The application and impact of electronic warfare in the Russian Ukrainian war*

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Abstract

According to a report by the New York Post, the Royal United Services Institute (RUSI) released a report on May 19 titled "Meat Grinder: Russia's Use of Technology in the Second Year of the Inva- sion of Ukraine." The report mentions Russia's use of technology in defence systems, leading to Ukraine losing up to ten thousand unmanned aerial vehicles (UAVs) every month. Since 2022, Russia has deployed high-density electronic warfare equipment in the eastern Ukrainian region of Donbas, with a continuous increase. Currently, Russian forces deploy an electronic warfare system every 9.6 kilometres along the approximately 1200 kilometre front line.[1]mmWith rapid develop- ments in electronic technology and the miniaturisation of electronic reconnaissance and attack equipment, the nature of warfare has changed compared to large-scale, high-powered conflicts like the Gulf War. Ground forces at the forefront are often utilised for enemy reconnaissance, situational awareness, identification, and guiding weapon attacks through command and control systems, con- tributing to better operational efficiency.

In the initial stages of the attack, Russia used electronic warfare to almost completely suppress Ukraine's reaction capabilities and missile defence systems. Subsequently, they initiated airborne operations near Kyiv in an attempt to seize the Hostomel Airport. Russia's electronic warfare capa- bilities performed poorly due to a lack of resources in equipment, personnel, and expertise required for such large-scale operations. The use of Chinese-manufactured components also made their equipment susceptible to Ukrainian interference. Additionally, overconfidence among Russian military commanders and a lack of coordination in planning electronic warfare units contributed to the failure.

In the subsequent air combat, Russia aimed to suppress Ukraine's air defence systems by using UAVs to provoke the activation of their anti-aircraft missile systems. This was

coupled with elec- tronic warfare attacks and subsequent ground or air firepower suppression, forcing Ukraine to with- draw its medium-range air defence missiles, giving the Russian Air Force a significant advantage in the region. Russia also interfered with Ukraine's UAVs' communication and navigation equip- ment using electronic warfare systems, achieving effective suppression in the initial months.

After the failure of the operation near Kyiv, Russia shifted its focus to securing occupied territories and reorganised its forces for operations in the Donbas and southeastern Mariupol regions. They adjusted their electronic warfare deployment and operations in these areas, disrupting navigation and weapon position detection in the Ukrainian front lines effectively. Approximately 90% of Ukraine's UAVs were estroyed, and the ground control stations for these UAVs were also attacked, resulting in severe threats in the region. Furthermore, Russia intercepted and decrypted Ukraine's 256-bit encrypted Motorola radio communications.[2]

The Way Ukraine Conduct WE During WarmmAs for Ukraine's electronic warfare strategy, they were well-prepared before the conflict, relying on high-frequency ground and airborne radio systems provided by the United States and satellite networks to maintain communication during electronic warfare attacks. In terms of electronic reconnaissance, Ukraine could detect and locate parameters of Russian electronic warfare systems from a considerable distance, allowing them to quickly target and destroy equipment. Ukraine destroyed a total of 31 pieces of equipment in this manner.[3]

Currently, Ukrainian forces continue to use receiver-based anti-drone systems and GPS jamming systems provided by the United States to interfere with and damage the electronic equipment on Russian drones, continuously shooting down Russian UAVs to counter subsequent attacks. Addi- tionally, Ukraine employs radio jamming systems provided by the United States to interfere with Russian tactical communication, disrupting their troop movements.

On the frontline and nearby areas, Ukraine deploys a significant number of individual soldier detection systems to detect electronic signals from enemy drones, anti-aircraft missiles, elec- tronic warfare jammers, artillery, and multiple rocket launchers. These soldiers calculate the source, direction, distance, and type of weapons based on these signals, transmitting coordinates to rear forces for target destruction. This information

also helps commanders understand the battlefield situation for subsequent operational actions.[4] However, despite Ukraine's efforts, Russia seems to maintain an overall advantage in electronic warfare in the current conflict. Ukraine needs to continue utilizing small, mobile, and concealed electronic reconnaissance and interference equipment and seek continued support from allies to maintain effective combat capability.

What Could We Learned

In summary, electronic warfare has proven to be one of the few successful strategies for Russia in the Ukrainian offensive and will likely remain a core aspect of their military operations. Coor- dination and careful planning of electronic warfare are crucial for optimal results. The Russian military's overconfidence and lack of effective coordination in the initial stages allowed Ukraine to maintain communication and resist initial attacks. The experience suggests that detailed plan- ning and coordination of electronic warfare with the main operational plan are vital for success. The Taiwanese military could draw lessons from the Ukrainian experience, particularly in the development and deployment of ground-based electronic warfare equipment to enhance overall defense capabilities.

[1] 〈俄發動電子戰成關鍵每月擊落烏軍1萬架無人機〉，《看中國》，2023年5月24日，https://www.secretchi- na.com/news/b5/2023/05/24/1036511.html。

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“Russian Electronic Warfare in Ukraine 2022-2023,” iDR(INDIAN DEFENCE REVIEW), July 7, 2023, http://www.indiandefencereview.com/news/russian-electronic-warfare-in-ukraine-2022-2023/.

[4]“Ukraine’s Invisible Battle to Jam Russian Weapons,” BBC, August 4, 2023, https://ww-w.bbc.com/news/world-europe-66279650.

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