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THE USE OF UNMANNED AERIAL VEHICLES IN THE SECOND WORLD WAR: MILITARY-HISTORICAL ASPECT AND INTERNATIONAL LEGAL REGULATION

Abstract. This article is concerning on comprehensive analysis of the use of unmanned aerial vehicles during the Second World War with regard to military-historical aspects, provisions of international humanitarian law at that time, the technical capabilities of the belligerent states and the prerequisites for further development of the regulatory framework for the use of these latest means of warfare.

The peculiarities of the legal status of unmanned aerial vehicles in the period from 1939 to 1945 have been studied; the relationship between technological progress and the provisions of international law has been established; the practice of using unmanned aerial vehicles by different states in terms of international law in force at that time has been examined.

The scientific novelty consists in the attempt to combine historical and legal analysis with the study of the development of military technologies in the Second World War for the first time on an interdisciplinary level and to define whether the use of unmanned aerial vehicles (e.g., pilotless guided bombs, target drones, etc.) complied with the principles and norms of international humanitarian law of that time. The article also examines how the events of 1939-1945 influenced the formation of current international legal regime on autonomous and remotely controlled weapons.

It has been found that at the time of the Second World War, international law did not contain separate rules on the use of unmanned aerial vehicles. However, even

then, some principles of this field of law – in particular, the principles of proportionality, necessity and protection of civilians – had to be applied to new means of warfare. The absence of proper legal regulation created gaps that remain in part to this day in the context of autonomous weapons systems. The experience of the Second World War proves the need to constantly update international law in line with technological progress. Particular attention should be paid to the ethical aspects of unmanned aerial vehicles, which, although not subject to international regulation in 1939-1945, are now becoming particularly relevant.

Keywords: unmanned aerial vehicles, Second World War, international humanitarian law, international legal regulation, military technologies, autonomous systems, aviation activity.

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ЗАСТОСУВАННЯ БЕЗПІЛОТНИХ ЛІТАЛЬНИХ АПАРАТІВ У ДРУГІЙ СВІТОВІЙ ВІЙНІ: ВІЙСЬКОВО-ІСТОРИЧНИЙ АСПЕКТ ТА МІЖНАРОДНО-ПРАВОВЕ РЕГУЛЮВАННЯ

Анотація. Ця стаття присвячена комплексному аналізу використання безпілотних літальних апаратів під час Другої світової війни з урахуванням військово-історичних аспектів, положень міжнародного гуманітарного права того часу, технічних можливостей воюючих держав та передумов для подальшого розвитку нормативно-правової бази використання цих новітніх засобів ведення війни.

Розглянуто особливості правового статусу безпілотних літальних апаратів у період з 1939 по 1945 роки, встановлено взаємозв'язок між технічним прогресом та положеннями міжнародного права, проаналізовано практику використання безпілотних літальних апаратів різними державами з точки зору міжнародного права, що діяло на той час.

Уперше на міждисциплінарному рівні зроблено спробу поєднати історико-правовий аналіз з дослідженням розвитку військових технологій у Другій світовій війні та встановити, чи відповідало застосування безпілотних літальних апаратів (зокрема, безпілотних керованих бомб, дронів-мішеней тощо) принципам і нормам тогочасного міжнародного гуманітарного права. Також розглянуто вплив подій 1939-1945 років на формування сучасного міжнародно-правового режиму автономної та дистанційно керованої зброї.

Встановлено, що на час Другої світової війни міжнародне право не містило окремих норм щодо застосування безпілотних літальних апаратів. Проте вже тоді деякі принципи цієї галузі права – зокрема, принципи пропорційності, необхідності та захисту цивільного населення – доводилося застосовувати до нових засобів ведення війни. Відсутність належного правового регулювання в контексті автономних систем озброєнь створила прогалини, що частково залишаються і донині. Досвід Другої світової війни доводить необхідність постійного оновлення міжнародного права відповідно до технічного прогресу. Особливу увагу слід приділити етичним аспектам використання безпілотних літальних апаратів, що, хоч і не були предметом міжнародного регулювання в 1939-1945 роках, зараз набувають особливої актуальності.

Ключові слова: безпілотні літальні апарати, Друга світова війна, міжнародне гуманітарне право, міжнародно-правове регулювання, військові технології, автономні системи, авіаційна діяльність

Problem statement. The unmanned aerial vehicles (UAVs, or drones) play a key role in reconnaissance, targeting and destruction of various enemy objects and manpower in modern warfare.

