THE ROLE OF NAVAL STRIKE DRONES IN THE RUSSIA-UKRAINE WAR

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Abstract

Modern military conflicts increasingly depend on advanced technologies. The use of unmanned naval drones can transform traditional military operations by reducing human risks and enhancing attack efficiency. Leading nations worldwide are actively developing and deploying such technologies, closely observing Ukraine's successes in this field.

Key words: artificial intelligence, network environment, hybrid warfare, information warfare, cyber threats, manipulative influence, information security, special information operations.

Introduction

The Russia-Ukraine war, which began in 2014 and escalated significantly in 2022, has driven an implementation of new military technologies. Among the most critical developments are naval strike drones, which have proven highly effective in destroying enemy vessels. This research focuses on analyzing the role and effectiveness of naval strike drones in modern military conflicts, their impact on warfare strategies, and the potential for further technological development.

Purpose of the article: The primary objective of this study is to analyze the effectiveness of naval strike drones used in the Russia-Ukraine war, identify the most successful models, and explore their impact on unblocking maritime trade routes and countering traditional naval forces.

Methodology

The paper uses such scientific methods as observation, analysis, synthesis, and generalization.

Result and Discussion

Overview of Naval Drones Used in the Russia-Ukraine War

"MYKOLA"

The first known Ukrainian unmanned surface vessels (USVs) of unspecified type, referred to as "Mykola" by Russian media, were used in September 2023 and during the attack on Sevastopol on October 29, 2022. These USVs, along with unmanned aerial vehicles attacked the Russian fleet in port, damaging the frigate "Admiral Makarov" and the minesweeper "Ivan Golubets". Picture of USV "MYKOLA", picture 1.

- **Technical characteristics of "Mykola":**
- Length: 5.5 meters
- Full weight: up to 1,000 kg
- Range: up to 430 nautical miles (800 km)
- Autonomy: up to 60 hours

- Combat load: up to 200 kg
- Maximum speed: 43 knots (80 km/h)
- Navigation: automatic GNSS, inertial, visual
- Video transmission: up to 3 HD video streams
- Crypto protection: 256-bit encryption.

Picture 1: USV “MYKOLA”

“MAGURA” The Maritime Autonomous Guard Unmanned Robotic Apparatus (MAGURA V) is a new Ukrainian unmanned surface vessel performing tasks such as reconnaissance, patrol, rescue operations, mine warfare, fleet protection, and combat missions. With a hydrodynamic hull and V-profile, it offers high maneuverability and stealth capabilities.

The first time Magura was used was recorded on May 24, 2023, during an attack on the Russian reconnaissance ship “Ivan Khurs”. On June 11, Ukrainian drones attacked the Russian ship “Priazovye” 300 km from Sevastopol, demonstrating impressive range.

MAGURA became the first unmanned vehicle in the world to completely destroy an enemy ship. It demonstrated high efficiency, hitting and destroying the largest number of enemy vessels. Picture of USV “MAGURA”, picture 2.

- **Confirmed Targets:**
- Damaged the reconnaissance ship “Ivan Khurs” on May 24, 2023.
- Damaged the patrol ship “Sergey Kotov” twice in 2023.
- Sunk the landing craft “D-144 Serna” on November 11, 2023.
- Sunk the large landing ship “Cesar Kunikov” on February 14, 2024
- Reconnaissance ship “Ivan Khurs” – damaged on May 24, 2023.
- Patrol ship “Sergey Kotov” – damaged twice - July 24 and September 13, 2023.
- Landing craft “D-144 Serna” – sunk on November 11, 2023, along with a BTR-82 on board.
- Landing craft “D-295 Akula” – sunk on November 11, 2023.
- Missile boat “Ivanovets” – sunk on February 1, 2024.

- Large landing ship “Cesar Kunikov” – sunk on February 14, 2024.
- Patrol ship “Sergey Kotov” – sunk on March 5, 2024, along with a Ka-29 helicopter.
- Two high-speed special-purpose boats “RIF-75” – destroyed on May 6, 2024.
- Large-scale attack on KS-701 “Tunets” boats on May 30, 2024 – three damaged, one destroyed.

