



ELROM AIR AND SPACE  
RESEARCH CENTER  
Tel Aviv University

# BOO OR BOOM?

RUSSIA'S OPENING AIRSTRIKES IN UKRAINE  
THROUGH THE LENS OF MOSCOW'S STRATEGIC DESIGN

**DANIEL RAKOV, ASSAF HELLER, SARAH FAINBERG,  
ITAMAR HELLER**

ELROM AIR AND SPACE RESEARCH CENTER, TEL AVIV UNIVERSITY

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RESEARCH REPORT (0122E): NOVEMBER 2022

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# **Boo or Boom? Russia's Opening Airstrikes in Ukraine through the Lens of Moscow's Strategic Design**

Research (0122E): November 2022

Daniel Rakov, Assaf Heller,  
Sarah Fainberg, Itamar Heller

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## EXECUTIVE SUMMARY

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During the first day of the war, Russia targeted some 30 facilities across Ukraine, firing approximately 100 ballistic and cruise missiles from various land, air, and sea-based platforms. The present research provides a preliminary analysis of the “opening strike’s” characteristics both at the operational and tactical levels. It examines the extent to which the opening strike conformed Russia’s initial strategic and operational design and assesses the target selection as well as the strikes’ level of accuracy.

During the opening strike Russia launched attacks on airfields, ammunition depots, anti-aircraft systems, and ports as part of its strategic design to precipitate the collapse of the Ukrainian government while avoiding civilian casualties. Russia’s opening strike did not apparently intend to disable all the affected facilities, but to trigger a shock and awe effect.

By simultaneously attacking targets all around Ukraine, the “opening strike” was designed to disorient the Ukrainian leadership and military command regarding the attack’s main direction, showcase Russia’s military strength to the Ukrainian civilian population, and deter Western powers from intervening in the conflict and providing outside assistance. This latter goal was to be achieved – among other means – by attacking Ukraine’s western regions.

Of special importance was the role of Russia’s use of long-range high-precision missiles in line with Russia’s concept of “deterrence through limited use of force”: in Russian thinking the use of high-precision long-range missiles, including nuclear-capable ones, is meant to signal to Russia’s adversaries its resolve and its will to prevent an uncontrolled escalation.

A large proportion of Ukraine’s air defense capabilities, fighter aircrafts, and drones were not attacked or damaged during the “opening strike,” nor did Russia make any effective effort to swiftly gain air superiority following the opening blow’s failure.

In the last years, Russia developed defense procurement plans and military concepts designed to fully implement its vision of a “reconnaissance-strike complex” and build new military capabilities to carry out real-time, accurate, and continuous attacks on enemy targets.

Russia's "opening strike" and subsequent air combat operations in Ukraine suggest that its actual air combat capabilities and land and sea forces' firepower abilities fall short of its military thinking. On the first day of the invasion Russia launched 100 missiles "only" and showed a preference for "convenient" (fixed) targets without carrying out follow-up aerial attacks. In the subsequent weeks, Russia's air combat operations were distinctively characterized by its Aerospace Forces' (VKS) limited activity, poor coordination with other forces, and inability to establish air superiority.

Based on an analysis of attacks on airfields during the "opening strike" sampling 21 out of 100 missiles, it appears that compared to standard accuracy of Western GPS-guided munition, Russia's missile accuracy rates are low – a 50-60% direct hit accuracy rate at approximately 10 meters and a 30-40% near-miss rate between 30 and 50 meters.

The poor performance of the Russia's inaugural missile attacks derives from several factors: the insufficient quantity of precision-guided missiles that the Russian army can launch simultaneously; limitations regarding its weapons stockpiles; difficulties regarding real-time intelligence; the inability to implement the "reconnaissance-strike complex" vision along with underestimation of the Ukrainian military and local civilian resistance to the invasion and the illusion of a swift land incursion and takeover of large territories across Ukraine.

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## BACKGROUND

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The ongoing war in Ukraine has provided a unique opportunity for operational learning to Israel's defense and security stakeholders. It has showcased the contemporary challenges facing a fighting force involved in a large-scale operation. It has also deepened our understanding of Russia's way of warfare and weapon systems and the ways in which they have confronted Western military concepts and military hardware. This war may thus provide important insights on the military capabilities and concepts of adversaries and enemies that the IDF may confront in its future areas of operation.

At the time of writing, fighting in Ukraine continues, and there are certain domains in which it is premature to draw conclusions from an Israeli perspective. Such caution is particularly relevant when it comes to the analysis of strategic issues which are constantly evolving, and for which one should wait for the war termination or stabilization. Consequently, we opted to focus on the war's **operational aspects** based on completed phases of the conflict that can be analyzed in and by themselves.

This article aims to be the first in a series of research reports that will examine various dimensions of the war in Ukraine. Our first topic is the Russian use of precision-guided missiles in its "opening strike" on February 24, 2022. The reason why we focus on the "opening strike" is because Russia's initial military actions in Ukraine were the most carefully planned and as such reflected Russia's preliminary military thinking rather than its subsequent attempt to improvise solutions to problems encountered during the fighting. Within this framework, the present research addresses three main questions:

1. What the opening strike may indicate about the accuracy of Russian missiles?
2. What is the connection between the Russian Army's war plan and Moscow's strategic objectives?
3. Which operational concepts laid behind the use of long-range precision-guided missiles in the initial strikes?



