



CAUSES OF THE FAILURE OF RUSSIAN AVIATION IN ACHIEVING AIR SUPREMACY IN THE UKRAINE CONFLICT AND SUBSEQUENT INFLUENCES ON ITS EVOLUTION

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The large-scale conflicts from recent decades in Yugoslavia (1999), Iraq (1991 and 2003), Afghanistan (2001-2014) and Libya (2011) have shown the importance of achieving and maintaining air supremacy. The states of the world are trying to modernize their aircraft or build new ones in order to meet this goal, simultaneously with doctrinal changes in the field and changes in the techniques, tactics and procedures by which military pilots act. The states that remain anchored in the past and do not take into account these developments, risk not being able to use the air force effectively, with major repercussions on the results of military operations, a fact also seen in the war in Ukraine in 2022.

Keywords: combat aircraft; military objectives; air space; air supremacy; qualitative ratio;



“We must be prepared to control the air above the earth’s surface or be buried beneath it” (Counterair Operations, 2011, p. 12.).

General Charles Horner, Commander of the Air Component of the Joint Force during military operations DESERT SHIELD and DESERT STORM

INTRODUCTION

The current conflict in Ukraine has its origin in the actions of the Russian Federation to annex Crimea, an integral part of Ukraine, in 2014, followed by the armed conflict of the self-proclaimed separatist republics of Donetsk and Luhansk in the eastern area. During this entire period, the two states probably prepared militarily for the current conflict. The air force, an important part of each of the two armed forces, also participated in this effort.

From the definitions of degrees of airspace control given in the *Manual of Operations against Enemy Air Forces* (2010, p.10), the major difference between air superiority and air supremacy can be seen as degrees of control. If in the first degree the adversary can still launch surface-to-air missiles and use aircraft in combat missions, in the second they are unable to act effectively.

Aware of the importance of obtaining and maintaining air supremacy in the initial phase of the armed confrontation in the further development of the conflict, the Russian side tried to meet this objective, while the Ukrainian side tried to prevent the Russian forces from meeting this objective, a fact achieved until the present moment.

In this regard, we note that the conflict in Ukraine largely followed the stages established in the last international wars, especially in terms of its similarity, in the beginning, with the interventions in Yugoslavia (1999), Iraq (2003) and Libya (2011). This aspect is mainly due to the fact that the current military theory states the importance of the use of the air force in the initial phase of an armed conflict, in order to obtain and maintain the desired degree of airspace control, as well as due to the lessons identified from the previously specified

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If the Russian armed forces used aviation offensively, the Ukrainian armed forces judiciously combined air defensive actions with offensive ones, knowing the classic theory stipulated since the beginning of aviation by Giulio Douhet, considered one of the founders of air power theory, who stated, in 1910, that "only by mastering the air will we be able to fully benefit from an advantage that can be exploited when the enemy is forced to stay on the ground".

wars and studied by both countries military specialists. Important for the Russian side was to obtain and maintain air supremacy so that they could later develop their military operational plan.

Thus, after the preparation (informational, economic, spatial, cybernetic etc.) phases of this conflict, which have become, we could say, classic at the present time, the proper combat phases followed. Within the latter, the first should have been the lethal combination of surface-to-surface missile strikes (of all types – classic, cruise) and the use of aviation, mainly for the purpose of destroying Ukrainian command and control centres and the air force of this state (by neutralizing radars, aviation and surface-to-air missiles). Later, depending on the results of this operation – the offensive air operation – the Russian armed forces could continue their plan. Up to a certain point, it could be seen that the Russian military applied these principles well, so that the armed conflict began on the morning of 24 February 2022 with a massive surface-to-surface missile attack, followed by the action of the Russian aviation. But, probably anxious to get to Kiev quickly, or following wrong assessments by the security services, they simultaneously started the land invasion, on a rather large front – according to my estimates – about 1,500 km, from north of Kiev following the eastern border and ending in the south, at the border between Crimea and Ukraine, without waiting to evaluate the result of the actions of own aviation. For example, in the intervention in Yugoslavia, NATO did not make this mistake, continuing the air operation for several months, the Serbian side resigning as a result of the air bombing.

