#GIDSstatement 11 / 2024

Duncan Redford

Maritime Lessons from the Ukraine-Russia Conflict: USVs and the Applicability to the Baltic and High North

#GIDSstatement | No. 11 / 2024 | October 2024 | ISSN 2699-4372

The present article is one of several working papers resulting from a workshop conducted prior to the 2024 Kiel International Seapower Symposium on the topic 'Re-Learning War: Lessons from the Black Sea'. The workshop was co-hosted by the GIDS and the Institute for Security Policy at Kiel University (ISPK) on 20 June 2024. The topic of each paper was discussed during the workshop. All articles have been peer-reviewed and will also be published in the ISPK's 'Policy Brief' format.

GIDS GERMAN INSTITUTE FOR DEFENCE AND STRATEGIC STUDIES

The German National Library lists this publication in the German National Bibliography; detailed bibliographic information is available online at http://dnb.dnb.de

ISSN 2699-4372

This #GIDSstatement is published by the German Institute for Defence and Strategic Studies (GIDS) – DSSF (Directorate Strategic Studies and Research).

Contributions are available free of charge from the GIDS website: www.gids-hamburg.de

Proposed citation:
Duncan Redford, Maritime Lessons from the Ukraine-Russia Conflict: USVs and the Applicability to the Baltic and High North, #GIDSstatement 11/2024, GIDS: Hamburg.

GIDS
German Institute for Defence and Strategic Studies
Bundeswehr Command and Staff College
Manteuffelstraße 20 · 22587 Hamburg, Germany
Tel.: +49 (0)40 8667 6801
buero@gids-hamburg.de · www.gids-hamburg.de

Dr Duncan Redford*

Maritime Lessons from the Ukraine-Russia Conflict: USVs and the Applicability to the Baltic and High North

Introduction

One state's fight for survival is another's potential learning opportunity. The Ukraine-Russia conflict which has been ebbing and flowing across Ukraine since February 2022 is no exception. The question is: are the various states watching from the side lines learning the right lessons?

Understandably, much attention has been focused on the land aspects of the Ukraine-Russia conflict. One of the areas that has been poured over by analysts and treated as some sort of video arcade game by Youtubers and other voyeurs – often as part of information warfare operations by both sides – has been drone attacks. Analysts and other observers have been astounded both by the rapidity of development of uncrewed aircraft systems (UAS) in the conflict and the degree of improvisation of commercial off-the-shelf systems that Ukraine has achieved. The lexicon of these systems – quadcopter, first person view (FPV) and more – has entered the mainstream off the back of the considerable interest in the conflict across the world.

In the maritime domain there also have been considerable, if not always as public or frequent, learning opportunities for all interested navies. The issue of coastal defence missile systems has yet again hammered home lessons from, for example, HMS Glamorgan in the 1982 Falkland Islands Conflict. The loss of the Russian cruiser Moskva has again raised the (old) lesson regarding the mindset of combatants and mentally making the transition from peace to conflict.[1] The maritime arena has also seen the use of drones before, but this time uncrewed surface vehicles (USVs) are increasingly used in FPV kamikaze type attacks against Russian naval shipping and littoral infrastructure. Yet the Ukrainians are not the first to explore this technology – the Iranians and Houthis got there first.[2] This paper will consider Ukrainian style one-way attack (OWA) USVs and their wider utility in maritime warfare.

---

* Dr Duncan Redford is a historian at the UK's Ministry of Defence. His research areas include the defence of seaborne trade and the relationship between the sea and national identity. His views do not represent those of the Royal Navy or the UK Ministry of Defence.

1 One might think of the Royal Navy's failure in pre-World War 1 and World War 2 mobilisation to issue lifejackets to all seagoing personnel. See Redford 2014: 11.

2 Sutton 2022b; La Grone 2017.

The use of USVs in the war

Necessity is often the mother of invention and for Ukraine, following the scuttling, capture or destruction of almost all its surface ships on the outbreak of the war, this is especially true. Uncrewed surface vehicles offered the Ukrainians a cheap and expendable way to challenge Russian naval dominance of the Black Sea. In this respect the Ukrainians have been extremely successful. While all the information operations and 'wishful sinkings' reports in the media are making the picture far from straightforward, it seems that the Ukrainians had a USV capability from at least September 2022 when a Mykola USV washed up on a beach outside Sevastopol.[3] By the end of October 2022 Ukraine was using USVs (and UAVs) in coordinated attacks on the Russian Naval Base at Sevastopol.[4] The following month USVs attacked the Russian naval base at Novorossiysk.[5]