The widespread use of drones in armed conflicts for more than past 50 years – from the Vietnam War to Russia's full-scale aggression against Ukraine – clearly shows that this technology has changed the very paradigm of warfare. However, the active use of UAVs in hostilities began much earlier. Its origins can be traced back to the events of the Second World War, when the main belligerent states began to actively experiment with remotely piloted and autonomous aerial platforms.

In the military historiography of the Second World War research of UAVs use has traditionally remained on the periphery of academic analysis. Some publications deal with technical specifications or individual engineering projects, such as the German flying bombs, the American and British radio-controlled aircrafts for anti-aircraft artillery training. At the same time, a comprehensive military-historical analysis that would systematise the technological, tactical and strategic aspects of the use of UAVs in the period 1939-1945 is still underdeveloped. Information on the use of drones during the war is often scattered in specialised technical or memoir sources, archival materials and is not always included in scientific circulation.

It should be noted that UAVs were used during the Second World War not only as experimental platforms, but also as means of warfare, e.g. in the form of different types of ordnance – gliding bombs, suicide drones or radio-controlled torpedo bombers. This makes it possible to understand these technologies as early examples of weapons with partial autonomy or remote control, which in fact became the forerunner of modern precision-guided munitions and attack drones. It is also important to consider the philosophy of the use of UAVs in relation to the evolution of views on cost-effectiveness and ethical aspects of remote target destruction.

Consideration of the legal aspects of the use of such systems in the context of international humanitarian law (IHL), which during the Second World War was represented by the provisions of Hague and Geneva Conventions, is of considerable research value. The problem is that at the time this law did not define clearly the unmanned weapons, which creates the basis for a comparative analysis with the modern interpretation of drones within the framework of *jus in bello*.

Analysis of recent research and publications. The problem of the use of UAVs during the Second World War is attracting increasing attention in interdisciplinary research, from military history to international humanitarian law. Whereas the use of drones in the conflicts of the 21st century has already gained wide theoretical and practical understanding, the historical experience remains insufficiently studied.

One of the first thorough attempts to systematise the history of unmanned aerial vehicles was the work "Unmanned Aviation: A Brief History of Unmanned Aerial Vehicles" by Lawrence R. Newcome (published in 2004 by American Institute of Aeronautics and Astronautics, and then by Pen and Sword Aviation in Great Britain). The author covers in detail the key stages in the development of unmanned systems – from the first concepts and experiments to their actual combat use. Particular attention is paid to the period of the Second World War, in particular to the American TDR-1, which were used in attacks on Japanese in the Pacific as early as 1944. He also stresses upon the fact of systematic loss of technological experience due to the cessation of development between the wars, which led to the "reinvention of the wheel" with each new generation of UAVs. From his point of view, failure to take previous experience of the use of drones into account led to significant losses of time and resources. For example, the launch of Hellfire missiles from a Predator drone in 2001 was seen as "the world's first use of the armed UAV", ignoring the historical fact that Maverick missiles were launched from a Firebee drone in 1972 (and the TDR-1 were used in 1944). Newcome calls these examples "lost trivial lessons" that are nevertheless of strategic importance in shaping the current understanding of UAVs as a weapon system (Newcome, 2004). Consequently, his research has not only historical, but also practical value: it allows us to see UAVs as a phenomenon that has developed in waves, being in the shadow of post-war demilitarisation and re-emerging in times of new global conflicts.

A significant contribution to the military history research of the issue in question is "Royal Air Force Historical Society Journal" (№ 45, 2009), which contains a number of articles revealing the evolution of British weapons, including air bombs, missiles, depth charges, mines and torpedoes. Namely the work by Nina Burls "RAF Bombs and Bombing 1939-1945" is focused on the transformation of strategic bombing and describes early technologies related to aviation automation that enabled the further development of remote platforms, in particular for sea mining, anti-shipping attacks and aerial reconnaissance. Also worthy of note is Wing Commander David Herriot's research on the development of air-to-ground systems,

which mentions engineering solutions that were later adapted to the unmanned format.