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CAUSES OF THE FAILURE OF THE AIR FORCE OF THE RUSSIAN FEDERATION TO ACHIEVE AND MAINTAIN AIR SUPREMACY

One of the basic rules of armed conflict states that the offensive force must achieve numerical superiority in forces and assets, in principle in a ratio of 3:1, or if the forces are sensitively equal, to possess technological superiority. According to data from open sources, at the beginning of the conflict the Russian Federation possessed a number of approximately 1,379 combat and transport aircraft and a number of 961 helicopters of all types, of which approximately 330 aircraft and 240 helicopters were allocated for this operation (<https://www.minusrus.com/en>). As for the combat aircraft of the two sides, they were basically in the first two month of the same type (with variations in terms of upgrades or armament), respectively Ukraine owning MiG-29, Su-27, Su-24, Su-25, Mi-24, Mi-8/17, of Soviet production. Subsequently, the Russian side tried to use newer generation aircraft, such as Su-57 or Su-35. Probably this type of aircraft was not used on a large scale due to the fact that the Russian Federation was obliged to preserve its aircraft in order to be able to counterbalance the NATO air power.

Other sources show a total number of 4,173 aircraft, from which fighter and fighter-bomber aircraft – 772, ground attack aircraft – 739, transport aircraft – 445 and helicopters – 1,543. In comparison, the Ukrainian Air Force operated a number of approximately 318 combat aircraft, from which fighter and fighter-bomber aircraft – 69, ground attack aircraft – 29, transport aircraft – 32 and helicopters – 112 (Statista, 2022).

Of this total number of aircraft, at the beginning of the conflict, probably at least 25% were unavailable for various reasons, including the need for repairs or maintenance. Later, during the evolution of the conflict, the daily availability of aircraft decreased further due to their use in actual combat conditions, combined with the loss rate. It should be noted that, if we can only make assumptions about the state of operability of the Ukrainian aircraft, we can say about the Russian aircraft assigned to the operation that they were in a state of operability, only by the fact that they were deployed by air on various airfields near the conflict zone, located on the territory of the Russian Federation or in Belarus.



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Therefore, it can be concluded that the ratio of 3:1 in favour of the offensive forces was achieved. It is also worth noting the overwhelming ratio of surface-to-surface missiles, missiles that were used permanently and in large numbers and which should have facilitated the hitting of the command-control centres of the Ukrainian Air Force, infrastructure and material and human resources, which would have meant supporting the offensive air operation.

Also, in order to achieve air supremacy, the headquarters of the Russian joint forces should have established a list of prioritized targets for striking, in a predetermined order. After each air strike, the same headquarters, through the specific structures and with appropriate means, had to evaluate the degree of success, in accordance with the operational requirements, so that the final goal of the operation, as a whole, could be achieved. As noted, Russian forces executed a large number of sorties/aircraft and hit a large number of military and civilian targets, presumably in accordance with their own priority target list.

And yet, something did not go according to plan, because after about two months of military operations, the Russian armed forces withdrew from the northern and north-eastern front, concentrating their military actions on the southern and eastern front, failing to gain air supremacy.