Of course, attacks on ships at sea using these FPV USVs required a different level of capability than attacks on ships in harbour and against fixed maritime infrastructure. It took until May 2023 for the Ukrainians to be able to carry out a narrowly unsuccessful attack against the Russian intelligence gathering ship *Ivan Khurs*.[6] Successful attacks followed with landing ships and corvettes being severely damaged or sunk.[7] USVs were also used to attack the Kerch Bridge on 17 July which resulted in severe damage to the roadway.[8] To the time of writing (June 2024) it appears that there have been nearly 30 USV attacks by Ukrainian units on Russian ships, both at sea and in harbour, as well as a solitary attack on the Kerch Strait bridge. Overall, the bulk of the attacks (17 out of 27) appear to have had limited success inflicting only minor damage or to have been completely unsuccessful,[9] but the attacks that were successful, especially those that sank the TARANTUL-class missile corvette *Ivanovets* and the ROPUCHA-class landing ship *Caesar Kunikov* in January and February 2024 respectively, have demonstrated the threat posed by such systems as well as providing useful video footage for the information war.

More importantly, the level of attacks by Ukrainian cruise missiles, UAS and USVs on Sevastopol have effectively made that base untenable for high value units of the Russian Black Sea Fleet, or those that have not already been sunk. From October 2023 it seems that the Russian KILO-class SSKs,[10] armed with Kalibr land-attack cruise missiles, have been moved out of Sevastopol to Novorossiysk on the eastern seaboard of the Black Sea. Furthermore, there have been apparent attempts by the Russian Navy to use disruptive or deceptive painting to confuse drone operators, which seem to have been ineffective.[11]

All this points to significant achievements, but just in the information warfare domain, where the video footage of the USV attacks has been watched many thousands of

3 Sutton 2024d; Sutton 2022c.
4 Sutton 2024d; Bachega/Gregory 2022; Navy Lookout 2022.
5 Sutton 2024d.
6 Sutton 2024d.
7 Ozberk 2024b; Ozberk 2024a; Felstead 2024.
8 Bubalo/Goksedef 2023.
9 Figures inferred from Sutton 2024d.
10 Lister et al. 2023; Dickson 2023.
11 Sutton 2023a; Sutton 2024a.

times. One clip just 70 seconds long of the attack on the corvette *Ivanovets* has been watched 45 thousand times in four months.[12] In military terms, the Ukrainian forces have achived effective sea denial. The Russians are unable to use the Black Sea for their own puposes and have been forced to withdraw vulverable ships back out of immediate danger from USVs, UAS and cruise missile attacks.

USV considerations

There are a number of issues that the Ukrainans have resolved or mitigated in order to gain the successes they have had with their USVs. The first variable to be considered is the environmental conditions. The numerous clips of footage available for the Ukraine USV attacks, whether successful or unscucessful, all have one thing in common. Day or night, the sea conditions are *very* good. If we look at the average conditions for the Black Sea, it can be seen from the data in figures 1 and 2 that the conditions which appear to be needed for an attack are far more benign than the norm.

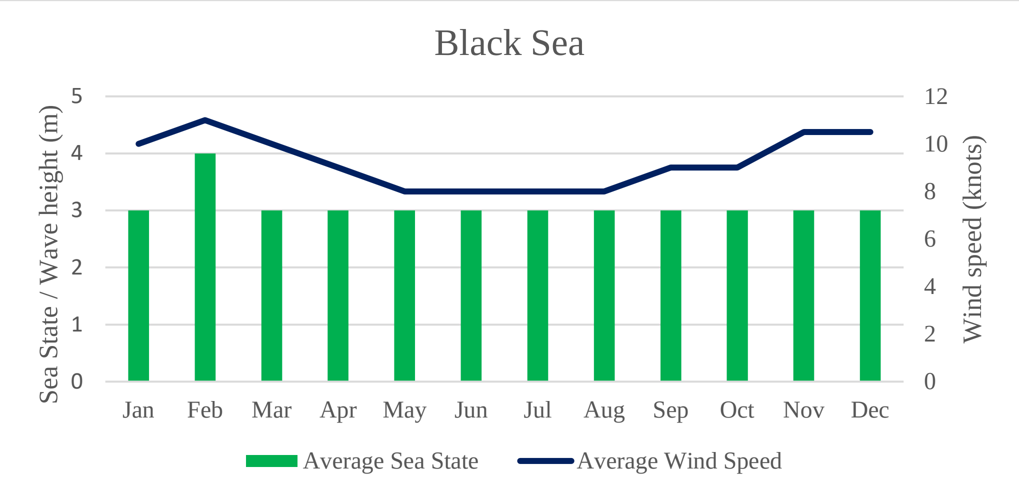

Fig 1: Black Sea average sea state and wind speed each month.[13]

