

The air war over Ukraine

The inability of Ukraine or Russia to gain air superiority has led to a deadly stalemate.



Russian missiles strike Kharkiv on September 9th, 2022. (Photo: Courtesy by [Vadim Belikov](#))

By AVEDIS HADJIAN

KYIV.— In December of last year, Russia launched its biggest air attack on Ukraine since the full-scale invasion on February 24, 2022, with hundreds of missiles and drones as well as possibly nine Tu-95 strategic bombers. The air raids against mostly civilian targets, including a maternity hospital, left at least 58 dead and more than 160 wounded in Dnipro, Kharkiv, Konotop, Kyiv, Lviv, Odesa, and Zaporizhzhia.

According to the United Nations Human Rights Monitoring Mission in Ukraine, at least 641 civilians were killed or injured in January, a 37 percent increase from the number of civilian casualties recorded in November 2023. On a trip to Kyiv by your correspondent in late January, three explosions were clearly heard from a hotel that doubled as a shelter. The missiles on January 23 made impact more than an hour after the air raid alert at 5:44 AM. The eastern city of Kharkiv

was also hit in that wave of air strikes, which caused the death of 18 people and injured at least 130, including a pedestrian in the capital who was maimed.

There may not be a letup in the carnage until the stalemate in the air war is broken, said Colonel David Pappalardo, of the French Air Force, currently serving as the Air and Space Attaché at the Embassy of France in the United States. The reason for that is that the deadlock in the skies is also mirrored in the bloody positional warfare in the battlefields of Eastern Ukraine.

“We’re still in a World War I style war dominated by artillery, and neither side has any real air superiority that would enable it to use air power to break the deadlock and create a gap in the front line that could be exploited,” he said.

Two years into the full-scale invasion, Col. Pappalardo identified four developments in the war in the air:

- Russia has acquired a certain local air superiority over the years: it has partially learned from its mistakes and its tactical aviation has played a key role in recent Russian successes on the ground, as at Adviiivka for example. Yet Col. Pappalardo mentioned the heavy losses of the Russian Air Force as well, including 15 aircraft allegedly shot down in late January and early February, including a second A-50 early warning aircraft.
- The improvement in Ukraine’s deep strike capabilities is pushing the Russian air forces to move away from the front and disperse in order to preserve their preserve its ability to operate.
- Both parties are intensively using electronic warfare as well as drones of the ISR (Intelligence, Surveillance, and Reconnaissance) and FPV (First-Person View) types, among others, to obtain local operational superiority. “To a certain extent, you could say that the artillery duel is ‘boosted by the use of steroids’, the steroids being the large number of drones that tend to make the battlefield even more transparent”.
- Russia has intensified its strategic air attack against Ukrainian critical infrastructure since the end of December 2023, the effect being partly mitigated by Ukrainian Air Force air defence with the support of western nations.

Stalemate, not attrition

Stalemate, however, does not mean attrition, said [Justin Bronk](#), Senior Research Fellow for Airpower and Technology at the Royal United Services Institute in London.

“I would not characterise the air war over Ukraine as attritional,” said Justin Bronk, of RUSI. “Instead, what we are seeing is both sides’ air forces concentrating of standoff strikes with both cruise missiles and glide weapons against fixed targets, rather than dynamic close air support and interdiction.”

Caution explains this.

“Neither has so far been able to sufficiently attrit the others’ ground-based air defence systems—composed of surface-to-air missile (SAM) batteries and radars—to be able to operate sustainably over the frontlines themselves,” Bronk said. “Whilst both sides have taken and continue to take losses—primarily to long range SAM engagements—they are relatively low compared to the number of sorties being flown due to the cautious operational posture of both air forces.”

The stalemate stems from an inability by Ukraine to gain air superiority over Russian forces.

“Given the size of fighter force it could generate and maintain, Ukraine cannot gain air superiority over Russian forces due to the heavy density and sophistication of Russian ground-based air defences, and the much larger and more technically advanced Russian fighter force. Instead, the goal of both Ukrainian ground-based air defences and the fighter force (including once F-16 and possible Gripens are delivered) must be to prevent Russia gaining air superiority over the battlefield,” he said. “In other words, Ukraine needs to be resourced to maintain its air defence posture which has (so far) successfully kept the Russian Aerospace Forces behind their own lines and thus relatively ineffective throughout the war.”