Some possible causes of this failure could be:

a) Deficient planning at the joint level of the military operation as a whole

This fact is primarily a consequence of the level of forces involved and the length of the front line. Practically, the existence of at least four fronts: the Northern Front, with forces from the Eastern Military District, attacking in the Belarus-Kiev direction; the North-Eastern Front, with forces from the Central Military District, attacking in the Belgorod-Kiev direction; the Eastern Front, with forces from the Western Military District, attacking in the Donbas-Kharkiv direction; the Southern Front, with forces from the Southern Military District, attacking in the direction of Crimea-Zaporozhe and Mariupol (Seth, 2022) led to the needs of existence of several headquarters of at least corps level, subordinated to a unified command – the Command of the Russian Forces for Ukraine, which made cooperation and coordination of military actions difficult. The list of prioritized targets required to be hit in the first stage by aviation and missiles was not correctly drawn

up and did not include the entire territory of Ukraine, which led the possibility of conducting the manoeuvre of forces and assets from the east to the west of the Ukrainian Air Force. Moreover, the economic potential of sustaining the air force was not neutralized in a timely manner.

Secondly, the planning probably started from certain erroneous premises provided by the security services, given the events and the successful annexation of Crimea. Thus, it is likely that the Russian Federation relied on the adherence and support of ethnic Russians and pro-Russians in Ukraine to the objectives of the military operation, as well as on quickly winning over the Ukrainian population through propaganda, which should have led to an easy victory, without much military losses. This fact, as noted, did not happen.

Comparing with Operation Desert Storm, where the international coalition used a total of 1,798 aircraft of all types (Mischie, 2020, p. 298) against an Iraqi air force that had approximately 656 aircraft (Ib., pp. 294-295) to a smaller territory than the Ukrainian one, I believe that the planners allocated insufficient aircraft.

Last but not least, the air force likely relied on the neutralization of Ukrainian air defences and command and control by long-range surface-to-surface and air-to-surface missiles, moving quickly to attack infrastructure, economic, logistic support and groupings of forces, probably with the aim of diminishing the morale of the population and creating pressure on the Ukrainian political-military leadership for the purpose of capitulation. Either way, the planning process should have provided the permanent evaluations of the strikes executed with missiles and aviation and the adaptation of the air operation plan to the realities of the battlefield.

b) The deployment depth of the Ukrainian military airfields from the take-off airfields of the Russian aviation

From the first hours of the invasion, the Ukrainian Air Force took off to oppose the invaders, conducting air battles, some of them being victorious according to the statements of military officials from Kiev, but also to execute the manoeuvre of forces and assets deep into its own territory. In a short time, the aircraft that remained after the first hours of the war headed, most of them, to the west of Ukraine, to the Ivano-Frankivsk airfield. The Lviv airfield was also used for the manoeuvre.



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Russian aviation operated, from the north, most often from the airfields in Belarus, namely Zyabrovka (Gomel), Lida and Lulinets. The other military airfields located on the territory of the Russian Federation from which it was possible to operate with fighter or bomber aircraft were at a great distance from the intended targets, the closest being the Seshcha airfield, at a distance of approximately 411 km from Kiev and 800 km from Ivano-Frankivsk.

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As it can be seen on the maps, the average distance between the Belarusian airfields used by the invaders and the Ivano-Frankivsk airfield is about 600 Km, the nearest being the Lulinets airfield, about 450 km away. If we take into account the declared combat range of 750 km for the Su-25 aircraft with two additional tanks (https://en.wikipedia.org/wiki/Sukhoi_Su-25), it turns out that the tactical range is approximately 380 km. However, from the images provided by various media channels with such aircraft in action, it can be seen the lack of additional tanks, which means that the tactical range is even less. Similarly, Su-27 aircraft have flight distances of approximately 1,340 km at sea level, without armament (Sukhoi Su-27, Wikipedia), which results in a tactical range of approximately 670 km. If we take into account the weapon variant, it turns out that the tactical range drops quite a bit, being probably somewhere around 500 km.

Therefore, it would have been very difficult for the Russian Air Force to be able to hit airfields in western Ukraine with aviation. This fact allowed Ukraine to be able to use aviation practically throughout the war.

c) Lack of specialized aircraft, considered force multipliers

The Russian Air Force did not have a sufficient number of aircraft specialized in electronic warfare, early warning, stealth and aerial refuelling. Or, in the given situation, they would have been essential in supporting air operations. Thus, for example, the tactical range could have been increased by using aircraft with an air refuelling role. Declaratively, Russia has a number of 15 IL-78 aircraft (https://en.wikipedia.org/wiki/Russian_Air_Force) with this role. But it is not known how many were available at the time of the invasion. Thus, many Ukrainian targets, important for the Russians, remained unreachable for aviation, trying to hit them with missiles.