Indeed, the average sea state for the Black Sea is sea state 3 all year, with the exception of February when the average sea state is sea state 4. This indicates wave heights of 0.5 m to 1.25 m, except in February when the waves are between 1.25 m and 2.5 m in height.[14] At the same time, the average wind speed is between 8 and 11 knots. Unfortunately, there is no data available on the significant wave height for the Black Sea. Even in the benign conditions in which USV attacks were made, there was at times significant pitching of these small 5.5 m long drones, which appeared to make keeping the target vessel in sight in the targeting camera a challenge. The difficulties in maintaining an adequate target picture and a covert approach in more typical conditions for the Black Sea should not be underestimated. For example, the Ukrainian *Sea Baby* USV has a

12 BFBS 2024.

13 Data supplied by the UK's JOMOC. I am grateful to Lt Cdr Max Parsonson RN for his invaluable help in compiling this data. No data available for Significant Wave Height.

14 OUCU 2023.

significant visual detection signature due to its planing hull design and the resulting bow up posture and prominent bow wave. This will be exacerbated as the sea state and wave heights increase.

The impact of reduced visibility should also be considered, whether by rainfall, snowfall, fog, or another type of impairment, as this will affect not only the ability to find and identify a target using cameras and electro-optics, but also to manoeuvre to an intercept position and then mount a successful attack. This is compounded by the low height of eye of the targeting cameras on the USVs, typically around 0.5 m.[15] This gives a horizon range for the USV of 2500 m; if the height of eye is increased to 1 m then the horizon range increases to 3600 m. If the height of the target is considered then the range at which the target can be seen can increase considerably. In the case of a *Nanuchka*-class missile corvette, the top of the Band Stand search/fire control radar above the bridge superstructure (more prominent than the vessel's lattice work mast) is approximately 17 m above the waterline.[16] This gives a maximum visual range of about 9-10 nautical miles as the top of the radar dome starts to appear over the horizon.[17]

In the case of the Black Sea, the operating environment is, on average, favourable for the use of electro-optics for target identification and subsequent attack. As figure 2 shows, the number of days per month when rain or snow can be expected is low, as is the number of days where visibility will be 5 nautical miles or less.

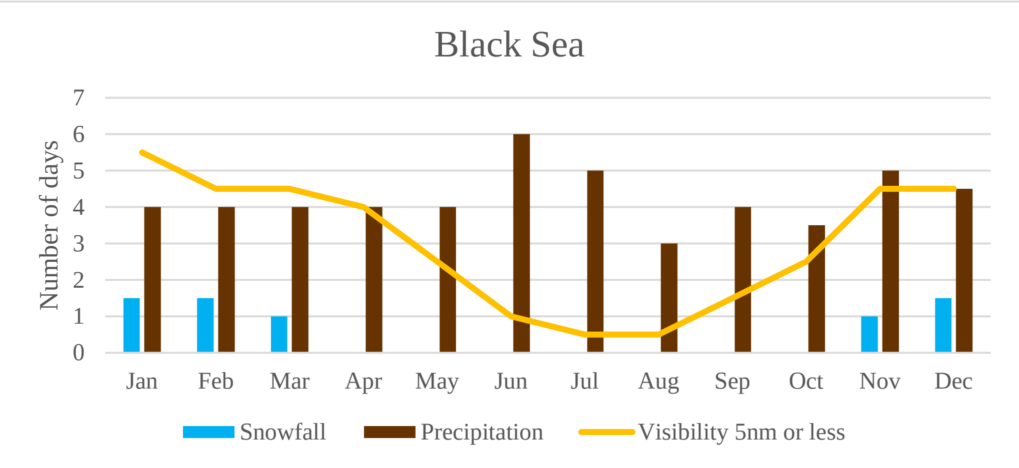

Fig. 2: Black Sea days per month of rain, snowfall, or visibility 5 nm or less.[18]

The relatively short range at which the electro-optics onboard the USV will be able to see a target, does, however, place a premium on wider domain awareness and the ability to guide the USVs into the area in which the target is expected. The Ukrainians have successfully exploited their own intelligence sources as well as open-source intelligence (OSINT) – the war, after all, has been watched avidly by pundits, professional and amateur, who have made rapid and effective use of a wide range of sources, including

15 Sutton 2024c.
16 Heights derived from data in Pape (ed.) 2022: 675.
17 As the key factor is the height of a prominent feature like the main radar, this can mean that much larger vessels (in displacement and length) have broadly similar ranges, because their upperworks are roughly similar in height.
18 Data supplied by the UK's JOMOC. I am grateful to Lt Cdr Max Parsonson RN for his invaluable help in compiling this data.

