

# Carrier killer: Taiwan's Tuo Jiang-class missile corvette

[Content preview – Subscribe to Jane's International Defence Review for full article]

Developed under the Hsun Hai programme, the stealthy Tuo Jiang-class missile corvette is designed to provide the Taiwanese Navy a high-end, asymmetric means to defeat amphibious landing and capital ships. *Kelvin Wong* explores the type's development and capabilities



*Tuo Jiang seen during sea trials before its March 2015 commissioning. (Lung Teh)*

1682748

Faced with the increasing naval capabilities of its cross-strait rival, the Republic of China Navy (RoCN) fielded the initial example of what could be an eventual fleet of 12 500-tonne class fast, stealthy, and heavily armed missile corvettes in March 2015.

A development of the TWD24.98 billion (USD782 million) Hsun Hai (Swift Sea) programme, the RoCN's Tuo Jiang-class fast missile corvette (FACM) is designed to bridge the capability gap between the service's principal surface combat platforms - the Keelung-class (modernised ex-US Navy [USN] Kidd-class) destroyers, Cheng Kung-class (licence-produced USN Oliver Hazard Perry-class) frigates, Chi Yang-class (ex-USN Knox-class) frigates, and Kang Ding-class (French La Fayette class) - and its coastal patrol craft.

As such, the Tuo Jiang-class is expected to assume responsibility for the lower intensity maritime security missions currently undertaken by the service's larger and more-expensive destroyers and frigates in peacetime, while providing an affordable but effective asymmetrical counter against an adversary's larger warships.



*Taiwan's first indigenous Tuo Jiang-class stealth corvette participated in its initial RoCN exercise on 1 January 2014, seven days after being delivered. (Taiwanese Ministry of National Defense )*

1628957

Plans for the development of the new missile corvette were first made known to the public in 2009. In April 2010, then deputy minister of National Defense Lin Yu-pao revealed that detailed design work was well under way with the first vessel expected to be delivered by 2014.

"In order to face the increasing threat across the Taiwan Strait, RoCN has developed a new type of littoral combat ship, high-efficiency wave-piercing Catamaran [WPC]," the RoCN announced at the 2013 Taipei Aerospace & Defense Technology Exhibition (TADTE). "This ship design increases ship mobility and provides for greater stealth technology, larger capacity, and better adaptability to environmental conditions."



*A high efficiency wave-piercing catamaran hull form was selected for its greater stability and shallower draft characteristics. (Lung Teh)*

1682749

[Continued in full version...]

## **Design features and challenges**

According to official specifications released by the RoCN, *Tuo Jiang* is 60.4 m long, 14 m in beam, and has a draft of 2.3 m. The vessel displaces 567 tonnes at full combat load and is crewed by 41 personnel, including officers.

In terms of propulsion, *Tuo Jiang* is outfitted with an MTU 20V 4000 M93L diesel engine - rated at 4,300 kW (5,766 bhp) - coupled directly to a pair of MJP CSU (Compact Steering Unit) 850 water-jets via a Centa CL-80 FS3 shaft in each hull. This arrangement enables the ship to reach a stated maximum speed of 43 kt. Hotel electric power is provided by a pair of Kohler 350EOZC marine generator sets with each producing 350 kW of electricity.

An RoCN official told *IHS Jane's* at TADTE 2015 that while the stern deck of *Tuo Jiang* can support a 10-tonne medium naval helicopter, it is also a multimission payload bay that is capable of accommodating two 20 ft (6.1 m) ISO-standard mission module containers, although the service is still deliberating on the type of systems to integrate onto the vessel.



*The engineering space in Tuo Jiang. The ship is outfitted with four MJP CSU 850 water-jet propulsion systems that enable it to achieve a maximum stated speed of 43 kt. (Lung Teh)*

1682751

"We are not ready to discuss what these modules will be as we are still trying to understand the capabilities and limitations of this new ship," he said. "However, we can essentially configure [it] to perform a wide range of missions such as mine countermeasures, if deemed necessary."