Regarding Airborne Early Warning (AEW) aircraft, also declaratively, Russia has 15 A-50s and an unspecified number of IL-80 command

and control aircraft (https://en.wikipedia.org/wiki/Russian_Air_Force). In the same way, their availability is not known here either, however, on the Eastern and South-Eastern fronts the use of this type of aircraft was attempted. If such aircraft had been used, with specialized and trained military personnel on board, at least the air battles, so much publicized by the Ukrainians, could have been avoided.

Stealth aircraft are missing from the combat inventory of the Russian troops. Declaratively, there are some Su-57 type aircraft, which would have this characteristic and which would have been used, on a limited basis, after the retreat around Kiev, without any definite data on these actions.

But the biggest shortcoming of the Russian Air Force was specialized electronic warfare aircraft. Basically, Russia does not own such aircraft, having various containers for this purpose placed on combat aircraft. However, the lessons learned from previous conflicts show that when such aircraft exist, it is very important to coordinate the force packages with the action of these aircraft. In the absence of proper coordination, losses can be as high as if there were no electronic warfare aircraft. I believe that this is one of the main reasons for the high losses in aircraft suffered by the Russian aviation. For example, coalition air forces involved in Operation Desert Storm in Iraq in 1991 flew 8,478 sorties with EA-6B Prowler and EF-111 Raven electronic warfare aircraft out of a total of 132,029 sorties (Stillion, 2015, p. 25).

d) Pilots training

Just as important as the aircraft themselves is the combat training of pilots and air force doctrine. The mathematical formulas for calculating the probability of destroying a target always introduce this variant. Air combat, said Major General Victor Strîmbeanu, represents “one of the highest technological expressions of human confrontation [...] controlled [...] through education, training, motivation” (Strîmbeanu, 2020, p. 51), from which results the importance of the existence of standards, as high as possible, in the training of military pilots.

The fact that the Russian pilots were operating the same type of aircraft as the Ukrainian ones became a major disadvantage for them, because practically the defensive ones knew their training method, as well as the advantages and disadvantages of real combat use of these aircraft. On the contrary, after the invasion of Crimea, the armed forces of Ukraine benefited from training from Western countries, especially the USA and the UK, this aspect being a major advantage.



ROMANIAN
MILITARY
THINKING

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From the images that appeared in the media, it was possible to see how Russian aircraft carried out low-altitude flights to launch weapons or to search and identify their targets. This tactic is specific to pilots trying to break through the enemy's anti-aircraft defences, a fact probably due to the lack of electronic warfare aircraft, on the one hand, and to the lack of precision weaponry, such as anti-radar missiles, on the other hand.

At the same time, if the standard for maintaining the qualifications of mission-ready pilots in NATO countries is a minimum of 180 flight hours per year, on the Russian side most pilots did not reach this standard.

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Moreover, executing CAS (Close Air Support) or SEAD (Suppression of Enemy Air Defences) missions with aircraft without modern avionics systems and precision weaponry in an environment with multiple threats from both GBAD (Ground-Based Air Defence) systems and man-portable anti-aircraft systems /MANPADS is very difficult, even for a well trained pilot.

e) Aircraft quality

It was observed, in this phase, the use of some aircraft, generally bomber – Su-24, Su-25 aircraft –, without having modern avionics systems integrated with the weapon system, which would facilitate the piloting of the aircraft and allow for the pilot to distribute his attention to threats in the air environment or surface-to-air threats. Moreover, many such aircraft used unguided reactive projectiles, probably with a short range, up to 5 km, without integrated avionics systems. Thus, for hitting the targets, for accuracy, classical methods were used, i.e. the attack from the dive, under a certain angle, which leads to a greater vulnerability of the aircraft due to the relatively long time spent on the predetermined trajectory.



