# EVOLUTION OF AIRPOWER DOCTRINE IN THE RUSSIA- UKRAINE WAR: LESSONS FOR THE 21ST CENTURY

**Khushi Kaur Arora**
Post graduation student,
Amity Institute of Defence and Strategic Studies
Amity University, Noida, Uttar Pradesh, India

**Abstract**

This study examines the evolution of air power doctrine in the context of the Russia–Ukraine war, with a focus on how contemporary operational realities are reshaping traditional concepts of air superiority. Classical air power theory has long emphasized the rapid achievement of dominance through offensive counter-air operations and suppression of enemy air defences (SEAD). However, the ongoing conflict demonstrates a departure from this model, as neither Russia nor Ukraine has been able to establish uncontested control of the air domain. Instead, the war is characterized by persistent contestation, driven by resilient Integrated Air Defence Systems (IADS), the widespread use of unmanned aerial systems (UAS), and the growing importance of electronic and cyber warfare.

The study employs doctrinal analysis and operational assessment to evaluate key dimensions of this transformation, including air defence adaptability, SEAD limitations, drone proliferation, and multidomain integration. It finds that modern air warfare increasingly prioritizes denial, survivability, dispersion, and cost-imposition strategies over decisive dominance. The integration of low-cost drones and electronic warfare has altered the tempo and economics of air operations, while layered air defence networks have emerged as effective equalizers against technologically superior air forces.

The paper argues that the Russia–Ukraine war represents a critical inflection point in the evolution of air power doctrine. Rather than rendering classical principles obsolete, it redefines their application under conditions of technological diffusion and near-peer competition. The findings suggest that future air power strategies must emphasize resilience, multidomain coordination, and sustained operational adaptation. These insights hold significant implications for military planning and doctrinal development in twenty-first-century warfare.

**Key Terms**-Air Power Doctrine, Air Superiority, Russia–Ukraine War, Integrated Air Defence Systems (IADS), Suppression of Enemy Air Defences (SEAD), Unmanned Aerial Systems (UAS), Drone Warfare, Electronic Warfare, Multidomain Operations, Military Strategy, Contemporary Warfare

## INTRODUCTION

People have long seen air power as a game-changer in modern war. Think back to the heavy bombing runs in World War II, or the slick, precise air strikes we've seen since the Cold War ended—owning the skies has always been a top priority and a key to success. With control up there, armies and navies move more freely, hit deeper targets, and get a huge edge both physically and mentally over the enemy. For decades, especially from the late 1900s into the 2000s, the big military players just assumed that their high-tech air forces would quickly take command of the air whenever conflict broke out.

Russia's full-scale invasion of Ukraine in February 2022 threw a wrench into a lot of old assumptions. Even with its massive air force, Russia hasn't managed to dominate the skies over Ukraine. What's unfolded instead is a drawn-out, fiercely contested air war. Ukraine's Integrated Air Defence Systems (IADS) keep hanging on. Russia's efforts to suppress those defenses (SEAD) haven't really broken through. Drones—unmanned aerial systems—buzz everywhere. Cyber and electronic warfare matter more every day, woven right into the fight.

Instead of proving the old doctrines right, this war has shown where they fall short and forced everyone to rethink how air power really works.

This dissertation examines the evolution of air power doctrine as reflected in the operational realities of the Russia–Ukraine war. It argues that the conflict represents not a rejection of classical air power principles, but their transformation under contemporary technological and strategic conditions. Air superiority in this war has not been achieved through rapid, overwhelming aerial dominance. Instead, both sides have adapted to a condition of persistent contestation in which denial, survivability, dispersion, and technological integration play central roles.

A defining feature of this evolution has been the performance and adaptability of air defence systems. Ukraine's layered IADS—combining legacy Soviet-era platforms with modern Western-supplied systems—has prevented Russia from operating freely in Ukrainian airspace. Mobility, deception, distributed command structures, and real-time intelligence support have enhanced defensive effectiveness. In response, Russian air operations have increasingly relied on stand-off munitions, cruise missiles, ballistic systems, and one-way attack drones. These developments highlight the growing importance of defence-driven air strategy in contemporary warfare.

At the same time, the war has pushed unmanned aerial systems—drones—into the spotlight at every level, from the front lines to big-picture strategy. They do it all: gathering intelligence, watching enemy movements, correcting artillery fire, hitting infrastructure, and carrying out loitering strikes. Drones aren't just cheap; they're flexible and plug right into digital networks, which has completely changed how quickly and widely air power can be used. This isn't just a technical upgrade—it's a shift in thinking. Now, air capability isn't just about having the most advanced manned jets. It's about networks of distributed, connected systems working together across different domains.

There's another layer to this change: air operations are now deeply tied to cyber and electronic warfare. Jamming signals, messing with GPS, grabbing control of the spectrum, and tapping into satellite intelligence—these tactics are now standard for both attack and defense in the air. The Russia–Ukraine war makes it clear: you can't talk about air superiority today without talking about the electromagnetic spectrum and information warfare. Air power in the twenty-first century lives in a world where everything is connected—across land, air, cyberspace, and beyond.

This study therefore seeks to assess how the operational experiences of the Russia–Ukraine war are reshaping air power doctrine. It addresses the following central question: **How has the Russia–Ukraine conflict influenced the evolution of air power doctrine, and what lessons does this evolution offer for twenty-first-century warfare?**

Methodologically, the dissertation employs doctrinal analysis supported by operational case study examination. It draws upon strategic literature, defence assessments, and documented battlefield developments to evaluate shifts in air superiority, IADS performance, SEAD effectiveness, unmanned systems integration, and infrastructure targeting strategies. The aim is not merely to describe events, but to identify patterns of doctrinal adaptation.

This dissertation unfolds in four parts. First, we lay out the historical roots of air power doctrine and what really underpins the idea of air superiority. Next, we dig into how the Russia–Ukraine air campaign actually works—looking at denial strategies, integrated air defence, and the surge in drone warfare. Then, we break down what these changes mean for doctrine as a whole. Finally, we pull together the key lessons from the conflict and ask what they mean for future military planning in the twenty-first century. The Russia–Ukraine war stands out as one of the most important state-on-state conflicts in recent memory. Its air campaign offers a sharp, real-world view of how air power doctrine is changing. With new military technologies spreading fast and contested airspaces becoming standard, tracking these doctrinal shifts isn't just interesting—it's crucial for anyone thinking seriously about strategy today.

