CSIS BRIEFS

F-16s Unleashed

How They Will Impact Ukraine's War

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THE ISSUE

The paper explores the implications of supplying F-16 fighter jets to Ukraine. It examines the strategic- and tactical-level effects, outlines limitations and obstacles in their utilization by the Ukrainian Air Force and presents recommendations to leverage the platform's capabilities to support Ukraine objectives. This document provides invaluable insights for policymakers, military strategists, and academics grappling with the intricate dynamics of European security.

BACKGROUND

Ukrainian F-16s will be challenged to independently create conditions for a much-desired breakthrough in the war with Russia. But with the right strategy, doctrinal approach, logistical support, and training, F-16s could provide a critical advance in enhancing Ukraine's border defense and establishing localized air superiority, significantly bolstering Ukraine's position on the ground. The underwhelming 2023 Ukrainian counteroffensive, combined with finite Western materiel support, prompts the question: what role can Ukrainian F-16s play in 2024?

Rather than a year marked by significant military maneuvers, 2024 may become a rebuilding period for both Ukraine and Russia. As in a rebuilding phase in sports, recently trained Ukrainian F-16 pilots will likely showcase periods of excellence while gaining vital experience that could lay the groundwork for lasting advantages over Russian forces. Consequently, the authors expect the impact of giving Ukraine F-16s in 2024 to be primarily strategic, offering long-term benefits rather than immediate tactical gains.

The first section of this brief describes the strategic implications of giving F-16s to Ukraine. The next section describes the challenges expected during F-16 integration and their potential tactical influence on the battlefield in 2024.[1] Finally, the authors offer a set of short- and long-term recommendations that policymakers can incorporate to complement the political aims of the North Atlantic Treaty Organization (NATO)'s strategy to support Ukraine's war effort.

PART I: STRATEGIC IMPACTS

1. **Opponents of the free world fear the airpower of the United States and its allies**. These air forces have been purposely built to strike strategic targets, counter the power of great armies and navies, and defend sovereign territory. They have been highly successful over the past 80 years. A significant portion of the power of these air forces comes from the technological superiority they possess over their adversaries, in addition to the might of their combined size across the alliance. The F-16 is the most prolific

Western fourth-generation fighter jet produced, with thousands still in active service and highly upgraded versions still in production. Furthermore, as the mainstay of NATO air forces for decades, and with its impressive combat record, giving Ukraine such an iconic jet sends a strong message of U.S. and NATO commitment to help Ukraine defend its sovereignty.

2. **The capabilities of the F-16 enable Ukraine to hold more Russian targets at risk and, in turn, gain more leverage in the war and at the negotiation table**. To create a strategic "fleet in being" that Russia must respect, the size of the F-16 fleet matters. NATO countries have committed **65 F-16s** to Ukraine. However, more are needed to give the Ukrainian Air Force more power to affect the ground war. As a simple starting point, NATO should be willing to replace all of Ukraine's Soviet-era fighters with F-16s or equivalent NATO-standard aircraft and dramatically expand the size of Ukraine's fighter fleet beyond pre-2022 strengths. Some estimates suggest that the size of Ukraine's fighter fleet was only **69 aircraft** in March 2023. By NATO standards, that number of aircraft may make up no more than three fighter squadrons (with 18 aircraft per squadron). Ukraine needs close to 12 fighter squadrons to achieve the air support needed for the war on the ground, with four squadrons primarily responsible for each core mission set: (1) suppression of enemy air defenses, (2) air interdiction, and (3) defensive counter air. This aim would require 216 F-16s, with 18 aircraft in each squadron. Additionally, NATO should have a reserve of F-16s available for resupply on demand, proportional to historical combat loss rates.

   The well-known conventional strengths of the F-16 fit neatly within the core mission sets Ukraine needs to execute. Ukraine can leverage these advantages while placing the Russian forces in its territory at a disadvantage. Additionally, F-16s can carry a significant variety of weapons in the U.S. Air Force (USAF) inventory that are supported by an active and expanding industry. Alternatively, F-16s could increase the potency of Ukraine's interdiction campaign in the Black Sea, further degrading the effectiveness of Russia's Black Sea fleet or threatening the flow of sanctioned trade to and from Russian ports in the Black Sea.