commercial satellite imagery, voicing their assessments and opinions widely on the internet. It is perhaps no surprise then, that a few days after OSINT analysis of the *Moskva*'s operating patterns hit the internet on 7 April 2022[19], there was a successful coastal defence missile strike against the ship on 13 April leading to it sinking the next day.[20] The guidance problem from the USV's launch area to their interception area has been taken care of by use of the StarLink satellite communications system to pass data to and from the USV. However, this is not a sovereign capability; indeed, Space X, the owner of StarLink, threated to turn off Ukrainian use of the system in February 2023.[21]

Utility for NATO

Is this repeatable elsewhere? Undoubtably, yes. Is this repeatable against Russia in a conflict with NATO? That is harder to say. Certainly, the types of USVs used by Ukraine have achieved the ranges needed to operate effectively in the Baltic and around northern Norway in the Norwegian Sea and into the Barents Sea. Furthermore, these USVs are easily launched from trailers, making them relatively independent of infrastructure for launching – a concrete slipway or hard is sufficient. However, range alone is not enough to be certain. Even when the ability to provide command and control for the drones using satellites is assumed, the answer is far more complex. In fact, the answer is the favourite one of academics and is truly loathed by maritime practitioners: it depends.

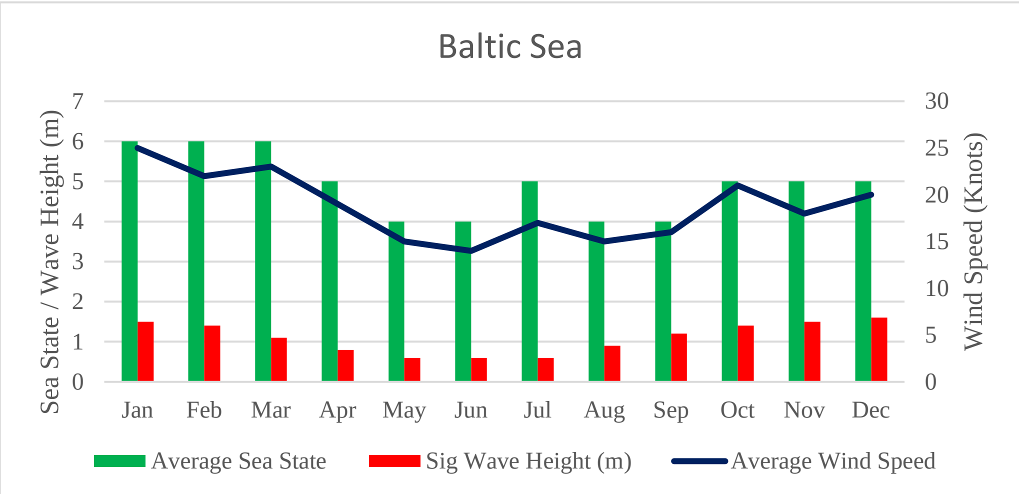

Fig. 3: Baltic Sea average sea state, wave height and wind speed each month.[22]

If the environmental data for the Baltic Sea and Norwegian Sea are considered, there is little cause for optimism. In both areas, as can be seen from figures 3 and 4, the average sea state is higher than that encountered in the Black Sea. While there is no significant wave height data available at present for the Black Sea to compare to the Baltic and

19 Sutton 2022a.
20 Sutton 2024d.
21 Sutton 2024d.
22 Data supplied by the UK's JOMOC. I am grateful to Lt Cdr Max Parsonson RN for his invaluable help in compiling this data.

Norwegian Seas, it is notable that while the Baltic is under 1.5 m for the whole year, this is not the case for the Norwegian Sea where the significant wave height has a maximum of 4 m and a minimum of 1.5 m.

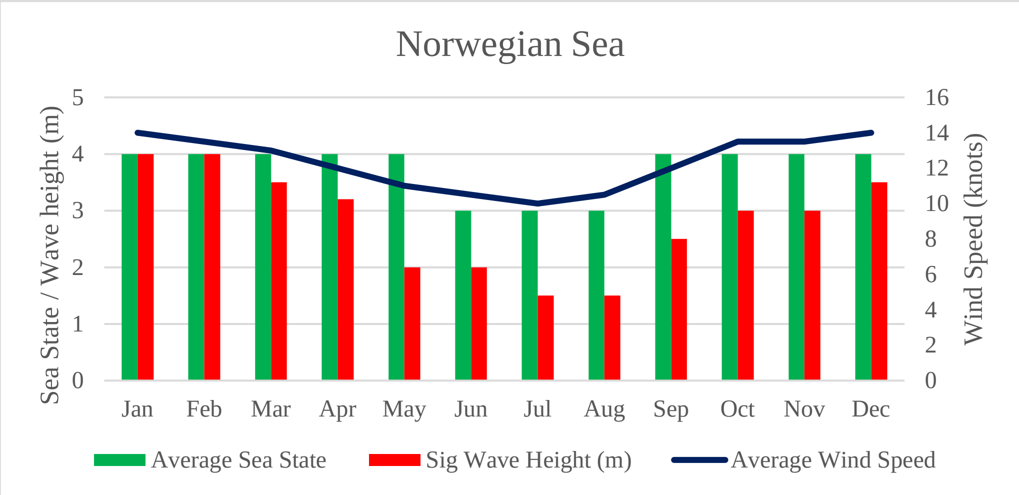

Fig. 4: Norwegian Sea average sea state, wave height and wind speed each month.[23]