## HISTORICAL FOUNDATIONS AND CONCEPTUAL EVOLUTION OF AIR POWER DOCTRINE

Air power doctrine took shape in the early twentieth century, right as military aviation started to come into its own. Giulio Douhet stands out among the first big thinkers in the field. In The Command of the Air, he claimed that bombing from the sky—not slow, bloody ground battles—would decide the wars of the future (Douhet, 1921/1983). Hit the factories, hit the cities, he argued, and you break the enemy's will to fight. If you control the air, you control the outcome. Douhet's ideas sparked plenty of debate, but they left a real mark on military doctrine everywhere.

World War II put some of Douhet's theories to the test. The Allies hammered Germany and Japan with strategic bombing, chasing the vision of victory from above. Yet, postwar analysis made it clear—air power alone didn't deliver the knockout blow (Biddle, 2002). Still, one thing stuck: you can't win without air superiority. That idea got baked into doctrine and never left.

Then came the Cold War, and with it, a whole new set of challenges. Technology raced ahead. Surface-to-air missiles and dense air defence networks sprang up, especially in the Soviet Union. Suddenly, Western air planners had to focus on Suppression of Enemy Air Defences (SEAD) if they wanted any hope of dominating the skies (Deptula & Bowie, 2024). Air campaigns turned into complex operations featuring electronic warfare, smart bombs, and tightly coordinated strike packages—all built to take out radars and missile sites before sending aircraft deep into enemy territory.

The 1991 Gulf War appeared to validate this model. Coalition forces rapidly dismantled Iraqi air defences and established uncontested control of the air within days. Precision air strikes targeted command centers, logistics hubs, and infrastructure with minimal coalition losses. This operational success reinforced the doctrinal assumption that technologically advanced air forces could reliably secure air superiority in the early stages of high-intensity conflict (Warden, 1995). Similar patterns were observed in NATO operations in Kosovo (1999) and in the Iraq War (2003), further entrenching the belief in rapid air dominance.

However, these conflicts largely involved adversaries with comparatively limited air defence modernization and constrained electronic warfare capabilities. As Hunter Stoll (2024) notes, post–Cold War air campaigns often occurred in permissive or semi-permissive environments, which shaped expectations about the feasibility of decisive air superiority. The absence of peer-level contestation created a doctrinal environment in which air dominance was treated as an operational norm rather than a contested objective.

The Russia–Ukraine war breaks from the pattern we've seen in recent conflicts. This isn't another Western intervention against an outmatched opponent. Here, both sides came prepared. They brought legacy air defense systems, piles of surface-to-air missiles, and cutting-edge precision tech. Ukraine held onto its old Soviet S-300s and made them work alongside newer Western systems like NASAMS, IRIS-T, and Patriot batteries. The result? A layered Integrated Air Defence System that shuts down Russian freedom in the skies (Oleshchuk, 2023; Stoll, 2024).

All this points to a shift in military thinking. It's not just about who can strike hardest from the air. Defensive strength matters more than ever. Airspace over Ukraine stays contested because denial strategies, careful dispersion, and a focus on survival make it tough for even a stronger air force to take control. Instead of replaying the quick, decisive air wars of the 1990s, this conflict drags out, showing that when two near-equals face off, air dominance can stall into a long, grinding stalemate.

Moreover, the proliferation of unmanned aerial systems has further complicated traditional models. Kunertova (2023) argues that drones have decentralized air power, enabling both state and non-state actors to conduct aerial reconnaissance and precision strikes without traditional air force infrastructure. In the Russia–Ukraine context, the integration of UAS into both offensive and defensive operations has reshaped operational tempo and targeting practices.

Taken together, these developments suggest that air power doctrine is undergoing a period of recalibration. The historical emphasis on rapid offensive dominance is increasingly supplemented by considerations of resilience, integration, and multidomain survivability. The Russia–Ukraine war therefore represents not an anomaly, but an inflection point in the conceptual evolution of air power.

## LITERATURE REVIEW: DOCTRINAL DEBATES ON AIR SUPERIORITY, IADS, SEAD, AND UAS

### Air Superiority in Contemporary Warfare

Air superiority has always sat at the heart of air power doctrine. Douhet, writing in the early twentieth century, famously claimed that controlling the skies would decide modern wars—you could skip over the blood and mud of ground battles if you owned the air. Later writers pushed back against Douhet's confidence, but the core belief stuck: if you wanted to win, you needed air superiority first. This idea shaped doctrine all through the twentieth century.

Then came the post–Cold War years. Experiences in the Gulf War seemed to prove the old assumption right. The U.S. and its allies tore through Iraqi air defenses during Desert Storm, making it look easy—Warden (1995) and others pointed to this as proof that advanced air forces could seize control early and keep it. NATO saw similar results in Kosovo and Iraq in 2003. These victories fed into what analysts now call the "air dominance paradigm." Air superiority wasn't just a goal anymore; it became the starting point, the baseline for operations (Deptula & Bowie, 2024).

But this consensus isn't holding up so well lately. Stoll (2024) points out that new air defense systems, long-range missiles, and digital integration make it much harder to dominate the air quickly—especially against near-peer adversaries. Dalsjö and colleagues (2022) go further: they argue that Russia's war in Ukraine shows how simply having more aircraft doesn't guarantee control. Russian forces ran into serious trouble trying to translate numbers into actual air superiority. These studies argue that air superiority isn't a simple yes-or-no situation anymore. Instead, it's a shifting condition, shaped by enemy denial tactics and operational limits.

Now, with the war in Ukraine, scholars are back to questioning whether the old air superiority doctrine still makes sense. Instead of the quick and easy dominance that many expected, the conflict has turned into a drawn-out aerial struggle. This has forced military thinkers to take a hard look at assumptions that once seemed untouchable.

### Integrated Air Defence Systems (IADS) and Denial Strategies

A critical body of literature examines the evolution of Integrated Air Defence Systems (IADS) and their implications for offensive air operations. During the Cold War, layered Soviet air defence networks compelled NATO planners to develop sophisticated SEAD capabilities. The central premise was that neutralizing radar, missile batteries, and command nodes was essential for achieving air superiority (Deptula & Bowie, 2024).

Contemporary analyses suggest that modern IADS have become increasingly resilient due to mobility, digital networking, and redundancy. Oleshchuk (2023) highlights how Ukraine's adaptive employment of legacy systems such as the S-300, combined with Western platforms including NASAMS and IRIS-T, created a layered defensive architecture capable of denying Russian aircraft operational freedom. This hybridization of Soviet-era and Western technologies reflects a doctrinal shift toward defence-driven air strategy.