   The quantity of targets Ukraine can hold at risk with F-16s is a function of (1) the overall quantity of F-16s Ukraine receives, (2) the type and quantity of weapons it receives, (3) U.S. and NATO employment restrictions placed on Ukraine (i.e., restricting employment beyond Ukraine's borders), (4) the fusion of intelligence between NATO and Ukrainian sources, (5) the proficiency of the pilots and support personnel that can optimize F-16 effectiveness, and (6) the air strategy Ukraine chooses to use for its F-16s (primarily for air defense or offensive missions such as strategic attack or interdiction of fielded forces and Russian logistics).

   Additionally, giving Ukraine F-16s presents NATO and the United States with a unique opportunity to gather intelligence on the potency of allied aircraft and weapons against Russian and Iranian equipment and tactics. This could be leveraged as an opportunity to gather strategic intelligence as Russia reacts to the introduction of the F-16 and follow-on security packages of logistical support for use with the aircraft. With collaboration between Ukraine and NATO, these insights can inform NATO's leaders of the viability of the alliance's strategy and tactics in certain domains.

3. **Giving F-16s to Ukraine is a significant step forward to further integrate the country into the U.S. and European economic and defense ecosystem, which will increase Ukraine's strength in the long term**. Assuming the belligerent countries have equal will to fight, attritional wars are typically won by the side with the greatest economic and industrial strength and the greatest ability to manifest those strengths on the battlefield through more equipment, people, and ammunition. In ***The Wages of Destruction***, Adam Tooze asserts that the economic and material strengths of the Allies in World War II overwhelmed Germany's capacity to field enough equipment and people to resist the persistent assault over the long term. In 2020, the Ukrainian economy was about **9.5 times smaller** than Russia's ($155.5 billion compared to $1.5 trillion), and the Ukrainian population was 3.5 times smaller than Russia's. For economies with equivalent levels of industrialization, industrial capacity roughly follows the measurements of gross domestic product and population.

Sustainment and reconstitution of warfighting formations, including aviation, is a challenge for Ukraine. Before the Russian invasion, Ukraine's military used equipment mostly from the former Soviet Union, and many of the supply chains to repair or replace the equipment and its ammunition needs no longer exist or are controlled by Russia. Over time, these Soviet relics have lost their effectiveness as damage and shortages in parts and ammunition render them unfit for combat. The situation cannot support a positive outcome for Ukraine in a long attritional war. Therefore, supplying Ukraine with NATO or U.S. standard equipment is critical to sustain Ukrainian efforts because those weapon systems and Ukrainian operational needs can be integrated into U.S. and NATO supply chains. Over time, Ukraine would become more systemically integrated with NATO.

4. **The U.S. resupply of Israel during the Yom Kippur War of 1973 shows how commonality of equipment becomes a strategic asset in sustaining forces during attritional wars**. The lessons from the Yom Kippur War should inform NATO decisionmakers of the value of supplying the Ukrainian Air Force with F-16s.[2] During the war, a coalition of Arab countries led by Egypt strategically surprised Israel, leaving it little time to prepare for the invasion. Israel's military doctrine called for preemptive air strikes similar to those it had used during the 1967 war to offset its quantitative disadvantages in personnel and equipment vis-à-vis its adversaries. However, U.S. national security advisor Henry Kissinger made clear that U.S. support was contingent on Israel receiving the first blow. The Israeli Air Force (IAF) plan and strategy depended upon preemptive strikes. When the option for a preemptive strike disappeared, Israel lost a significant advantage. The IAF paid dearly: it lost 15 percent of its total combat aircraft (60 aircraft) in less than 24 hours and about 35 percent of its total combat aircraft by the war's end—catastrophic losses for any air force in such a short period.[3] By the end of the first week of the war, Israel was in bad shape and gravely needed a resupply of ammunition, tanks, and aircraft.

   Luckily, the IAF had modernized most of its fleet prior to the war with U.S.-made A-4 Skyhawks and F-4 Phantoms, also flown by the USAF and U.S. Navy (USN). Israeli prime minister Golda Meir asked the United States for assistance, which kicked off a large resupply effort, including **Operation Nickel Grass**, in which the United States provided Israel with large numbers of 155 mm howitzers, M-60 and M-48 main battle tanks, and 100 USAF F-4s and 36 USN A-4s to reconstitute the IAF inventory. Consequently, the resupply efforts by the United States to Israel outpaced those of the Soviet Union to the Arab coalition, allowing Israel to change the balance of the war enough to secure a negotiated settlement about 10 days after the first U.S. resupply.

