“The boat and platform separate immediately after leaving the aircraft and both descend to the water under their own parachutes. SOF operators then parachute from the aircraft following the



SAFE Boats International: 1394670

The USN’s 49 ft Riverine Command Boat is built by SAFE Boats International to a modified Swedish Combatboat 90 design. An RPB is also shown (rear).

load and land near the ready-for-use boat in the water,” the NATO source explained.

Zodiac Milpro’s Futura Commando (FC) 470 MIB is one model used by a variety of undisclosed SOF force elements worldwide. Its availability in a variety of sizes provides mission flexibility for deploying teams.

“The hull shape is especially important as it can get a large load on the plane as well as give the driver manoeuvrability in different and often dangerous conditions,” a Zodiac spokesperson told *IHS Jane’s*.

The FC 470 family of MIBs is powered by a multi-fuel outboard engine and includes a flexible fuel tank and waterproof equipment bags for secure stowage of kit. The latest model in the company’s range – the FC 470 Evol 7 – features a modified hull shape and a new high pressure inflatable floor reinforced with a Duratane sleeve that is designed to make the boat lighter and more comfortable for those on board.

The 4.7 m long craft is capable of carrying up to 10 personnel with a maximum payload of 1,250 kg and usable floorboard area of 3 sq m, although it is limited to a 55 hp engine in its base configuration. However, an optional rigid floor enhancement enables it to support a 60 hp engine.

In a covert role, SOF teams are able to approach an AO and either deflate and cache the MIB underwater or on a beach. For the duration of the mission, gas canisters must therefore be carried to inflate the craft for extraction.

NATO SOF teams continue to evaluate Proteum’s unmanned surface board, which can be carried in MIBs and RHIBs for covert insertion onto a target. The board is virtually silent, lightweight, and manoeuvrable, with autonomous options for littoral and riverine insertion, according to the company.

It weighs 35 kg with capacity to carry a load of 180 kg, is propelled by an electric motor with minimal magnetic and noise signatures, and has an endurance of 60 minutes. Lying chest-down on the board, a single operator steers the craft, at speeds up to 3 kt, onto a landing site.

According to company officials, Sweden’s Special Operations Group is amongst potential customers considering the utility of the unmanned surface board.

High-end warfare

At the other end of the riverine warfare spectrum, Swedish boat manufacturer Dockstavavet’s 19-tonne, all-aluminium Combatboat 90 (CB 90) platform has found favour in a number of international coastguards and naval forces – including Greece, Malaysia, Mexico, Norway, and Sweden – as a fast attack craft and troop transport for littoral operations. The CB 90 has been successfully demonstrated in rivers and other inland waterways.

According to *IHS Jane’s Fighting Ships*, the 15.9 m long, 3.8 m wide CB 90 has a draft of only 0.8 m which, combined with its partially



The USN Expeditionary Combat Command is receiving the new and larger Mk VI Patrol Boats, which feature greater range and endurance, heavier armament, and a more extensive C4ISTAR fit compared to existing assets.

SAFE Boats International: 1451149

ducted twin Rolls-Royce Kamewa FF waterjet propulsion system and underwater control surfaces optimised for high manoeuvrability, enables high-speed operations even in cluttered shallow-water environments. The CB 90 is typically operated by a crew of three in a wheelhouse, with accommodation in the boat's mid-section for up to 20 fully equipped troops, or 2.8 tons of equipment.

The baseline CB 90 design features a high-speed chine-form hull, with reverse sheer and a landing ramp at the bow. The vessel's engines and machinery are located in an insulated and watertight compartment in the aft quarter of the hull.

The vessel's weapons fit normally includes a 12.7 mm HMG or 40 mm AGL fixed on a

ring-mount aft of the wheelhouse; a pair of fixed 12.7 mm HMGs are also mounted forward of the helmsman's position. A remote weapon station (RWS) can be installed in place of the crew-served ring-mount weapon.

A number of variants have been developed since production began in 1991. For example, the CB 90HEX model built for the Royal Malaysian Navy (RMN) is equipped with twin Caterpillar CAT 3406E diesel engines that provide a total output of 1,605 hp; it also features an Onan 230V AC genset, and air conditioning.

In contrast, the CB 90HS variant developed for the Royal Swedish Navy's (RSwN's) Amphibious Corps features NATO STANAG 4569 Level 4 protection – covering the wheelhouse, troop compartment, and machinery

room – which is capable of withstanding rounds of up to 7.62 mm in calibre. The CB 90HS is also equipped with cabin overpressure systems for protection against nuclear, biological, and chemical (NBC) threats.

The CB 90 has been license-produced by Washington-based SAFE Boats International for the NECC's CRF as the Riverine Command Boat (RCB). This variant is optimised for the C2 role within a riverine squadron that includes a mix of other assets such as the 11 m Riverine Patrol Boat (RPB) and 10 m Riverine Assault Craft (RAC).