Also noted was the small use of high precision weapons, from the last generation, which could have produced far greater effects by executing precision strikes from a long distance and out of range of defensive ground systems. This is probably also due to the sanctions imposed on the Russian Federation, including access to technologies or microchips, which makes it difficult to replace these munitions in the short term.

Thus, if from a quantitative point of view a favourable ratio was achieved, from a qualitative point of view, of the aircraft used, the ratio was sensibly equal. It is worth noting that although the Russian side has 4++ generation aircraft, such as Su-34 or Su-35S, a small part of them have been introduced into combat. It is likely that the Russian armed forces maintain some modern technology, as well as precision weaponry, to counter the threat they perceive as coming from NATO. Anyway, according to the estimates of the Ministry of Defence in Kiev, about 24 Su-35 aircraft were lost on the Ukrainian front until 11 August (Roshchina, 2022).

f) Use of air assets for the purpose of executing ISR – intelligence, surveillance and reconnaissance missions

These missions play a crucial role in the air offensive operation aimed at gaining air supremacy. Through them, accurate information is obtained about the position, movements, intention, order, techniques, tactics and procedures of the adversary, allowing preventive and timely action. In this way, information can be found about the position, for example, of ground-based air defence means.

If Ukraine had to find unconventional solutions to resist, such as the use of commercial drones, adjacent to its own UAVs (Unmanned Aerial Vehicle), especially the TB-2 drones, both for ISR and strike purposes, the Russian side, during the analysed period, used only tactical drones, specific to ground forces. This type of drones had small tactical range and had no strike capabilities. Thus, Russian planners had to rely on satellite analysis or information from the security services, which allowed Ukraine to hide certain weapons systems or evade from missile strikes. However, it is difficult to hit a pinpoint target (like BUK or S-300 anti-aircraft systems) with a long-range surface-to-surface missile.

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g) Supporting Ukraine with weapons from outside the country
Perhaps this cause is the most defining for the failure of Russian aviation. Indeed, after the first military strikes with missiles and aviation, the capacity of the Ukrainian armament industry was greatly diminished, and perhaps, without the delivery of weapons from the outside, especially man-portable anti-aircraft systems, the situation would have been different.

In this way, the losses in terms of anti-aircraft systems could have been successfully replaced, ensuring a permanent fire presence in the airspace against enemy aviation.

Moreover, probably based on the allies' promises to identify solutions that would allow it to repair the unavailable aircraft or even replace them (as it was later observed), the Ukrainian Air Force used, following Western tactics and in a complex way, its own aviation almost daily, both to conduct air-to-air combat and to strike Russian troops around Kiev.

Also very important was providing access to the various satellite networks for imagery and analysis – both needed by planners and for communications, in order to maintain the functionality of the command and control system. It is well-known that Elon Musk provided access to the Starlink network satellites.

h) The political constraints imposed on the Russian armed forces

In any armed confrontation, the political side establishes the mandate for the use of armed forces, including certain constraints. Although they are not public for this conflict, certain restrictions can still be inferred. Thus, the non-use of latest technology, such as Su-57 aircraft or T-90 tanks, in the beginning, derives from the strategic directions drawn by the political leadership of the Russian Federation, in terms of combating US hegemony. Moreover, certain capabilities, other than nuclear ones, that represented a credible threat had to be preserved. Also in this regard, correlated with the impossibility of the Russian industry to recover in the short term the technological gap with respect to potentially adversary countries, the limited use of precision munitions can be explained.

Another constraint could explain the lack of bombing political-administrative centres in the capital Kiev, despite the fact that Russian planes operated in the airspace above this city.

