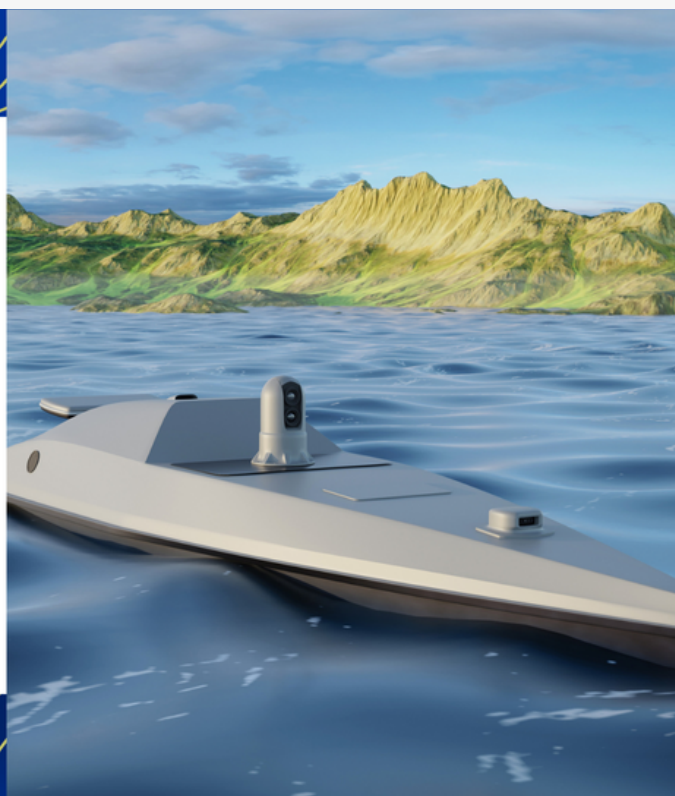


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**UKRAINIAN NEPTUNE CRUISE
MISSILES AND SEA DRONES –
HOW A COUNTRY WITHOUT A
REAL NAVAL FLEET IS CHANGING
THE BALANCE OF POWER IN THE
BLACK SEA AND THE FUTURE OF
NAVAL WARFARE**

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Introduction

When Russian President Vladimir Putin launched his open war of aggression against Ukraine in February 2022, most observers expected the Ukrainians to hold out for a few days in the face of a superior armed force. After two years of war, the situation on the ground remains ambiguous for Ukraine. However, in the Black Sea, Ukraine has been able to notch several successful naval strikes. The Russian Navy having lost several critical vessels, has had to withdraw from the Black Sea Fleet's headquarters in Sevastopol in Crimea and relocate several ships to Russian harbours. Additionally, it is increasingly failing in its efforts to enforce a grain embargo against Ukraine by sea. Newly developed naval drones and anti-ship missiles are likely key factors contributing to Ukraine's successes. This Infolash aims to analyse these new weapons systems and their impact on the Russo-Ukrainian War, the balance of power in the Black Sea and their implications for the future of maritime warfare.

Background – The Balance of Power in the Black Sea Before the Ukraine War

Historically, Ukraine's naval capabilities have always been relatively modest primarily due to Russia inheriting the majority of the former Soviet fleet in 1991. The annexation of Crimea and the seizure of many docked Ukrainian naval vessels further crippled the Ukrainian navy. In 2018, Russia demonstrated its naval superiority in the Black Sea when it detained several Ukrainian naval vessels in the Kerch Strait at the entrance to the Sea of Azov. Consequently, when Putin initiated Russia's invasion of Ukraine in 2022, Ukraine found itself ill-prepared to counter the Russian Black Sea Fleet. Smaller Ukrainian ships were swiftly destroyed, leading Ukrainian forces to sink their own flagship Hetman Sahaidatschnyj to prevent its capture (Cancian, 2024). Russia blockaded the Ukrainian harbours with sea mines and its warships. As a consequence, the export of grain by sea, economically vital to Ukraine's survival, collapsed and could only be temporarily resumed thanks to an agreement with Russia. In order to free itself from this desperate situation and fight off the Russians in the Black Sea, Ukraine had to become inventive (Dickinson, 2024).

The Ukrainian Sea Drone and Anti-Ship Warfare Programmes

Ukraine began developing alternative maritime weapons systems long before the start of the Russian war of aggression. In 2015, Ukraine presented a prototype of the R-360 Neptune anti-ship cruise missile for the first time at an arms fair in Kyiv. The design by the Luch Design Bureau in Kyiv was a further development of the Russian Kh-35 cruise missile with improved range, targeting through an inertial navigation system and electronics (Guttman, 2022). The land-based system has a range of up to 300 kilometres, carries a 150-kg warhead and can foil enemy radar by flying at low altitudes of 3 to 10 meters (Guttman, 2022). The system has been in the Ukrainian Navy's arsenal since 2021, though the final test phase was thwarted by the start of the war (Guttman, 2022). The exact quantity of cruise missiles in Ukraine's possession remains undisclosed, though estimates suggest it is limited, with Ukraine actively seeking additional supplies of Western anti-ship missiles (Axe, 2022). Ukraine is currently working on another increased-range version of the Neptune. It has also succeeded in modifying the cruise missile for the originally not intended use against land targets (Axe, 2023b).