## RESEARCH METHODOLOGY

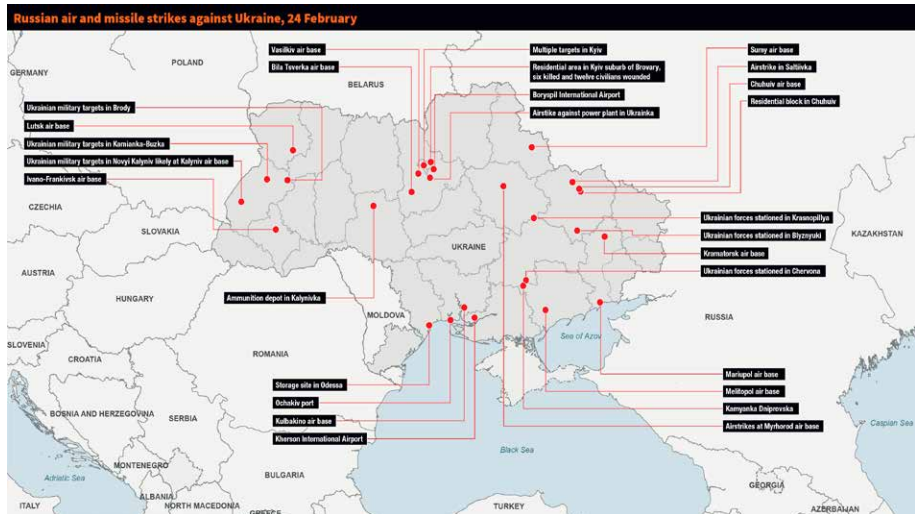
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This research is based on a combination of two conceptual axes. The first one is a *top-down* approach through which we attempted to understand how the use of precision-guided missiles derived from Russian strategic concepts and the Russian army's campaign plan.

The second axis is a *bottom-up* analysis of the Russian firepower plan. We relied on published works addressing the scope of Russian attacks and their targets. Yet, as a primary source of research, we used satellite images of the airfields attacked by the Russians, which enabled us to assess both the campaign's guiding principles and the attacks' actual results. We carried out an analysis of all the airfield strikes that we were able to relate to the "opening strike" of February 24, 2022 (21 missiles out of around 100 launched in total). The airfields' generic structure made it easier to identify the approximate targets, compared to the damage inflicted on other facilities. The number of strikes that we analyzed and their distribution across eight facilities in different locations in Ukraine provide us with a representative sample that is sufficient for a rough and preliminary assessment of the accuracy degree of Russian missile strikes on their targets.

This research relies on a range of sources published by research institutions and in the media regarding Russian attacks, the broader context of military and political moves that Russia has undertaken since the start of its campaign, publicly available assessments from Western and Ukrainian intelligence agencies *ante bellum* and during the war, and academic works on Russian military thinking over the past two decades. It should be noted that Russian official statements should be viewed with skepticism, and explanations of Russian activities by Ukrainian and Western sources are not necessarily objective.

# ATTACKS ON AIRFIELDS



Map of aerial attacks carried out by the Russian army in Ukraine on February 24, 2022.  
Source: Janes<sup>1</sup>

According to multiple Western sources, Russia used over 100 missiles during its opening strike.<sup>2</sup> It seems that most missiles used for the attack were surface-to-surface Iskander-M (SS-26 Stone) ballistic missiles, and Iskander-K (SSC-X-7), KH-101/555 (AS-15) and Kalibr (SS-N-30A) cruise missiles launched from airborne, sea, and ground platforms. Some published reports argued that Tochka-U (Scarab-B, SS-21) surface-to-surface ballistic missiles (SSM) were used on the first day of the war, yet the type of damage inflicted on the airfields that we analyzed in the present research cannot validate this assertion. At a later stage, however, Tochka-U SSM were launched on airfields located near the border with Russia.

Most satellite images do not enable to identify the type of missiles that hit their targets on the first day of war since those missiles – each of them carrying a warhead of between 500 and 700 kilograms – do inflict similar damage on

1 “Janes Analysis: Ukraine Conflict,” Janes, February 25, 2022, <https://www.janes.com/defence-news/news-detail/Ukraine-crisis> (accessed March 21, 2022).  
2 Brian E. Everstine, Twitter post, February 24, 2022, <https://twitter.com/beverstine/status/1496869155420934153> (accessed March 21, 2022).

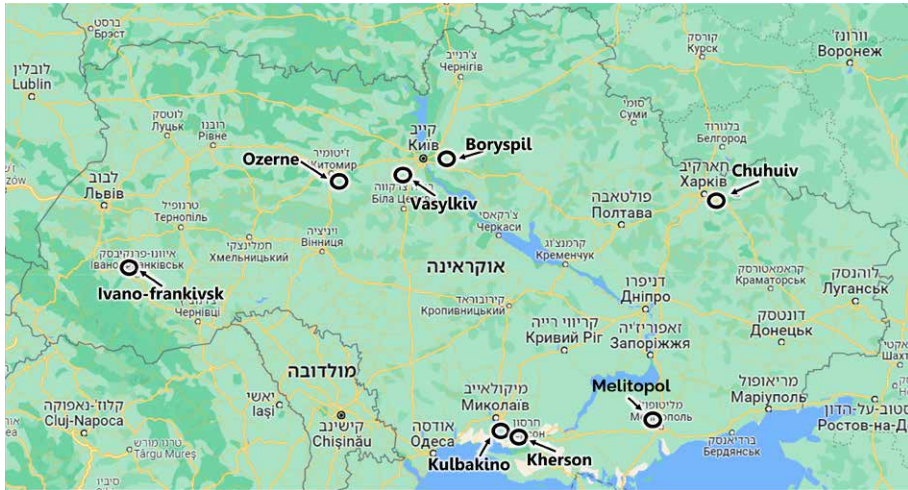
the ground.<sup>3</sup> A significant number of strikes targeted airfields and air defense systems. According to the spokesperson of Russia's Ministry of Defense, 11 air bases, 14 air defense systems, and 36 radar installations were attacked on the first day of fighting.<sup>4</sup>

We analyzed attacks on airfields for which there was sufficient visual documentation. See Appendix A for a detailed analysis of the hits on each of the following airfields during the first day of fighting:

<b>Airfield</b>	<b>No. of missiles</b>	<b>Targets attacked</b>	<b>Main targets that were not attacked</b>
<b>Kulbakino</b>	4	Mig-29 and Su-25 aprons central apron, bomb storage depot	Mig-29 and Su-24 fighter jets and runway
<b>Ozerne</b>	8	Two central aprons, Su-27 fighter jets, and runway	Su-27 fighter jets deployments
<b>Chuhuiv</b>	4	L-39 aircraft apron and three complexes of buildings	Su-24 fighter jets, transport aircrafts, and runway
<b>Vasylkiv</b>	1	Vehicle parking area	Runway and aircraft hangars
<b>Melitopol</b>	1?	Apparently, an ammunition storage facility	Unknown
<b>Kherson</b>	1?	Apparently, a fuel reservoir	Unknown
<b>Ivano-Frankivsk</b>	1?	Fuel reservoir	A line of Mig-29 aircraft
<b>Boryspil</b>	1?	Apparently, a fuel reservoir	Unknown

3 Josh Smith, "Analysis: Russia's missiles see mixed results in Ukraine war as world watches," *Reuters*, February 28, 2022, <https://www.reuters.com/world/europe/russias-missiles-see-mixed-results-ukraine-war-world-watches-2022-02-28/> (accessed March 21, 2022).

4 "Russia fires cruise missiles at Ukraine military infrastructures," *The Times of Israel*, February 26, 2022, [https://www.timesofisrael.com/liveblog\\_entry/russia-fires-cruise-missiles-at-ukraine-military-infrastructure/](https://www.timesofisrael.com/liveblog_entry/russia-fires-cruise-missiles-at-ukraine-military-infrastructure/) (accessed March 21, 2022).



Attacked airfields analyzed in this research<sup>5</sup>

## What may the “opening strike” indicate about the accuracy of Russian missiles?

We examined the degree of missile accuracy based on a comparison between the impact point and the estimated target. Since the intended targets’ coordinates are unknown, we assessed their locations based on principles of reasonable operational planning. This method has an inherent problem because it makes assumptions about Russian intentions. However, this rough analysis is sufficiently reliable to indicate that the level of accuracy of Russian missiles is lower than that of standard Western GPS-guided munitions:

1. The probability of relatively high accuracy (up to 10 meters): 50-60%.
2. The probability of a near miss (30 to 50 meters): 30-40%.
3. The probability of missing the target (above 100 meters): 10%.

The reasons for the low accuracy rates are not clear. It is unlikely that Russia’s low accuracy rates were caused by the very short notice that its armed forces received prior to the war since the “opening strike” in particular should have been planned secretly and over an extended period of time.

5 Illustration prepared by Tel Aviv University’s Elrom Air and Space Research Center.

Possible alternative explanations for relative inaccuracy may be related to the following factors:

1. The Level of Missile Accuracy is worse than claimed by the producers: the stated accuracy of the Iskander-M ballistic missile, the Iskander-K cruise missile, and the Kalibr-I is just a few meters. Their performance should have been far better than the results seen in the actual attacks.
2. Geospatial Intelligence Accuracy: the hits' characteristics do not indicate a systematic mistake in geographic coordinates of the targets; rather, random errors – whether in coordinates or in missiles.
3. Ukrainian Jamming of Satellite Navigation Systems: no mention was made (in open sources) of Ukrainian satellite jamming against Russia on the first day of the war. Furthermore, Russian missiles use different guidance systems: for example, the Iskander-M is fitted with electro-optical guidance. Yet Western armies have provided support to the Ukrainian army and may have assisted them in navigation jamming as well including since the very first day of the war.

This work focuses only on the cases when Russian missiles made it near their targets and exploded and does not examine their failure rate. While some U.S. officials leaked to the Reuter's News Agency that the Russian missiles' failure rate could be as high as 60%, another "senior defense official" subsequently refrained from confirming this estimate and claimed that failure rates varied from day-to-day.<sup>6</sup> In any case, both sources acknowledged that Russian missiles suffered from a significant failure rate.

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6 Phil Stewart, "Exclusive: U.S. assesses up to 60% failure rate for some Russian missiles, officials say," *Reuters*, March 25, 2022, <https://www.reuters.com/business/aerospace-defense/exclusive-us-assesses-up-60-failure-rate-some-russian-missiles-officials-say-2022-03-24/> (accessed March 27, 2022).

Senior Defense Official, "Senior Defense Official Holds a Background Briefing", *U.S. Department of Defense*, March 25, 2022. <https://www.defense.gov/News/Transcripts/Transcript/Article/2979038/senior-defense-official-holds-a-background-briefing/> (accessed March 27, 2022).

## **WAR PLAN, OPERATIONAL DESIGN AND STRATEGIC THOUGHT**

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### **What is the connection between the Russian Army's plan and Moscow's strategic objectives?**

Russia's war against Ukraine was designed to be "a continuation of policy through other means" and was framed as a response to the West's refusal to comply with Russian demands regarding European security architecture. In the last months of 2021, Russia presented several demands to the West, including an end to NATO's expansion eastwards, and a roll-back of NATO's offensive capabilities from the countries neighboring Russian borders that developed in the past two decades.<sup>7</sup> In our assessment – which dovetails with intelligence estimates, statements by Western leaders, and works of leading experts – President Putin expected that a swift and successful campaign in Ukraine would strengthen his bargaining position vis-à-vis the West when it comes to designing security arrangements and promoting a new global power balance.