Probably based on the historical rights of the Russian minority in terms of territorial disposition, it was decided to limit the invasion to the east of the Dnieper River. At the same time, the limitation of the conflict within the borders of Ukraine was constantly considered, a fact that allowed the training of the soldiers of this state in neighbouring countries, on a technique that was later deployed on the front line.

Also, the desire to retain power by the current leadership led to a limitation of the number of forces involved in direct confrontation, contrary to the wishes of the military leaders, with the aim of being able to limit the negative effects resulting from the potentially higher number of dead Russian soldiers on the front. That is precisely why paramilitary groups (such as the Wagner group) or foreign mercenaries were also involved.

INFLUENCES OF FAILURE TO ACHIEVE AIR SUPREMACY IN THE COURSE OF ARMED CONFLICT

One of the most important benefits of obtaining and maintaining air supremacy is represented by facilitating the freedom of movement and action of own troops, by destroying the offensive potential of the opponent, especially its aviation, thus resulting in winning the initiative on the battlefield. It would also have provided the ability to strike any ground target from the air with a high aircraft survivability rate. By failing to achieve this objective, the Russian troops on the ground were forced to advance to the shelter of their own artillery, but under the combined fire of the adversary, which also led to an increase in the number of victims and destroyed equipment.

At the same time, the lack of airspace control by Russian forces in the western and south-western part, allowed Ukraine to achieve three particularly important aspects:

- bringing from outside the country the resources necessary to continue the defensive military operation and sending them to the front line;
- continuing the use of own combat aviation from the airfields of this side against the adversary;
- continued training with school-trainer aircraft (probably L-39) for the generation of new military pilots, at the Ivano-Frankivsk airfield.



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In the south, these failures allowed Ukraine to maintain land-based maritime defence capabilities such as anti-ship missiles, particularly in the Odessa area. Moreover, they were successfully used against Russian ships, of various sizes, which either blockaded Ukrainian ports combined with artillery or missile strikes on land, in order to create favourable conditions for landing, or supported the troop resupply operation located on the Serpents Island. Perhaps the most resounding success in this regard was the hitting and sinking of the flagship of the Russian Black Sea Fleet – the cruiser Moskva, on 13 April. Following this strike, the Russian ships retreated approximately 100 km off the Ukrainian coast, and later, after receiving new anti-ship combat capabilities, the threat of a landing in the Odessa area practically disappeared.

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In the same way, I believe that various targets on the territory of Belarus could have been hit, but Ukraine probably refrained from such actions in order to not give reasons to this state to join this invasion with troops and equipment.

Another implication was to allow the achievement, in a continuous, articulated and unitary manner, of the act of command-control at the central level of the political-military leadership. Moreover, it facilitated the use of armed TB-2 drones, which could provide planners with real-time information about the adversary, and where they identified valuable targets (such as GBAD systems, command points etc.) enabled their immediate neutralization.

Also, without air supremacy, the other specific missions of the air force were severely affected, especially those in direct support of ground forces (air denial, air support, reconnaissance, air assault missions and airborne). This fact was seen especially in the attempt, I could say desperate, of the Russians to conquer an airfield inside Ukraine, in the first month of the conflict. Thus, on 26 February, using vertical manoeuvres with helicopters and transport aircraft, they tried to occupy the Antonov and Vasylykiv airfields, near Kiev. In the absence of effectiveness of air support missions, the enemy's troops



were neutralized mainly by Ukrainian artillery. Similarly, attempts were made to capture some airfields in the eastern part, among which I would mention the Millerovo airbase, attacked on 25 February with surface-to-surface missiles by the Ukrainians, the Russian forces losing a significant number of helicopters. Similarly, ISR missions deep into Ukrainian territory were practically absent. These missions are carried out with tactical UAVs, since, on the one hand, Russia has not operationalized such systems that can act at long distances and, on the other hand, they would be shot down by the air defence system that works coherently.