Special attention in historiography should be paid to the little-studied example of Japanese Fu-Go balloon bombs launched in 1944-1945 against the United States of America. Robert C. Mikesh in his "Japan's World War II Balloon Bomb Attacks on North America" highlights both the technical features and tactical goals of this campaign, which, despite its archaic nature, can be considered one of the first forms of strategic pilotless strike. The Fu-Go is an obvious example of how the belligerent state sought ways to inflict non-contact damage on the enemy while preserving the lives of their own personnel (Mikesh, 1973).

A substantial contribution to the interdisciplinary understanding of unmanned warfare has been made by Katherine Chandler in her "Unmanning: How Humans, Machines, and Media Perform Drone Warfare" published by Rutgers University Press (Chandler, 2020). The author analyses the phenomenon of remote warfare as a media, technical, and political construction in which not only drones but also discourses, notions of humanity, technology, responsibility and corporeality interact. Chandler's book views unmanned systems not as neutral technical objects, but as actors on the political stage transforming the way war is waged. The connections between early experiments with remote control eighty – ninety years ago and modern drone warfare infrastructure have been emphasised too. This allows researchers to revisit the UAVs of the Second World War not only from the perspective of technical archaeology, but also in the light of ethics, law and military propaganda. In this way, the scientific understanding of historical episodes, such as the use of the V-1, TDR-1 or Fu-Go, gains new relevance.

As of the history of UAVs and their legal status it is impossible to avoid mentioning an article "The emergence of lethal surveillance: Watching and killing in the history of drone technology" by K. H. Kindervater in which the thorough analysis on the history of drone technology in the context of reconnaissance, targeting and use of lethal force has been carried out. In particular author studies the origin and development of lethal surveillance concept, tracing its roots from the First and Second World Wars through the Cold War period to the technological boom of the 1990s (Kindervater, 2016). This work is of special value for the study of UAVs during the Second World War, as Kindervater argues that it was during these years that two key trends in Western military doctrine were formed – the growing importance of intelligence, surveillance and reconnaissance (ISR) as well as the development of dynamic targeting. According to the researcher, this dynamic has become a prerequisite for the modern integration of intelligence and combat functions within drones, when the decision-making process of surveillance and destruction is actually combined into a single technological and tactical practice (still under the final human control but with the increasing application of the artificial intelligence). Therefore, such a historical analysis allows not only to rethink the role of UAVs as a weapon during the Second World War, but also to see how certain

elements of this weapon (namely tele-assisted targeting and remote control) became the institutional basis of the modern doctrine of "surveillance strike". In the context of this study, it is possible to follow up the evolution of legal uncertainty and moral dilemmas in the use of drones – from the experimental developments of the TDR-1 and Mistel to modern lethal surveillance in armed conflicts of the 21st century.

Important for Ukrainian research tradition is a collective monograph "Unmanned aerial vehicles in military affairs" edited by S. P. Mosov (Kyiv, 2019), which systematises the historical stages of creation, classification, functions, factors of influence, experience of combat use and prospects for the development of UAVs. The combat use of drones in the 20th and 21st centuries has been examined separately with regard to the Soviet, American and Israeli experience (Mosov et al., 2019). There is also a significant emphasis on the UAVs countermeasures and Ukraine's role in the modern development of drones, which adds weight to the comparative analysis in the military-historical retrospective.

The authors of this article have also previously studied this topic. In their work, they traced the historical path of unmanned aviation from antiquity to the present, identified key stages in the development of unmanned systems, emphasised the role of technological and legal factors, and analysed the codification sources of international humanitarian law (from the Lieber Code to the Hague Conventions). The periodization proposed by the authors allows for a comprehensive assessment of the dynamics of UAVs development through the prism of technical, legal and ethical dimensions (Akimov, Pokhylenko, 2025).

Thus, modern historiography demonstrates considerable scientific interest in the topic of UAVs in the military context. However, there is still a lack of interdisciplinary research that would combine the technical evolution, combat practice and legal status of drones during the Second World War. It is this aspect that constitutes a scientific niche for further reflection.

The article **aims** at a comprehensive study of the use of UAVs during the Second World War through the prism of military historical analysis and international legal understanding. Particular attention is paid to the relationship between the technical development of drone technology, political and strategic priorities of the countries participating in the war and the regulatory and legal challenges that arose in the context of total armed conflict**.**

Presentation of the main material.