In our view, Moscow's military strategy behind its initial battle plan included the following elements:

1. Carrying out a swift offensive from several directions against Ukraine, concomitantly – along the front lines and deep inside the Ukrainian territory. The goal was to gain control (probably full occupation was not expected to be achieved quickly) of the main urban areas – including Kyiv – in just a few days and depose the Ukrainian government.
2. Russia's ground maneuvers reflected its intention to achieve extensive territorial gains in the eastern and southern areas of the country – east of the Dnipro River and on the coast along the Black Sea and the Sea of Azov – where the proportion of the Russian-speaking population was high. It is not clear if the intention was, as the campaign progressed, to also take control of Ukraine's western territories where most of the population speaks Ukrainian and is especially hostile to Russia. It seems that the

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<sup>7</sup> Andrew Roth, "Russia issues list of demands it says must be met to lower tensions in Europe," *The Guardian*, December 17, 2021, <https://www.theguardian.com/world/2021/dec/17/russia-issues-list-demands-tensions-europe-ukraine-nato> (accessed March 21, 2022).

operational planning was based on a flawed assessment of the Ukrainian army's strength and the wrong assumption that it would swiftly collapse with the widespread Russian military campaign.

3. Drawing a boundary around the war zone by deterring the Western military from intervening directly in the fighting so that it would only involve Russian and Ukrainian troops. This latter goal was promoted mostly by nuclear threats and allusions.
4. Attempting to avoid significant harm to the civilian population or the resort to indiscriminate attacks. Russia's cautionary approach to Ukrainian civilians was especially evident during the first days of the war and reflected its will to avoid triggering anti-Russian sentiments in the Ukrainian population. This caution may also derive from Moscow's mistaken assumption that the local population would welcome their "liberation" with "bread and flowers."
5. Framing the campaign as a limited offensive – a "special military operation". The expression "special military operation" is actually unique and was coined specifically for the Ukrainian campaign: it implies fighting on a limited scale ("an operation only" rather than war) and yet with the characteristics of a "special operation" – a concept reserved for special forces/intelligence operations. Additionally, on the opening day of the war and the following days, President Putin described the Russian assault as a purely preventative and defensive measure: Russia had no alternative because Ukraine and the West would have acted against Russia if it had not started the fighting.<sup>8</sup>

Therefore, the opening strike with precise missiles was directed almost exclusively at military targets and was not designed to cause any significant damage, based on the assumption that a rapid advance of the Russian forces would enable a quick control of critical infrastructures. The attack on airfields in the west of the country during the opening strike seemed to signal to Western powers and Ukraine Russia's resolve to prevent direct Western military intervention in the campaign and to demonstrate its ability to disrupt the delivery of Western aid.

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8 Website of the President of the Russian Federation, "Obrashcheniye Prezidenta Rossiyskoi Federatsii" [Address by the President of the Russian Federation], February 24, 2022, <http://kremlin.ru/events/president/news/67843> (accessed March 27, 2022).

## Which operational concepts laid behind the use of long-range precision-guided missiles in the “opening strike”?

It is difficult to propose a single explanation for Russian campaign logic during the war and specifically for the reasoning behind the opening strike. First, the Russian military leadership avoided to provide a detailed explanation about the war plan. Second, there is a wide gap between Russia’s doctrinal military thinking prior to the war (as it was understood by both Russian and Western experts) and the Russian Armed Forces’ actual performance on the battlefield where its poor preparedness sharply contrasted with the Ukrainian army’s surprising capabilities (sustained by widespread Western military assistance).

Mirroring the West’s military thought of the past decades, the Russian military’s dominant thinking regarding the war’s inaugural move revolved around a massive, multi-dimensional attack, as illustrated in the Russian concepts of “New Generation Warfare.”<sup>9</sup> The Russian army’s main threat is a war against NATO forces, and its force building intended to prepare for such scenarios. Over the past decade, the Russian military has focused on developing the effective combination of military-kinetic and “non-military” measures – prior to and after military action.<sup>10</sup> Like Western military planners, the Russian military understood the need to establish air superiority at the start of a conflict<sup>11</sup> and spent many years developing its “reconnaissance-strike complex” (or “RUK”) capabilities, namely, the ability to direct accurate and continuous fire based on real-time and accurate intelligence data.<sup>12</sup>

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9 Jānis Bērziņš, “Not ‘Hybrid’ but New Generation Warfare,” in *Russia’s Military Strategy and Doctrine*, ed. Glen E. Howard and Matthew Czekaj (Washington, DC: Jamestown Foundation, 2019).

10 Michael Kofman, Anya Fink, Dmitry Gorenburg, Mary Chesnut, Jeffrey Edmonds, Julian Wallert, Kasey Stricklin, Samuel Bendett, *Russian Military Strategy: Core Tenets and Operational Concepts*, CAN Research Memorandum, CNA, August 6, 2021, [https://www.cna.org/CNA\\_files/pdf/Russian-Military-Strategy-Core-Tenets-and-Operational-Concepts.pdf](https://www.cna.org/CNA_files/pdf/Russian-Military-Strategy-Core-Tenets-and-Operational-Concepts.pdf) (accessed March 21, 2022).

11 V. B. Zarudnitskiy, “Faktery dostizheniya pobedy v voyennykh konfliktakh budushchego” [Factors of victory achievement in future military conflicts], *Voyennaya Mysl*, no. 8, 2021, 41-42. <https://cyberleninka.ru/article/n/factory-dostizheniya-pobedy-v-voennyh-konfliktah-budushchego/viewer> (accessed March 21, 2022).

12 “Genshtab: osobennost’ju konfliktov budushhego stanet primeneniye robotov i kosmicheskikh sredstv” [General Staff: future conflicts will be characterized by employment of robots and space systems], TASS, March 24, 2018, [https://tass.ru/armiya-i-opk/5062463?utm\\_source=google.com&utm\\_medium=organic&utm\\_campaign=google.com&utm\\_referrer=google.com](https://tass.ru/armiya-i-opk/5062463?utm_source=google.com&utm_medium=organic&utm_campaign=google.com&utm_referrer=google.com) (accessed March 21, 2022).