*IHS Jane's* was also briefed on the other capabilities being trialed aboard the vessel, which include a configurable mission bay in each hull. For example, a towed sonar array is currently deployed from the port mission bay, while an overhead boom extends from the starboard bay to launch and recover a 6 m rigid-hull inflatable boat (RHIB).

[Continued in full version...]

## **Armament**

The ship's principal offensive capabilities come from its array of 16 indigenously developed anti-ship missiles housed amidships in raised launchers. These comprise the turbofan-powered Hsiung Feng 2 (Brave Wind 2, or HF-2) and the ramjet-powered Hsiung Feng 3 (HF-3), the latter being dubbed the 'carrier killer' by its developer, the National Chung-Shan Institute of Science and Technology (NCSIST), during the 2011 iteration of TADTE.

According to *IHS Jane's Strategic Weapon Systems*, the subsonic HF-2 is equipped with a 225 kg high-explosive (HE) semi-armour-piercing warhead and has a stated range of 81 n miles (150 km), while the supersonic HF-3 carries a 120 kg HE warhead and can engage targets at up to 108 n miles away.

NCSIST had earlier described the 660 kg HF-3 missile - which has a length of 5.1 m, and a claimed maximum speed of Mach 2 - as a 'carrier killer', with local media reports suggesting that the weapon programme has been accelerated in response to the possible future deployment by China of its modified Kusnetsov-class aircraft carrier, ex- *Varyag*, which began sea trials in 2011. The HF-3 programme is part of a USD406 million programme to provide the RoCN with improved naval attack missiles. Production of these weapons commenced in 2010.

Speaking to *IHS Jane's* at the inaugural Kaohsiung International Maritime and Defence Expo in September 2016, a NCSIST official said the *Tuo Jiang* class is armed with a 'high-low' mix of HF-2 and HF-3 missiles, which enables the vessel to overwhelm the organic defences of a high-value surface target with missiles from multiple attack vectors.

"With the subsonic HF-2 being highly manoeuvrable, the crew can programme one or more of these missiles to adopt evasive approaches to the target, while the ramjet-powered HF-3 missile further challenges the adversary's ability to employ its countermeasures, increasing the overall damage potential of the attack," the official noted.

Besides its anti-ship missiles, *Tuo Jiang* is armed with a 76 mm Oto Melara main gun. Besides that, two triple torpedo tubes enable it to engage in anti-submarine warfare (ASW) missions, while a stern-mounted Raytheon 20 mm Vulcan Phalanx close-in weapon system (CIWS) and four 12.7 mm machine guns provides point defence against small surface targets and low-flying aircraft. Chaff dispensers mounted on the vessel's fore and aft sections improve its survivability against infrared- and radar-guided anti-ship missiles.

NCSIST officials told *IHS Jane's* at TADTE 2015 that gun-based CIWS systems typically offer a much shorter engagement range when compared with defensive missiles. For example, the maximum effective range of the 20 mm Phalanx CIWS is only 1.47 km in the horizontal plane. With supersonic anti-ship missiles such as the air-launched Chinese YJ-12 system reportedly capable of speeds between Mach 2 and Mach 4, there is extremely limited time for a successful gun interception. Moreover, gun systems can only engage one target at a time and further time is lost in re-training the weapon to deal with another threat.

With a missile-based CIWS, the ship can engage multiple targets simultaneously at comparatively longer ranges. The ability of these missiles to manoeuvre and intercept modern anti-ship missile systems - which can be programmed to fly evasively to defeat projectile countermeasures - also increases the survivability of the ship.

The institute took the opportunity at the event to unveil a new short-range naval surface-to-air missile (SAM) system designed to replace the gun-based CIWS systems presently employed by the RoCN's surface combatants.

Called the Sea Oryx SAM system, it is primarily designed to intercept anti-ship missiles, low-flying aircraft, and UAVs. An NCSIST engineer told *IHS Jane's* on 16 August that the launcher itself is based on an adapted Raytheon 20 mm Vulcan Phalanx six-barrelled Block 1B CIWS platform - with modifications to the mount and drivetrain assembly - to facilitate ease of replacement and

logistics support, although the 20 mm rotary cannon has been replaced by an 8- or 16-cell missile launcher canister and long-wave infrared (LWIR) electro-optical system.