Great Britain developments. Even before the outbreak of the Second World War the Great Britain had already made progress in the development of the UAVs, primarily for training anti-aircraft artillery. In 1935, a series of radio-controlled "Queen Bee" targets based on the De Havilland DH.82B Moth trainer aircraft were produced. It was due to this model that the term "drone" was coined in English military terminology, which later became a common term for all drones. According to historians, this word originated as a play on words – name of the pilotless aircraft and a distinctive humming sound from its engine, similar to the sound of drone.

During the Second World War, the British continued to use "Queen Bee" to simulate the enemy aircraft for the anti-aircraft gunners; the use of strike UAVs directly in combat operations was not implemented at that time.

These historical facts are confirmed not only by the documents from the Imperial War Museum archives – such as the manual "The elementary electrical and optical principles of searchlights" (1939) published by the War Office (Imperial War Museums, catalogue number: LBY WO 588) – but also in modern research. In particular, Vanitha N. et al. point out that the De Havilland DH.82B "Queen Bee" was the first example of an affordable radio-controlled drone that pioneered the development of unmanned aviation and formed the concept of using UAVs for various tasks, including surveillance and security (Vanitha, Padmavathi, Nivedha, Bhuvana, 2022). Moreover, the indirect benefits of such developments were significant. Firstly, drones significantly improved the effectiveness of air defence training enabling anti-aircraft gunners to be prepared in conditions as close to combat as possible, practising their skills in detecting, tracking and engaging air targets. Secondly, the experience gained in radio control and automation became the basis for the next generations of UAVs, including not only targets, but also reconnaissance and strike. Despite the absence of combat drones in the British arsenal during the war, the country's technological achievements significantly influenced the further development of UAVs in Western Europe. Thus, in the 1950s and 1960s, the Great Britain was already actively cooperating with the United States of America in this field, using approaches that had been developed before 1939.

Thus, the British developments of the Second World War should not be underestimated: although they were not implemented in the form of combat drones, they laid the methodological, technical and even terminological basis for the further development of drones in military affairs.

The USA projects. The United States of America had been actively experimenting with UAVs long before the outbreak of Second World War. The first attempts to create automated weapons date back to the First World War: in 1917, the Curtiss-Sperry flying bomb was developed, and in 1918, the Kettering Bug, which were actually prototypes of guided cruise missiles. During the Second World War, the USA initially also focused on developing target aircraft that were used to train anti-aircraft gunners. The next step was made towards creating high-precision munitions. The first full-fledged US combat drone was the twin-engine Interstate TDR-1, which was developed in the early 1940s and put in mass production in 1944. The TDR-1 was equipped with a television camera and a radio control system that allowed the operator from another aircraft to guide the drone to the target. However, instead of 2,000 planned only about 200 TDR-1s were assembled and tested in the Pacific against Japanese. The TDR-1s had certain successes in striking ships and ammunition depots, but their general performance was poor due to the technical imperfections of the guidance system, the need for human control and the dependence to weather conditions. As a result, the project was closed as ineffective.

Another ambitious American attempt to turn manned bombers into unmanned "flying bombs" was an Operation Aphrodite conducted in 1944 by the US Army Air Force using modified versions of the B-17 and B-24 heavy bombers (the BQ-7 and BQ-8 respectively) stripped of any unnecessary equipment and fitted with cameras and automatic stabilisers enabling radio control from another aircraft. After take-off the crew would set the aircraft on course, activate the remote control systems and bail out, transferring the task of further flight and guidance to an operator from command aircraft (usually another B-17 or B-24). During August-September 1944 dozens of these "flying bombs" were used against fortified German targets in France, including naval bases facilities and V-1 launch sites. However, the effectiveness of such strikes was extremely low: most of the drones failed to reach their targets due to technical failures, control system limitations or destruction by the enemy air defences. In many cases, the drones simply crashed without causing any damage. The biggest drawback of these UAVs was their high vulnerability to anti-aircraft fire: "An unmanned aircraft could not evade shells, had no defensive weapons and operated only during the day, making it an almost perfect target". Despite the technical breakthroughs and low efficiency these drones were ahead of their time – such experiments provided valuable experience for future generations of engineers and strategists, demonstrating the possibility of targeted use of combat UAVs, and raised a number of ethical and tactical issues that remain relevant in the 21st century.