As a result, Western experts expected that the war against Ukraine would open as an operational surprise for the Ukrainian army (after the continued buildup of Russian forces denied them the possibility of a strategic surprise) and that the Russian troops would attempt to deliver a decisive blow on the “centers of gravity” of the Ukrainian system, both in the heartland and on the front lines. The aim was to crash Ukrainian command and decision-making capabilities. It was expected that the attack would be a combined effort – kinetic, informational, cybernetic, electronic warfare, and synchronized with a political effort. It was estimated that the kinetic component would match the unique characteristics of the Russian army, which is based on massive, statistical firepower combined with modern land, sea, and air capabilities.

While Russian theorists imparted great importance to the “reconnaissance-strike complex” and especially to high-precision firepower, Russian military experts questioned, even before the start of the conflict, the ability of the Russian army to deliver a decisive blow with enough high-precision weapons given the gap between Russian and Western capabilities in the field of high-precision and guided weapon systems and the assessment that Russia has a limited stockpile of such weapons.<sup>13</sup>

Additionally, the long-range, high-precision missiles that played a central role in the opening strike constitute a major tool in the Russian conceptualization of “strategic deterrence,” and especially of “deterrence through a limited use of force.” Since most missile platforms used in the “opening strike” had dual capabilities – both conventional and nuclear – their use, apart from any physical damage, demonstrated Moscow’s ability to use such weapon systems in a nuclear configuration. This signals both Russia’s resolve and its desire to avoid an escalation to a more severe conflict (according to the Russian “escalation management” ladder) in which nuclear weapons could be considered. In line with the Russian concept of the “limited use of force,” the targets of long-range missiles are military and economic infrastructures, and they are used to prevent widespread harm to civilians.<sup>14</sup>

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13 Mikhail Khodarenok, “Prognozy krovozhadnyh politologov: O vostorzhenykh jastrebah i toroplivykh kukushkah” [Forecasts by Blood-Thirsty Political Analysts: On Thrilled Hawks and Hasty Cuckoos], *Nezavisimoye Voyennoye Obozrenie*, February 3, 2022, [https://nvo.ng.ru/realty/2022-02-03/3\\_1175\\_donbass.html](https://nvo.ng.ru/realty/2022-02-03/3_1175_donbass.html) (accessed March 21, 2022).

14 Shmuel Shmuel, “A’l Haylot Tilim v’Dimion Mizrahi – Sugiot Hatkifa b’Ma’agalim Rehukim” [On Missile Forces and Eastern Imagination – Long-Range Attack Concepts], Dado Center, March 2, 2022, [link to the article](#) (accessed March 27, 2022).

The Ukrainian airfield targets selected by the Russians during the opening strike suggest that the Russians had no intention of disabling the Ukrainian air force's capabilities. Very few aircraft were attacked, and of those few, only some were fighter aircraft. In general, no critical airfield infrastructures were attacked. Whereas it might have been quite easy for the Russians to incapacitate Ukrainian airbases by launching heavy strikes on their runways, as most of them had only one runway, the airbases remained operational. Russian strikes' inaccuracy or failures cannot explain why those airfields suffered only minor damage unless it was their original intent.

The February 24 opening strike is, therefore, consistent with Russian operational logic:

1. The targets align with preliminary Russian theoretical thinking – airports, airbases, air defense systems, weapons depots, and seaports (Appendix B).
2. The opening strike was integrated into a multi-dimensional attack; the precision missile attack was directed at the entire Ukrainian heartland using land, aerial, and naval platforms. At the same time, a simultaneous land attack was made – from the north, south, and west – accompanied by coordinated informational and political operations.
3. The simultaneous attack across the entire country was apparently designed to confuse the Ukrainian leadership and its military command about the main military thrust and create the impression of an overwhelming attack.
4. The Russians may have attempted to achieve operational surprise by presenting their continuing build-up of forces as an exercise. It is unclear to what extent the Ukrainian army and the West were really surprised. Still, based on media coverage in Ukraine before the attack and immediately after, it seems that the massive military attack directly striking all areas of the country was not indeed expected by the Ukrainian public.<sup>15</sup>
5. The attacks throughout the entire Ukrainian territory, using long-range missiles that were filmed and photographed by civilians, combined with the visible damage in urban population centers (in some cases, the attacks targeted fuel reservoirs to create long-lasting smoke clouds), were apparently

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15 Jim Heintz, "‘The worst sunrise in my life:’ Ukrainians wake to attack," Associated Press, February 24, 2022, <https://apnews.com/article/russia-ukraine-europe-russia-kyiv-8bdf0355fca9faf6cc1b70eb86cc387f> (accessed March 21, 2022).

designed to frighten the country's political and military leadership and to demonstrate Russia's military might.

6. The use of long-range missiles removed the need to use fighter jets for strikes. It may be related to fears regarding the safety of the aircraft whose failure could have brought operational and reputational damage. It is possible that the Russians tried to adopt the American model of a "clean," long-range attack. Aircrafts may have also launched ARM (Anti-Radiation Missiles) and Kh-31 (AS-17) missiles against radar installations, which only made a modest contribution to the efforts to attack the Ukrainian heartland.