According to unofficial data, the total damage to the Russian fleet from MAGURA attacks exceeds 500 million dollars.

Picture 2: USV “MAGURA”

“MAMAY”

During the attacks on the landing ship “Olenegorsky Miner” and the tanker “Sig”, the SBU used the maritime drone “Mamay”. Both attacks, which caused significant damage, took place far from Ukrainian-controlled territory. These unmanned surface vessels, significantly larger than other canoe-like models, first appeared in September 2022. Despite their larger size, they remain compact, allowing for more fuel and increased range. 1

The drone’s design includes a flat hull, providing a maximum speed of up to 60 knots (110 km/h). It is equipped with one or two satellite communication antennas and an electro-optical camera. The warhead is activated by any of the three impact sensors located on the bow, which have proven their reliability.

Picture of USV “Mamay”, picture 3.

- **Design and features:**
- Flat hull for maximum speed up to 60 knots (110 km/h).
- Equipped with one or two satellite communication antennas and an electro-optical camera.
- Warhead activated by any of the three impact sensors on the bow.

Picture 3: USV “Mamay”

“SEA BABY”

The SBU also has the unmanned naval vehicle “Sea Baby” in its arsenal. It is known that on July 17, 2023, at 03:04 and 03:20 local time, two Sea Baby drones attacked the Crimean Bridge, damaging a support and a span of the bridge. Additionally, on September 14, 2023, the same drone likely hit the small missile ship “Samum”, as later video showed the ship being towed with a noticeable list. In October 2023, the Sea Baby damaged the project 22160 patrol ship “Pavel Derzhavin”, the tugboat “Professor Nikolai Muru”, and in December, the mine countermeasure vessel “Vladimir Kozytsky”. Picture of USV “Sea Baby”, picture 4.

- **Characteristics of Sea Baby:**
- Length: 6 meters
- Width: 2 meters
- Height above waterline: 0.6 meters
- Speed: 49 knots max
- Range: 540 nautical miles (1,000 km) with additional fuel tanks
- Combat load: 850 kg
- Propulsion: 2 internal combustion engines with 200 hp each, driving two water jets
  Communication: Satellite communication

Picture 4: USV “Sea Baby”

“TOLOKA TLK-150”

The underwater drone “Toloka” is smaller in size compared to surface kamikaze boats. The only parts above the water surface are the antenna and cameras, making detection by radar and visual means more of a theoretical discussion. Its warhead strikes below the waterline, likely causing significant damage. Picture of USV “Toloka”, picture 5.

Characteristics of Toloka:

TLK-150:

- Length: 2.5 meters
- Range: up to 100 km
- Propulsion: Electric motor
- Warhead or payload capacity: 20-50 kg
- TLK 400:
- Length: 4-6 meters
- Range: up to 1200 km
- Warhead or combat load: up to 500 kg
- TLK 1000:
- Length: 4-12 meters
- Range: up to 2000 km
- Warhead or combat load: up to 5000 kg

However, there is currently no information about its participation in combat.

Picture 5: USV “Toloka”

“MARICHKA”

The underwater vehicle “Marichka” is a new development by the Ukrainian company AMMO. This autonomous underwater vehicle has a hull length of 6 meters and a diameter of 1 meter, with an operational range of 1000 km.

On August 24, 2023, the successful testing of “Marichka” was announced. This underwater drone is capable of targeting landing ships, boats, submarines, missile carriers, coastal fortifications, and bridge supports. If necessary, it can also carry military or civilian cargo and conduct reconnaissance missions [2]. Picture of USV “Marichka”, picture 6. There is currently no information about its participation in combat operations.

Picture 6: USV “Marichka”

“ODUVANCHIK” / “DANDELION” (Russian Federation)

The Kingisepp Machine-Building Plant (KMZ) in St. Petersburg, known for producing boats for Russian security forces and naval drones, has introduced a new strike drone called the BBKN “Oduvanchik”. The full name of this drone is “high-speed unmanned boat-carrier”. The Russian Ministry of Defense ordered ten units for testing. According to Russian media, these tests are expected to take place directly in the combat zone against Ukraine.

