Expendable Unmanned Marine Vehicle

ULAQ

KAMA

SARF EDİLEBİLİR İNSANSIZ DENİZ ARACI

ULAQ KAMA'NIN DENİZ HAREKATINDA KULLANIM DÜŞÜNCELERİ

Hasan Özyurt
(E) Tümamiral Hasan Özyurt,
Meteksan Savunma Sanayii A.Ş. Yönetim Danışmanı

METEKSAN SAVUNMA | ARES SHIPYARD

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“ULAQ KAMA Expendable Unmanned Marine Vehicle”, Meteksan Defense Industries A.ÿ. Developed in partnership with ARES Shipyard, it is a high-speed, long-range, agile and low-silhouette platform with autonomous, semi-autonomous or remote-controlled operation, equipped with an explosive charge that can be detonated upon interception or operator control.

Gövde Yapısı	: Gelişmiş Kompozit
Uzunluk	: 6m
Genişlik	: 1.54m
Su Çekimi	: 0.35m
Azami Hız	: 50+ knots
Menzil	: 200+ NM
İtki Sistemi	: Benzinli Motor & Sujeti
Faydalı Yük	: 200+ kg

Figure 1 UGLY KAMA and Technical specifications

Examining the potential for use of a platform, or more accurately a weapon, such as ULAQ KAMA, in naval operations from the perspective of a defense planner and operational planner can also enable understanding of the possible approaches of people at these levels to a new weapon system. You will find a simplified animation of this later in the article. However, before going into more detail about ULAQ KAMA, it may be useful to take a brief look at the technological trends, defense planning and operational planning approaches related to our subject.

Technological Trends:

The development of technology continues from tools, mechanisms and machines that increase people's muscle strength to automation-based systems that improve human perception, understanding and decision-making abilities. (Figure-2) . Automation, which we can define as the ability of machines to perform certain tasks without the need for human control, is today applied in many military and civilian areas.

Figure-2 Historical Development Trend of Technology

Solutions for security needs also benefit from the applications of technology that improve human perception, understanding and decision-making abilities. However, today, technological innovations rapidly reach application maturity in other fields before the military field, and are later or simultaneously adapted to the military field. In other words, the role of military needs in driving technological development is decreasing. One of the areas where this situation is best observed is the development of Unmanned Systems.

With technological development, Unmanned Systems that can perform more complex tasks and have automation capabilities supported by artificial intelligence began to appear on the scene. The technological maturity reached and expected in unmanned systems makes it inevitable for the military applications of these systems to become widespread. Another factor supporting this proliferation trend is that critical technologies, which until recently were the monopoly of their manufacturers, have now become available or accessible to many state and non-state actors. Thus, these types of technologies find wide military and civilian applications and create a large and untouched market (resource) that supports their further development.

Defense Planning Concept:

Defense planning processes are systematic approaches used by governments and military organizations to determine and implement issues related to national defense, such as strategies, policies, allocation of resources and development of capabilities. It would be sufficient to define a highly technical area defense planning process - in the context of this article - as "the creation, maintenance and modernization of the force to meet security needs". In the process of meeting security needs; Current and expected future threats and risks, Current and future status of the existing force, Concepts and doctrines of using force,

- Characteristics of the vital, impact and area of interest geography where military forces are likely to be used, Resource availability and
- resource use priorities, Expected developments in technology and
- their military applications,
- New/additional talent needs are determined by analyzing the lessons learned from the activities carried out.

Although these parameters are expressed as a list, there is a cyclical cause-effect relationship between them rather than a hierarchical relationship.

Operational Planning Concept:

Defense planning and operational planning are actually interconnected and complementary processes. Both parties work in close cooperation to ensure the effective use of resources towards the achievement of national security objectives. Operational planning in summary; It focuses on using existing opportunities and capabilities in a manner and effectively that will create the desired kinetic effects on the targets in order to achieve strategic security objectives.

Although the general principles of the operational planning approach remain the same, the objectives and the manner of using force are expressed in a way specific to the operational environment (Land, Air, Sea). For example, in naval operations; A strategic goal is usually set to destroy or weaken the enemy's military and economic power at sea. Naval operational planners focus on creating influence on the centers of gravity that will enable this strategic goal to be achieved. In this context, marine elements;

- To establish naval superiority,
- To ensure sea control,
- Controlling maritime transportation routes,
- to transfer power,
- It performs duties such as ensuring maritime security.