Stoll (2024) further argues that Ukraine's success in air denial demonstrates the strategic value of dispersion, deception, and mobility within IADS structures. Rather than relying solely on technological sophistication, Ukrainian air defence effectiveness has been linked to adaptive command practices and integration with intelligence-sharing networks. This finding challenges earlier assumptions that offensive air power retains inherent superiority over defensive systems.

The literature increasingly frames modern air warfare as a contest between offensive strike capabilities and defensive denial networks. In the Russia–Ukraine context, the persistence of contested airspace underscores the growing importance of IADS resilience in shaping operational outcomes.

### SEAD Limitations and Operational Constraints

Suppression of Enemy Air Defences, or SEAD, has long stood as a key step on the road to air superiority. Western military thinking leaned hard on coordinated electronic warfare, precision strikes, and anti-radiation missiles—all aimed at knocking out radar and missile systems right at the start of a fight (Warden, 1995).

But the picture is changing. Recent analyses point out that SEAD isn't as straightforward in near-peer conflicts as doctrine might suggest. Take Ichaso's (2023) look at the Russian campaign in Ukraine: despite fielding modern aircraft and sophisticated electronic warfare gear, Russia's SEAD efforts early in the invasion were patchy and poorly coordinated. Ukrainian air defences held out, forcing Russian pilots into stand-off tactics and keeping them from reaching deep targets.

Dalsjö and colleagues (2022) dig into why this happened. They point to structural problems in the Russian Aerospace Forces—training gaps, shaky coordination, and more. On a broader level, Ukraine's approach highlights the trouble with old-school SEAD methods. When air defence units stay mobile, use decoys, and operate in dispersed networks, they become much tougher to hunt down and destroy.

So the game is shifting. Future SEAD missions need to go beyond just kinetic strikes. Integrating cyber tools, dominating the electronic spectrum, and maintaining persistent ISR will matter more than ever. The Russia–Ukraine war isn't just a case study—it's a warning. Quickly wiping out enemy air defences isn't as easy as some doctrines suggest, and military planners need to rethink what effective SEAD looks like now.

**Unmanned Aerial Systems (UAS) and the Decentralization of Air Power**

One of the most significant themes in recent air power scholarship concerns the rise of unmanned aerial systems. Kunertova (2023) argues that drones represent a structural transformation in the character of air warfare by lowering the cost of aerial capability and expanding access to precision strike functions. Similarly, Eslami (2022) highlights the strategic implications of Iran's drone exports to Russia, emphasizing how loitering munitions alter operational tempo and saturation dynamics.

In Ukraine, both sides have integrated UAS extensively across tactical and strategic levels. The use of Turkish Bayraktar TB2 drones in early Ukrainian operations demonstrated the value of ISR-strike integration, while Russia's employment of Shahed-type loitering munitions illustrated the utility of cost-effective saturation attacks against infrastructure (Kunertova, 2023). These developments reflect what some scholars describe as the "democratization" of air power, wherein aerial capability is no longer monopolized by states possessing advanced manned aircraft fleets.

Melnikov et al. (2023) note that the modernization of unmanned platforms increasingly incorporates autonomous navigation, improved targeting algorithms, and integration with electronic warfare systems. This convergence enhances the survivability and effectiveness of drones in contested environments. The Russia–Ukraine conflict thus serves as a practical demonstration of how UAS reshape operational doctrine.

Rather than replacing traditional air forces, drones appear to complement and complicate them. Their proliferation challenges platform-centric definitions of air superiority and introduces new cost-exchange dynamics between offensive saturation and defensive interception.

**Multidomain Integration and the Electromagnetic Spectrum**

Recent studies spotlight how air operations now blend tightly with cyber and electronic warfare. Hackett and Nolin (2024) point out that modern wars mix kinetic and non-kinetic actions so thoroughly, it's tough to draw clean lines between them anymore. Electronic warfare systems don't just sit on the sidelines—they jam radars, scramble communications, and mess with GPS signals, all of which hit air campaigns where it hurts.

Take the Russia–Ukraine war. Both sides use electronic warfare to throw off drones, breaking their navigation and targeting. Stoll (2024) digs into how this electromagnetic battle shapes who gains the upper hand on the ground, making it clear: you can't talk about air superiority without talking about spectrum dominance. As ISR, cyber tools, and space-based tech get woven together, air power doctrine can't stay stuck in its old silo. It has to shift—fast—toward a multidomain approach.

**Synthesis and Identified Gaps**

The current research circles around a few big themes: IADS are getting tougher, old-school SEAD tactics aren't keeping up, drones are changing the game, and air operations now have to mesh with both electronic and cyber warfare. Most studies tend to focus on just one of these shifts at a time. Not many step back and look at how all these changes, together, are pushing air power doctrine in a new direction.

The Russia–Ukraine war offers a rare chance to connect the dots. With one long, messy conflict, we can look at air superiority, how IADS actually hold up, where SEAD falls short, the explosion of drones, and how everything gets pulled together across different domains. This dissertation takes that opportunity—moving past just listing what's happening on the ground, and instead, rethinking what all these changes mean for the future of air power.

## OPERATIONAL EVOLUTION OF AIR POWER IN THE RUSSIA–UKRAINE WAR

**Initial Russian Air Campaign and Strategic Objectives (February–April 2022)**

When Russia launched its full-scale invasion in February 2022, the Russian Aerospace Forces (VKS) entered the fight with a clear edge—more aircraft and better technology than Ukraine. At that point, Russia had more than 1,500 fixed-wing combat aircraft, including modern multirole fighters like the Su-30SM, Su-35S, and Su-34, plus long-range strike planes and electronic warfare assets (Kyzym et al., 2023). Ukraine, by comparison, relied mostly on older Soviet-era jets—MiG-29s, Su-27s, Su-24s—many of them only lightly modernized.

From a doctrinal standpoint, Russia seemed ready to follow a textbook air campaign: knock out Ukrainian air defenses, hit air bases and grounded aircraft, then grab air superiority to pave the way for ground forces. The first strikes focused on airfields, radar sites, and command centers across several regions—clearly aiming to shut down Ukraine's air power fast (Ichaso, 2023).

But in practice, Russian operations took a different turn. During those first weeks, Russian sorties covered a lot of ground, but the scale and coordination of their suppression efforts fell short of what we'd expect from Western-style SEAD campaigns (Dalsjö et al., 2022). Missile attacks damaged infrastructure, but Ukrainian air defenses kept working, and Ukrainian pilots kept flying—even in contested skies.