An air terror campaign

Air attacks can be particularly scary. Once a bomb or a missile gets past anti aerial defenses, there may be no effective protection other than the limited safety offered by an air shelter. The most destructive weapons, the two atomic bombs dropped by the United States on Japan in August 1945, came from the air.



RUSSIAN AIR FORCE

Total Aircraft: 3,649

FIGHTERS: 912	
	Su-24; Su-34; Su-30; Su-35 (photo); Su-27; MiG-31; MiG-29; Su-57; MiG-35
BOMBERS: 121	
	Tu-22; Tu-90 (photo); Tu-160
CLOSE AIR SUPPORT: 197	
	Su-25
HELICOPTERS: 1,430	
	Mi-8/17; Mi-24/35; Ka-52; Mi-28 (photo); Mi-26; Ka-226; Ka-27; Sa 355; H215M; Mi-2
TRAINERS: 487	
	L-39; Yak-130 (photo); Ansat; Tu-134; Mi-2; Su-27; DA42; Mi-28; Mi-29
TRANSPORT: 410	
	An-26; IL-76; An-12; L-410 (photo); An-72; An-148; Tu-134; An-124; An-22; An-140; IL-18; Tu-154
AERIAL TANKERS/REFUELERS: 19	
	IL-78
SPECIAL MISSION: 73	
	IL-20/22; An-30; A-50/100 (photo); Tu-21; An-12; IL-80; An-26; IL-76; Tu-134; Tu-154; An-140

But terror in the air had ruled the skies for the entire duration of the Second World War, especially towards the end with the German V2 rockets, the precursors of modern ballistic missiles.

William Liscum Borden, an American pilot and future nuclear strategist (more sadly remembered for penning a letter that accused nuclear scientist Robert Oppenheimer of being a Soviet agent), had the extraordinary opportunity of seeing a V2 in flight from the vantage point of the cockpit of his B-24 bomber after a nighttime mission over the Nazi-occupied Netherlands in November 1944:

“It resembled a meteor, streaming red sparks and whizzing past us as though the aircraft were motionless,” Borden wrote. “I became convinced that it was only a matter of time until rockets would expose the United States to direct, transoceanic attack.”

Closer to our days, the images of two hijacked airplanes hitting the Twin Towers on September 11, 2001, epitomized the catastrophic potential of an air attack, paradoxically with commercial flights improvised into weapons.

Life in Kyiv continued more or less uninterrupted as fear has apparently been normalised, with pedestrians and traffic circulating while air raid sirens blared through the city. A crowded Central Post Office outside the Maidan Square was working normally during an air attack alert one morning in late January with nobody showing the slightest concern. It was mostly elderly women and schoolchildren, merrily chatting among themselves and laughing out loud, who had taken refuge in the Maidan metro station during the air raid, with no obvious signs of concern.

Asked about the sustainability of continued Russian air attacks over Ukraine, Charles S. Maier, the Leverett Saltonstall Research Professor of History at Harvard University, said that several questions needed to be disentangled first before answering the question.

“First, does Russia have the means to mount such a campaign? I imagine that it if doesn’t have the capability now, it could develop it in such order – unless pressure within the country forced Putin to look for a negotiated solution,” he said. That, he added, at the moment seemed unlikely. “Would Russia have the resources to make

unoccupied Ukraine look like Gaza now? That is more doubtful.”

Yet, he said, it might demoralize the Ukrainians so that they accepted the loss of territory and renunciation of any dreams of joining the EU or a security pact.

“Second and harder to answer: can Ukrainian morale withstand another year or more of air war? I can’t answer that. We know that bombing attacks were not enough to force Germany to surrender. But the country was living with a ruthless dictatorship and any signs of defeatism were ruthlessly punished”.

More generally, he thought that Ukrainian victory and Russian defeat had been celebrated prematurely by many Western commentators. “At a certain point Ukrainians might feel that the US, NATO, and EU were willing to let their country fight a proxy war on behalf of the West, which was enjoying immunity”.