Understandably, the Ukrainians are extremely reluctant to give away the performance of their USVs, but it is not hard to see that a 5 m vessel with a freeboard of at most 0.5 m may not be able to cope with the seas that can be expected in both the Baltic and Norwegian Seas. Even if they can float and manoeuvre, the movement of the hull may well be so great that effective control and closure to the impact point may be unachievable.

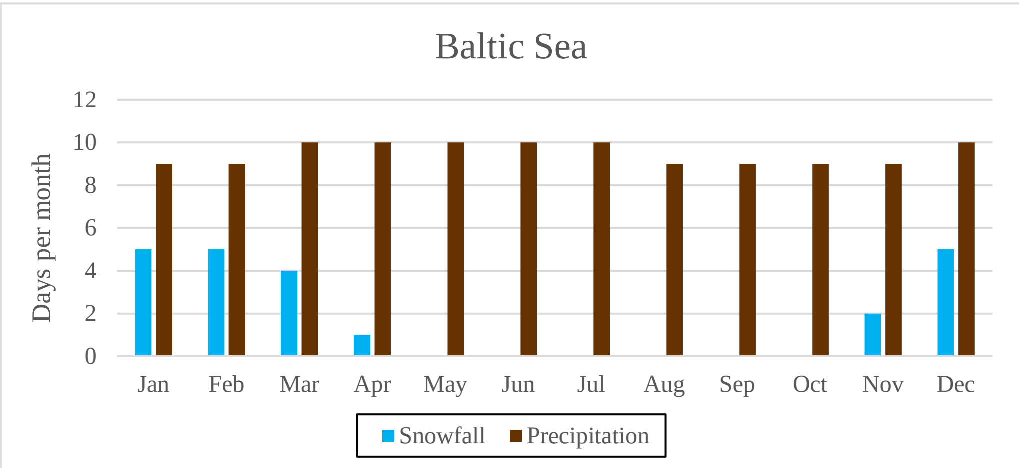

Fig. 5: Baltic Sea days per month of rain or snowfall.[24]

23 Data supplied by the UK's JOMOC. I am grateful to Lt Cdr Max Parsonson RN for his invaluable help in compiling this data.

24 Data supplied by the UK's JOMOC. I am grateful to Lt Cdr Max Parsonson RN for his invaluable help in compiling this data. There was no data available on visibility.

Nor are the environmental issues limited to the potential violence of the sea and how this will limit the employability of USVs. Electro-optics, depending on their capabilities, can be adversely affected by snow and rain. As figures 5 and 6 show, the Baltic and High North see relatively high numbers of days were there is rain or snow, or days when the visibility is likely to be below 5 nautical miles (data for days with visibility below 5 nautical miles was unavailable for the Baltic), in comparison to the Black Sea (figure 2). This may further limit the tactical opportunities for the use of OWA USVs.

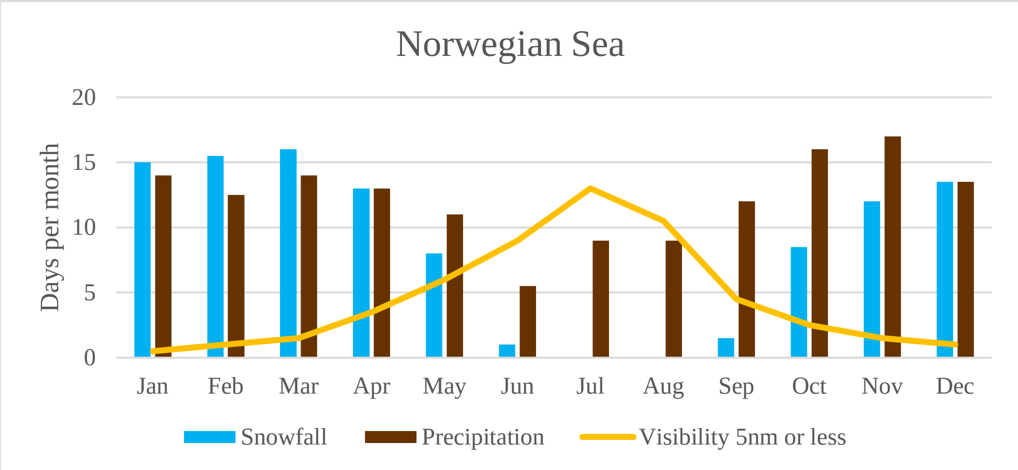

Fig. 6: Norwegian Sea days per month of rain, snowfall, or visibility 5 nm or less.[25]