By adapting combat techniques to the quantitatively unfavourable situation, benefiting from the failure of the Russian aviation to achieve air supremacy, as well as from its own planners who knew how to draw up, in a formidable way, the list of targets that had to be hit (the lines of supply, GBAD and artillery systems mainly) and the intelligent, combined use of all weapon systems (aviation, missiles, UAVs, artillery etc.) the Russian army forced were made to retreat on two fronts (North and North-East).

Russian aviation losses, according to the Ukrainian Ministry of Defence, amounted to 233 aircraft, 196 helicopters and 136 GBAD systems as of 16 August (Ministry of Defence of Ukraine, 2022). Even if we take into account the fact that, in such situations, the side on the defensive tends to artificially increase the number of losses of the opponent, and we halve these losses, they are quite high.

The failure of the Russian air force also focused on the demoralization of the Russian pilots, who began to use less common combat tactics, such as launching munitions from helicopters from grass cutting flight form pull-up or from bombers flying horizontally at low height. All this leads to inaccuracy in the strikes and denotes the fear of the pilots, the low morale as well as the fact that the Ukrainian side has a sufficient number of anti-aircraft systems of all kinds through which it becomes effective in defending its own airspace.

Without air supremacy, no more vertical manoeuvres were attempted, by means of helicopters or airborne missions. Also due to the vulnerability of helicopters and transport aircraft, the manoeuvre of forces and assets began to be executed on land. Moreover, the supply of the Russian troops near the contact line had to be carried out by land, from the depth of the own battle positions. All those facts

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made the movement of troops and equipment difficult, exposing them to Ukrainian strikes. Video materials promoted by the media confirm these aspects, in which various weapon systems, especially HIMARS systems, neutralize bridges or weapon depots behind Russian lines.

Also a consequence of the inability to obtain air supremacy was the withdrawal from Serpents Island. It occurred as a result of well-planned, sustained and combined strikes (artillery, aviation and reconnaissance-strike with UAVs), executed almost daily in the period before the withdrawal by the Ukrainian side. Those actions demonstrated to us the inability of the Russian air force to intercept and neutralize Ukrainian aircraft or drones, on the background of the lack of radar information that would provide a permanent aerial picture of the conflict zone. We deduce from it the importance of AEW-type aircraft in the economy of the confrontation and the lack of Russian ones in the area of operations. In the same manner it was also possible to hit fuel depots in the Russian Belgorod area by Ukrainian Mi-24 helicopters.

Another consequence was the transformation of the war into one dominated by artillery weapons, which produce massive losses especially in terms of infrastructure, but also significant losses of human life among non-combatants. At the same time, Ukraine was given the opportunity to restore its network of airfields, which it used for specific aviation manoeuvres and the execution of airstrikes against opponents, with the few remaining operational aircraft.

With the withdrawal of Russian troops from the northern and north-eastern regions of Ukraine, the Russian aviation has not undertaken, until now, offensive air operations specific to obtaining supremacy, remaining present on the Donbas front, where it has, without a doubt, air superiority. In this area, they perform ground forces support missions, in an environment characterized by MANPADS threats. It can be seen from the daily reports of the Ukrainian armed forces that Russian planes and helicopters are still being shot down, which shows that the anti-aircraft defence is working, and the degree of survivability in the airspace related to the conflict zone remains low.

Also, as the war dragged on, as a result of the pressures of international community sanctions, superimposed on own economic problems, it was found that political limitations further affected the ability of the Russian Air Force to effectively support military operations.

All these aspects have created the possibility of Ukrainian counteroffensives, even if they have been limited so far. The retreat around Kiev, following the failure to obtain air supremacy, was due to a combination of factors, among which the most important was the difficulty in resupplying the troops with ammunition, equipment and supplies, as a result of the permanent strikes carried out by the Ukrainian armed forces. It is not excluded that in the future, by creating a quantitative and qualitative ratio in terms of artillery, tanks and armour, equal to that of the Russians, in certain directions, we will witness the transition from defensive to offensive, with the aim of recapturing the lost territories.