Sortie records show Russian jets flew in large numbers, yet often stayed at higher altitudes or operated from stand-off ranges to avoid surface-to-air missile (SAM) threats (Lubiejewski, 2023). They didn't risk many deep strikes into areas with heavy air defenses. Ukrainian air defense wasn't wiped out; Russian forces faced steady pressure from ground-based systems instead of securing total air superiority.

All this points to a gap between Russian doctrine and what actually happened. Russia had the equipment and numbers for major SEAD operations, but Ukraine's air defense tactics—survivability, dispersal—frustrated those plans. So instead of quickly dominating the skies, Russia found itself in a prolonged, contested air war right from the start.

## Ukrainian Integrated Air Defence System (IADS) Adaptation

A central feature of the operational evolution of air power in the conflict has been the performance and adaptation of Ukraine's Integrated Air Defence System. Prior to 2022, Ukraine retained substantial Soviet-era air defence assets, including S-300 and Buk systems, which formed the backbone of its defensive architecture. Despite concerns regarding modernization gaps, these systems provided layered coverage across key urban and strategic regions (Kyzym et al., 2023).

As the war progressed, Ukraine adapted its IADS through mobility, decentralization, and integration with Western-supplied systems. Platforms such as NASAMS, IRIS-T, and later Patriot batteries expanded interception capability against cruise missiles and ballistic threats (Oleshchuk, 2023). Rather than operating as static defensive installations, Ukrainian SAM units frequently relocated to reduce vulnerability to counterstrikes.

Mobility emerged as a defining feature of Ukrainian air defence resilience. By minimizing radar emissions, employing decoys, and dispersing launchers, Ukrainian forces increased the difficulty of Russian targeting. This adaptive approach reflects a shift from rigid defensive postures toward dynamic, survivability-oriented doctrine.

Intelligence-sharing arrangements with Western partners further enhanced the effectiveness of Ukraine's IADS. Real-time information regarding missile launches and aerial movements enabled anticipatory interception and more efficient allocation of limited interceptor resources (Stoll, 2024). While this support did not eliminate vulnerabilities, it contributed to sustained denial of uncontested air operations.

Importantly, Ukrainian air defence did not eliminate Russian air activity; rather, it imposed operational constraints. Russian aircraft continued to conduct missions, particularly near frontlines and from stand-off ranges. However, the persistence of Ukrainian SAM threats limited freedom of manoeuvre and reduced the feasibility of sustained low-altitude strike operations.

The resilience of Ukraine's IADS thus played a central role in preventing rapid Russian air dominance. Instead of collapsing under initial strikes, Ukrainian air defences demonstrated adaptability consistent with contemporary denial-oriented doctrine.

## SEAD Constraints and Operational Adjustments

The limitations of Russian SEAD operations represent a critical operational dimension of the air campaign. Classical SEAD doctrine emphasizes coordinated strikes against radar installations, missile batteries, and command nodes to dismantle defensive networks early in conflict. While Russia possessed anti-radiation missiles and electronic warfare capabilities theoretically suited to this mission, empirical assessments suggest that suppression efforts were neither sustained nor comprehensive (Ichaso, 2023).

One explanation advanced in strategic analyses concerns coordination and training limitations within the Russian Aerospace Forces (Dalsjö et al., 2022). Effective SEAD operations require tightly integrated strike packages, real-time intelligence, and adaptive targeting cycles. The distributed and mobile nature of Ukrainian IADS further complicated detection and neutralization.

As a result, Russian aircraft increasingly adopted stand-off tactics. Precision-guided munitions and cruise missiles were launched from outside dense air defence coverage zones, reducing exposure risk but also limiting strike flexibility (Lubiejewski, 2023). High-altitude bombing runs became more common, which in turn reduced targeting precision in certain contexts.

This adaptation reflects an operational recalibration rather than total failure. Russian air power continued to contribute to battlefield shaping, particularly along contested frontlines. However, the inability to dismantle Ukrainian air defences comprehensively prevented the establishment of uncontested air superiority.

The persistence of contested airspace underscores a broader doctrinal implication: in near-peer environments featuring mobile and layered IADS, SEAD operations may require sustained, multidomain integration rather than discrete opening-phase suppression campaigns.

**The Expansion of Unmanned Aerial Systems (UAS)**

As the air campaign dragged on, drones took center stage. Russia and Ukraine both leaned hard into unmanned aerial systems—not just for watching the battlefield, but for guiding artillery and hitting targets. Early on, Ukraine's Bayraktar TB2s showed what's possible when you pair ISR (intelligence, surveillance, reconnaissance) with precision-guided bombs, especially against armored vehicles (Kunertova, 2023).But drone use didn't stop there. It got creative fast. First-person-view (FPV) drones started showing up for direct attacks. Loitering munitions hung in the air, always ready to strike. Russia, for its part, rolled out Shahed one-way attack drones—cheap, effective, and perfect for overwhelming Ukrainian air defenses or going after power stations (Eslami, 2022).The numbers tell the story. Drone launches soared as the war went on, especially during the big push against infrastructure in late 2022 and after (Hackett & Nolin, 2024). Suddenly, you had this weird imbalance: a cheap drone could force defenders to fire off expensive interceptor missiles. That pushed the cost-exchange equation out of whack. Defenders had to make hard choices about where to spend their high-value munitions.All these drones threw old air defense plans out the window. Systems built to spot and shoot down planes or cruise missiles struggled with smaller, quieter threats. Radar tactics changed. Forces had to rethink what to prioritize and how to stretch their resources.Drones weren't just a sidekick to piloted jets anymore. They started running the show, shaping both daily tactics and big-picture strategy. This wasn't just a fluke—it marked a real shift in how modern militaries think about air power..