The environmental limitations USVs may encounter in the Baltic and High North suggest that they will need considerable development to achieve their full potential and survive contact with the elements. Making USVs bigger to enable them to operate in more unforgiving sea conditions makes them easier to detect by adversary systems. Therefore, USVs will probably have to move away from the current planing hulls with a noticeable visual signature, to hulls which, for example, exploit the Lürssen effect, which will have the added benefit of more speed for a given power input and greater stability in higher sea states.

While NATO has access to its own long-range communications systems which could support USV operations, the ability to use them in an Article V scenario against Russia cannot be assumed. Operations in command and control denied or degraded environments are facts of life now; GPS can be 'spoofed' too. All of this may have an impact to a greater or lesser degree on the practical utility of OWA USVs for NATO either in the High North or in the Baltic.

At the same time as USVs are being rapidly developed by the Ukrainians, we are seeing the Russian Navy developing new and potentially effective countermeasures. Close-in weapons have proven effective against USVs up to a point – the greater the number of attacking USVs and the greater the number of threat axes being used, the less effective close-in weapons will be. Helicopters have also been used to try to defeat USV attacks, although the actual success of these measures is still somewhat clouded by the fog of war and propaganda in the Russo-Ukraine conflict. The latest counter-USV

25 Data supplied by the UK's JOMOC. I am grateful to Lt Cdr Max Parsonson RN for his invaluable help in compiling this data.

development is the use of FPV one-way attack uncrewed aerial drones. None of this should be a surprise to maritime observers; these are, except for OWA FPV UAS, tried and tested anti-fast attack and anti-fast inshore attack craft approaches.

We should also expect to see increased effort going into passive countermeasures. The Kerch Strait bridge is now well protected by booms – this is an obvious harbour defence measure that can be readily replicated. Older ideas, related to booms, may make a comeback such as a modification of the pre-WW1 era ship-mounted anti-torpedo net concept, only this time designed to detonate USVs not anti-ship torpedoes at a safe distance from the warship. Chemical obscurants (smoke!), made largely irrelevant in the maritime domain due to radar, but still a staple passive defence for armoured fighting vehicles against electro-optically guided weapons, may make a return to the sea as cross-domain learning takes place – if it takes place. However, it should always be considered how your actions are compelling an enemy to operate in a way of your choosing and to expend scarce and valuable resources in a manner disadvantageous to them, which may make OWA USVs extremely useful, despite their limitations.

To deal with these active and passive real and potential countermeasures to Ukrainian style USV attacks, the USVs will have to grow to accommodate self-protection measures, more effective situational awareness and targeting systems, possibly reducing their potential to successfully attack an enemy. Indeed, some of these things have already happened – Ukrainian USVs are already mounting short-range fire-and-forget anti-aircraft missiles for use against Russian helicopters and aircraft.[26] Nor were they the first USV user to do so.[27] The value of the additional benefit of a larger sized platform increasing its environmental survivability and thus creating more opportunities for successful engagements over a wider area should not be underestimated.

Thus, the future utility of USVs lies not in harbour attack, or as a one-way kamikaze attack drone but as a weapon carrier, able to exploit stealth and low observability to promote its survival and get into weapon range before launching a relatively short-range attack which will be hard to counter, especially if done en masse. Yet there is still a problem with this vision. The more weapons you put on the USV the bigger it gets; the more you need to invest in ensuring its survival, the less expendable it is – which is exactly the problem navies faced with their crewed warships. So, are the right questions being asked about USVs in the first place?

Perhaps the real question regarding the transformative (or not) nature of USVs for maritime combat is about the ends of sea power rather than the means. As Julian Corbett observed towards the start of his seminal discussion on *Some Principles of Maritime Strategy*:

> Since men live upon the land and not upon the sea, great issues between nations at war have always been decided—except in the rarest cases—either by what your army can do against your enemy's territory and national life or else by the fear of what the fleet makes it possible for your army to do.[28]

What does this mean? In the context of USVs as demonstrated in the Russo-Ukrainian war it means sea denial, sea control, economic warfare and power projection. Ukraine

26 Sutton 2024b.
27 Ozberg 2021.
28 Corbett 1911: 16.

has imposed sea denial on Russia's Black Sea Fleet: Russia is, at the moment, unable or unwilling to face the risks of operating in a sea contested by USVs. This may change in the future. The Russians have started using FPV UAS drones to attack USVs.[29] This may tilt the balance back in Russia's favour, or it may be invalidated by more Ukrainian innovation. Ukraine has, to a limited degree, sea control at times and places of its own choosing in order to achieve certain missions and operations. What Ukraine has not been able to do (yet) is to turn its ability to deny Russian use of the Black Sea (and its own ability to achieve sea control where and when it desires) into something that reaches wider via economic warfare or power projection – that telling phrase of Corbett's 'the fear of what the fleet makes it possible for your army to do.'