The second Ukrainian in-house production is drones. The war in Ukraine has already demonstrated the importance of unmanned systems for land warfare (Cotovio et al., 2023; Maccabelli, 2023). However, maritime drones are also showing their growing importance in naval warfare. Unlike traditional anti-ship missiles such as the Neptune cruise missile, which have long been a staple in naval arsenals worldwide (Lake, 2020), maritime drones are a relatively new phenomenon (Cancian, 2024). Until now, not much information about the Ukrainian sea drone programme has been made public (Shukla et al., 2023).

It is assumed that Ukraine only began developing drones at the start of the war or shortly before and that development was completed in a very short time (Shukla et al., 2023).

Presently, Ukraine boasts several operational maritime drone models, with the most notable being the Maritime Autonomous Guard Unmanned Robotic Apparatus Magura V5 (Militarnyi, 2024). Measuring 5.5 meters in length and 1.5 meters in width, it can reach speeds of up to 77.8 km/h and has a range of up to approximately 833 kilometres including large parts of the entire Black Sea (Militarnyi, 2024). The Magura V5 serves multiple functions, including reconnaissance, search and rescue operations, mine detection and, as a kamikaze drone with a payload capacity of 320 kg of explosives, for direct assaults against sea targets (Vakulina, 2024). The advantages of the system are clear. Although the small drone cannot submerge itself completely and stays on the water's surface, it is hard to detect, especially at night (Shukla, 2023). Additionally, it is fast and manoeuvrable and can change course flexibly during attacks which makes it very difficult to intercept (Shukla, 2023). With an estimated unit price of €230,000 (Wanhoff, 2023), it is also relatively affordable (Militarnyi, 2024).

Analysis of the Impact of the Weapons Systems on the Ukraine War

Ukraine is using both the Neptune cruise missiles and its sea drones, primarily the Magura V5, in defence against the Russian forces. Ukraine achieved its first significant success with the sinking of the Russian guided missile cruiser and the flagship of the Black Sea Fleet *Moskva* on 14 April 2022, 120 km off the coast of Odesa. This was made possible by two hits fired from land-based Neptune cruise missiles (Cooper, 2022). In August 2023, Ukraine successfully operated a modified Neptune against a land target for the first time destroying a radar system of the modern Russian S-400 Triumph air defence system in Cape Tarkhankut in Crimea (Axe, 2023a). This feat was replicated in September 2023, when Ukraine conducted a similar strike on another S-400 system, this time targeting its launchers with two Neptune missiles in Yevpatroiia, Crimea (Syngaiivska, 2023).

The first confirmed use of the Magura V5 drones took place on 29 October 2022, when the minesweeper *Ivan Golubets* and the Frigate *Admiral Makarov* were hit in the Port of Sevastopol (Stepanenko *et al.*, 2022). On 24 May 2023, the sea drones allegedly attacked Russian reconnaissance ship *Ivan Khurs* north-east of the Bosphorus setting a new dimension in terms of range. The Ukrainian and Russian versions of the success of the attack differ, but, certainly, the ship did not sink as a result of the attack (Ozberk, 2023). Since then, numerous suspected and confirmed attacks on Russian ships using naval drones have been documented. On 4 August 2023 for example, the landing ship *Olenegorski Gornjak* was severely damaged in the bay of Novorossiysk (Tagesschau, 2023), and two other landing ships followed, sinking in November 2023 (Defense Express, 2023). In Crimea, the missile corvette *Ivanovets* was sunk on 1 February 2024 (BBC, 2024) and the landing ship *Caesar Kunikov* on 14 February 2024 (Rüesch, 2024). In March 2024, Ukraine once again demonstrated the success of the use of naval drones through the increasing use of pack attack tactics by sinking the Russian patrol ship *Sergey Kotov*, which was attacked simultaneously from different directions by several Magura V5s making it virtually impossible to defend against all the drones (Defense Express, 2024).

However, one should be cautious about declaring the weapon systems as wonder weapons or game changers. Not all Ukrainian success in the Black Sea can be attributed to the use of the self-produced R-360 Neptune and Magura V5 alone. Many Russian losses are attributable to the use of other weapon systems; Harpoon anti-ship missiles supplied by Western allies (Roblin, 2022), attacks by UAVs such as the Turkish Bayraktar TB2 (Sutton, 2022) and air-launched missiles and cruise missiles also supplied by Western allies such as the British Storm Shadow and the French SCALP. These Western cruise missiles enabled prestigious successes for Ukraine such as the devastating destruction of the Russian headquarters of the Black Sea Fleet in Sevastopol in September 2023 (Stern, 2023) and the destruction of the submarine Rostov na Donu and landing ship Minsk also in the harbour of Sevastopol in September 2023 (Martínez et al., 2023). Likewise, there are areas of maritime warfare which are largely shielded from the use of such systems. Neither maritime drones, the Neptune cruise missile, nor systems supplied by the West enable Ukraine to take action against Russian submarines, which are still able to operate unchallenged in the Black Sea. Furthermore, none of these systems facilitates the achievement of the remaining crucial Ukrainian objectives in the Black Sea, namely, conducting an amphibious campaign to reclaim Crimea and removing the sea mines laid down by Russian forces in Ukrainian waters (Cancian, 2024).