5. **Finally, while F-16s alone will not provide air superiority, they are a vital component of this goal**. For more than 100 years, militaries have known air superiority is essential to the success of any conventional ground campaign, but World War II was the first time the technology and capacity of mass production existed at the degree necessary to demonstrate the merits of air superiority. Examples include the Germans during the Blitz of 1939–40, the UK Royal Air Force and U.S. Army Air Forces' air campaign in Europe in 1944–45, Israel's victory in the Six-Day War of 1967, and the swift U.S. defeat of Iraq in Desert Storm and Operation Iraqi Freedom. In each case, casualties for the ground forces operating under air superiority were relatively low compared to those of their counterparts fighting without air superiority. Additionally, the tempo of ground campaigns improved significantly compared to the ground campaigns of World War I, in which each ground force maintained relative parity with others in terms of technology and the size of its army.[4]

   Per the USAF **Air Force Doctrine Publication 3-01**, control of the air is among the top priorities of the joint force and is classified into three categories: (1) air parity, (2) air superiority, and (3) air supremacy. The air war in Ukraine over the past two years is best classified as one of air parity, where no force controls the air for its own ends or faces significant interference. According to U.S. Air Force doctrine, air superiority is the "degree of control of the air by one force that permits the conduct of its operations at a given time and place without prohibitive interference from air and missile threats. Air superiority may be localized in space (horizontally and verti-

cally) and in time, or it may be broad and enduring."

Air supremacy results when one side is incapable of effective air interference in the operating area, which the United States has generally enjoyed in conflicts over the past few decades.

Today, each side of the war in Ukraine has a relatively robust air defense capability such that each can deny air superiority to the other. The missing component of air superiority for Ukraine is an offensive air capability, which the F-16s will begin to provide. Therefore, ground forces find themselves locked in relatively static battles of attrition, unable to create the conditions for a decisive maneuver campaign that could change the trajectory of the war. The robust Russian Integrated Air Defense System (IADS) makes establishing air superiority over the entire occupied territory a difficult feat. However, the Ukrainian Air Force can focus on establishing localized air superiority over limited areas for limited times. Such localized air superiority would be coordinated with Ukrainian land offensives to support a breakthrough operation and would be most effective with combined arms operations. Giving F-16s to Ukraine is an essential move toward establishing air superiority.

Gaining air superiority enables the land component to bypass or maneuver through enemy forces and obstacle belts. Trench warfare exists on both sides because neither side has air superiority. However, trenches cannot stand up to the constant bombardment and might of 500–2,000-pound bombs, as demonstrated by the U.S. coalition in Operation Desert Storm, in which an air war lasting more than 40 days pulverized the Iraqi military to such a degree that it surrendered less than 100 hours after the start of the ground invasion. Likewise, **tanks, artillery, and armored vehicles** will succumb to cluster bombs, Maverick missiles, and 500–2,000-pound bombs. With air superiority, Ukraine's F-16s can bring these effects to the battlefield.

PART II: F-16 INTEGRATION CHALLENGES AND TACTICAL INFLUENCE IN 2024

The Ukrainian Ground Forces has showcased its adeptness in assimilating cutting-edge Western weaponry into its arsenal with remarkable efficacy. Within its artillery corps, the Ukrainian Ground Forces phased out antiquated Soviet systems, replacing them with the technologically advanced M142 High-Mobility Artillery Rocket System (HIMARS) and accompanying munitions supplied by the United States. Following a **three-week training** regimen for M142 operators and maintainers, Ukrainian forces learned effective tactics, techniques, and procedures (TTPs), enabling them to proficiently target Russian ammunition and fuel depots, bases, command and control nodes, and critical resupply infrastructure. While Ukrainian troops were familiar with **various rocket launchers**, HIMARS represents a substantial leap forward compared to Ukraine's previous reliance on organic BM-30 Smerch and BM-27 Uragan systems, boasting superior capabilities including extended range, improved precision, enhanced mobility, and a faster rate of fire. While Ukraine's successful integration of HIMARS presents tactical and operational challenges for Russia, mastering the integration of F-16s into the war strategy to produce impacts of a similar magnitude will be a formidable endeavor.