Nevertheless, there are also evident significant gaps between the opening strike itself and Russian theoretical concepts and strategic assumptions. First, the opening strike deep into the Ukrainian territory did not align with the Russian concept of "disintegration of the adversary system" both in terms of the quantity of the missiles launched and the target selection:

1. The plan included an attack of approximately 100 missiles on some 30 facilities in a fashion that avoids full destruction and causes limited damage to each facility. An analysis of the attacks indicates significant differences in the nature of the damage. In most of the facilities analyzed, non-critical components were attacked (probably deliberately). Although all military airfields were attacked, a typical attack involved only two to four missiles per facility. The Russians did not choose to carry out a focused attack on a "sample target," as they later did, for example, in the attack on the Yavoriv base on March 13, 2022, which was hit by approximately 30 cruise missiles.<sup>16</sup> At the end of the campaign's first month, the total number of missiles launched by the Russians was estimated at 1,250, a little more than 40 missiles per day.<sup>17</sup> If it was the case, the opening strike represents the record-high number of launches during the campaign and could also underscore that the relative scarcity of Russian launch platforms is a significant capability constraint. Some of the limitations are also due to the vast size of Russian territory and the large number of its adversaries (these

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16 "Russian air strike kills 35 at western Ukraine military base, officials say," Forces.net, March 14, 2022, <https://www.forces.net/ukraine/russian-air-strike-kills-35-western-ukraine-military-base> (accessed March 21, 2022).

17 U.S. Department of Defense, "Senior Defense Official Holds a Background Briefing," March 25, 2022, <https://www.defense.gov/News/Transcripts/Transcript/Article/2979038/senior-defenseofficial-holds-a-background-briefing/> (accessed March 27, 2022).

prevent the deployment of all national capabilities to the battlefield, in our case, Ukraine) and to the need to preserve sufficient weapon stockpiles in case of a military escalation, especially if the conflict expands into a war with NATO countries.

2. More than a month into the war, the Ukrainian army maintained a significant capacity to challenge Russia's freedom of action in the Ukrainian airspace, using aircraft and some of the air defense systems it originally had, in addition to weapon systems seized from the Russians during the fighting and systems supplied by the West.<sup>18</sup> It appears that no Russian attack – as successful as it may be – would have enabled Russia to gain total air superiority (in light of the abundance of anti-aircraft systems, aircraft and other relevant military facilities in Ukraine). The Russian army's plan of attack seemed to have assumed a rapid advance of Russian forces and disintegration of Ukrainian resistance forces. However, the “shattering” of Russian offensive moves in the first days of the campaign left the Russian army without air superiority and imposed severe restrictions on the subsequent use of its forces in a combined mode.
3. At some airfields, one can reasonably attribute the minimal damage caused during the attacks to Russia's intention to use them for later invasion needs. Russian airborne troops (VDV) tried to take the Hostomel airfield near Kyiv and use it as a springboard for the attack on the Ukrainian capital, right in the beginning of the invasion. The Russians captured Chuhuiv airfield close to Kharkiv early in the war; and attempted, but failed, to take over the Vasylykiv airfield, to the South of Kyiv. Nevertheless, this logic does not explain the minimal damage caused to airfields located further away, in the center and the west of Ukraine.

Secondly, in the last decades much effort was invested to upgrade the importance and centrality of the Russian air force on the battlefield, in comparison to the Soviet traditional view of an airpower as a support arm of the Ground Forces. Nevertheless, the “opening strike” and the following operations of the Russian air force during the war in Ukraine emphasize that, similarly to the past, the

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18 Justin Bronk, “Is the Russian Air Force Actually Incapable of Complex Air Operations?,” Royal United Services Institute, March 4, 2022, <https://rusi.org/explore-our-research/publications/rusi-defence-systems/russian-air-force-actually-incapable-complex-air-operations> (accessed March 27, 2022).

Russian army's conceptual thinking regarding the "reconnaissance-strike complex" significantly surpasses its fighting units' actual capabilities:<sup>19</sup>

1. The choice of targets for the attack indicates that the Russians avoided the need to launch preliminary intelligence collection operations shortly before the attack. Most of the targets at the airfields were fixed infrastructures and a small number of parking aprons for aircraft (which were also characterized by static deployment). It is possible that the Russians assumed that the Ukrainians would change aircraft deployment to improve their survivability. However, it seems that, on most bases, the aircraft remained in their permanent parking strips.
2. There is an ongoing debate in the military expert community whether the employment of cyber tools and electronic warfare was significant during the first day of the Russian assault. These are areas in which the Russian military was supposed, according to pre-war assessments, to excel and show a distinct advantage compared to Western military forces. The lack of information regarding achievements in these areas strengthens the estimate that, practically, the offensive operations in these domains did not significantly contribute to the potential success of the "opening strike." There is information that suggests that Western forces, especially the United States and the United Kingdom, have secretly helped Ukraine in these domains, and if they did so already during the "opening strike," it is conceivable that they had successfully neutralized some of the Russian efforts. Additionally, we would suggest that Russian cyber and electronic warfare attacks against Ukraine and the West over the past few years generated operational friction that helped Ukraine develop improved defense capabilities and reduced the element of surprise in these domains.
3. Beyond the launching of long-range cruise missiles, Russian air force fighter jets (as opposed to helicopters) were not integrated during the first days of the campaign and played too anemic of a role later. It became evident, as fighting continued, that the air force had difficulties creating continuous attacks following the opening strike, either to advance the goal

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19 Dmitry (Dima) Adamsky, "Tarbut Estrategit v'Hadchanut Tsvait: Hachpa'at Hatarbut Haestrategit a'l Hama'apekha b'Inianim Tsvaim b'Russia, b'Artsot Habrit v'belsrael" [Strategic Culture and Military Innovation: The Influence of Strategic Culture on the Revolution in Military Affairs in Russia, the United States and Israel], Ben-Shemen: Modan, 2012, pp. 76-80.

of achieving air superiority or to carry out its missions: bombing, assisting maneuvering forces, and intelligence gathering. Even though the Russian air force did, as fighting continued, demonstrate the ability on several occasions to execute attacks using multiple weapon systems on a single target or to perform hundreds of sorties a day, the question still arises as to why its innovative capabilities, which showed relative success in Syria, have not been sufficiently played out in the war in Ukraine.

