



Naval Drones: Evolution, Not Revolution in Maritime Warfare

Chong De Xian and Sandy J. Pratama



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For strategic effect, naval drones should be networked with manned platforms.
Image from Wikimedia Commons

KEY TAKEAWAYS

- **Naval drones are reshaping how maritime operations are conducted, not redefining naval power itself.** Their value lies in enhancing surveillance, strike reach, and operational endurance within existing fleet structures — reinforcing rather than replacing conventional forces.

- **Technological advantage remains fleeting.** Conflicts such as those in Ukraine and Nagorno-Karabakh show that drones are only as effective as the satellite, intelligence, and industrial networks that sustain them.

- **Integration of manned platforms, uncrewed systems, and digital networks will shape the future of maritime warfare.** The key challenge for navies is to synchronise these capabilities into cohesive, adaptive, and interoperable force architectures capable of enduring in contested environments.

Introduction,

Naval drones have dominated global headlines amid recent conflicts, emerging as one of the most disruptive innovations in contemporary maritime warfare. From an initial state of overwhelming Russian [dominance](#) and Ukraine's [negligible naval capabilities](#) in the Black Sea, Kyiv's innovative [campaign](#) against the Russian Black Sea Fleet marks a remarkable strategic reversal. By employing uncrewed surface vessels (USVs) with precision and ingenuity, Ukraine has eroded Moscow's maritime freedom of action and carved out operational space for itself. In a further evolution, Ukraine's USVs — reportedly equipped with modified air-to-air missiles — have begun to deny Russian aircraft freedom of movement over the Black Sea, including the reported downing of two Su-30SM fighter jets. Similarly, the Houthis — once a localised insurgent group — have leveraged drone technology to project power far beyond Yemen's borders, conducting [high-profile attacks](#) on naval and commercial vessels in the Red Sea. Both actors demonstrate how technological adaptation, precision-strike capability, and asymmetric operational concepts can yield outsized strategic effects.

Against this backdrop, global interest in naval drones has surged, with many states racing to develop or acquire such systems. China's [unveiling](#) of its extra-large unmanned underwater vehicles (XLUUVs) at the recent Victory Day Parade attracted widespread attention, fuelling speculation over their capabilities and intended roles. Taiwan has likewise announced [plans](#) to mass-produce some 1,300 Kuai Chi USVs to bolster its island defence posture. Together, these developments reflect a broader shift toward autonomous maritime systems as states seek to expand their reach, resilience, and deterrence at sea.

Yet despite their growing prominence, it remains premature to regard naval drones as the definitive “tip of the spear” in future maritime warfare, despite the changes they have brought about. This paper seeks to put the evolution of naval drone warfare into perspective, and argue that instead of focusing solely on unmanned capabilities as a revolutionary replacement for traditional fleets, military planners should see them as an evolutionary force multiplier whose true value lies in their integration within broader, networked systems of maritime power.

Revisiting Earlier Drone Conflicts

The recent hype surrounding naval drones is not unprecedented. With advances in digital technologies and the [proliferation](#) of new exporters such as China and Turkey,

the financial and technological barriers for small and medium powers to acquire and operate armed drones at scale were significantly lowered in the 2010s. The [Second Libyan War](#) (2014–2020) became the first [large-scale](#) drone conflict, with the UN-backed Government of National Accord deploying [Turkish TB2s](#) against the Libyan National Army, equipped with [Chinese-made Wing Loongs](#).

In Syria, Turkey's 2020 *Operation Spring Shield* demonstrated how [massed drone strikes](#) could suppress armour, artillery, and airdefence systems, delivering tactical success without deploying manned airpower. These operational lessons reached their most pronounced expression in the [2020 Nagorno-Karabakh War](#). The war's [dramatic imagery](#) of drones surgically destroying tanks and air defences was broadcast worldwide, reinforcing the perception of a revolutionary shift in warfare.