**Strategic Infrastructure Targeting and Air Power Application**

As the war dragged on—moving past the initial invasion and into a grinding stalemate—Russian air forces started zeroing in on Ukraine's critical infrastructure. By October 2022, and with growing intensity through 2023 and 2024, Russia launched coordinated missile and drone attacks against Ukraine's energy grid, transport routes, logistics centers, and defense-industrial sites (Hackett & Nolin, 2024).These attacks weren't random. Russian planners mixed cruise missiles, ballistic weapons, and loitering munitions, layering them to swamp Ukrainian air defenses. Their goals were clear: cripple Ukraine's military logistics and command structure, and wear down the population by targeting energy systems—especially in the dead of winter.From the standpoint of air power, this marked a shift. Russian forces adapted, leaning into stand-off strike tactics because the skies were too dangerous for deep bombing runs with manned aircraft. Instead, they fired long-range precision weapons from relative safety, sticking to Russian or contested airspace. This let them hit targets while keeping their planes out of harm's way.The mass use of Shahed-type drones added a new twist. Russian commanders flooded the skies with cheap, unmanned drones, forcing Ukraine to burn through interceptors and spread out its defenses (Eslami, 2022). Every time Ukraine improved its interception rates—thanks in part to Western-supplied systems—Russian forces ramped up attack volumes or switched up their strike mix.Reports show Ukraine scored impressive interception rates, especially after getting Patriot systems to counter ballistic missiles (Stoll, 2024). But even strong defenses couldn't stop every attack. Just a few successful strikes on energy sites triggered bigger problems, disrupting logistics and civilian life.This campaign shows how Russian air doctrine evolved under tough conditions. Instead of chasing air superiority, Russia focused on relentless, long-range strikes meant to grind down Ukrainian resilience over time. Air power, here, became less about dominating the battlefield and more about steady, strategic disruption.

**Drone Saturation and Cost-Exchange Dynamics (2023–2025)**

By 2023 and into 2024–2025, the scale and frequency of drone operations increased significantly. Strategic assessments indicate that thousands of one-way attack UAVs were launched over extended periods, often in conjunction with cruise missile salvos (Hackett & Nolin, 2024). This escalation reflected both technological adaptation and industrial recalibration.

The cost-exchange dynamic between offensive drones and defensive interceptors became a central operational consideration. Intercepting relatively inexpensive unmanned systems with high-value surface-to-air missiles imposed resource pressures on Ukrainian defence planning. In response, Ukraine expanded the use of alternative interception methods, including anti-aircraft artillery and electronic countermeasures, to reduce reliance on expensive missile stocks.

The operational environment thus evolved into a cycle of iterative adaptation. Russian forces diversified drone flight paths and timing to complicate interception, while Ukrainian forces enhanced radar integration and multi-layer interception strategies. This reciprocal adjustment underscores the dynamic nature of air power evolution within the conflict.

Importantly, drone operations were not confined to Russian employment. Ukrainian forces increasingly deployed long-range unmanned systems to strike air bases, ammunition depots, and logistical nodes within Russian-controlled territory. These strikes extended the geographic scope of air contestation and challenged assumptions regarding rear-area sanctuary.

The growing role of drones in both offensive and defensive contexts signals a decentralization of air power capability. Unlike traditional air campaigns reliant on limited numbers of advanced aircraft, drone-based operations allowed sustained aerial activity at lower relative cost and with distributed risk. This development reflects a structural shift in the operational character of air warfare.

## Electronic Warfare and Spectrum Contestation

While ground combat raged, electronic warfare (EW) took on a life of its own. Both sides threw everything they had at disrupting the skies—jamming signals, scrambling GPS, cutting off communications. Russian systems like Krasukha and the Leer series went after Ukrainian drones, trying to knock them off course or blind their targeting (Hackett & Nolin, 2024).Ukraine didn't just sit back. Their teams tweaked drone controls, turned to backup navigation techniques, and built mesh networks to keep their drones talking even when the airwaves got ugly. The fight for control over the electromagnetic spectrum quickly became just as important as the air battles themselves.Electronic warfare shaped every part of the drone war. Jamming sometimes threw off precision-guided weapons, but Ukrainian countermeasures brought those systems back online. This constant back-and-forth between kinetic strikes and electronic attacks shows just how tangled modern air power has become.EW isn't some side project anymore—it's right at the heart of air operations. This shift marks a real change in how militaries think: air superiority doesn't exist without spectrum dominance..

## Late-Phase Adaptations and Persistent Contestation

By 2024 and into 2025, the air campaign exhibited characteristics of sustained mutual denial rather than decisive control by either side. Russian aircraft continued to operate, particularly along frontline regions, but largely avoided deep penetration into heavily defended zones. Ukrainian manned aircraft operated under similar constraints.

The persistence of contested airspace over multiple years suggests that neither side achieved classical air superiority. Instead, both adapted to operating within a constrained environment shaped by layered defences, electronic interference, and drone proliferation.

Russian forces dispersed aircraft across multiple air bases to mitigate vulnerability to Ukrainian drone strikes. Simultaneously, Ukrainian forces fortified defensive positions and expanded interceptor networks. This reciprocal dispersal reflects a shift toward survivability-oriented posture across both offensive and defensive air assets.

Operational tempo remained high despite these constraints. The continuation of missile and drone strikes demonstrates that contested airspace does not equate to inactivity. Rather, air power in this context functioned as a sustained instrument of attrition and disruption.

## Analytical Assessment of Operational Evolution

Having outlined the operational developments chronologically and thematically, certain analytical observations emerge.

First, the conflict demonstrates that numerical and technological superiority alone does not guarantee rapid air dominance in near-peer environments. Russian air power, while extensive, encountered structural and adaptive constraints that limited its ability to dismantle Ukrainian IADS comprehensively (Dalsjö et al., 2022).

Second, the resilience of Ukraine's air defence architecture underscores the growing strategic value of denial strategies. Mobility, dispersal, intelligence integration, and layered coverage proved sufficient to prevent uncontested air operations.

Third, the proliferation of unmanned systems fundamentally altered the operational calculus. Drone saturation, cost-exchange dynamics, and distributed strike capability reshaped the tempo and economics of air warfare (Kunertova, 2023). Air power became more persistent, decentralized, and iterative.

Fourth, the integration of electronic warfare highlights the inseparability of air operations from multidomain contestation. Spectrum control directly influenced kinetic effectiveness, reinforcing the necessity of integrated planning.

Collectively, these developments suggest that the Russia–Ukraine war reflects not a collapse of air power doctrine, but its adaptation under contested conditions. Classical principles of air superiority remain relevant; however, their operationalization has evolved toward sustained denial, resilience, and multidomain integration.

## DOCTRINAL IMPLICATIONS AND LESSONS FOR 21ST CENTURY WARFARE

### Reframing Air Superiority: From Dominance to Denial

The operational developments observed in the Russia–Ukraine war suggest that traditional conceptualizations of air superiority require reassessment. Historically, air superiority was framed as a condition in which one belligerent achieved uncontested control of the air domain, enabling unrestricted operations for friendly forces while denying similar freedom to the adversary. This understanding was reinforced by post–Cold War interventions in which technologically superior air forces rapidly dismantled opposing air defences (Warden, 1995).