The design of the “Oduvanchik” differs from the previous BBM RK-700 “Visir” model that KMZ previously offered on the market. According to available information, the drone can reach speeds of up to 80 km/h and has a range of up to 200 km. Its payload capacity is 600 kg, likely including a warhead in the bow section. These characteristics are similar to those published for the RK-700 “Visir”.

Ukrainian intelligence previously reported that Russian designers studied the wreckage of Ukrainian kamikaze drones that attacked the Black Sea Fleet. This suggests that the “Oduvanchik” incorporates developments from Ukrainian engineers. Photos show signs of reverse engineering, and the external appearance of the “Oduvanchik” resembles Ukrainian drones.

It is still being determined how the drone will be controlled without satellite communication, as the corresponding antennas are absent on board. An inertial navigation system with GPS signal correction, similar to that used in Shahed-136 drones, will likely be used, or the use of communication relay drones is possible. Picture of USV “Oduvanchik”, picture 7.

Theoretical Analysis and Prospects

Ukrainian naval drones have demonstrated high effectiveness in real combat conditions, highlighting the importance of innovative technologies in modern warfare. Differences in the effectiveness of various models can be attributed to technical characteristics, tactical application, and operational conditions. It is worth noting that at the beginning of the use of naval drones in the Black Sea, there were no methodological documents or training centers for the operators of these devices. Ukrainian units such as the Defence Intelligence of Ukraine (HUR), the Security Service of Ukraine (SBU), and the Armed Forces of Ukraine (AFU) developed the necessary experience and knowledge from scratch. This included the development of tactical approaches and the operational training of personnel in real combat conditions.

Thanks to the independent development of methods and strategies for their use, the Ukrainian military created a unique tactical system for using naval drones, which proved highly effective. The absence of previous instructions and training programs did not hinder them but rather stimulated Ukrainian specialists to find innovative solutions and respond quickly to challenges during the conflict.

This experience has significantly contributed to the development of modern military technologies and changed perceptions about the capabilities of unmanned maritime vehicles in contemporary conflicts. It demonstrates that even in the absence of preparatory infrastructure, determination, ingenuity, and a willingness to learn can ensure significant military success.

It should be noted that Ukraine had no previous methodological recommendations or training centers for the use of naval drones. Ukrainian units accumulated experience in using these innovative technologies independently. Against this backdrop, the Main Intelligence Directorate of Ukraine took the lead in developing and implementing tactics for using naval drones in combat conditions. The team appears to have resolved communication issues, as evidenced by video recordings from these drones that accurately hit enemy ships. It is also likely that one of the methods of controlling and correcting naval drones was through the cameras that captured these strikes. Since these videos were later published in the media, we can conclude that the video stream

from them was consistently transmitted to the maritime drone control center, indicating reliable communication between the device and the pilot [7].

Ukrainian military forces demonstrated high operational flexibility and adaptability and created an effective system for using drones in the Black Sea region. The lack of methodological documents and training centers forced Ukrainian operators to independently develop and systematize drone usage tactics, leading to significant success in countering the Russian fleet.

These naval drones have posed a serious threat to the Russian Black Sea Fleet, forcing the adversary to revise its strategies and relocate military ships to reduce the risks of their destruction. Using naval drones has significantly enhanced the effectiveness of Ukrainian armed forces in the maritime zone, creating new challenges for the Russian fleet and shifting the balance of power in the region [4].

The Russian Federation employs various strategies to counter naval drones, using both traditional and modern methods. One of the primary methods is aviation. Military aircraft and helicopters detect and destroy naval drones in the early stages of their approach to targets. Aviation provides a quick response and significant firepower, reducing risks to the fleet. Additionally, the Russian side has published videos of naval drones being hit by FPV drones.

Another method is the use of firearms. Russian warships are equipped with machine guns and automatic weapons used to destroy drones at close range. This approach is less technologically complex but requires high accuracy and coordination from the ship crews.