The RCB features increased firepower, with four electrically powered crew-served weapon mounts that can support a 7.62 mm M240 machine gun, a 12.7 mm M2HB HMG, or a

Comment

For militaries seeking to project power ashore, inland waterways will likely gain strategic importance as countries in the Asia-Pacific region unlock the transport potential of the extensive network of rivers and canals prevalent throughout the region. According to the Asian Development Bank (ADB), this mode of carriage is increasingly being recognised as a clean and energy-efficient method to move people and goods when compared with traditional land-based networks.

The organisation noted that it has already provided technical assistance or loans to inland waterway development projects in

China, India, Indonesia, and Vietnam. As awareness and interest in such programmes grows around the region, such waterways may even enable the establishment of new inland transport routes that cut across several countries. The strategic utility of such transport networks may also be considered in future military operational planning.

Elsewhere in the region, archipelagic countries like the Philippines, which comprises more than 7,000 islands and islets, have recognised the utility of riverine capabilities for internal security operations. With the complex network of inland river and coastal

transport routes in and around the archipelago, capable riverine craft enable efficient insertion and extraction of forces in the country's longstanding conflict with separatist insurgents.

Like the United States, Australia is resurrecting its riverine warfare capabilities. According to the country's latest defence white paper, which was publicly released on 25 February 2016, the Australian Department of Defence has a requirement for a riverine patrol capability – comprising a number of "lightly armed small patrol boats" – which is to be stood up in around 2022.

12.7 mm GAU-19/B Gatling gun. Depending on mission requirements, the ring-mount weapon can also be replaced by an Mk 49 RWS equipped with a 12.7 mm M2HB HMG.

According to briefing documents supplied to *IHS Jane's*, the company has built nine RCBs and a total of 43 RPBs for the USN and USMC.

It is also building a new generation of littoral patrol boats for the USN, which will be operated by the CRF. Designated the Mk VI Patrol Boat (PB), the 25 m long, aluminium-hulled vessel has a stated range of 600 n miles, but also has been designed for extended deployments with accommodation, a galley, and shower facilities. Powered by two MTU 16V 2000 M94 diesels that produce 5,200 hp, the vessel can achieve sprint speeds in excess of 30 kt.

The Mk VI PB is understood to be armed with two 25 mm Mk 38 Mod 2 RWS as well as six crew-served mounts capable of supporting the same range of weaponry as the RCB. Unmanned aerial vehicles (UAVs) or unmanned underwater vehicles (UUVs) can be launched and recovered from its stern.

“Globally transportable, the Mk VI PBs can operate from amphibious ship well decks and other forward locations, while partnering with allied navies at a new and more effective level than at any time in recent history,” said Lt Cdr Cragg, revealing that two vessels will be deployed to the USN Fifth Fleet’s AOR in the second quarter of fiscal year 2016, with two more expected to be deployed to the Seventh Fleet AOR by the end of 2016.

“These combatant craft will bring the capability to persistently patrol littoral areas beyond sheltered harbours and bays for the purpose of force protection and friendly and coalition forces and critical infrastructure,” Lt Cdr Cragg added. “Some of the missions of the Mk VI PB include, but are not limited

to, security force assistance, theatre security co-operation, support to mine countermeasure operations by launching and recovering UUV, and high-value unit shipping escort.”

River monitor

Indonesia’s North Sea Boats is pushing its catamaran X18 Tank Boat concept as a fast and stealthy weapons platform specifically designed to deliver close-in and long-range fire support in coastal and riverine environments. First unveiled at the 2014 Indodefence exhibition in Jakarta as the Fire Support Vessel (FSV) concept, the X18 features a foil-assisted catamaran hull form – constructed predominantly from infused vinylester carbon composite material – that is 18 m long, 6.6 m wide, and has a draft of 1 m.

The vessel can accommodate a four-person crew and up to 20 troops, as well as a RHIB on its stern deck. Equipped with a pair of 1,200 hp MAN V8 engines, MJP4-50 waterjet propulsion systems and a 6,000-litre fuel tank, X18 can achieve a top speed of 40 kt. The maximum stated range of the vessel is projected to be 350 n miles at 30 kt and up to 900 n miles at an economical cruise speed of 9 kt.

North Sea Boats owner John Lundin told *IHS Jane's* that the X18 is a concept inspired by the river monitors employed during the Vietnam War, platforms that were essentially armoured vessels with large-calibre shore bombardment weapons. These vessels are typically employed in brownwater operations on waterways such as deltas, estuaries, lakes and rivers.