Perhaps the most important lesson of the Russia-Ukraine conflict for the High North and Baltic is to reinforce, or remind us of, an old one. That, as Julian Corbett pointed out, the natural state for the sea is to be uncommanded.[30] This is a highly important (old) lesson about not just USVs, but maritime warfare, which practitioners and maritime analysts should be fully aware of, but which in the age of multi-domain operations and campaigns may not be fully understood by others, especially politicians or those used to measuring success by the amount of enemy ground occupied.

Conclusion

The Ukrainians have achieved something that should be almost impossible – without a navy, they have not only achieved sea denial, but also limited sea control. They have done so using a combination of old techniques (coastal defence missiles, mine warfare, land attack systems) and new ones (UAS and USVs). In doing so, they, and the Russian responses (or lack thereof), have highlighted old lessons regarding the mental and physical preparation of combat and the importance of not underestimating capabilities. They have also highlighted an old fundamental lesson of naval power – it is how navies can influence events ashore that is the decisive effect; the ends not the means is the key issue.

Are all these lessons applicable in the Baltic and High North? In the case of USVs probably not. The environmental conditions in the Baltic and High North are such that they are highly likely to severely restrict the use of USVs in an OWA concept of operations. At the same time, there are an increasing range of countermeasures that may be employed against OWA USVs that will inhibit their ability to close and attack targets at sea or inshore, be they ships or fixed infrastructure. The twin pressures of surviving the violence of the sea and of the enemy will probably result in the steady evolution of the OWA USV into a reusable weapon carrier. USVs are almost certainly here to stay and will provide a useful maritime capability for today's casualty-adverse body politics, but the lessons that NATO navies need to understand are old ones, sometimes dressed up in new clothes.

29 Satam 2024; The Maritime Executive 2024; Defense Mirror 2024.
30 Corbett 1911: 91.

List of References

Bachega, Hugo/Gregory, James (2022): 'Massive' drone attack on Black Sea Fleet – Russia, in: BBC from 29-10-2022, https://www.bbc.co.uk/news/world-europe-63437212, last accessed on: 05-06-2024.

British Forces Broadcasting Service (BFBS) (2024): Dramatic footage shows Ukrainian drone boats destroying Russian warship, in: youtube.com from 02-02-2024, https://www.youtube.com/watch?v=aHFlqgCyElo, last accessed on: 11-06-2024.

Bubalo, Mattea/Goksedef, Ece (2023): Ukraine says it launched July attack on bridge to Crimea, in: BBC from 03-08-2023, https://www.bbc.co.uk/news/world-europe-66397227, last accessed on: 06-06-2024.

Corbett, Julian Stafford (1911): Some Principles of Maritime Strategy, Longmans: London.

Defense Mirror (2024): Russion FPV Drone Downs Ukrainian Magura V5 USV in Black Sea Encounter, 30-05-2024, https://www.defensemirror.com/news/36910/Russian_FPV_Drone_Downs_Ukrainian_Magura_V5_USV_in_Black_Sea_Encounter, last accessed on: 17-06-2024.

Dickson, Peter (2023): Putin's fleet retreats: Ukraine is winning the Battle of the Black Sea, in: Atlantic Council from 04-10-2023, https://www.atlanticcouncil.org/blogs/ukrainealert/putins-fleet-retreats-ukraine-is-winning-the-battle-of-the-black-sea/, last accessed on: 06-06-2024.

Felstead, Peter (2024): Ukrainians sink another major Black Sea Fleet surface ship, in: European Security & Defence from 14-02-2024, https://euro-sd.com/2024/02/major-news/36596/ukrainians-sink-another-ship/, last accessed on: 06-06-2024.

La Grone, Sam (2017): Navy: Saudi Frigate Attacked by Unmanned Bomb Boat, Likely Iranian, in: U.S. Naval Institute from 20-02-2017, https://news.usni.org/2017/02/20/navy-saudi-frigate-attacked-unmanned-bomb-boat-likely-iranian, last accessed on: 05-06-2024.

Lister, Tim/Chernova, Anna/Mezzofiore, Gianluca/Kostenko, Maria/Murphy, Paul (2023): Satellite imagery indicates Russia moving navy ships to other ports after Sevastopol attacks, in: CNN from 05-11-2023, https://edition.cnn.com/2023/10/05/europe/russia-naval-assets-sevastopol-intl/index.html, last accessed on: 06-06-2024.