In the performance of these tasks, the modes of action that generally include the following options are put forward and implemented through the operation planning process.

- To maintain uninterrupted and detailed situational awareness within the operational area and to ensure the freedom of movement of its forces and to restrict the opponent's/potential enemy's freedom of movement (counter mobility),
- To carry out the mission by minimizing the survival risks, • To influence the enemy by staying out of the enemy's sensor and weapon range,

• Advantage of maneuver agility and firepower over the enemy

- Creating a surprise effect by using
- To benefit from the advantages provided by geography to the maximum extent, to implement operational options that will reduce the disadvantages, to ensure the security and survival of the elements in the bases and ports, and to continue to use these regions in the development of the operation.

Use of ULAQ KAMA in Naval Operations:

After this brief conceptual summary, let's return to the use of ULAQ KAMA in naval operations. We will proceed within the framework of an evaluation process that is likely to occur between two senior Defense Planning and Operations Planning officers working at a strategic naval headquarters: Let's assume that you are a Naval Operations Planner and your colleague
responsible for Defense Planning tells you; • It can be produced easily and cheaply in a short time, • It has a cruising range
of 200+ NM and a high speed of 50+ knots,

• The possibility of counter-detection is very difficult due to its small radar cross-section and extremely low infrared signature,
• Able to navigate safely in narrow waters, inside ports, in the open sea, even in GNSS jamming environment, in remote control or artificial intelligence supported autonomous/ semi-autonomous modes,
• It can also contribute to reconnaissance and surveillance activities with its sensor payloads,

• Able to precisely detonate the 200 kg explosive charge it carries when it hits its target, creating a wound close to the waterline of the target,

• Able to attack the target both independently and as a swarm with partner boats/other IDAs,
• Able to predict the target's evasive maneuvers and develop tactics against the maneuvers,

• Able to take evasive maneuvers against defensive fire that the target may open, • Can be launched
into the sea from a coastal area or from a boat as small as a tugboat,

• Able to wait in an area at sea at low speed without being noticed when necessary by taking advantage of the low probability of detection, and can apply the most appropriate attack maneuver alone or in coordination with other boats when making contact with the target,
• Able to infiltrate the areas where the target elements hide/wait without being detected, distinguish between the targets it detects there and attack the targets it chooses/selected,

• Able to neutralize himself safely by returning to a designated area when he cannot find a target or when necessary, • Performs waiting, target selection,
attack and re-attack activities; He posed a question about whether you can use an Unmanned Marine Vehicle (WAV) in naval operations, which can operate in autonomous, semi-autonomous or remote control modes, and can be controlled by operators in all of these modes (human in the loop or human on the loop).

Since you follow recent technological developments and practices in the war between Ukraine and Russia, you knew that such a question would be asked to you sooner or later. The idea of manned or unmanned boats carrying out suicide attacks to neutralize warships or high-value targets is not actually very new and original. You also have a detailed knowledge of asymmetric usage examples of manned or unmanned marine vehicles. Some examples immediately come to mind:

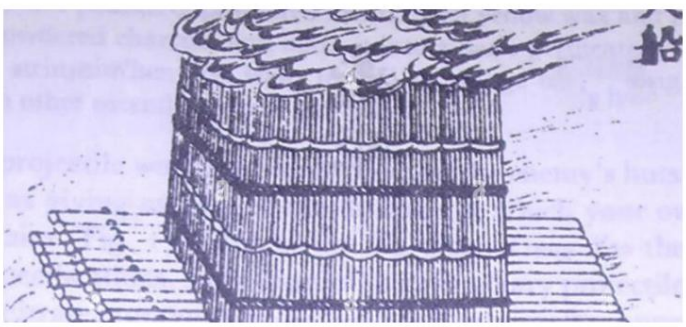


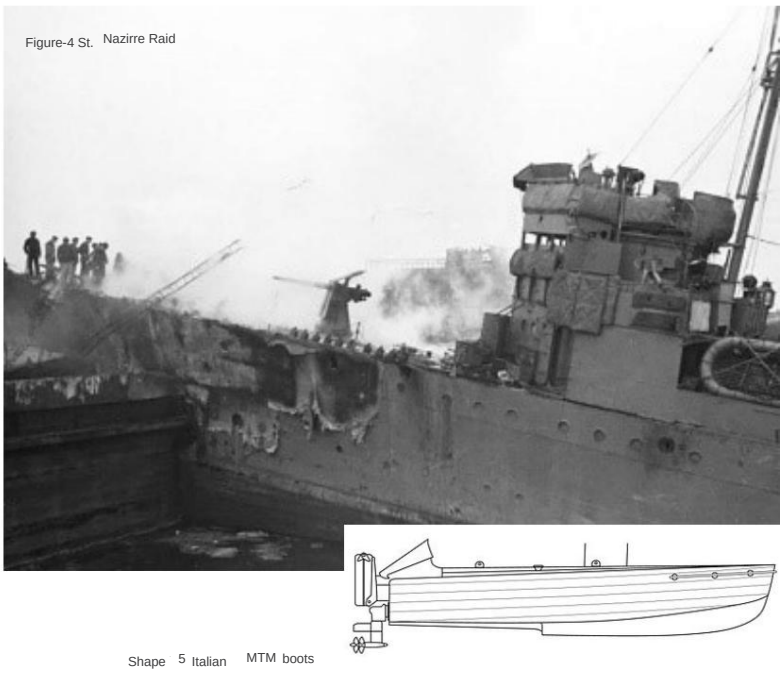
Figure-3 China Fire Ships

• In the time of wooden ships, fire ships were set on fire and sent to the enemy to create panic on the enemy or to disrupt the enemy's order: Generally, old, out-of-ammunition or cheap ships built for this purpose were used for this purpose. The known use of stock ships dates back to the "Red Rocks" war in Ancient China in 208 AD (Figure-3). The most effective recorded use is in the Battle of Gravelines (1588) by the English Navy, which was at a disadvantage in terms of relative strength compared to the Spanish Navy. In this battle, fire ships cause the Spanish navy to disperse and lose the battle.

• II. Examples from World War II are also
interesting: The British sent the destroyer HMS CAMPBELTOWN loaded with explosives to a dry dock in Saint-Nazirre, France, destroying the only dock on the French coast where German ships could be maintained.
Italians attack anchored ships by loading their speedboats called MTM (Motoscafo da Turismo Modificato-Modified Travel Boat-Figure-5) with explosives. These boats, loaded with 300 kg of explosives on their bows and capable of a speed of 33 knots, caused heavy damage to HMS YORK and the Norwegian Tanker Pericles in Suda Bay (HMS YORK was sunk by its own personnel, while Pericles was sunk as a result of the attack).

The Japanese damaged more than 10 US ships in the Philippines and Japan Seas with the boats they used for suicide attacks and called Shinyo (Sea Quake) (Figure-6).

Figure-4 St. Nazirre Raid



Shape 5 Italian MTM boots

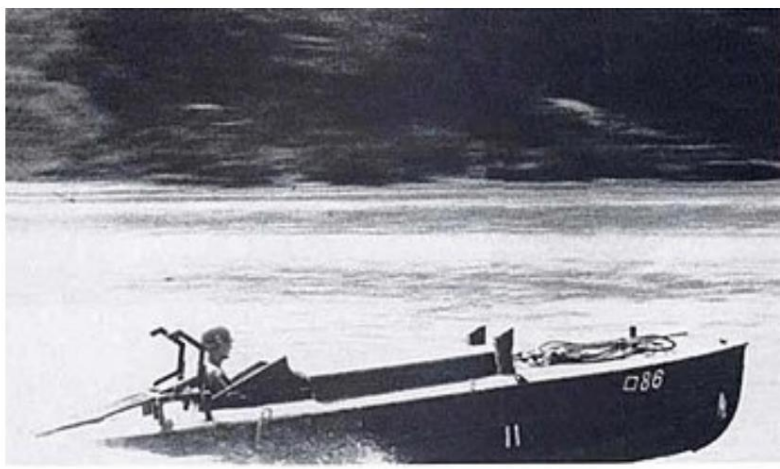
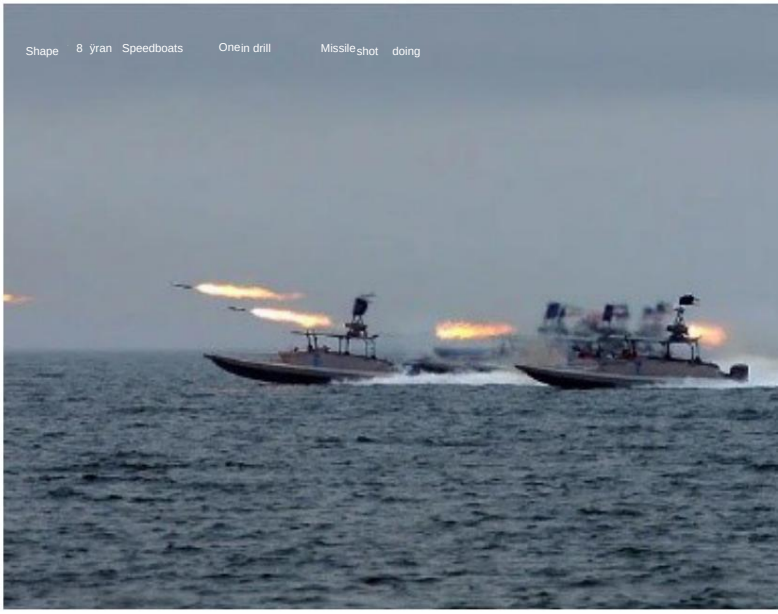