German designs. The military-industrial base of the Third Reich also did not stand aside from experiments with UAVs. Although Germany hardly ever produced classical drones in the modern sense, its scientists and engineers actively worked on innovative concepts that combined manned and unmanned components in one combat system. Their most famous development of this type was the Mistel system. This hybrid aircraft consisted of a Junkers Ju 88 bomber packed with explosives and a Focke-Wulf Fw 190 fighter attached to the top, which served as a manned targeting vehicle. The principle of operation of the Mistel was as follows: the pilot, flying the fighter, set the two aircraft on a combat course. When approaching a target (such as a ship, bridge etc.), the fighter would detach and return to base, while the explosive-laden Ju 88 would dive on the target and destroy it. Such design allowed for a powerful strike against enemy with relative safety for the pilot. The first successful flight of the Mistel took place in July 1943, and by the end of the war Germany had managed to assemble about 250 Mistels of various modifications. However, their combat effectiveness turned out to be rather limited. The most ambitious task for Mistel was an attempt to attack Allied bridgehead in Normandy in June 1944, but for various reasons (Allied air superiority, the Mistel's vulnerability during takeoff and flight) this operation failed. Mistels were employed also on the Eastern Front, especially when attempting to destroy strategically important bridges across the Vistula and Oder in 1945 as part of the Wehrmacht's desperate struggle to deter the Soviet offensive on Berlin. However, despite the large-scale efforts and unique engineering approach, the Mistel lacked accuracy, reliability and security.

According to the analysis of combat reports and the testimony of the pilots themselves, most of these attacks failed without causing significant damage. Researcher Robert Forsyth concludes that Mistel remained a marginal episode in the German military-technical arsenal, a symbol of a technological experiment in the face of impending defeat (Forsyth, 2001). It is necessary to stress upon the fact that whereas technically Mistel was not a fully autonomous UAV (as it required a manned component), its lower part (the Ju 88 with explosives) actually acted as a guided unmanned drone projectile, similar to modern kamikaze strike UAVs. This example demonstrates how, back in the 1940s, engineers tried to implement concepts that are now embodied in modern kamikaze drones such as the Shahed-136 or Switchblade.

In addition to the Mistel project, Germans worked on precision guided weapons. Two key figures in these technological developments were Dr. Max Otto Kramer and Herbert Alois Wagner. The former, an electrical engineer and aerodynamicist from Ruhrstahl AG, became one of the leading experts in the development of the first ever precision munition. It was under his leadership that the Fritz-X (or FX 1400), an armour-piercing anti-shipping glide bomb, was created. It had a radio-controlled system and was used by the Luftwaffe from the autumn of 1943. The most famous operations were the sinking of the Italian battleship Roma as well as damaging the British battleship HMS Warspite and the American cruiser USS Savannah. Kramer's another promising development was the Ruhrstahl X-4 surface-to-air missile, which was supposed to target Allied bombers; Despite its innovativeness, the X-4 was not used in combat due to the late completion of its development.

The latter scientist was engaged in creation of Hs 293 glide bomb at the Henschel Flugzeug-Werke AG. This munition had bearing surfaces, a rocket booster and a box tail fin to ensure stability, was remotely controlled by radio or by a television guidance channel and designed to hit large naval targets. The Hs 293 was successfully used since the summer of 1943 in the Atlantic: in particular, on 25 August 1943, such bomb sank the British sloop HMS Egret in the Bay of Biscay. Wagner's development is considered the forerunner of modern anti-ship missiles and aircraft guided bombs.

The Fritz-X and Hs 293 glide bombs as well as the X-4 missile demonstrated the Third Reich's potential to compensate for Allied naval and air superiority with technological innovation. However, despite numerous successful combat deployments, these projects had a number of deficiencies – operator dependence, limited combat capability, vulnerability to radio electronic countermeasures etc. Most experimental versions did not reach the stage of mass production, but left a significant mark on the development of post-war precision weapons systems.

In the second half of the Second World War, Germany was the first to use cruise missiles on a massive scale (primarily in the context of terror against civilians). The most famous example was the V-1 missile (also known as the Fi-103,