The Maritime Executive (2024): Video: Russian FPV Drone Destroys Ukrainian Boat Drone, 30-05-2024, https://maritime-executive.com/article/video-russian-fpv-drone-destroys-ukrainian-boat-drone, last accessed on: 17-06-2024.

Navy Lookout (2022): Considering the implications of the attack on the Russian fleet in Sevastopol, 07-11-2022, https://www.navylookout.com/considering-the-implications-of-the-attack-on-the-russian-fleet-in-sevastopol/, last accessed on: 06-06-2024.

OUCO (2023): Understanding Sea State: A Comprehensive Guide, 30-03-2023, https://ouco-industry.com/understanding-sea-state-a-comprehensive-guide/#Sea_State_Definitions, last accessed on: 12-06-2024.

Ozberk, Tayfun (2021): Iran Boosts IRCG Navy's Swarm Attack Capabilities, in: Naval News from 14-12-2021, https://www.navalnews.com/naval-news/2021/12/iran-boosts-ircg-navy-swarm-attack-capabilities/, last accessed on: 17-06-2024.

Ozberk, Tayfun (2024a): Ukraine sinks Russian Tarantul-II class corvette with Kamikaze USV swarm attack, in: Naval News from 01-02-2024, https://www.navalnews.com/naval-news/2024/02/ukraine-sinks-russian-tarantul-ii-class-corvette-with-kamikaze-usv-swarm-attack/, last accessed on: 06-06-2024.

Ozberk, Tayfun (2024b): Ukraine hits Russia's Ropucha-I class LST Caesar Kunikov with USV attack, in: Naval News from 14-02-2024, https://www.navalnews.com/naval-news/2024/02/ukraine-hits-russias-ropucha-i-class-lst-caesar-kunikov-with-usv-attack/, last accessed on: 06-06-2024.

Pape, Alex (ed.) (2022): Jane's Fighting Ships 2022-2023, Jane's Information Group: London.

Redford, Duncan (2014): A History of the Royal Navy: World War II, I. B. Tauris: London.

Satam, Parth (2024): Russia Destroys Ukrainian Magura Unmanned Surface Vessel with FPV Drone, in: The Aviationist from 30-05-2024, https://theaviationist.com/2024/05/30/fpv-vs-magura/, last accessed on: 17-06-2024.

Sutton, H I (2022a): Russia's Most Powerful Warship In The Black Sea Is Operating In A Pattern, in Naval News from 07-04-2022, https://www.navalnews.com/naval-news/2022/04/russias-most-powerful-warship-in-the-black-sea-is-operating-in-a-pattern/, last accessed on: 14-06-2024.

Sutton, H I (2022c): Suspected Ukrainian Explosive Sea Drone Made From Recreational Watercraft Parts, in: U.S. Naval Institute from 11-10-2022, https://news.usni.org/2022/10/11/suspected-ukrainian-explosive-sea-drone-made-from-jet-ski-parts, last accessed on: 05-06-2024.

Sutton, H I (2022b): Ukraine's New USV Compared, in: Convert Shores from 22-09-2022, http://www.hisutton.com/Ukraines-New-Explosive-USV.html, last accessed on: 05-06-2024.

Sutton, H I (2023a): Russian Navy Attempts To Disguise Its Most Powerful Warship In Black Sea, in: Naval News from 22-06-2023, https://www.navalnews.com/naval-news/2023/06/russian-navy-attempts-to-disguise-its-most-powerful-warship-in-black-sea/, last accessed on: 06-06-2024.

Sutton, H I (2024a): Russian Navy's Deceptive Camouflage In Black Sea Not Effective Against Infrared, in: Convert Shores from 10-03-2024, http://www.hisutton.com/Russian-Navy-Deceptive-Camouflage-IR-Spectrum.html, last accessed on: 06-06-2024.

Sutton, H I (2024b): Ukraine Has World's First Navy Drone Armed With Anti-Aircraft Missiles, in: Naval News from 21-05-2024, https://www.navalnews.com/naval-news/2024/05/ukraine-has-worlds-first-navy-drone-armed-with-anti-aircraft-missiles/, last accessed on: 17-06-2024.

Sutton, H I (2024c): Overview Of Maritime Drones (USVs) Of The Russo-Ukrainian War, 2022-24, in: Convert Shores from 17-06-2024, http://www.hisutton.com/Russia-Ukraine-USVs-2024.html, last accessed on: 11-09-2024.

Sutton, H I (2024d): Timeline of 2022 Ukraine Invasion: War In The Black Sea, in: Convert Shores from 12-08-2024, http://www.hisutton.com/Timeline-2022-Ukraine-Invasion-At-Sea.html, last accessed on: 11-09-2024.