Figure-6 Shinyo Class Japan Suicide A shoe

Even though they are not loaded with explosives and are used by people, Iranian Speed Boats (Figure-7 and Figure-8) are worth taking into consideration with their high speed of 55 knots, maneuverability, difficulty in detection and swarm tactics.

Shape 7 ÿran Speed Boats



Shape 8 ÿran Speedboats Onein drill Missileshot doing

You know that these examples are no longer asymmetrical in the face of the advanced defensive capabilities of today's warships. However, in the ongoing war between Ukraine and Russia, Ukraine is successfully using Unmanned Marine Vehicles (Figures 9, 10 and 11), which it built in small workshops with very simple facilities: •

Admiral Makarov Frigate and a minelayer in Sevastopol port on October 29, 2022, • On 24 May 2023, the Ivan Khurs intelligence ship, approximately 150 NM off the Bosphorus, • On 11 June 2023, the Russian Intelligence ship Priazovye, 185 NM southeast of the Ukrainian coast, • On 19 July 2023, the Kerch Bridge, ,

• On August 4, 2023, the Olenogorsky Gornyak tank landing ship and the fuel tanker Sig, known as the Russian State Ship, became the targets of Ukrainian Kamikaze IDAs.

When you examined these events as an expert, you came to the conclusion that an old idea that had lost its asymmetrical feature had become asymmetrical again thanks to technology.

Shape 9 Ukrainian Kamikaze Unmanned Marine Vehicles

Shape 11 Ukraine Kamikaze Watercraft For Transfer

Shape 10 Ukrainian Kamikaze Unmanned Marine Vehicle on Trial Course17

Shape of Ukraine Kerch 12 in Bosphorus Bridge Attack

2nd one used Generation Kamikaze Unmanned Marine Vehicle

Aware that the first victims of the war are the truth, you approach the statements made by Ukraine and Russia regarding these attacks with caution. However, a Ukrainian personnel who led these attacks said in an interview, "It will take 10 years or more for the Russians to develop a measure against this type of weapons, because they are trying to counter a 21st century weapon with 20th century equipment, we have 100 years between us and them."15 You see how compatible his statement is with your views. A Russian Security Expert's Ukrainian Unmanned Surface

Referring to their vehicles; His comment that "we now need to understand that the enemy has a long arm and can reach very far with it"15 also confirms this effect. First and naturally such a

You are reviewing the defensive measures that can be taken against the threat. In your list that you created with your professional experience; There are measures such as increasing air and sea patrols in the approach waters of the bases, placing buoys and/or net-like obstacles at the port entrances and around the ships, implementing 24-hour lookout measures on ships in transit, and keeping the personnel responsible for defense against asymmetric threats in a high state of readiness. You think that the Russian Navy has also taken similar measures. On the other hand, you are aware that these measures will have a cost, that you will have to allocate some resources, especially for port defense, and that maintaining a high state of readiness for a long time will be stressful and tiring for the personnel. You note the fact that a very cheaply produced weapon requires such costly defensive measures as an asymmetric effect.

