



# F-16 Integration in Ukrainian Air Force Training

# **F-16 as one of the options for improving the existing system of training aviation specialists of the Air Force of Ukraine**

The Russian full-scale invasion from the very beginning became a serious challenge for the Ukrainian Air Force. It underlined the importance of comprehensive training of domestic aviation specialists for the effective conduct of real combat operations, while exposing many years of miscalculations, and sometimes negligence, indifference and deliberate 'sabotage' in the financing and organisation. The Ukrainian pilots, who were the first to be trained by Western allies for combat operations on modern F-16 aircraft, are already defending Ukraine from the air, which opens up a guaranteed prospect of practical improvement of the current system of training aviation specialists of the Air Force of the Armed Forces of Ukraine in the near future.

## **Current context**

At the initial stage of the Russian invasion of Ukraine, the tactical aviation brigades of the UAF had more than 200 combat (all-weather fighters fourth generation MiG-29 'Fulcrum' MiG-29UB, Su-27 'Flanker' and Su-27UB 'Flanker-C', frontline bombers with variable-sweep wing Su-24M 'Fencer' and Su-24MR 'Fencer-E', attack aircraft Su-25 'Frogfoot' and Su-25UB), and training (mostly L-39 'Albatros') aircraft in their staffing.

At the same time, under agreements with Western partners, Ukrainian aviation specialists should be trained to operate modern foreign-made aircraft independently and eventually transfer about 100 combat aircraft. In 2024, the Air Force received 10 F-16 Fighting Falcon light multipurpose fighters, which have already begun 'combat duty' and other assigned combat missions in the air.

During the Russian-Ukrainian war, the AF personnel, in coordination with the air defence forces of the Land Forces, managed to close the sky for the Russian jets. However, there are still issues, preventing the Ukrainian Air Force from achieving full dominance of its airspace.

### **The main reasons for this are:**

- significant combat losses during missions against numerically superior airborne aggressor;
- underfinancing of the tactical aviation brigades of the UAF;
- the lack of a clearly defined and materially supported state programme for specialised higher military aviation educational institutions to teach aviation cadets to master the basic skills of operating combat aircraft with further,

targeted, specialisation-specific, practical strengthening of the combat professional capability of flight and lift personnel of tactical aviation brigades.

The amount of funding for training the required number of military flight specialists and their graduation should guarantee the estimated number of modern combat aircraft and the long-term need for qualified aviation personnel for 4-5 years.

To restore the educational and practical experience of its aviation school, Ukraine needs significant material resources and time to ensure the creation of the necessary training and simulation facilities, high-quality professional development programmes for teaching staff and experienced pilot-instructors necessary for high-quality and effective training of flight and maintenance personnel, including those working with Western aviation combat equipment.

Currently, the Ukrainian pilots undergo an integral training course on F-16 fighters at Fetesti (Romania), Skrydstrup (Denmark) and Morris Air National Guard Base (Arizona, USA). Totally 12 pilots from Ukraine have already completed or are in the final stages of flight and combat training . At the same time, at least 14 more pilots from Ukraine are undergoing training in Romania.

In addition, the American training programme is to be expanded to 30 Ukrainian pilots in 2025. As an experiment, the experienced combat pilots who operate MiG-29s, are to be retrained on F-16s within an accelerated training programme that will last about 6 months.

## **Why F-16s are so important for the Ukrainian Air Force**

Compared to the Soviet MiG-29, the combat potential of the F-16 is significantly enhanced by the joint and integrated interaction of its own airborne aerial reconnaissance, navigation, targeting systems and guided missile systems, which are integrated with the long-range radar surveillance systems of E-3A AWACS and Saab 340 AEW&C.

At the same time, the F-16 aircraft system can carry AIM-7 Sparrow and AIM-120 AMRAAM anti-aircraft missiles, which can hit enemy air objects in the airspace at a distance of up to 160 km. It is of particular importance in case of effective preventive fire on Russian bombers when they are using GBUs from approximately 60-80 km from the frontline. This has been the expectation of officials and residents for more than a year, especially in the frontline areas in southern and eastern Ukraine, where Russian air forces have been targeting civilian infrastructure.

Taking into account the prospect of the transfer of Saab 340 AEW&C radar aircraft to Ukraine and the possibility of more effective information acquisition from NATO AWACS E-3A aircraft, the combat use of F-16 may bring a completely new organisational level of an aerial warfare.

## History of pilot training in Ukraine

After the collapse of the Soviet Union, the territory of Ukraine retained significant stocks of aviation weapons and their carriers (including strategic aviation), as well as numerous flight training institutions.