These were imponderables he could not answer. “I do know that so far everyone inside Ukraine and in the West has been insisting on Ukrainian victory, and unless there is a revolution inside Putin’s Russia that seems hard to envisage.”

He said historian Eugen Weber once quoted a Cretan proverb: “The rock falls on the egg, woe to the egg. The egg falls on the rock, woe to the egg”.

Writing from Kharkiv, [Jade McGlynn](#), a researcher in the War Studies Department at King’s College London, said that “an air terror campaign against civilians could play a strategic role as part of Russia’s efforts to pound Ukrainians into submission and capitulation.” However, she added, that was “unlikely to work as other historical examples, e.g., the Blitz or Allied bombing of German cities, show.” According to McGlynn, a specialist in Russia under Putin, it has the opposite effect, “as it tends to reinforce resistance to the bombing party among the civilian population.”



Damage to a residential building in Kyiv following a Russian air raid in September 2023. (Photo: Avedis Hadjian)

Kharkiv is so near the launching sites of missiles that very often they strike first before the raid alerts can be sounded.

“Until Ukraine receives more Patriot or other forms of air defence as well as F-16s with secure comms and training for pilots, Russia has a considerable upper hand in the skies,” she said. “Right now, Kharkiv lives under an almost constant air raid alarm, and 20 percent of buildings here are destroyed.”

Colonel Pappalardo broadly agrees with these conclusions. “Russia is using long range bombing to exert leverage on the enemy and break the morale of its population,” he said. “This is admittedly a big concern for the Ukrainian which largely explains the relentless call for more air defense system and ammunitions to the western forces and supporters of Ukraine.”

Yet history shows that a terror campaign by itself can rarely help to achieve a state strategic objective, he said, quoting the example of Britain’s campaign that failed to destroy the German war economy or crack the morale of the population of the bombed German cities.

“Eighty years later, the resilience of Ukrainian population and economy is also stunning, and I do not think that an air terror campaign alone against civilian targets in Ukraine will help Russia achieve its strategic goals.”

Diagoras’ problem

A problem Col. Pappalardo identified in the analysis of the air warfare in Ukraine was ‘Diagoras’ Problem.’ It refers to judging a situation based on the available evidence while ignoring factors we may not know. Diagoras, a Greek sophist of the 5th century BC, was once shown the portraits shipwreck survivors who had prayed. It was proof, he was told, that the gods answered the prayers. Where were the portraits of those who had prayed but had not survived the shipwreck, he retorted.

In Ukraine, while we are seeing the effectiveness of drones, we are not seeing any clear pathway to air superiority, the key for breaking the stalemate.

In the case of the air war in Ukraine, Col. Pappalardo says, we are seeing the potential of drones, and other non-conventional weapons. But if we fail to recognize Diagoras’ question, it would be easy to conclude that drones are the future of warfare.

“An inability to recognize the Diagoras problem in Ukraine would lead to the unfortunate conclusion that the future of air power will rest solely on drones, be they loitering munitions, FPVs [first-person drones], MALEs [medium-altitude long endurance drones] and so on,” he said. “The war in Ukraine proves that while drones provide affordable air power and play a significant role in combat operations, they cannot replace traditional air forces in achieving air superiority.”

For all these reasons, he stuck to the conclusion of an [article](#) he wrote in August 2022 for the Atlantic Council:

These initial lessons invite Western military planners to reflect on the need to adapt their air force structures, which must reconcile qualitative edge and quantitative depth. Cheaper, lighter, and less exquisite platforms will have to find their place in the force structure to support a new-generation fighter, which will remain essential to face the most demanding missions.



A Ukrainian Air Force Su-27 flanker. (Photo: Courtesy UAF)

The costs of the air war

Ekonomichna Pravda, a Ukrainian newspaper, calculated the costs of Russian air raids on a single day in February at \$423 million (£332 million). The newspaper offered [a tally](#) of the weapons employed on that date (including 20 Iranian-made Shahed UAVs and three Iskander-M ballistic missiles), according to the Ukrainian Air Force and their approximate prices.

[Thomas Newdick](#), a defence writer who covers military aerospace topics and conflicts for The War Zone publication, said that estimates in this field are vexingly difficult.