Nevertheless, Ukrainian success has far-reaching consequences, as the continuing losses of the Black Sea Fleet weigh particularly heavily on Russia. Turkey's blockade of access to the Black Sea for all military vessels based on the Montreux Convention makes it near impossible for Moscow to compensate for its losses with reinforcements from the other Russian fleets (Rüesch, 2024). Consequently, Russia has been forced to move large parts of its remaining Black Sea fleet to its naval base in Novorossiysk, in the eastern Black Sea, where they remain within the range of Ukrainian drones and in return are more restricted in their operational capability (Latschan, 2024). It is estimated that the Russian Black Sea fleet has lost 40 per cent of its naval tonnage since February 2022 and is therefore considerably weakened with far-reaching consequences for the Russian war effort (Latschan, 2024). Russia's ability to strike land targets in Ukraine from the sea is seriously hindered and the prospect of amphibious landing operations on the southern coast of Ukraine around Odesa is now untenable, freeing up Ukrainian soldiers assigned to coastal defence for deployment to the contested fronts in Kharkiv, the Donbas and Zaporizhia (Cancian, 2024). At the same time, reports of success from the Black Sea boost morale and have long-term economic consequences by breaking Russia's grain embargo (Cancian, 2024; Dickinson 2024). The grain trade is one of the most important sources of income and of vital importance for Ukraine's war-battered economy. Correspondingly devastating were the effects of the Russian blockade in the western Black Sea, particularly before and after the temporary regulated export agreement with Russia between July 2022 and July 2023 (Dickinson, 2024).

Lessons for the Future of Naval Warfare

Ukraine's maritime success has not gone unnoticed by the rest of the world with numerous parties taking note. The Yemeni Houthis have begun using similar unmanned kamikaze speedboats in their attacks on ships in the Red Sea (U.S. Central Command, 2024). Both China and Taiwan are also keeping a close eye on the clashes in the Black Sea (Lau, 2024), as they appear to be ushering in a new era of maritime warfare. Ukraine's utilisation of low-cost drones and land-based anti-ship missiles has underscored the diminishing efficacy of expensive large surface vessels in coastal defence scenarios, impeding enemy ships' operations in specific areas (Bischoff, 2023). Russia's current struggle to counter swarm attacks by sea drones highlights the inadequacy of existing defences, particularly against unconventional threats such as drones, which have traditionally been overlooked in favour of air defence systems. The combined use of UAVs and USVs renders most modern warships vulnerable and, as in the Black Sea, significantly reduces the radius of action in which the ships can move relatively safely.

As a result, navies worldwide are being urged to develop appropriate countermeasures to mitigate the emerging threat posed by drone swarms and protect their vessels (Cancian, 2024). In the future, maritime drone systems could also be used in many domains such as espionage in denied areas, to secure aircraft carrier groups, infrastructure protection and anti-submarine warfare (Bischoff, 2023). Thereby the interaction of drones with other systems will also play an important role and harbours new challenges for effective interoperability (EDA, 2023). Ukraine is already showing that the combined use of different weapon systems, for example, UAVs and USVs against sea targets, can increase the probability of success (Stepanenko et al., 2022). Accordingly, it can be assumed that in the future a great deal of attention will be paid to the interaction of unmanned systems on land, in the air and at sea (EDA, 2023). It is therefore important to create uniform standards for unmanned systems across the armed forces of the EU and NATO countries. Projects such as the EDA's INTERACT (EDA, 2023) show that work is already underway in this area.

Conclusion

The Ukrainian Navy, having long been subordinate in comparison to its Russian counterpart, has against all odds succeeded in subverting the dynamic of Russian naval superiority in the Black Sea over the last two years. The Russian Black Sea Fleet has suffered heavy losses, lost its regional dominance and has been forced to withdraw from large swathes of the western Black Sea. While Ukraine has not emerged victorious in the overall conflict and remains under considerable pressure, particularly on land, its maritime achievements have yielded significant short-term and long-term benefits. Central to Ukraine's maritime success have been its indigenous innovations such as the R-360 Neptune cruise missile and the Magura V5 naval drone. They offer important advantages such as relatively low costs, long ranges, flexibility in launching and difficulties for the enemy to take effective countermeasures, especially in the case of pack attacks by sea drones. More importantly, they also prove that Ukraine has succeeded in finding its own home-made answer to break Russia's Black Sea dominance in the form of proprietary state-of-the-art developments. Ukraine can therefore secure its own supplies in the long term and is not dependent on handouts from the West. The ongoing domestic political blockade of Ukrainian aid measures from the U.S. shows that this effect cannot be overestimated (Boot, 2024). At the same time, the Ukrainian case is demonstrating to the world that the future of maritime warfare is changing, even if it is only just beginning. Maritime drones are likely to play an increasingly important role in many domains, creating new challenges for the operational use of the systems as well as for the interoperability of USVs with other manned and unmanned systems in the air, on land and at sea.

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