However, the subsequent history of the Ukrainian aviation school is rather difficult and sad, as it suffered an irreparable blow due to funding cuts caused by the general foreign policy course towards disarmament, cost savings in important defence areas of state funding, by the early 2010s, the school, which was Kharkiv National University of the Air Force, unique in its ability to annually graduate up to 300 lieutenants of comprehensively trained aviation specialists of flight and lift personnel, was forced to graduate lieutenants of 'instructors of trained departments' instead of lieutenants 'pilots' without the appropriate number of flight hours due to extremely limited supply of aviation kerosene.

Among other events of the period of independence, the following can be noted:

- The priorities for pilot training have changed. Whereas in Soviet times, priority was given to strike aircraft, since Ukraine's independence, the fighter aircraft took the key role.
- Changes also occurred at the final stage of pilot training: Specialisation was introduced, so that already in the 4th year of training, future pilots underwent direct flight training on the aircraft they would operate after graduation and at the airfield where the aviation brigade to which they would be assigned after graduation, for better integration with their future duty station.

After 2014, a gradual revival of the Ukrainian air school and flight training tradition began.

First, a significant increase in funding made it possible to gradually increase the flight hours available to cadets. Modern simulators were also introduced for ground training of pilots in the cockpit, lowering risks for personnel and providing additional opportunities to practice the interaction of the aircraft crew and the flight control group in the event of possible incidents in flight.

## The period of full-scale invasion

During the years of full-scale war, due to Ukraine's small pilot training capacity, there was no alternative but to use the pilot training programs provided to Ukraine as assistance. Nearly a month ago, the Royal Air Force of the UK completed the training of the 200th Ukrainian pilot.

The training in the UK is one of the 3 stages of the overall training course for flying F-16 aircraft. During this stage, Ukrainian pilots receive 80 hours of flight practice on a Grob G-115 pre-flight training aircraft of the RAF and gain practical skills in aircraft control,

initial navigation, extended formation and instrument flight in difficult weather conditions. In addition, they are taking pre-training courses in English to improve interoperability with NATO air forces.

The evolution of the missions performed by aviation is quite dramatic due to the nature of war and its dynamism. However, the approach to training does not fundamentally change, only adjustments are made to the current airspace and the dangers present. Due to the rarity of air-to-air combat engagements, the focus of training is now to assist the Ukrainian ground-based air defense component by shooting down manned and unmanned aircraft of the aggressor. However, all other aspects have not been excluded from the training program.

### **Adaptation to Western models and changes in training programs**

The transition to Western combat aircraft is expected to pose a number of challenges, even for experienced and battle-tested pilots of the Ukrainian Air Force.

An example of the atypical comfort for Ukrainian pilots is the ergonomics of the cockpit of the F-16 aircraft. The seat is tilted at a greater angle to the longitudinal axis of the aircraft. This was done to reduce the head-to-pelvis load on the pilot by redirecting it in the chest-to-back direction.

Even such things as the aircraft control knob are located in a different place: on Soviet aircraft the control stick is located between the pilot's legs, on the F-16 aircraft, it is on the side panel. In critical situations, a former pilot of a MiG-29 aircraft may reflexively reach for the wrong controls for functional systems, which can lead to significant problems or even loss of control over the aircraft in a time crunch.

Another example of the peculiarity of operating the F-16 aircraft for Ukrainian pilots is the more modern display visualisation of flight parameters and the performance of the aircraft's functional systems in the cockpit. Weapons control, navigation, and other things needed to be mastered from scratch because Soviet aircraft had a much older analog control system. Also, it is important that the location of many sensors, control systems, and other things is different, and a pilot needs to get used to it again.

An important aspect of pilot retraining will be the aircraft's feel and general control limitations. Unlike the F-16, the MiG-29 has a much higher thrust-to-weight ratio (the ratio of the powerplant thrust to its weight) and a higher maximum operational angle of attack, which enables it to accelerate faster and turn faster during maneuvering.

Ukrainian pilots need to get used to all these factors and change their dynamic stereotypes and reflexes that they have been acquiring for many years. This is not an easy task at all, and judging from the experience of other countries such as Poland, Romania and others, it is a very long process.

Another significant challenge was the issue of English-language adaptation, despite the general focus of some training courses on the acquisition of the necessary NATO-

specific aviation terminology by Ukrainian pilots, many of them still have difficulty interacting with specific terms and instructions.

### **Peculiarities of the F-16's use in combat operations in Ukraine and integrated cooperation within the Air Force**

In case of possessing several types of Soviet-made aircraft, new focus should now be on preparing to integrate Western aircraft with other, mostly older, systems.

Pilot training has always been conducted with the expectation that other foreign aircraft systems, will be used in Ukraine's airspace in the future. Almost immediately, it was established that the main role of F-16 aircraft systems was to conduct air operations at longer distances, while such aircraft systems as the MiG-29 would operate at shorter ones.

in the field of communications and efficient data transmission this is a long-standing problem with old Soviet aircraft, as their electronics are mostly analog, unlike F-16 and modern drones, so their rapid combat integration is difficult and time-consuming.