“Our concept is targeted at archipelagic countries that have thousands of islands,” he said. “It is logistically difficult to transport and deploy heavy equipment such as large-calibre artillery and tanks around these islands.”

Lundin added that the terrain on these islands, particularly closer to shore, creates unfavourable conditions for artillery and armoured vehicle operations as it is typically marshy, reducing the vehicles’ ability to manoeuvre and support operations.

“The X18, with its shallow draft capability, can operate very close to shores or river banks to provide support fires without these limitations,” Lundin explained. “We also chose a catamaran design instead of a monohull as we found that it is then possible to make the vessel as short as possible to operate in these confined environments. Our calculations have shown that it is the shortest possible length to accommodate a 105 mm calibre weapon without compromising stability.”

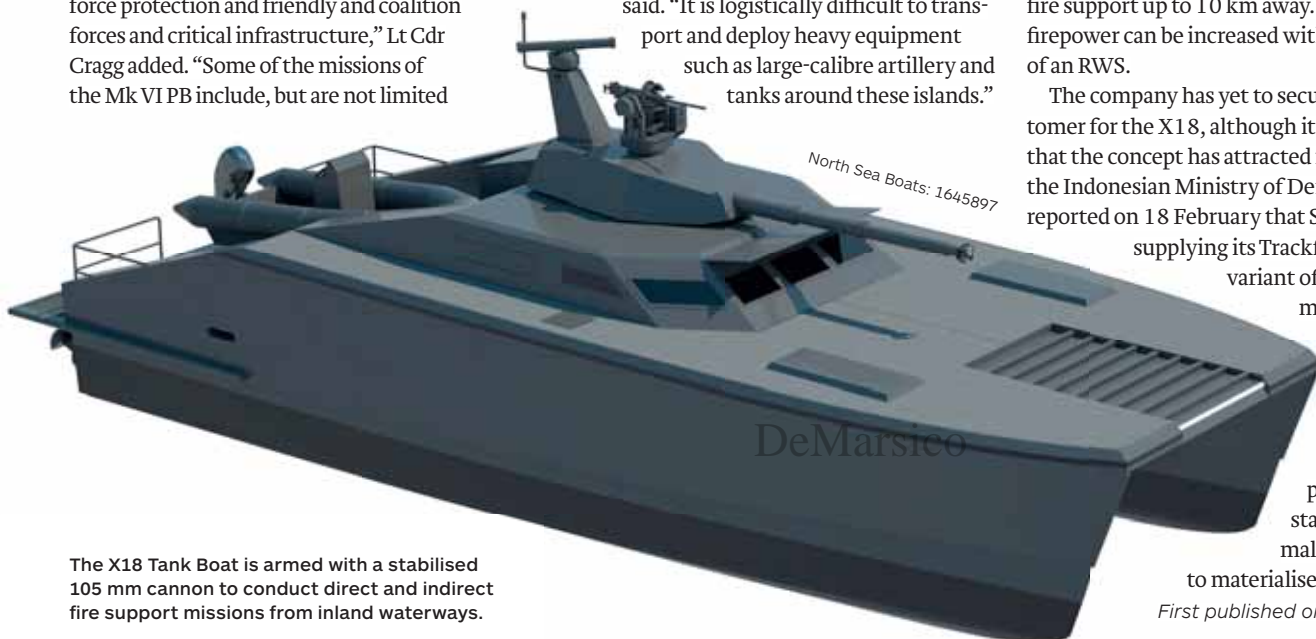
The X18’s key feature is its ability to fit a variety of large-calibre direct-fire weapons on its roof-mounted gyro-stabilised turret.

The company has partnered with Belgium’s CMI Defence to fit its 105 mm CT-CV rifled gun and turret system as the vessel’s main armament. According to *IHS Jane's* Land Warfare Platforms: System Upgrades, this two-person turret weighs 4,500 kg in its standard configuration with STANAG 4569 Level 1 ballistic protection, although its weight can be further reduced with the armour removed.

The turret system is equipped with a bustle-mounted autoloader and can fire all NATO-standard 105 mm ammunition as well as the Falarick Gun Launched Anti-Tank Guided Missile (GLATGM) that is capable of defeating armoured targets at a maximum range of 5 km. With the ability to elevate the gun up to 42°, the turret is also capable of laying indirect fire support up to 10 km away. Short-range firepower can be increased with the addition of an RWS.

The company has yet to secure a launch customer for the X18, although it is understood that the concept has attracted interest from the Indonesian Ministry of Defence. *IHS Jane's* reported on 18 February that Saab will be supplying its Trackfire RWS and a variant of its 9LV combat management system to meet an expected Indonesian requirement, although company officials stated that a formal contract has yet to materialise. ■

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The X18 Tank Boat is armed with a stabilised 105 mm cannon to conduct direct and indirect fire support missions from inland waterways.