“Working out the costs of munitions, especially older-generation ones, is notoriously tricky and there are plenty of different ways of calculating it,” he said, adding that any calculations are only really going to provide a rough estimate. “But as a rough estimate, this figure is at least plausible.”

Several factors compound the cost assessments.

“The difficulty comes in comparing weapons in production, like the Kh-101 cruise missile, with ‘legacy’ weapons like the Kh-22 that were produced decades ago and have since been sitting in stockpiles,” he said. “The S-300 is another case in point: Russia is seemingly using up older missiles (that were manufactured for air defense) and employing them against targets on the ground, specifically as a low-cost/high-intensity weapon.”

Newdick noted that “the cost of the Iranian-supplied Shahed drones is also very difficult to assess, based on widely varying figures given for the deal under which these were transferred to Moscow.”

Air superiority and air denial

In the circumstances, air denial is the safest strategy that Ukraine can pursue in the face of Russian threats, according to Bronk, at RUSI.

“If Russia were to gain air superiority, it would risk relatively rapid Ukrainian defeat,” he said. “Thus, keeping Ukrainian forces supplied with the SAM interceptor ammunition and replacement systems over time required to keep the Russian air force at bay is essential.”

Bronk, who is also a Professor at the Royal Norwegian Air Force Academy, said that fighter jets alone, like the F-16s promised to Ukraine, would not help address the country’s air strategy needs.

“Fighters will help but are not an answer on their own, due to limitations around numbers, munitions, vulnerability of airbases to missile strikes and lack of persistence when airborne without refuelling tanker support.”

Colonel Pappalardo remarked that General Valerii Zaluzhnyi, the former Commander-in-Chief of the Armed Forces of Ukraine, “never mentioned the F-16” in his November 2023 essay, “Modern positional warfare and how to win in it.” Instead, “he emphasized the need for drones, loitering munitions, decoys and electronic warfare.”

In the short term, he thinks Gen. Zaluzhnyi “is right because it will take years for the Ukrainian air force to achieve ‘proficiency’ in flying F-16s, as Gen. James Hecker himself, commander of US Air Forces in Africa and Europe, recently declared.”

Airpower alone “can achieve strategic effects,” Colonel Pappalardo said. “The strategic value of airpower depends on the conditions of every special case as it occurs, yet steadily increases in significance when combined with other arms across the domains and across the levels of war.”

Still, he insisted that the deadlock needed to be broken.

“Air superiority is not an optional capability,” he said. “Without it, you are doomed to fight like during WWI, which is very costly in terms of human lives. And yet, airpower alone cannot substitute for sound strategy. All-domain integration would be rather a key factor for operational superiority in a highly contested environment.”

For all its technological prowess, the German V2, hailed as a *wunderwaffe*, or a “miracle weapon,” by the Nazi regime, failed to turn the tide of a war for an increasingly desperate Germany that was, indeed, looking for miracles. It was also extremely costly to produce at a time when the economy struggled to sustain the war effort.

Newdick, the aerospace writer, doubts that Russia can maintain the intensity of its air campaign.

“As to whether Russia can sustain this pace of air attacks on Ukraine, from what we have seen, no,” he said in response to a question. “Since the start of the full-scale invasion, Russia hasn’t been

sustaining this kind of tempo; instead, it has been periodically launching much larger strikes to inflict more damage by overwhelming Ukrainian air defenses.”

There was also a big question about the continued availability of, especially, more advanced



An improvised memorial in Irpin, near Kyiv, made up of cars wrecked in Russian air strikes. (Photo: Avedis Hadjian)

Russian cruise missiles and ballistic missiles, he said. “For this reason, we are seeing Russia instead rely heavily on (cheaper, available) Shahed drones and even North Korea-supplied ballistic missiles.”

Two powerful weapons developed for anti-aerial defense and for naval combat, respectively, are now being launched against targets for which they were not intended. This, Newdick believes, may be signaling the limits of Russian stocks. “The use of S-300 and Kh-22 also points to Russia selecting less-than-

ideal weapons for the task in hand, driven by economic factors and/or the availability of more suitable weapons (likely both).”

Perhaps another Diagoras’ Problem—a development that we may be failing to see—is that Russia may be entering its own *wunderwaffe* phase of the war. ♦

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