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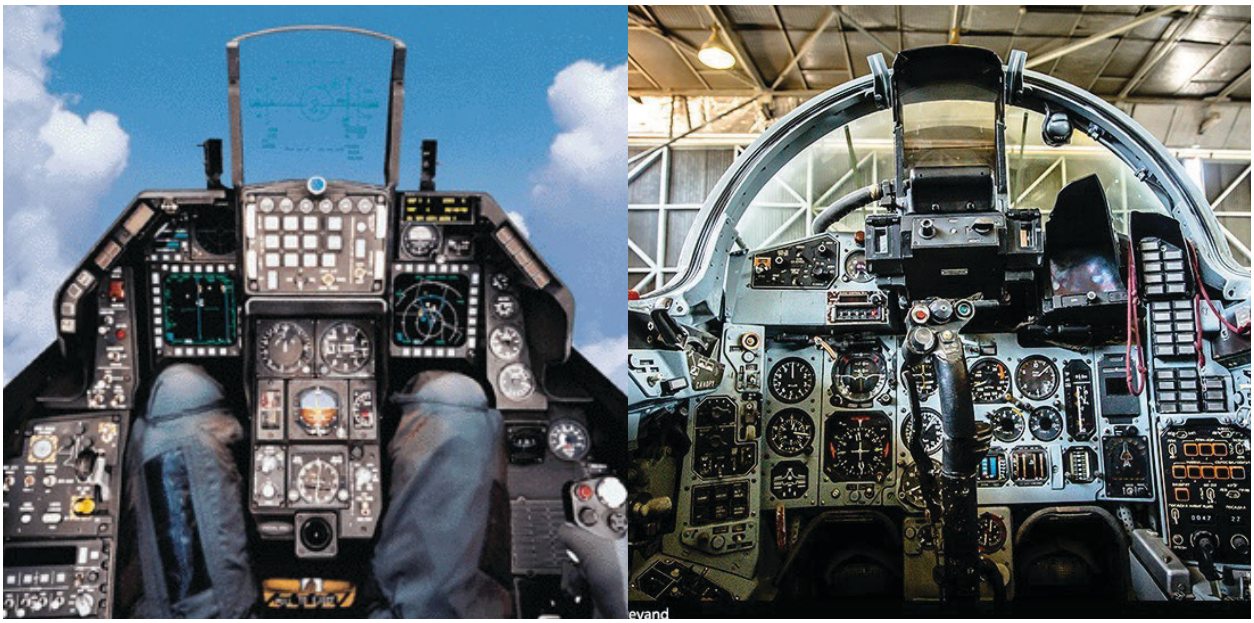
It will be years before the Ukrainian Air Force has enough experience to execute combat missions effectively. However, if supplied with the proper air-to-ground munitions, they will quickly be able to execute long-range strikes (air interdiction). Training a proficient F-16 pilot takes a long time. For instance, the training timeline for USAF fighter pilots, from initial flight training to certification as a combat-qualified wingman, spans three to four years. Furthermore, the total training duration extends to four to five years when factoring in leadership training essential for executing formations of fighter tactics in combat. While Ukrainian fighter pilots already possess basic airmanship skills, adapting to an aircraft with a fundamentally different cockpit interface and instrument layout, designed around a different concept of **human factors engineering**, requires an alternative way of thinking. This reality means experienced fighter pilots will also need time to tran-

Figure 1: F-16 and MiG-29 Cockpits



Note: The fundamental differences and advantages of the F-16 are described in Gerry Doyle and Mariano Zafra, "The Air War over Ukraine," Reuters, December 14, 2023, https://www.reuters.com/graphics/UKRAINE-CRISIS/FIGHTER-JETS/jnvwwqyylvw/.

Source: F-16 cockpit from U.S. Air Force via Wikimedia Commons; and MiG-29 cockpit from Hossein Zohrevand/Tasmin News Agency via Wikimedia Commons.

sition effectively. Furthermore, their flying experience with Soviet-era fighter aircraft will not necessarily translate to the fly-by-wire controls and design of the F-16.

To fully leverage the capabilities of the F-16, Ukrainian fighter pilots must become familiar with battle-proven TTPs honed over the past four decades. To make a significant combat impact, Ukrainian F-16 pilots must excel in three mission sets: offensive counter air/air interdiction (OCA/AI), offensive counter air/air operations–suppression of enemy air defenses (OCA/AO-SEAD), and defensive counter air (DCA). These mission sets will allow the Ukrainian Air Force to maximize the combat capabilities of the F-16 while not exposing them to higher combat losses executing more complex combat missions.

Ukraine must start flying combat sorties and build experience immediately.