Information about the mine barriers installed by Ukraine off the coast of Odessa just before the war started, preventing a possible Russian landing operation, the sinking of the cruiser Moscow with a guided missile attack by Ukraine, information about Ukraine's successive (successful or unsuccessful) Unmanned Marine Vehicle attacks. When you combine these data, you can interpret the news about the decrease in the activities of the Russian Navy in the Black Sea more meaningfully from the perspective of an expert.

The operative impact of the Ukrainian Navy, which is almost insignificant in size compared to Russia's Black Sea Fleet and whose combat elements were neutralized in their ports at the very beginning of the war, is remarkable. “A decisive naval victory may not have been won, but still the Russian Black Sea Fleet cannot freely use the Black Sea Theater of Operations, prolonging the war in favor of Ukraine,” you conclude. Moreover, you cannot miss the fact that Ukraine's kamikaze IDA attacks in the Black Sea have created a paradigm shift in that the asymmetric threat generally expected in coastal areas and narrow waters can also manifest itself in the high seas.

You realize that the features of the bot your Defense Planner colleague told you about are quite advanced. Behind these features and capabilities, there must be meticulous and competent engineering and strong artificial intelligence support. When you consult your colleague for more information, you learn that the boat in question is the “ULAQ KAMA” developed in partnership with Meteksan-ARES Shipyard. With ULAQ KAMA, you understand that conceptual ideas in the field of "Armed Unmanned Marine Vehicle (SIDA)" have reached the technological realization stage and the resulting product has much more advanced features than the Unmanned Marine Vehicles used by Ukraine. A weapon system you have never used before…
However, you can already foresee that the mentioned capabilities and the artificial intelligence behind them will provide you with many options and flexibility in naval operations.

First you compare it with a mine weapon. You can use naval mines, which are cheap and easily procured weapons, for purposes such as restricting or delaying the enemy's movements in the event of a war, directing them to a certain area, or keeping the enemy out of a certain area. But you see that the mine obstacles, their ability to be installed in a narrow area, their stability, the possibility of restricting your movements after they are spilled, the firing mechanisms, and the limitation of their target discrimination abilities, no matter how advanced they are, are the important differences between ULAQ KAMA. from sea mines with ULAQ KAMA

You evaluate that some of the expected operative effects can be created in larger areas and in a more flexible way, which can complement the effects expected from mine warfare.

Today, submarines, which are still effective and make a potential opponent think deeply, perform a similar task. They go to outpost areas and engage their targets with their deadly torpedoes from the start of hostilities. They restrict the enemy's movements on the open sea and thus play a very important role in preventing access to the area. Yes, but their deployment to the operational area takes time, and their obligation to maintain their secrecy always poses a dilemma in terms of survival and effectiveness. The enemy may also choose a course of action that will leave your submarines untargeted, and may restrict your submarines from using their weapons by applying intense anti-submarine warfare pressure in areas where your submarines are likely to be located.

Perhaps you think that with ULAQ KAMA, a style that will reduce the pressure on friendly submarines by creating a surface threat that the opponent will have to take into account can be implemented and thus contribute to the general operation.

ULAQ KAMA is similar in many ways to torpedo assault boats that are not currently in the inventory. You may remember that torpedo gunboats, of which the German Jaguar Classes (Figure-13) are one example, can approach surface targets undetected to a range that can make a deadly "heavy torpedo" attack, thanks to their low radar cross-section, high speed and maneuverability. In addition, the torpedo boats' tactics of attacking their targets with groups of several ships resemble the swarm attack ability of ULAQ KAMAs. But ULAQ KAMA, much higher

Shape 13 Jaguar Class Torpedo Bot

It has speed, maneuverability, a much lower silhouette and most importantly, it does not have personnel that you would need to take risks on.
Other considerations emerge in your comparison with guided missiles. Guided missiles are very fast, long-range, fire-and-forget weapons with a high hit probability. But in addition to being expensive, their numbers in your inventory are usually limited, so you need to spend your guided bullets carefully. You must make maximum use of their beyond-the-horizon range to avoid the possibility of the firing platform being detected by the enemy and counter-attacking.
On the other hand, surface ships have sensor, decoy and weapon systems to detect and defend against guided missiles, and they apply very effective tactics in this field. In other words, guided missiles have no longer been asymmetrical for surface ships. In addition, you need to attack a ship that has the ability to defend itself against guided missiles with salvos consisting of 3 or 4 guided missiles in order to saturate its defense system.