4. Many possible explanations have been suggested: the Russian pilots' lack of experience in SEAD (Suppression of Enemy Air Defenses) or DEAD (Destruction of Enemy Air Defenses) missions, insufficient flying time during peacetime, difficulties in friend-or-foe identification (due to similarity in weaponry and close proximity between Russian and Ukrainian forces) and fear of being shot down by "friendly fire" (Russian air defense systems). The argument was even made that the Russian air force lacks the ability to plan and perform complex air operations.<sup>20</sup>

This section can be summarized as follows: the opening strike that was not based on real-time intelligence and the continued air operations during the subsequent few weeks demonstrate that the "reconnaissance-strike complex" concept failed to take roots in the Russian air force's practice.

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20 Bronk, *op. cit.*

## CONCLUSION

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The war in Ukraine has been characterized by intense information warfare waged by all the actors involved. This makes it difficult to establish facts on the battlefield, even more than due to the usual “fog of war.” Analyzing the Russian “opening strike” may improve our understanding of Russia’s strategic and campaign logic prior to the war, since this operation was planned in advance, well before Moscow encountered any difficulties on the battlefield.

Several complementary explanations can be suggested for the design of the Russian “opening strike” regarding the use of high-precision missiles:

- 1. Positive goals:** the opening strike was designed to showcase precision strike capabilities, simultaneous launch on many targets, deep into Ukrainian territory. It was designed to disorient the Ukrainian army regarding the direction of the Russian attack, sow fear amongst the Ukrainian leadership and civilian population, limit damage on civilian infrastructure with the aim of using it later, deter the West from direct involvement – alongside Ukraine – in the warfare, signal the Russian desire to keep the conflict at a relatively low level (as per the Russian concept of “escalation ladder”), and limit the flow of Western aid into Ukraine.
- 2. Limitations:** constraints regarding the quantity of missiles that the Russian army can launch simultaneously and constraints regarding its armaments inventory. Difficulties also arise regarding real-time intelligence and the ability to implement the “reconnaissance-strike complex” concept.
- 3. Flawed core assumptions:** expectations of limited resistance from the Ukrainian army and local population and for a swift land operation that would gain control of extensive areas of the country.

The results of the opening strike, as analyzed in this paper, primarily strengthen the assessment that the accuracy levels of Russian missiles are lower than that of standard Western GPS-guided weaponry. Yet they also showcase the progress that Russia has made over the past decade to reduce its operational gap with the West in the field of high-precision, long-range guided munition systems. The question of high failure rates, if indeed it further proves to be correct, requires additional in-depth research.

Michael Kofman, one of the West's leading researchers on the Russian military, suggests that based on Russia's previous wars, we should not jump to hasty conclusions and warns against the adoption of mistaken lessons.<sup>21</sup> At this stage, while fighting continues, it is premature to make predictions about Russia's behavior and draw related lessons for Israel.

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21 Michael Kofman, Twitter post, March 13, 2022, <https://twitter.com/KofmanMichael/status/1503037150861869059> (March 21, 2022).



## **APPENDIX A: DETAILED ANALYSIS OF ATTACKS ON AIRFIELDS<sup>22</sup>**

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Airfields examined:

1. Kulbakino military airfield, Mikalov in southern Ukraine.
2. Ozerne military airfield in north-central Ukraine.
3. Chuhuiv military airfield in eastern Ukraine.
4. Vasylkiv military airfield in north-central Ukraine.
5. Melitopol military airfield in southern Ukraine.
6. Ivano-Frankivsk International Airport in western Ukraine.
7. Kherson International Airport in southern Ukraine.
8. Boryspil International Airport in north-central Ukraine.

### **Ozerne military airfield**

Military airfield with Su-27 aircraft.

Five targets were attacked with eight missiles:<sup>23</sup>

1. Northern apron – two strikes. The distance of the strikes from the center of the lengthways axis of the apron is 10-30 meters.
2. Eastern apron – two strikes in the sand, third, accurate strike on an aircraft. The distances of the strikes from the center of the lengthways axis of the apron are 50 meters and 150 meters.
3. A building located between the two northern aprons – one strike, some 30 meters from the structure.

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<sup>22</sup> Interpretation of satellite imagery – Israel Air Force Satellite Imagery Unit.

<sup>23</sup> Joseph Dempsey, Twitter post, March 2, 2022, <https://twitter.com/JosephHDempsey/status/1498811803484270597> (accessed March 21, 2022).

General Staff of the Armed Forces of Ukraine in Facebook, February 24, 2022, <https://www.facebook.com/GeneralStaff.ua/posts/257864443193308> (accessed March 21, 2022).

4. Two targets on the runway – two strikes on the sand and not the runway. The distance of the strikes from the center of the runway is 50 meters and 30 meters.

### **Melitopol airfield**

A military airfield with transport planes. One target was attacked, probably a facility for weapons storage. It is unclear whether it is inside the airfield or nearby.<sup>24</sup>

### **Boryspil, Kherson, Ivano-Frankivsk airports**

All three are international airports. Ivano-Frankivsk is also used by Mig-29 fighters that are parked in a line. Each of the three airports was attacked, probably by one missile. The elements attacked are not clear, but in all three cases, the element attacked had caused long burning.

### **Kulbakino airfield**

A military airfield. Before the attack, Su-24, Su-25, and Mig-29 fighters, transport planes, and L-39 training aircraft were stationed there. Four targets were attacked with four missiles.<sup>25</sup>

1. Su-25 parking apron (two destroyed).
2. Parking apron with Mig-29 and L-39 aircraft (six Mig-29 and two L-39 were hit).
3. Empty central apron next to the runway – some 30 meters from the center of the apron.

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24 Natasha Bertrand, Twitter post, February 24, 2022, <https://twitter.com/NatashaBertrand/status/1496870755245637633> (accessed March 21, 2022).