*The Sea Oryx missile system is being developed as an upgrade for existing small- and medium-sized Taiwan Navy ships to provide increased survivability against high-speed missile threats. A video of the new system fitted to a Tuo Jiang-class missile corvette was showcased at the TADTE 2015 exhibition. (IHS/Kelvin Wong)*

1638925

According to the NCSIST, the system will launch the new Sea Oryx missile, which is essentially a navalised and upgraded variant of the short-range Tien Chien 1 (Sky Sword 1, or TC-1) air-defence missile that is being employed in the air force's Indigenous Defense Fighter (IDF) aircraft and the army's ground-based mobile Antelope air-defence system. As a comparison, *IHS Jane's Air-Launched Weapons* states that the TC-1 missile - which is equipped with an HE fragmentation warhead - is 2.87 m long, 127 mm in diameter, and weighs 90 kg. A single-stage solid-rocket motor enables it to achieve a maximum range of approximately 8 km.



*Tuo Jiang's bridge with the navigation and engineering console cluster. (Lung Teh)*

1682750

While its performance specifications were not disclosed, enhancements to the TC-1 missile include a new datalink, an imaging infrared (IIR) seeker, inertial navigation system (INS), and an improved rocket motor. To reduce its storage footprint, the stabilising and control fins are folded when loaded in the launch canister. The navalised missile is typically fired in the lock-on after launch (LOAL) mode to minimise reaction time, with launch command initiated from the ship's combat management system (CMS) or from a dedicated console.

[Continued in full version...]

### **Future development**

In mid-2016 the RoCN unveiled an ambitious 23-year, USD14.7 billion force modernisation plan that comprises as many as seven new shipbuilding programmes in addition to the remaining 11 Tuo Jiang-class missile corvettes originally provisioned for under the Hsun Hai programme.

With a projected timeline that spans from 2017-40, major proposed developments include Aegis destroyers and missile frigates, submarines, high-speed minelayers and minehunters, landing platform docks (LPDs), multipurpose transports, as well as oceanographic survey and rescue boats. However, an official from the service's N5 (headquarters planning) told *IHS Jane's* in Kaohsiung that production will depend largely on available funding, although the resources have already been allocated for the new minehunters with the first of six being built by Italian firm Intermarine.

According to the RoCN, the new Tuo Jiang corvette builds will be ordered in three flights (3+3+4) with improvements progressively incorporated to each tranche as they become available. As opposed to the first vessel, the Flight 1 design is expected to feature increased defensive firepower with vertically launched TC-2N SAMs, as well as improved secondary armament forward of the bridge with two XTR-102 twin-barrelled gun mounts that are outfitted with 20 mm T-75 cannons.



*First-of-class Tuo Jiang seen at its launch ceremony at shipbuilder Lung Teh's yard in Yilan county in December 2014. (Ministry of National Defense)*

1525946

The Flight 1 design also suggests an emphasis on improving stealth, with other features including an enclosed mast that houses a rotating phased-array radar based on the CS/MPQ-90 as well as a revised forward superstructure and bridgehouse arrangement. Unconfirmed reports suggest that the hull will be lengthened and widened by about 4-6% over *Tuo Jiang* to accommodate the expected increase in displacement. Construction of the initial batch of three hulls is now slated to commence in 2017.

[Continued in full version...]

For the full version and more content:

### IHS Jane's Military & Security Assessments Intelligence Centre

*This analysis is taken from [IHS Jane's Military & Security Assessments Intelligence Centre](#), which delivers comprehensive and reliable country risk and military capabilities information, analysis and daily insight.*

*IHS country risk and military capabilities news and analysis is also available within IHS Jane's Intelligence Review. To learn more and to subscribe to IHS Jane's Intelligence Review online, offline or print visit <http://magazines.ihs.com/>*

For advertising solutions contact the [IHS Jane's Advertising team](#)