Target information is extremely important for accuracy of engagement and target discrimination.

important. You may also need to take some risks to determine the target correctly. In short, guided missile engagement is a complex process that does not consist of pressing a button.

You are reconsidering the features of ULAQ KAMA to understand how it can be compatible with your main weapon, over-the-horizon guided missiles, and whether they can complement each other. First of all, you see that the small dimensions of the ULAQ KAMA (surface height 60 cm), combined with its high speed and maneuverability, create an asymmetry in its favor for the existing sensor and weapon systems of surface ships. You remember from your past experiences that torpedo assault boats can be detected neither by radar nor by eye up to a distance of 5000-6000 yd (4500 - 5500 meters), and after detection, the target has an extremely short time to defend itself and their attacks are usually successful.

A torpedo assault boat, which is an advanced version of the German Zobel Class and serves as the Kartal Class in the Turkish Navy, approached within 50 yards of an Arleigh Burke Class destroyer with highly advanced sensor and weapon systems in an exercise and was not noticed by the destroyer until the boat turned on its searchlights. An old incident comes to your mind. ULAQ KAMA has much smaller dimensions than the EAGLE Class assault boats. Based on your experience, you predict that the detection distance by a surface ship cannot be more than 4000 yd (3600 meters) even under the best conditions. You calculate that ULAQ KAMA will reach its destination by covering this distance in 4 minutes or less, thanks to its high speed. The target has a very short time to defend himself. An adversary who knows that you have a weapon like the ULAQ KAMA will either not go to sea or will compromise his own privacy by implementing measures such as activating active sensors to eliminate detection asymmetry. There are no people on ULAQ KAMA. In other words, you will be able to conduct surface operations in enemy-controlled areas without risking the firing platform and your personnel.

You estimate that ULAQ KAMA can be used independently, but using it in a swarm of 3-4 boats against some targets will increase the probability of success. This feature is similar to attacking targets with high self-defense capabilities with salvos of 3-4 guided bullets. Guided projectiles are your primary weapon, but the salvo sizes required for a successful engagement can quickly deplete your inventory.

ULAQ KAMA can be a solution for you to use guided bullets more economically, thanks to its low cost and the ability to produce large quantities in a short time. A tactical thought comes to your mind that the enemy can defend by using close air systems in surface mode in a ULAQ KAMA attack, and the ammunition loaded on these weapons may decrease, and the chance of success of your guided projectile engagements will increase during the time required for reloading.

One of the most important difficulties in engagements with guided missiles is target discrimination. Target discrimination for guided missiles, which generally find their target with a seeker head (radar and/or infrared (IR) seeker), is made during the engagement planning phase. If there is another contact around your target that you have not detected before, the guided bullet seeker head does not have the ability to distinguish it. ULAQ KAMA, on the other hand, can distinguish targets with an advanced sensor system, artificial intelligence (autonomy) or operator support. You note this as an important feature to prevent environmental damage and mutual interference. Guided missile

Engaging with targets patched on land to protect against their attacks is another challenge. You think that you can benefit from ULAQ KAMA's target discrimination features in this type of engagements.

You can easily foresee that the fact that ULAQ KAMA is very difficult to detect with radar or even electroptic systems, especially at night and in limited visibility conditions, will create a surprise effect on the enemy, especially in geographies such as coastal waters where distances are shorter than the open seas. Thanks to the fact that ULAQ KAMA can be used against an enemy who takes advantage of the coastal waters geography, if sufficient intelligence is provided, you can attack hostile surface elements hiding in places such as bays, harbors or shelters where guided missiles cannot be effective, with minimum risk, and the enemy who knows that you have such an ability will be able to attack enemy surface elements hiding in places such as bays, harbors or shelters where guided missiles cannot be effective. You think that he will not be able to use such positions as easily as he used to.

ULAQ KAMA also has the ability to precisely report the location of a detected target. This feature makes it a reconnaissance and surveillance platform and a "target report element" in addition to being a weapon, allowing it to be used with guided missiles.