Grace Rahman, "Video shows explosion at Air Base, not Ukraine's main airport," Full Fact, February 28, 2022, <https://fullfact.org/online/ukraine-air-base/> (accessed March 21, 2022).

25 David Kime, Twitter post, February 25, 2022, <https://mobile.twitter.com/CyberRealms1/status/1497124857477226497> (accessed March 21, 2022).

Official web site of the Ministry of Defense of Ukraine, "Address by the Commander-in-Chief of the Armed Forces of Ukraine, Lieutenant-General Valery Zaluzhnyi," February 24, 2022, <https://www.mil.gov.ua/en/news/2022/02/24/address-by-the-commander-in-chief-of-the-armed-forces-of-ukraine-lieutenant-general-valery-zaluzhnyi/> (accessed March 21, 2022).

4. Munitions storage facility – the end of the storage facility was hit, some 10 meters from its center.

No additional fighter or transport aircraft were attacked.



Planet Labs PBC satellite imagery of Kulbakino Airfield

## Chuhuiv airfield

A military airfield and flight school. The airfield had Albatros training aircraft (L-39), Su-24 fighters, and transport aircraft.



Planet Labs PBC  
(before the attack)



Planet Labs PBC  
(after the attack)



During the attack, four targets were attacked by four missiles:<sup>26</sup>

1. Training aircraft, probably L-39, apron – direct hit on the line.
2. Building located to the south of the apron.

<sup>26</sup> *Satellite Imagery Gallery*. (2021, September 15). Planet-Lab, <https://www.planet.com/gallery/#!/post/chuhuiv-air-base> (accessed March 21, 2022). Official web site of the Ministry of Defense of Ukraine, op. cit.

3. Building located between the northern maneuvering lane, the runway (to the west), and the approach lane (to the east) – in this case, a thick cloud of smoke made identification of the damage difficult.

4. An additional building located to the east of the main apron.

The runways and Su-24 aircraft were not attacked.

### Vasylkiv airfield

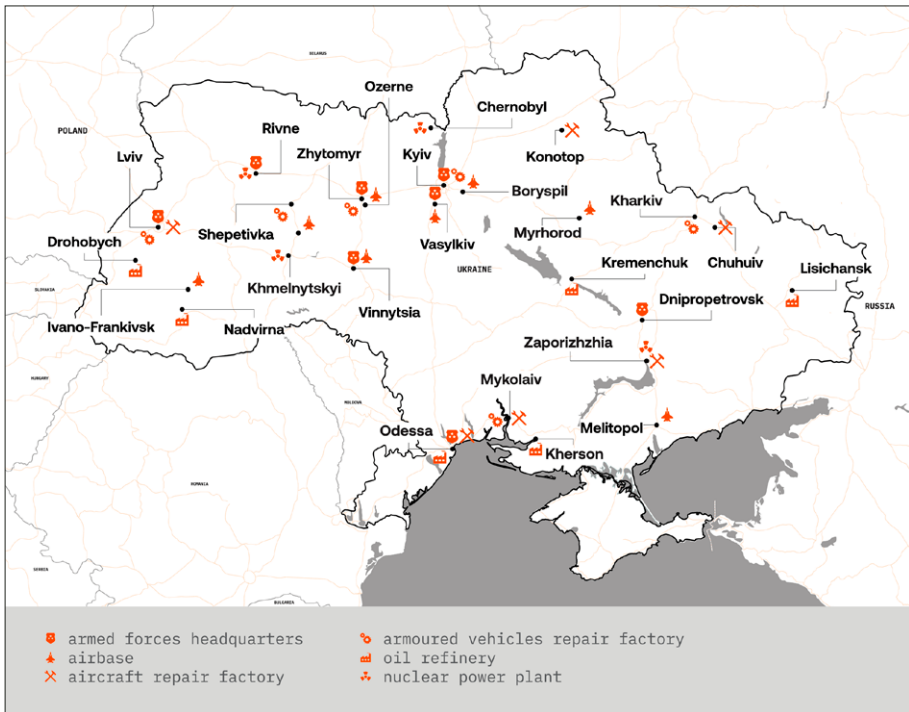
A military airfield used by Mig-29 aircraft. One target was attacked: vehicle parking area. Two burnt vehicles can be seen on the side of the parking area. Runways and aircraft hangers were not attacked.<sup>27</sup>



Black Sky satellite imagery of Vasylkiv Airfield

27 Joseph Dempsey, Twitter post, February 26, 2022, [https://twitter.com/JosephHDempsey/status/1497564764259733507?ref\\_src=twsrc%5Etfw](https://twitter.com/JosephHDempsey/status/1497564764259733507?ref_src=twsrc%5Etfw) (accessed March 21, 2022). “Vasylkiv airbase has been targeted in missile strike,” Liveuamap, February 24, 2022, <https://liveuamap.com/en/2022/24-february-vasylkiv-airbase-has-been-targeted-in-missile> (accessed March 21, 2022).

## APPENDIX B: LIST OF INFRASTRUCTURE TARGETS IN UKRAINE COMPILED BY RUSSIAN INTELLIGENCE AGENCIES (ASSESSMENT OF THE ESTONIAN INTELLIGENCE AGENCY ONE WEEK PRIOR TO THE WAR)



“Targets in Ukraine compiled by Russian intelligence that, if neutralized, can interfere with the command, recovery, and supply of the Ukrainian Armed Forces and Ukraine’s energy supply. Russian intelligence also has similar lists for other European countries...”<sup>28</sup>

28 Estonian Foreign Intelligence Service, “Russia is Ready for War,” February 15, 2022, <https://raport.valisluureamet.ee/en/russian-armed-forces/russia-is-ready-for-war/> (accessed March 21, 2022).



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