Learning and applying Western TTPs proficiently will likely take Ukrainian fighter pilots over a year. As a historical reference, the United States delivered the first F-16s to Israel in 1980. Eleven months later, the IAF flew the new platform on a daring and successful air strike against an Iraqi nuclear weapons production plant.[5] The IAF, despite the advantages of combat and Western tactics experience, chose to wait almost a year before employing the F-16. It takes time and experience to build the proficiency needed to employ a complex fighter effectively. Ukraine must start flying combat sorties and build experience immediately. Therefore, it will be difficult to measure the significant battlefield impacts of the F-16s until 2025, and expectations should be managed accordingly.

Ukraine must be able to organically maintain and repair the F-16s. One crucial lesson learned throughout U.S. military operations in Afghanistan was the vital role host-nation service members, rather than contractors, play in aircraft maintenance and repair. In Afghanistan, contractors predominantly handled maintenance support. Following the order to withdraw, their departure led to a significant decrease in **mission-capable** combat-ready aircraft. Similarly, the time, training, and experience required to cultivate proficient F-16 pilots are equally essential for developing competent F-16 maintainers. On average, it takes approximately five to eight years of on-the-job experience and rigorous certification (known in the USAF as "7-level" certification) to ensure the resident knowledge necessary for maintaining these aircraft. While not all maintainers are certified with "7-level" proficiency, the mid and upper levels of leadership, and their expertise, are essential to effective maintenance operations.

Ukrainians must embrace a military culture in which all recommendations or voices are heard, specifically from the junior ranks. Ukraine's impressive performance early in the war, and during the Kharkiv and Kherson counteroffensives, demonstrated its will and fighting ability. To capitalize on this fighting spirit, Ukraine must adopt NATO's method to improve pilot performance and proficiency—specifically, a somewhat scientific and rigorous debrief of each flight. Reviewing the data recorded from each flight ("watching the tapes") is crucial to this learning process. All aircrew are debriefed regardless of rank. Pride and ego must be sidelined to improve combat effectiveness and save lives. Furthermore, accurate battle damage assessment (BDA) should be reported back through the planning channels to maximize the efficiency of airpower by assigning strikes only to essential targets. Finally, this method of debriefing and the BDA feedback loop improve pilots' rate of learning and the effectiveness of all air operations.

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Poor doctrine presents a potential obstacle to maximizing the effectiveness of the F-16. **Doctrine** is a collection of best practices used to accomplish military objectives or effects. Ukraine should establish desired effects or objectives and then combine combat experience with Western TTPs to develop best practices. Rather than simply apply NATO or U.S. airpower doctrine, which is built around a robust command and control and resupply network, Ukrainians should own their doctrine while continuously improving it to confront the challenges from Russia on the battlefield.

Once introduced on the battlefield, F-16s will increase the Ukrainian Air Force's air-to-air capabilities. Leveraging its combat-proven **radar**, coupled with variants of the **AIM-120 AMRAAM** missile, Ukraine will extend its maximum air-to-air engagement range up to 180 km. This is an appreciable engagement range improvement compared to Ukraine's Soviet-era MiG-29 and Su-27 fighter aircraft. Additionally, Ukrainian F-16s can more effectively disrupt Russian close air support missions across contested battlefields. During the summer of 2023, Russian helicopters impeded and delayed the Ukrainian counteroffensive. With the introduction of the F-16, these helicopters will become vulnerable and less effective in supporting Russian defensive or offensive operations. Lastly, expect Ukrainian F-16s to suppress the long-range **glide bombs** tactics Russian fighters have adeptly used around Kharkiv.

The F-16 can improve Ukraine's layered air defense, contributing to detection and elimination of incoming drones and missiles.

Furthermore, the F-16 can improve Ukraine's layered air defense, contributing to detection and elimination of incoming drones and missiles. The recent successful **defense of Israel** against the Iranian assault of over 300 drones and missiles highlights the significance of this capability, as USAF F-15Es shot down over **70 drones**. However, the effectiveness of this approach hinges significantly on the interoperability of Ukrainian doctrine and technological systems. In the short term, while Russian IADSs remain intact, the battlefield conditions will make close air support too risky for Ukrainian F-16s. Instead, the Ukrainian Air Force should incorporate the F-16 as another platform capable of long-range strikes with the **British Storm Shadow or French SCALP**. Ukraine has already received **ground-launched small-diameter bomb (SBD) launchers** and should likewise be given the **air-launched versions** for its F-16s. Dropping SDBs from F-16s would complicate the Russian air defense, provide more opportunities for successful long-range fires, and enable targeting time-sensitive targets similar to the HIMARS—and at a far more economical rate.