The answer to the question posed to you by your Defense Planner colleague is beginning to emerge. You see that the advanced capabilities of ULAQ KAMA have the potential to be used together and in coordination with other warfare vehicles in naval operations and can provide you with operative and tactical options.
Based on the basic doctrine that the most important goal of the naval operation is to achieve naval superiority and subsequently to use your naval forces unrestricted by ensuring sea control and to prevent the enemy from doing this, ULAQ KAMA can be used to ensure sea control along with other capabilities you have, as in the case of Ukraine. You consider that you can limit the freedom of the enemy's naval elements to use their operational area even in situations where they are disadvantageous in terms of relative force comparison. For this purpose, to keep ULAQ KAMAs in the regions you have determined in the operation area, to direct them to the targets you have determined by using intelligence, reconnaissance and surveillance information, to control the nodes that provide access to the operational area by using ULAQ KAMAs as well as other elements / weapon systems, to the bases and ports used by the enemy. Organizing attacks in the form of raids are the first operative and tactical usage options that come to mind.

The fact that ULAQ KAMA is a small platform, that it can perform missions at long distances such as 200 NM with the support of a satellite control system and artificial intelligence, and that it can be launched from the beach or with another platform in areas where the enemy does not expect it, will increase your range of influence in the operational area and lead the enemy into some dilemmas. In addition to being an unmanned system, its features such as being able to be produced in large quantities in a short time, having a very low cost compared to a guided missile, and being able to create an asymmetric threat against the enemy, can be used together with other capabilities you have to prevent and restrict access to the operational area (Anti-Area Access Denial). You come to the conclusion that it can make A2AD) stand out as a supporting capability for its applications.

Based on the Ukrainian Unmanned Marine Vehicle attack on the Kerch Bridge on July 19, 2023, you note that ULAQ KAMA gives you the option to engage not only naval targets, but also critical facilities with access from the sea.

You are wondering about ULAQ KAMA's resistance to defensive fire that may be opened by the enemy. You are aware that it is a difficult target to hit with its small size and maneuverability, and when you examine its detailed features, additionally; Detailed design ideas such as choosing the explosive charge on it that will not explode with bullet hits, supporting the vital parts of the boat with additional ballistic protection, and preserving the stability of the boat by evacuating the water that may enter the boat as a result of hits with powerful pumps, attract your attention.

When you look at the issue in terms of war principles that guide you in operation planning and execution; The maneuver principle of ULAQ KAMA's use in naval operations, its ability to reach from one region to another within the operation area in a short time, the dominant (surprise) principle of its stealth feature, the survivability (safety) principle of its being unmanned and its very limited effect on the relative force comparison in case of loss, the enemy's You evaluate that it is compatible with the target and attack principles with the possible effects it will have on you.

In conclusion; As an operation planner, after the evaluations you have made above, your answer to your Defense Planner colleague who asks whether you can use a system with ULAQ KAMA features in the naval field of operations is shaped positively. When used together with your other facilities and capabilities and in a complementary manner, ULAQ KAMA will be an important surface warfare capability and will support you in achieving operative effects that will contribute to the strategic goal of warfare.

After evaluating the capabilities and potential of ULAQ KAMA, you, as a soldier, realize that you need to develop defensive measures against such a threat. You think that you can also benefit from a system like ULAQ KAMA to reinforce the training of your elements and improve defense tactics.

This evaluation process that we are trying to portray is, of course, a very simplified version of a real Defense and Operations Planning process. The process of taking a weapon system into inventory; It is carried out through stages such as concept studies, detailed analysis of concept-based operational needs, field trials and applications, and review of application doctrines.

Soldiers rightly approach a new capability (sensor, weapon, platform, etc.) with many reservations and skepticism. The basic principle is to use limited resources in the most effective way in decision processes. On the other hand, the lessons learned from the irreversible negative consequences caused by wrong choices, which are abundant in the history of war, also play an important role in these processes.

ULAQ KAMA will undoubtedly be subject to such difficult processes and tests. Factors that will make ULAQ KAMA advantageous during these processes; Meteksan Defense Industry Inc. and ARES Shipyard's pioneering position, which they have achieved and maintained with the initiative they have taken in unmanned marine vehicles, will be the potential that ULAQ KAMA promises with its design excellence, low cost and flexibility of use.

Source

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5. Human On The Loop (HOTL): In this type of systems, autonomy performs assigned tasks and processes without direct human intervention. However, humans continue to play critical roles such as monitoring system performance, making high-level decisions, tracking task execution, and intervening when necessary to resolve exceptional or complex situations where human judgment is needed.
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