However, the prolonged contestation of Ukrainian airspace indicates that air superiority in contemporary near-peer conflict may not manifest as absolute dominance. Instead, the operational environment reflects what may be more accurately described as *mutual denial*. Neither Russia nor Ukraine achieved complete control of the skies; yet both retained the capacity to conduct limited air operations under constraint.

This shift suggests a doctrinal recalibration from a dominance-centric model toward a survivability and denial-based model. Air superiority becomes less a binary achievement and more a fluctuating operational condition shaped by resilience, dispersion, electronic warfare, and layered defence systems (Stoll, 2024). In this framework, the objective is not necessarily to eliminate adversary air capability entirely, but to impose sufficient risk and cost to constrain its operational effectiveness.

Such a reconceptualization does not negate classical theory but refines it under contemporary technological realities. In environments characterized by mobile IADS, digital integration, and ISR transparency, rapid and decisive air dominance may be increasingly difficult to achieve.

### Integrated Air Defence Systems as Strategic Equalizers

The war between Russia and Ukraine also puts the spotlight on the limits of traditional SEAD doctrine. Suppressing enemy air defences is still essential for air superiority, but it's getting much harder when those defences are always on the move and hooked into digital networks. You can't just wipe out air defences in the opening days anymore. Future SEAD missions need a new playbook. It's not enough to just hit radars with missiles. Now, you have to blend in cyber attacks, electronic warfare, and constant surveillance to track mobile systems. Suppression becomes a continuous process—always chipping away, disrupting, and adapting—rather than just a big push at the start. The Russia–Ukraine war makes it clear: air campaigns have to prepare for a long, grinding contest, not a quick and easy sweep of the skies.

### SEAD in the Age of Mobility and Multidomain Warfare

The Russia–Ukraine conflict also exposes limitations in traditional SEAD doctrine. While suppression of enemy air defences remains a doctrinal necessity for achieving dominance, the feasibility of comprehensive early-phase neutralization appears reduced in environments where air defence units are highly mobile and digitally networked (Ichaso, 2023).

Future SEAD operations may require deeper integration with cyber and electronic warfare capabilities. Rather than relying solely on kinetic strikes against radar emitters, suppression may increasingly involve spectrum denial, cyber disruption of command networks, and persistent ISR to track mobile assets.

This suggests a doctrinal evolution toward multidomain SEAD, in which suppression is continuous rather than front-loaded. The Russia–Ukraine case indicates that air campaigns may need to adapt to sustained contestation rather than assuming rapid collapse of defensive networks.

## The Structural Transformation Introduced by Unmanned Systems

But maybe the biggest shift is the rise of unmanned aerial systems. Drones now handle everything from reconnaissance to strikes to loitering, and this spreads air power out across many platforms instead of centralizing it in a few high-end jets. Three big changes stand out: First, cheap drones force defenders to spend big on countermeasures, shaking up resource priorities. Second, drones give you round-the-clock surveillance, making surprise attacks much harder and the battlefield more transparent. Third, precision strikes aren't just for top-tier air forces anymore—distributed systems mean more players have access. All this means air power doctrine has to move beyond just counting airplanes. If you only look at how many jets each side has, you'll miss the bigger picture. Unmanned systems are now shaping the pace and character of air operations, and doctrine needs to keep up.

Three doctrinal implications emerge:

1. **Cost-Exchange Dynamics:** Low-cost drones can compel expensive defensive responses, altering resource allocation strategies.
2. **Persistent ISR:** Continuous surveillance reduces operational surprise and increases battlefield transparency.
3. **Distributed Strike Capacity:** Precision capability is no longer monopolized by advanced air forces.

These developments suggest that air power doctrine must expand beyond platform-centric metrics. Evaluating air superiority solely by aircraft inventories is insufficient in an environment where distributed unmanned systems shape operational tempo.

## Multidomain Integration as a Doctrinal Imperative

The integration of electronic warfare, cyber operations, and satellite-enabled intelligence into air campaigns indicates that air superiority must be conceptualized within a multidomain framework (Hackett & Nolin, 2024).

Air operations are increasingly dependent on spectrum access, secure communications, and ISR integration. The Russia–Ukraine war demonstrates that disruption in one domain directly affects effectiveness in another. Consequently, doctrinal evolution must prioritize interoperability between air, cyber, space, and electronic warfare capabilities.

**COMPARATIVE OPERATIONAL DEBRIEF: UKRAINE'S DEEP-STRIKE DRONE CAMPAIGN ("OPERATION SPIDER WEB") AND INDIA'S OPERATION SINDOOR (2025)**

## Strategic Intent and Political Framing

Ukraine's deep-strike drone campaign—commonly analyzed under the informal designation "Operation Spider Web"—emerged within the context of an ongoing full-scale conventional war. Its strategic intent was cumulative degradation rather than decisive battlefield transformation. The objectives included:

- Imposing rear-area insecurity.
- Forcing dispersal of Russian air assets.
- Increasing air defence allocation burden.
- Generating operational attrition over time.
- Demonstrating strategic reach despite airspace denial (Hackett & Nolin, 2024).

The campaign was structurally attritional and designed for repetition.

10

Operation Sindoor (2025), by contrast, occurred within a highly sensitive escalation environment. India's objective was neither sustained attrition nor infrastructure degradation. Rather, it reflected a calibrated strategic response designed to:

- Impose limited punitive cost.
- Signal retaliatory capability.
- Maintain escalation control.
- Reinforce deterrence credibility.
- Avoid transition to sustained conventional war.

Thus, the campaigns differ fundamentally in political framing: Ukraine's operations functioned within wartime continuity, whereas Operation Sindoor was situated within a deterrence-management framework.

## Operational Architecture and Planning Model

### Ukraine: Distributed Attritional Architecture

Ukraine's deep-strike operations relied on distributed launch platforms, modular drone design, and iterative mission planning. Operational characteristics included:

- Pre-programmed long-range UAV routes.
- Terrain masking and low-altitude penetration.
- Saturation waves to overwhelm layered IADS.
- Combined drone–missile sequencing.
- Repetition to impose cumulative strain (Kunertova, 2023).

Planning architecture was decentralized and adaptive. Feedback from previous strikes informed route modification and EW counter-countermeasures.