Furthermore, Russia employs electronic warfare (EW) systems to jam the control signals of naval drones. This likely reduces the drones' effectiveness, making them uncontrollable or causing them to lose contact with the control center. Using EW is an effective countermeasure, as it reduces the risk of physical damage to its own forces and assets. It is worth noting that there have been photos of what appear to be Ukrainian drones washed ashore, likely due to loss of contact with the control center. However, it seems that Ukrainian units have resolved this issue, as evidenced by the increasing number of successful strikes on enemy targets by naval drones.

Additionally, Russia is developing and implementing special water barriers, such as nets and barriers, to complicate or prevent drones from reaching their targets. These measures are aimed at protecting strategically important objects such as ports, military bases, and anchored ships.

The application of various methods by the Russian Federation to counter naval drones demonstrates the complexity and multifaceted nature of this task. Using aviation, firearms, electronic warfare systems, and water barriers indicates a strategy to defend against modern threats.

However, despite these measures, Ukrainian naval drones continue to demonstrate high effectiveness in real combat conditions. This suggests that innovative technologies and tactical flexibility can surpass traditional countermeasures, and defense against naval drones requires a more modern and technological approach, which no Russian warship currently has, as this threat was neither considered nor predicted during their design. [9]

The drones being developed by the Russian Federation are not yet widely used and have numerous problems with their tactical application. At present, it is difficult to speak about their real capabilities, and it is unknown whether the Russians will use them in this conflict. According to publicly known plans, Russian drones were supposed to become "hunters" of Ukrainian ones, but given the high maneuverability and small dimensions of Ukrainian drones, this seems a rather difficult task. However, Ukrainians should not dismiss this threat, as, for example, at the beginning of the war, the Russian Federation had an advantage in communication systems, evidenced by videos from other types of aerial drones deep in the Ukrainian rear. However, such solutions at sea have numerous differences.

Comparing to International Counterparts

Most leading countries worldwide are actively developing maritime unmanned systems, but their effectiveness still needs to be discovered as they have yet to participate in combat operations. However, Ukraine's experience can be valuable for developers and strategists in other countries, as it demonstrates how these technologies can change the course of military conflicts.

Impact on Future Military Strategies

The successes of Ukrainian naval drones may change perceptions of fleet use as a classic strategy. The use of autonomous systems reduces risks to personnel and increases the efficiency of military operations. Moreover, these technologies can be crucial for unblocking maritime trade routes and ensuring security in conflict regions.

In the modern world, naval strike drones represent significant potential for military operations and ensure security in the maritime environment. Even though most known drones operate on autopilot, future applications of naval strike drones may include greater autonomy and the ability to make real-time decisions.

The ability to make autonomous decisions will allow drones to effectively respond to changes in military operation tactics and adapt to them. This can be especially useful in the maritime environment, where situations can quickly change due to weather conditions and enemy actions [9].

Of course, it is important to consider the safety and management of drones in dangerous areas. Transitioning control from autopilot to pilot can be crucial for ensuring the safety and effectiveness of military operations.

Additionally, the development of artificial intelligence technologies can expand the capabilities of naval strike drones, enabling them to learn from their own mistakes and improve their effectiveness in military missions. In conclusion, future possibilities for using naval strike drones in the maritime sphere present great potential for ensuring security and conducting military operations. The development of technology and techniques and improving methods for managing these drones can solve many of the problems faced by military commanders and drone operators today, providing a more efficient and safer approach to using naval strike drones.

Conclusions

Naval strike drones have proven to be an important tool in the Russia-Ukraine war, demonstrating their high effectiveness in destroying enemy vessels and influencing warfare strategies. The MAGURA V5 drone stands out, particularly with its advanced technical characteristics and successful tactical implementation, confirming its high effectiveness. Ukrainian units have developed a highly successful drone tactic, making MAGURA V5 the most effective maritime drone in its class. Moreover, this drone became the world's first remotely controlled unmanned vehicle to not just damage but completely destroy a combat ship in real combat conditions, making its operational experience especially valuable for future strategies for using unmanned maritime systems.

Thus, the experience gained by Ukraine has not only changed the nature of hostilities in the Black Sea but also made a significant contribution to military science, opening new perspectives for developing and improving unmanned maritime technologies. Further analysis of these operations will help improve the technical characteristics of drones and their application methods in future conflicts, increasing Ukraine's overall military potential and ability to counter aggression at sea effectively.