or FZG 76), developed by Fieseler as part of the V-weapons (Vergeltungswaffe, or "retaliation weapons") programme. The V-1 was equipped with Argus As 014 pulse jet engine and carried a warhead weighing up to 1000 kg. The initial range of the missile was 250 km, and in later modifications it could reach up to 400 km. The design of the missile was relatively simple: the fuselage and wings were made of (respectively) thin sheet of steel and plywood, the control system was based on an autopilot with gyroscopes and the range control was provided by a counter with an anemometer. Due to the lack of post-launch guidance systems, the missile's accuracy was poor, which led to its use mainly for terror attacks on cities, primarily London, Antwerp and other ports and densely populated areas. The first V-1 strike on London took place on 13 June 1944, and a total of about 30,000 missiles were produced during the war, of which more than 10,000 were launched at the UK. The effectiveness of these weapon, despite significant civilian casualties (about 6,000 killed), was gradually declining due to the improvement of the Allied air defence systems (which include fighters (among them first jets), anti-aircraft guns, barrage balloons and radars). Simultaneously with the unmanned versions, a manned version of the V-1 called the Fieseler Fi 103R was also designed, which involved the use of a suicide pilot, but this project was never implemented in combat. Historically, the V-1 laid the groundwork for the development of cruise missiles in the post-war period, but it also raised ethical and legal questions about the use of weapons that could not distinguish between civilian and military objectives, which contravened the principles of international humanitarian law. The German experience was one of the reasons for the increased attention to the legal regulation of new means of warfare in the following decades, in particular in the Geneva Conventions of 1949.

Japanese inventions. During the latter years of the Second World War the Japanese Empire tried to compensate its technological lag in aerial warfare by developing guided missiles and bombs. The most significant examples of these were the I-Go guided munitions and the Ke-Go air-to-surface missile. The I-Go Type 1 radio-controlled bomb, developed in 1944 by Kawasaki, was equipped with Mitsubishi Tokuro-1 rocket engine and designed to strike naval targets. It resembled the German Henschel Hs 293, but had certain technical advantages – longer range (over 11 km) and higher speed (about 550 km/h); its guidance was provided by an operator from the launch aircraft who visually monitored and corrected trajectory. Having the fixed angle of turn (25 degrees), the bomb required to be vectored to the target by a zigzag trajectory. The first tests took place in the spring of 1945 using upgraded Ki-67 bombers, but this system was never used in operations due to the surrender of Japan. American experts who analysed the samples after the war noted the relative simplicity and technical imperfection of the controls and autopilots. In general, the I-Go was considered as an attempt to apply German experience in precision weapons in the Pacific theatre of operations (U.S. Naval Technical Mission to Japan, 1945).

Soviet experience. In the pre-war period, the Soviet Union was actively experimenting with various forms of remotely piloted aircraft (including unmanned gliders) and modifications of manned aircraft turned into radio-controlled combat platforms. An experimental glider PSN-1 (special purpose glider) was designed in Leningrad in 1935-1936with the purpose to carry a bomb or torpedo. This vehicle was launched in the air from a flying TB-3 bomber and after was guided to the target by infrared control system – an extremely innovative technology at the time. The design meant that the target would be hit with high accuracy, without risk to the pilot. In the following years, particularly in 1940, the radio-controlled TB-3, known as the "Daedalus" system, was tested, as well as a new airframe, the PSN-2, which had a much greater combat potential – it could deliver up to 1000 kg of explosives. However, tests of both systems demonstrated extremely low reliability: the guidance did not work stably, communication was often lost and the vehicles did not perform combat missions successfully. None of the prototypes were ever used in combat, and the programmes were eventually cancelled.

Despite certain technical breakthroughs, these systems remained at the level of laboratory experiments and did not influence on the course of hostilities. Compared to their German or American counterparts, Soviet projects were less advanced and did not receive further development (not least due to the extremely strained military economy and more urgent needs of the frontline). Thus, although there were technically ambitious attempts to create combat drones in the USSR at the beginning of the war, none of them reached practical implementation and UAVs themselves remained only a promising, but unrealised developments at the time.

International legal regulation. During the Second World War IHL did not contain special provisions on the use of remotely controlled or autonomous weapons, which led to a significant legal gap in the context of the rapid development of military technology. At that time, the basis for regulating the conduct of armed conflicts was the Hague Conventions of 1899 and 1907, which enshrined general principles, including the distinction between civilians and combatants, the prohibition of indiscriminate and disproportionate attacks, the requirement of military necessity and humanity. For a special mention deserves also the Martens Clause – specific IHL provision which stipulated that until a more complete code of the laws of war is issued, the populations and belligerents remain under the protection of the principles of international law, as they result from the usages established between civilized nations, from the laws of humanity and the requirements of the public conscience (Akimov, 2019).