It is also important to note that due to the many systems present in the air force, the number of missions performed by F-16 aircraft has significantly decreased. This has allowed pilots to focus more on other missions, greatly reducing the risks for pilots flying combat missions.

Also, due to the excessive use of UAVs, reconnaissance and ammunition adjustments are now often carried out with the help of UAVs.

Another problem faced by the pilots of F-16 aircraft is operating on unprepared runways and on highway airfields converted for use. Soviet aircraft, such as MiG-29 and Su-27, have special protective devices in their air intakes to prevent things like dirt and stones from entering the engines. This has greatly assisted Ukrainian pilots in solving combat missions using highway airfields or unpaved or snow-covered runways, as these protective elements have significantly increased the survivability and reliability of the aircraft. However the F-16 lacks such protective elements and due to the aircraft's demanding nature, operating on unprepared runways is not safely possible or is very difficult.

The battlefield is changing, and the needs and requirements of pilots are changing accordingly.

### **Potential expansion of training programs as a response to adaptation challenges**

In the future, as the fleet expands (including the Saab JAS 39, Mirage 2000, and possibly the Eurofighter Typhoon), training programs to prepare Ukrainian pilots to operate these aircraft may need to be expanded.

The best scenario for the organisationally effective combat use of heterogeneous types of aircraft systems is to create squadrons and then wings (aviation brigades) specialized in the same type of aircraft systems on the basis of young pilots, which will have specific tasks in terms of capabilities. In such a scenario of prospective combat use, it is desirable to create and implement training programs that provide for deeper specialisation in the areas of targeted training of aviation personnel and their effective solution of combat missions in jointly coordinated interaction in specific areas of achieved combat capability.

- F-16 and Mirage 2000 pilots: trained for long-range enemy destruction.
- Su-27 and JAS 39 Gripen pilots to more effectively perform medium-range enemy destruction tasks and patrol and fighter support for strike groups of Su-24m frontline bombers.
- MiG-29 and Su-25 pilots: to more effectively fulfill the mission of covering ground troops and engage in close maneuvering battles over the objects of cover.

In addition, programs to train all Air Force of Ukraine pilots to coordinate joint actions and interact with combat crews of the E-3A AWACS and Saab 340 AEW&C radar systems should be an important component of these programs.

### **Important conceptual personnel steps to meet the needs of the Air Force**

Although Ukraine is currently using its previously trained aviation personnel for retraining, it is necessary to start training young cadets for operating Western aircraft in accordance with NATO standards in order to reduce the gap between pilots of combat aviation performing combat missions in Ukrainian airspace.

Such a step will help to increase the combat effectiveness of both Western and Soviet aircraft and will also help to avoid crew errors that may arise due to the reasons described a bit above. However, it should be kept in mind that such training will be a much longer process than the rapid retraining programs that Ukraine is currently using, but this is, in fact, the best way to further develop the modern Ukrainian Air Force.

### **Conclusion**

To effectively defend its airspace during the Russia invasion, Ukraine needs several hundred modern manned aircraft systems of various types for various purposes. In order to recruit a sufficient number of highly qualified personnel to confidently pilot and reliably maintain these Western-made aircraft, Ukraine needs to gradually move to training young cadets instead of retraining experienced pilots. This will improve combat effectiveness and the specialisation of aviation wings in the future.

A significant need for Ukraine's military pilot training program is also the restoration of the Ukrainian training infrastructure: expanding the number and improving the quality

of experienced pilot instructors and faculty at aviation universities, expanding the range of modern aircraft training complexes, improving existing domestic pilot training programs, and creating adapted Ukrainian pilot training programs on Western aircraft.

To achieve this goal, Ukraine needs to create several experience exchange programs with Western partners, training programs for instructors and faculties based on Western models, taking into account the specifics of certain types of equipment and how it can be used in modern warfare.

The key need for the practical deployment of the Ukrainian military pilot training program is significant material injections from both the Ukrainian government and Ukraine's Western partners.

**Authors: Oleksii Kotov**, Former Deputy Head of the Kharkiv Air Force University named after Ivan Kozhedub (main Ukrainian Air Force School), former head of the Kremenchuk Flight College, Doctor of Technical Sciences, Full Professor at the National University of Zaporizhzhia Polytechnic, First-Class Test Pilot, **Anton Tabur**, Lead Consultant of 'Defence & Demining' Practice of DataDriven, **Andrii Lisnyi and Mark Kuzmenko**, Consultants of 'Defence & Demining' Practice of DataDriven.

DataDriven Research & Consulting

L: UNIT.City, Ukraine, Kyiv, str. Dorohozhytska, 3

E: office@datadriven.group

W: <https://datadriven.group>

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