The structure resembled a sustained interdiction campaign rather than a singular operation.

### Operation Sindoor: Centralized Precision Strike Architecture

Operation Sindoor reflected centralized operational control with strict timing synchronization. Its architecture likely included:

- Target intelligence confirmation through multisource ISR.
- Limited strike package composition.
- Defined ingress and egress corridors.
- Pre-planned escalation management protocols.
- Air defence alert posturing during and after execution.

The design prioritized precision, surprise, and political calibration over repetition.

Where Ukraine optimized persistence, India optimized decisiveness within narrow time windows.

## Technological Ecosystem and Platform Dependency

### Ukraine

Ukraine's model is platform-light but system-heavy. It emphasizes:

- Long-range unmanned aerial systems.
- Loitering munitions.
- ISR-data fusion.
- EW adaptation.
- Redundant guidance systems.

The technology ecosystem is modular, scalable, and industrially adaptable. It allows replacement without catastrophic capability loss.

### Operation Sindoor

Operation Sindoor reflects platform-centric doctrine. It depends on:

- Advanced manned aircraft.
- Precision-guided munitions.
- Electronic warfare support.
- Secure satellite and airborne ISR.
- Air dominance support systems.

The capital intensity per sortie is significantly higher than drone-based strike models.

This reflects two divergent technological philosophies:

- Ukraine: Distributed replaceability.
- India: Concentrated precision lethality.

## Logistics and Sustainment

Ukraine's drone campaign requires sustained industrial throughput. Its logistical architecture must maintain:

- Continuous drone production.
- Component sourcing.
- EW resilience upgrades.
- Launch-site mobility.
- ISR bandwidth continuity.

The burden is long-term and production-dependent.

Operation Sindoor required:

- Aircraft readiness cycles.
- Munition integration.
- Aircrew training.

- Real-time command coordination.
- Escalation contingency posture.

The logistical burden is front-loaded and capital-intensive but not structurally repetitive.

**ISR Integration and Intelligence Dependency**

Ukraine's drone campaign relies heavily on persistent ISR. Satellite imagery, signals intelligence, and battlefield reconnaissance enable route optimization and target selection.

12

However, individual drone missions may tolerate limited precision degradation because operational effect is cumulative.

Operation Sindoor required high-confidence, high-accuracy intelligence prior to execution. In politically sensitive environments, precision legitimacy is critical. ISR accuracy directly influences strategic credibility.

Thus:

- Ukraine's model tolerates iterative correction.
- Sindoor required near-zero-error targeting.

**Execution Dynamics**

**Ukraine**

- Multiple drones launched in waves.
- Variable timing to complicate interception.
- Redundant targeting to ensure effect.
- EW adaptation mid-campaign.
- Persistent operational tempo.

Execution prioritizes overload and attrition.

**Operation Sindoor**

- Time-bound strike window.
- Coordinated penetration.
- Immediate withdrawal.
- Rapid political communication.

Execution prioritizes clarity and containment.

**Escalation and Deterrence Calculus**

Ukraine operates under active war escalation. Its strikes contribute to attrition but do not fundamentally alter escalation ladder positions already surpassed.

Operation Sindoor operated under nuclear deterrence equilibrium. Escalation management was central. The operation had to demonstrate strength without triggering full-scale conventional war.

This distinction profoundly shapes doctrinal lessons for India.

**OPERATIONAL STRENGTH–WEAKNESS DEBRIEF**

**Ukraine Model – Operational Advantages**

- Scalable pressure.
- Distributed risk.
- Cost asymmetry leverage.
- Adaptive EW resilience.
- Strategic persistence.

**Ukraine Model – Operational Risks**

- Industrial dependency.
- Counter-drone system evolution.
- Diminishing surprise factor.
- Saturation diminishing returns.

**Operation Sindoor – Operational Advantages**

- Strategic clarity.
- Political signaling precision.
- Escalation calibration.
- High lethality per strike.
- Controlled operational exposure.

**Operation Sindoor – Operational Risks**

- High-value asset exposure.
- Escalation unpredictability.
- ISR dependency.
- Limited repetition viability.

**comprehensive comparative operational matrix**

| Analytical Dimension | Ukraine Deep-Strike Drone Campaign | Operation Sindoor (India, 2025) |
|---|---|---|
| Strategic Motive | Attritional degradation | Calibrated deterrence signaling |
| Conflict Context | Active conventional war | Pre-war nuclear deterrence environment |
| Operational Duration | Sustained, repetitive | Single, time-bound operation |
| Command Architecture | Distributed-adaptive | Centralized-controlled |
| Primary Platforms | Long-range UAVs, loitering munitions | Advanced manned aircraft + PGMs |
| Cost Structure | Low per unit, high aggregate | High per sortie, limited repetition |
| Logistics Model | Continuous production sustainment | Readiness-based strike cycle |
| ISR Dependency | Persistent but adaptable | High-precision, mission-critical |
| Execution Pattern | Saturation and iteration | Penetrate–strike–withdraw |
| Escalation Sensitivity | Embedded in ongoing war | High escalation management requirement |
| Risk Distribution | Distributed and replaceable | Concentrated in high-value assets |
| EW Integration | Continuous adaptation | Mission-specific integration |
| Psychological Effect | Sustained pressure | Strategic shock signaling |
| Scalability | High | Limited by escalation calculus |
| Vulnerability | Counter-drone tech evolution | Political and strategic backlash risk |
| Doctrinal Implication | Air denial through persistence | Air power as calibrated coercion |

**6.9 Doctrinal Lessons for India**

1. Integrate scalable long-range unmanned strike capacity alongside manned precision doctrine.
2. Invest in layered counter-drone architecture.
3. Enhance distributed ISR redundancy.
4. Develop industrial resilience for sustained aerial campaigns.
5. Formalize escalation-control air doctrines for nuclear-adjacent conflict environments.

**Conclusion**

The Russia–Ukraine war stands out as the most drawn-out conventional conflict between states in Europe since the mid-20th century. For anyone studying air power, this war is a live experiment in how doctrine changes when both sides have modern tools—layered air defenses, electronic warfare, drones, and constant surveillance. Unlike the one-sided air campaigns that defined Western thinking after the Cold War, this fight is messy and contested from the sky down.