CONCLUSIONS

After the reorganization of the Russian Air Force following the war in Georgia, the active involvement in the armed confrontations in Syria, the acquisition of last generation aircraft (according to Russian propaganda) and the large number of combat aircraft in the inventory, we would have expected for it to achieve air supremacy on the territory of Ukraine.

However, reality has shown us that due to faulty planning, based on erroneous information and which did not take into account all the specific elements (here I am mainly referring to the size of the theatre of operations – the entire territory of Ukraine), combined with the lack of specialized aircraft of electronic warfare, or the reduced number of early warning and air refuelling aircraft, the Russian air force was forced to admit its helplessness, by limiting, after the retreat around Kiev that began on 3 April, to the strikes with cruise missiles or providing air support to ground forces on the Eastern and Southern fronts.

Taking into account the definitions of the degrees of airspace control, as well as the way of action in this space with its own means by the Ukrainian Air Force, I can say that the Russian aviation only achieved air superiority in the first two months of the conflict, maintaining it today in Donbas, without reaching the level of air supremacy so desired by military leaders and planners.

After the date of the withdrawal from the north and north-east, as a result of the failure to achieve air supremacy, and probably heavy losses in equipment and pilots, combined with the restoration of the air defence capability of the Ukrainians and their own airfields,



After the date of the withdrawal from the north and north-east, as a result of the failure to achieve air supremacy, and probably heavy losses in equipment and pilots, combined with the restoration of the air defence capability of the Ukrainians and their own airfields, the Russian aviation did not undertake strikes in the depth of the combat disposition of the latter.



The bold strikes, carried out against Russian ships in the Black Sea and some industrial or infrastructure targets on the territory of the Russian Federation, led the aggressor to maintain troops and equipment on all the borders, a fact that allowed more freedom for Ukrainian's military planners.

the Russian aviation did not undertake strikes in the depth of the combat disposition of the latter. It was limited to actions in the vicinity of the contact line. This aspect provided flexibility to Ukrainian planners, along with much greater freedom of movement on the front line and permissiveness in the execution of troop and technical manoeuvres.

After the withdrawal from the Kiev area and the concentration of troops in the south and east, the Russian Federation continued the ground offensive, at a much lower rate, with the Air Force reducing the number of sorties. All of this led to a drop in the morale of the Russian forces, including the pilots. However, considering that quantity is a quality in itself, the troops of the Russian Federation are currently slowly advancing.

The bold strikes, carried out against Russian ships in the Black Sea and some industrial or infrastructure targets on the territory of the Russian Federation, led the aggressor to maintain troops and equipment on all the borders, a fact that allowed more freedom for Ukrainian's military planners. Moreover, the strikes on the air bases in Crimea, resulting in the loss of aircraft and personnel, caused these combat assets to be withdrawn inside Russia, thus increasing their range of action, with negative repercussions on the support possibilities of the ground forces.

Most of the data on the amount of the aircraft used in the conflict, as well as the losses suffered by both sides, comes from open sources. That is why they must be viewed with some scepticism, the reality being presented after the conflict is over. It is certain, however, that, from the actions taken by both sides, the decrease in intensity of the Russian airstrikes can be observed, which leads to the conclusion that the losses in equipment and personnel are significant. At the same time, there is an increase in Ukrainian air actions, which leads us to the conclusion that there is no longer a question of the Russian side obtaining air supremacy and operating on all unoccupied territory. How long the two sides can afford to sustain combat actions with aviation will depend on the ability of each to further train their pilots knowing that the training period of a military pilot is at least three years, and as far as the Ukrainian side is concerned, the possibility of receiving/acquiring other aircraft is also important.

We can state, in the end, that air supremacy will remain an essential factor in the way of conducting the wars of the future, which provides flexibility in planning and freedom of action and movement to the other categories of armed forces participating in the joint operation.

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