PART III: SHORT- AND LONG-TERM RECOMMENDATIONS TO CAPITALIZE ON THE F-16'S ADVANTAGES

SHORT-TERM RECOMMENDATIONS (IN 2024)

1. **To assist in the quality of learning, NATO should embed fighter pilots with Ukrainian Air Force units to aid with debriefing, learning, and mission planning, or set up virtual options for video**

footage review. In February 2024, French president Emmanuel Macron opened the door to Western nations sending their troops to Ukraine, stating, "**Nothing should be excluded**." Should future policy allow, NATO fighter pilots should aid Ukrainian aircrew and train them to review the tapes on every training or combat sortie to find lessons learned and improve tactics, techniques, and procedures. This tape review must be incorporated into the battle rhythm of Ukrainian fighter pilots. This will reinforce a culture of learning and ensure pilots provide and receive constructive feedback from every rank. Tape reviews increase tactical effectiveness and minimize losses. During review, learning is best achieved when individuals with the most expertise or proficiency lead the debrief, even if they do not hold the highest rank. Examples of this culture of debriefing may be found in the fighter and bomber units of the USAF and USN as well as within NATO air forces.

2. **The United States and NATO should authorize the use of cluster bomb munitions, GBU-39B SDBs, and Storm Shadow or SCALP missiles with the F-16s**. Specifically, the Cluster Bomb Unit (CBU)-87/89 and smart bomb equivalents (CBU-103/105) are most relevant for military targets in this context. A specific set of guidelines or restrictions on how the munitions may be used could be attached to the authorization of the weapons to minimize the risk of collateral damage. These weapons would aid in defending Ukrainian territory if Russia gains momentum toward a breakout on the battlefield. Cluster bomb munitions degrade and destroy large concentrations of personnel or equipment with fewer aircraft or strikes, while the SDB, Storm Shadow, and SCALP munitions can strike targets at great distances, improving the survivability of the employing aircraft. In 2023, Russia used attack helicopters with success to blunt the Ukrainian counteroffensive. If Russia can muster a breakout situation, it will require a concentration of personnel and equipment that cluster munitions are well suited to counter. Additionally, it is essential to include longer-range variants of the AIM-120 AMRAAM in the ammunition package. Enhanced air-to-air capabilities will bolster Ukraine's capacity to deter Russia's deployment of glide bombs.
3. **The United States and NATO should set up a permanent training rotation program for Ukrainian F-16 aircrew and maintainers**. After six months of combat, aircrew and maintainers should rotate to Ramstein Air Base for debriefing and the opportunity to rest and recuperate (R&R). After R&R, they should be allowed to refine their skill sets on a high-quality training range such as the Nevada Test and Training Range before returning to Ukraine for combat. The USAF and USN put their aircrew and maintainers through predeployment flying exercises to improve combat effectiveness, and these programs could be leveraged to provide Ukrainian units with a similar experience. For example, the USN saw dramatic improvements in combat effectiveness following the stand-up of the Navy Top Gun program during the Vietnam War, as evidenced by a 600 percent improvement to its aerial kill-to-loss ratio from Rolling Thunder (1968) to Linebacker (1972).[6] The USAF had equivalent improvements to its combat effectiveness after the creation of Red Flag in 1975, in which the Air Force kill ratio hovered around **2:1 throughout the Vietnam War**. In contrast, the USAF achieved **31 kills without a single loss** in direct air-to-air combat in Desert Storm. Vastly improved training and doctrine account for a significant portion of the dramatic improvement to each service's combat effectiveness. Following this logic, dedicating a unit at Nellis Air Force Base or another NATO base to orchestrate housing and training for Ukrainian aircrew and maintainers would make this initiative more effective.
4. **NATO should commit more F-16s in the next couple of months to bring its total commitment to at least 90**. This would allow Ukraine to convert five squadrons to F-16s (18 jets per squadron) using similar operations, maintenance, and sustainment practices as NATO units. For planning purposes, each additional set of 18 like-model F-16s would equate to another unit's worth of aircraft.[7] Since operational planning assigns missions and tasks to tactical units, the United States could help the Ukrainian Air Force by sending appropriately sized packages that can be seamlessly integrated into operations for improved efficiency. These numbers are the minimum needed and exclude aircraft needed for pipeline training and attrition.
5. **Ukraine should prioritize converting its units to F-16s based on criteria that will maximize**

the combat capability the F-16 brings to the Ukrainian Air Force in as little time as possible. The authors recommend three actions to aid in this decision. First, prioritize the units that most need fighter aircraft and that are most capable of meeting the needs of Ukraine's air strategy with the proper amount of aircraft and equipment. With these criteria, the equipment is the limiting factor—not the number of qualified people. Second, choose the unit currently assigned a mission that is the most similar to the anticipated role of the F-16 to capitalize on the culture, experience, and expertise ingrained in the people of the unit. Finally, access to higher-quality infrastructure and logistics will minimize the time aircraft sit grounded awaiting repairs or maintenance between missions. Therefore, picking a unit that already operates in a location with these features and remains beyond the range of most Russian air attacks will also aid Ukraine in reaping the dividends of the aircraft's capabilities sooner rather than later.