Rapid Evolution, Strategic Uncertainty

The pace of drone innovation has been extraordinary, but this very speed underscores how transient technological advantages can be: systems that appear revolutionary one year are quickly countered or rendered obsolete the next. The ongoing war in Ukraine illustrates this volatility. The [once-vaunted](#) TB2 drones from earlier conflicts have since fallen short of expectations as their [attrition rates](#) have proven unsustainable in contested airspace, and smaller drones have endured only by being [mass produced](#) at unprecedented scale and saturating the frontlines. While it is [estimated](#) that 60 to 70 percent of Russian battlefield losses are now caused by drones, the war remains ultimately decided by boots on the ground, combined arms manoeuvre, and control of territory — not by uncrewed systems alone.

Their operational success also depends on access to satellite navigation, secure communications, and data processing infrastructure. In Ukraine's case, the effectiveness of uncrewed surface and aerial operations has [hinged](#) on real-time targeting data from American reconnaissance satellites and NATO surveillance assets. Kyiv's ability to fuse commercial and military intelligence into strike planning underscores that its success is as much informational as it is technological. A [similar dynamic](#) was observed in the Nagorno–Karabakh War, where the integration of drones into a broader combined-arms framework, together with Armenia's obsolete air defences and limited warfighting capacity, proved decisive.

In both cases, what appears as autonomous warfare is, in fact, sustained by extensive external support networks spanning satellite infrastructure, intelligence sharing, and industrial supply chains. Large manufacturing capacity and resilient logistics are also required to sustain the high rates of attrition. These conflicts demonstrate that drones are transformative, not as replacements for conventional forces, but as cost-effective multipliers within a networked system of precision warfare.

Rethinking the Role of Drones in the Maritime Domain

Applied to the maritime context, drones are unlikely to be revolutionary. Rather, they represent the next step in the evolution of naval operations. The history of drone warfare suggests that the future of naval power lies not in singular technologies but in how effectively they are integrated into broader operational architectures. Their

true utility lies in extending the range, coverage, and survivability of traditional platforms, functioning as force multipliers rather than replacements. Concepts from the air domain such as the [Collaborative Combat Aircraft \(CCA\)](#) already point in this direction, combining manned aircraft with autonomous systems to expand capability and resilience.

A maritime analogue, what could be termed as the Collaborative Combat Vessel (CCV), is now taking shape across several navies. A key distinction between the CCA and CCV concepts is that the latter must operate with greater autonomy to overcome the complex technical challenges of communication and control at sea. Projects such as Anduril's [Ghost Shark](#), Boeing's [Orca](#), China's [experimental sea gliders](#), the United Kingdom's [Cetus](#), and Singapore's [Multi-Role Combat Vessel](#) all reflect parallel efforts to integrate uncrewed platforms alongside traditional ships within networked task groups.

Another lesson drawn from drone warfare is the need for an “attritable” force mix. Observations from the recent conflicts suggest this is best achieved through a blend of high- and low-end systems. High-end drones offer greater capability but are slower to replace, making them vulnerable to attrition. Low-end drones, though more limited in range and sophistication, can be mass-produced quickly to sustain operations in contested environments. [Studies](#) on the CCA model indicate that such a mix provides commanders with flexibility and operational depth, both equally relevant for maritime applications.

Doctrinal and operational questions, however, remain unresolved: how should command authority be delegated to autonomous units; what level of control or independence should be permitted in combat conditions; and how can such systems be produced and maintained at scale in protracted conflicts? The challenge is not whether to adopt drones, but instead how to weave these platforms systematically into the wider fabric of maritime power to create a resilient and interoperable force capable of enduring in contested environments.

Conclusion

While naval drones mark an important technological and operational evolution, they do not redefine sea power on their own. Their growing prominence reflects a shift toward networked, data-driven, and integrated forms of warfare rather than a break from the past. History shows that revolutions in military affairs come not from platforms alone, but from how new technologies are absorbed into doctrine, organisation, and strategy. The future of maritime warfare will therefore depend less on the number of drones deployed than on how effectively navies integrate manned and unmanned systems into a cohesive, adaptive, and sustainable architecture of sea power.

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