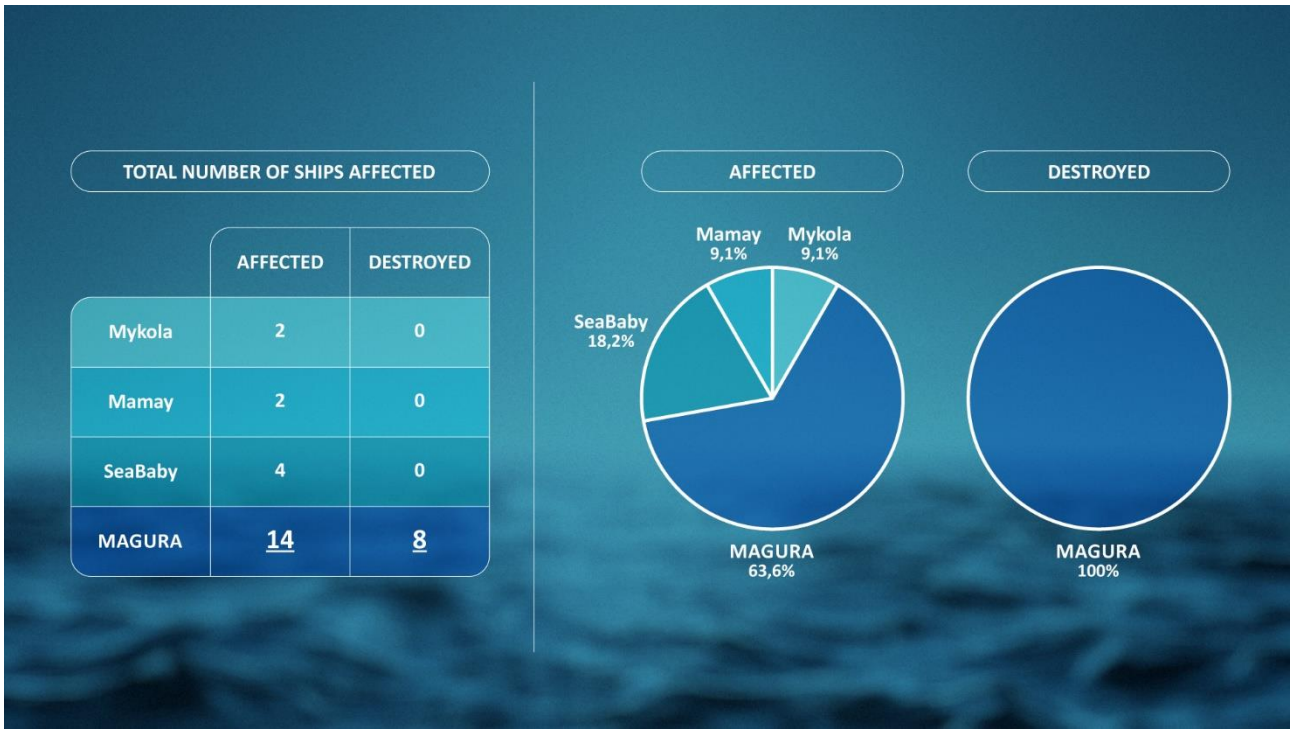
The experience gained during this conflict will contribute to the further improvement of both offensive and defensive systems, impacting future naval warfare strategies.

Performance Rating of Naval Drones

Based on the collected data, we have compiled a performance rating of naval drones in the Russia-Ukraine war:

1. MAGURA V5: hit 14 ships, 8 of which were destroyed.
2. SEA BABY: hit 4 ships.
3. Mykola: hit 2 ships.
4. Mamay: hit 2 ships.

For clarity, we will present the data in the form of a chart that shows the number of ships hit and destroyed by each type of drone, picture 7.



	AFFECTED	DESTROYED
Mykola	2	0
Mamay	2	0
SeaBaby	4	0
MAGURA	14	8

Picture 7: A chart shows the number of ships hit and destroyed by each type of drone

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