LONG-TERM RECOMMENDATIONS (BEYOND 2024)

1. **To substantially increase Ukraine's chances of victory, NATO should give Ukraine the equipment it needs to establish air superiority within its national borders**.[8] Providing F-16s is a step in the right direction toward this goal, but more equipment is needed. The authors estimate Ukraine needs 12 fighter squadrons of F-16s to significantly improve its position in the war. With 18 jets per squadron, this requires 216 F-16s on the front lines, and more should be placed in a reserve that can replace losses. Much has been written about the necessity of air superiority to support successful land campaigns. The remaining recommendations address helping Ukraine establish localized air superiority first, with broad and enduring air superiority as the eventual aim, to enable airpower's subsequent use to support the land war.
2. **Should U.S. and NATO political commitments allow, establish a NATO-Ukraine undergraduate pilot training (UPT) exchange program similar to programs for NATO pilots through USAF UPT bases**. Alternatively, the **Euro-NATO Joint Jet Pilot Training Program** could be modified to include Ukrainian pilots for a similar purpose but could also invest in building strategic relationships, with a multitude of NATO pilots going through the same program. Capturing Ukrainian talent early in their flying careers and training them with NATO methods and doctrine offers the greatest return on investment in the long term. This will result in a generational change of air doctrine that will take several years to bear fruit and, hence, a long-term strategic impact on integrating Ukraine into NATO methods.[9]
3. **For more impact on Ukraine's strategy, the United States and NATO should consider minimal restrictions on how Ukraine uses its F-16s**. The recent loosening of restrictions on munitions from the United States and other partners needs to continue with the inclusion of the F-16. Strikes should not be confined to Ukrainian territory. Ukraine may need to use its air force to interdict Russian logistics and forces or for strategic attack.[10] Additionally, the Ukrainian Air Force may need other systems to strike IADSs positioned in Russian territory, beyond the operational range of Ukraine's weaponry, to facilitate F-16 strikes. Such options may entail operations beyond Ukraine's borders. Additionally, restricting the use of F-16s to attacks within Ukraine's borders may result in a longer conflict such as the one the United States experienced throughout the Vietnam War until Operation Linebacker II, coupled with key diplomatic efforts led by the administration of U.S. president Richard Nixon, aggressively applied direct pressure to the leadership of North Vietnam. If Western support for Ukraine wavers, a longer conflict of attrition will favor Russia.[11]
4. **The United States should flood the Ukrainian Air Force with F-16s and other aircraft by incorporating decommissioned U.S. aircraft from the boneyard or those divested from its force structure**. This recommendation is not novel; it echoes CSIS senior fellow Ben Jensen's proposal in a *Wall Street Journal* **commentary** dated August 9, 2023. His insights remain pertinent and could be even more impactful today. Coupled with the ongoing manpower shortages facing Ukrainian forces, bolstering the Ukrainian Air Force's capabilities is imperative. Introducing EA-6Bs, A-10s, C-12 Hurons, AH-1s, UH-1s, and MQ-8 Fire Scout helicopters would substantially augment Ukraine's airpower. Leveraging existing artificial intelligence technology could transform many of these platforms

into unmanned vehicles capable of complementing manned aircraft operations. This capability was demonstrated recently with the Air Force secretary riding in the front seat of a **pilotless F-16 flight**.

5. **Do not impose U.S. doctrine or methods of warfare onto the Ukrainian Air Force**. The United States has a lot of experience, but the Western way of war may not fit Ukraine's methods or needs at this time. The U.S. role must be to impart hard-learned lessons, tried-and-true TTPs, and the capabilities and limitations of the F-16. Adaptation and understanding of the local realities and motivations is crucial to the success of a military strategy.
6. **Ensure Ukraine can maintain and repair the F-16s**. Effective maintenance and robust supply support are indispensable for preserving the operational readiness of military equipment. To secure the sustained operational lifespan of fixed-wing platforms, a vigorous and ongoing training pipeline must run in parallel with pilot training, alongside the modernization of maintenance personnel. Furthermore, F-16 maintenance teams should establish direct connections to experts (utilizing telemaintenance), facilitating the swift access required to support combat-ready fighters in the field.