When Russia launched its invasion, its air force seemed to follow the old textbook: take down air defenses fast, destroy enemy aircraft, and grab air superiority to help the ground troops push forward. But Ukraine's Integrated Air Defence System didn't just roll over. It adapted, held out, and forced Russia to change its game plan. Instead of ruling the skies, both sides had to operate cautiously, focusing on staying alive, improvising, and working around constant threats. Air power here isn't about dominance—it's about survival and flexibility. One clear lesson: in a near-peer conflict, air superiority is no longer something you "win" in the first days and keep forever. It comes and goes, shaped by who moves faster, disperses better, jams signals more effectively, and rebuilds quicker. Neither side holds total control; instead, they live with mutual denial. Classical air power theory still matters, but it needs a serious update for our era of rapid tech spread and fights that cross domains.

Perhaps the biggest shift has come with unmanned aerial systems. Drones have changed everything—how long you can keep eyes on a target, how much you can strike, and at what cost. Now, cheap drones force expensive interceptors into action, completely upending how militaries think about spending and risk. Drones haven't replaced jets or missiles, but they've expanded what air power means. Planning now has to account for distributed lethality and non-stop surveillance.Electronic warfare and fighting over the electromagnetic spectrum have also moved to the center. Winning in the air now means controlling the spectrum as much as the sky itself. Taking down enemy air defenses isn't a one-time job at the start; it's a rolling, adaptive challenge that blends cyber, electronic, and physical attacks, all at once.

The way both sides target infrastructure points to another truth: air power today disrupts and grinds down the enemy over time, not just with knockout blows. Precision strikes—whether from missiles or drones—aim to break energy networks, supply lines, and factories. Stand-off attacks have become a core part of strategy, especially when neither side dominates the air.

Looking at Operation Sindoor alongside Ukraine's drone campaign drives the point home. Ukraine's long-haul drone strikes show air power used relentlessly over time. Sindoor, on the other hand, shows careful, limited use under the shadow of nuclear deterrence. Air doctrine now has to do both: fight wars of attrition and manage crises with precision and restraint.For India, the stakes are obvious. Ukraine's example shows the value of strong, layered air defenses, home-grown drone tech, the ability to fight across domains, and the need for a resilient military industry. At the same time, any doctrine must balance precision and stability in environments where escalation is always a risk. It's not enough to have the best platforms; survival now demands flexibility, distributed strength, and the ability to handle constant attacks—both physical and electronic.In the end, the Russia–Ukraine war signals a deep shift in air power thinking for the 21st century. The future isn't about smashing the enemy from the air in a few days. It's about holding out, adapting, and fighting for every advantage in a world where everything—movement, cost, transparency, and tech—matters, and victory may come not from dominance, but from outlasting and outsmarting your opponent.

Ultimately, the evolution of air power doctrine in the Russia–Ukraine war reflects neither obsolescence nor continuity alone, but transformation through constraint. Air power remains central to modern warfare; however, its employment now requires recalibrated assumptions about superiority, suppression, escalation, and resilience. The lessons derived from this conflict will likely inform doctrinal development not only for major powers but for regional actors operating within technologically dense and politically sensitive strategic environments.In this sense, the war serves as both a caution and a guide: air dominance cannot be assumed, suppression cannot be presumed decisive, and superiority must increasingly be constructed through integration, persistence, and adaptation. The 21st-century air domain is not uncontested space—it is an enduring arena of competitive denial.

**References**


- Dalsjö, R., Berglund, C., & Jonsson, M. (2022). *Bursting the bubble: Russian A2/AD in the Baltic Sea region—Capabilities, countermeasures, and implications*. Swedish Defence Research Agency (FOI). https://www.foi.se/rest-api/report/FOI-R--4651--SE

- Hackett, J., & Nolin, P. (Eds.). (2024). *The military balance 2024*. International Institute for Strategic Studies. https://www.iiss.org/publications/the-military-balance/the-military-balance-2024

- International Institute for Strategic Studies. (2023). *The military balance 2023*. Routledge. https://www.iiss.org/publications/the-military-balance/the-military-balance-2023

- Ichaso, J. (2023). Suppression of enemy air defenses in modern warfare: Lessons from Ukraine. *Air & Space Operations Review*. https://www.airuniversity.af.edu/ASOR/

- Kunertova, D. (2023). The war in Ukraine shows the game-changing effect of drones depends on the game. *Bulletin of the Atomic Scientists, 79*(2), 95–102. https://doi.org/10.1080/00963402.2023.2178180

  - Oleshchuk, M. (2023). Air defence resilience in Ukraine: Operational adaptation under fire. *Ukrainian Air Force Command Briefings*. https://www.mil.gov.ua

- Stoll, T. (2024). Air superiority reconsidered: The Russia–Ukraine war and contested skies. *Journal of Strategic Studies*. https://www.tandfonline.com
    - Warden, J. A. (1995). Air theory for the twenty-first century. In B. R. Schneider & L. E. Grinter (Eds.), *Battlefield of the future: 21st century warfare issues* (pp. 103–122). Air University Press. https://www.airuniversity.af.edu/Portals/10/AUPress/Books/B_0099_SCHNEIDER_BATTLEFIELD_OF_THE_FUTURE.pdf
    - Watling, J., & Reynolds, N. (2022). *Operation Z: The death throes of an imperial delusion*. Royal United Services Institute. https://rusi.org/explore-our-research/publications/special-resources/operation-z
    - Watling, J., & Reynolds, N. (2023). *Meatgrinder: Russian tactics in the second year of its invasion of Ukraine*. Royal United Services Institute. https://rusi.org/explore-our-research/publications/special-resources/meatgrinder-russian-tactics-second-year
        - Kofman, M., & Lee, R. (2022). Not built for purpose: The Russian military's ill-fated force design. *War on the Rocks*. https://warontherocks.com/2022/06/not-built-for-purpose-the-russian-militarys-ill-fated-force-design/
        - Bronk, J. (2022). The air war in Ukraine: Russian performance and Ukrainian resilience. *Royal United Services Institute Commentary*. https://rusi.org/explore-our-research/publications/commentary/air-war-ukraine
        - Bronk, J., Reynolds, N., & Watling, J. (2022). *The Russian air war and Ukrainian requirements for air defence*. RUSI. https://rusi.org/explore-our-research/publications/special-resources/russian-air-war-and-ukrainian-requirements-air-defence

**For Operation Sindoor (2025)**

- Government of India, Ministry of Defence. (2025). *Official press briefing on Operation Sindoor*. https://www.mod.gov.in
- Press Information Bureau, Government of India. (2025). *Statement on Operation Sindoor*. https://pib.gov.in


17