However, these documents did not foresee clearly the specifics of air warfare, let alone regulate the use of technologically advanced weapons systems without direct human intervention. Against this backdrop, Germany was the first to massively use autonomous combat systems, in particular the V-1 cruise missile, which, despite its technical innovation, contradicted the basic principles of IHL. In particular, due to the lack of trajectory correction after launch, the missile could not distinguish between military and civilian targets, and its use against densely populated cities in the Great Britain and Belgium violated the principle of

proportionality and the prohibition of indiscriminate attacks. As a result, the British government declared the use of V-1 as a violation of international law. At the same time, the Allied powers also conducted experimental programmes to use remotely piloted aircraft, but their practice retained a certain level of human control, for example, in the Operation Aphrodite, where pilots initially took off with the explosive-packed airplane and bailed out only after setting its course to target. The use of such weapons was not accompanied by clear regulations, but it provoked an international reaction that subsequently influenced the evolution of legal regulation.

It was the experience of the massive use of remotely piloted systems in the 1940s that laid the groundwork for the principles enshrined in the Geneva Conventions of 1949 and the Additional Protocol to the Geneva Conventions Related to the Protection of Victims of International Armed Conflicts (Protocol I) of 1977, including the prohibition of indiscriminate attacks, the requirement to take precautionary measures and the legal examination of new weapons. The criticism of the use of uncontrolled systems contributed to the formation of the concept of human control, which became the basis of the modern approach to the legal assessment of autonomous weapons. In turn, the Nuremberg and Tokyo Military Tribunals, although did not directly address the use of such systems, enshrined the principle of command responsibility, according to which commanders are legally responsible for the choice of warfare methods, including technological solutions. Thus, the historical experience of the Second World War demonstrates the need for a timely legal response to technological innovations in the field of armaments and confirms the relevance of humanitarian law principles in the current environment.

Conclusions. Historical analysis shows that during the Second World War drones began to move beyond technical experiments and became part of tactical and strategic practice. The United Kingdom, the United States of America, Germany, Japan and the Soviet Union developed UAVs not only as training targets for air defence, but as combat weapons – flying bombs and guided missiles.

The technical evolution of drones has been uneven, with waves of knowledge lost between wars, leading to duplication of effort in new generations of development. Despite the limited results of many projects, it was during this period that the basic principles of remote control, telemetry, strike autonomy and reconnaissance were laid down.

During the Second World War legal mechanisms did not provide for a clear classification of unmanned systems or rules that would regulate the issue of responsibility for the remote destruction of targets. This created the basis for modern comparative studies in the field of *jus in bello*.

The ethical and philosophical aspects of UAVs emerged: despite their technical primitiveness, the very idea of remote destruction without endangering the operator caused a public and political resonance similar to contemporary discussions about “safe warfare” and the dehumanisation of combat.

The low level of scholarly institutionalisation of the topic of UAVs in the Second World War (as much of the material remains scattered in memoirs, archives, and technical literature) necessitates a thorough and comprehensive interdisciplinary analysis that combines history, law, technology, military strategy and ethics.

Prospects for further research. An interdisciplinary study of the legal status of UAVs in retrospect: an attempt to reconstruct the legal consciousness of the 1930s and 1940s in the field of the use of modern weapons, comparing it with modern standards of international humanitarian law, especially in the context of the combatant/non-combatant distinction, proportionality and military necessity, is relevant.

Civil-military technology transfers: examining how post-war UAVs development has been transferred to the civilian sector, the aviation industry and academia. This will allow us to understand the broader socio-technical impact of drones as a phenomenon.

Comparative analysis of the use of UAVs in conflicts of the 20th and 21st centuries: the experience of the Second World War should be compared with military campaigns of the last two decades (Iraq, Afghanistan, Syria, Ukraine) to trace continuity or break in technical solutions, strategic doctrines and legal regulation.

Study of the reception of UAVs in military culture: it is worth to learn how drones were perceived in military propaganda, art, cinema and journalism of the time – this will help to better understand not only the technical but also the symbolic importance of drones in the culture of war.

Given the national context of Ukraine, it is advisable to continue the study, focusing on the experience of the post-Soviet space, the transformation of technologies in the new conditions of hybrid warfare, and the role of Ukraine as one of the leading UAV innovators in the 21st century.

Thus, the study of the history of UAVs in the Second World War is not only a return to the forgotten pages of military technology, but also a key to understanding the modern paradigm of warfare, where distance, technology and law form a new logic of combat operations.

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