CONCLUSION

In 2024, Ukraine faces a critical juncture as its manpower, supplies, and ammunition reserves dwindle, providing an opportunity for Russia to seize momentum and exploit the West's waning support. Adding the F-16 to the Ukrainian Armed Forces will assist in stalling Russia's potential counteroffensive and further integrating Ukraine into the U.S. and European economic and defense ecosystem. This move also provides better sustainment of Ukraine's air power, improves the security of its airspace, and increases Ukraine's ability to hold more Russian targets at risk. It will take time to observe how Ukrainian F-16s affect combat operations. However, localized air superiority, followed by broad and enduring air superiority, should be the long-term goal, which will require more aircraft. Now is the time to ensure short- and long-term adjustments are made to partnership capacity in order for F-16s to play a critical role in 2024 and beyond. At the policy level, when addressing Ukraine's capabilities and capacity, the United States must decide what type of Ukrainian armed force it wants to support. Is it a Ukraine that can defend, deter, or defeat Russia? Regardless of wanted outcomes, Ukraine needs more aircraft, and it needs them now. ■

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ENDNOTES

1 In this context, "tactical" refers to the actions, conditions, and plans primarily developed and executed by military commanders.

2 Much of this was written with the knowledge gained through Brent L. Peterson's previous research writing a master's thesis for the School of Advanced Air and Space Studies at Air University. For more on lessons from the Yom Kippur War and other air strategies used in World War II, see Brent L. Peterson, "The Factors That Influence Air Strategy: How Do Leaders Choose Air Strategy?" (master's thesis, Air University, 2019), https://aul.primo.exlibrisgroup.com/discovery/delivery/01AUL_INST:AUL/1281122320006836

3 Dunstan Simon, *The Yom Kippur War: The Arab-Israeli War of 1973* (New York: Osprey, 2007), 175.

4 Ibid.

5 Shlomo Nakdimon, *First Strike* (New York: Summit Books, 1987), 124.

6 Dan Pedersen, *Top Gun: An American Story* (New York: Hatchette Books, 2019), 173.

7 Equipping units with the same model is a best practice for simplicity of operations, training, maintenance, and sustainment. F-16 models include the F-16C Block 30, F-16CM Block 52, and F-16 A/B MLU. Each variant contains a different mix of avionics, engines, and hardware distinct enough to qualify the aircraft as a unique model that requires unique training, equipment, and personnel to support the operation. The positive trade-off is that each model offers unique mission capabilities. This concept is analogous to the various versions of a basic truck or car that auto manufacturers offer.

8 In referring to Ukraine's borders, the authors make no judgment as to what those are and leave it up to the political leadership across NATO to decide. It will take more equipment to establish air superiority over the pre-2014 borders than over the pre-2022 borders.

9 Sources of innovation in military doctrine are described in Barry Posen's *The Sources of Military Doctrine* and Stephen Rosen's *Winning the Next War*. What the authors describe is influencing Ukrainian air doctrine through generational change, beginning with educating the youngest pilots and future leaders early in their careers. An example of how generational change affects military innovation may be found in Barry Posen, *The Sources of Military Doctrine* (Ithaca, NY: Cornell University Press, 1984), 76–80.

10 For more on the theories of how to apply airpower for the interdiction of ground forces in support of ground campaigns, see J. C. Slessor, *Air Power and Armies* (London: Oxford University Press, 1936). Slessor's principles influenced the German war theories that contributed to the Blitzkrieg doctrine, which can be effective when applied under the correct circumstances.

11 The key to the Operation Linebacker II air campaign was the application of Prussian general Carl von Clausewitz's theory of war as an extension of politics, as Nixon applied airpower in the right context to meet his political aims. For more, see Mark Clodfelter, *The Limits of Air Power* (Lincoln, NE: Bison Books, 2006), an informative analysis of how airpower interacted with political aims throughout the Vietnam War. The mismatch of airpower for political aims is described in an analysis of Operation Rolling Thunder beginning on page 118. The better application of airpower in Operational Linebacker II is described beginning on page 148, and an overall analysis of the strategic application of airpower for political aims begins on page 212.