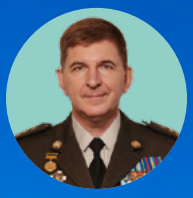
Should UAV operators be trained as pilots, technicians, or warfighters?

Authors



Viktor Kevliuk

Colonel (retired), former Head of Division at Joint Operative HQ of Armed Forces of Ukraine, C-level director at an UAVs manufacture, Expert board member at DataDriven.

Marvin Ybanez

Pilot of the Philippine Air Force (retired), Major, Head of the Air Force Capability Building Department, Expert board member at DataDriven.

Mark Kuzmenko

Consultant of 'Defence, Demining and Dual-Use' Practice of DataDriven.

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Introduction

In recent decades, drones have proven to be vital assets in modern warfare: in Afghanistan, they became indispensable for reconnaissance and precision strikes; in the 2020 Nagorno-Karabakh conflict, Bayraktar TB2s and loitering munitions reshaped the battlefield; and in a number of other regional wars, UAVs have repeatedly shown their ability to tip the balance of power. From the very outset of Russia's full-scale invasion of Ukraine, drones have likewise played a decisive role in halting the advance of enemy forces. Ranging from relatively large Bayraktar TB2s to small FPV drones, their use has transformed the nature of warfare. This rapid evolution has not only changed how drones must be operated, but also redefined how people must be trained to operate them - a task that has proven grueling and often requires vast amounts of experience. Against this backdrop, this paper will focus on the training process of UAV operators, particularly operators of Class II, Class III, and higher UAV systems as categorized under NATO standards, highlighting the requirements, methods, and challenges that shape their preparation.

https://en.wikipedia.org/wiki/List_of_drone_strikes_in_Afghanistan#/media/File:MQ-9_Afghanistan_takeoff_1_Oct_07.JPG

Candidate selection process

One of the few nations with significant experience is Ukraine. Its approach to the training of UAV (unmanned aerial vehicle) operators is rather complex but necessary given the circumstances Ukraine currently faces.

The recruitment and screening of applicants for training as UAV operators is based on general educational skills, as well as psycho-emotional and psycho-physiological characteristics.

Regarding education, usually the school education in Ukraine is enough for the candidate to be eligible for training, however it is important to outline that the candidate must understand basic physics and how the process of flight works. What's more, the candidate must have no problems with fine motor skills.

Another skill that gives an advantage to a candidate, and is always taken into consideration, is the English proficiency level. In Ukraine, English proficiency is sometimes vital because certain equipment delivered by partner nations can only be operated by someone who speaks English. What's more, even though around 95% of UAVs are currently produced domestically and interfaces for those UAVs are in Ukrainian too, many manuals, guides and other educational materials are in English. In order for an operator to efficiently advance in his knowledge and understanding of UAVs, proficiency in English is desirable.

Comparatively, in the Philippines, the selection process for UAV operators in the Defense forces is not separated from the manned pilot selection process. One who wants to become an operator of UAVs must go through all the steps needed to become a regular pilot. This is very different from

the Ukrainian approach, where recruitment is done without all of the tests usually required to become a regular pilot.

Physical requirements remain important but are less stringent than traditional pilot standards across NATO countries. For example, the British Army requires candidates to pass standard military fitness tests and undergo thorough medical examinations, particularly focusing on vision, hearing, and other health checks critical for technical operations. However, unlike traditional pilots, drone operators don't need to meet the physical demands of high-G maneuvers or confined cockpit environments, allowing for a broader candidate pool including those who might not qualify for conventional flight training.

Stages of training

Training begins with a theoretical stage, where candidates slowly but steadily study basic knowledge needed to operate an unmanned aerial vehicle: flight phases, how weather behaves depending on altitude, how air traffic control works and dispatcher commands.


https://upload.wikimedia.org/wikipedia/commons/e/e7/PUNISHER_DRONE_on_a_catapult.jpg

A key distinction in the theoretical stage of UAV training across countries lies in the teaching methods employed. In the EU, future operators may complete the theoretical part of training through self-study, online classes or any other forms that may be available - there is no explicit mandate that would require the training to be conducted offline. In contrast, other countries, including Indonesia and UAE, may require learners to undergo in-person instruction. This approach stems from training peculiarities: the theoretical stage typically begins with familiarization with the specific UAV model, since many trainees already have prior experience with drones, but still need to adapt to the characteristics of a new system.

The duration of theoretical training also differs, varying by country and by the class of UAV to be operated. Typically, the theoretical workload is more extensive for operators of third-group UAVs than for those in the second group - requiring knowledge of more complex terms such as advanced aerodynamics, long-endurance flight dynamics, high-altitude meteorology, integration with manned aircraft in controlled airspace and many others.

Theory is followed by simulator-based training, utilizing systems such as Mission Planner, MUSE, the Bagira UAV Mission Simulator, ground control stations with simulation modes, and other platforms. There, the operator learns how to plan missions and has an opportunity to exercise all the skills he will need as a beginner to operate real aircraft. During this stage an operator also learns how to do all the pre-flight preparations in practice. This stage forms primary skills and takes up to 30% of the total time needed to train a pilot. This phase is similar in all the countries - the only difference is the model of training station the countries use.

After this, if a pilot passes all the exams and gets a positive review from an instructor, he’s given the opportunity to use a training UAV. Much rarer are the cases when the pilot receives training on real combat UAVs right after his training on simulators.

Regarding the training UAVs - these can be made out of foam and plastic. They are usually relatively cheap, costing around 5 thousand euros each. Some models don’t contain cameras, as this is typically the most expensive component of a UAV. They are made to be identical in flight performance to the real combat aircraft which usually have a much higher price. Difference in price is vital, since it is much cheaper to replace specially designed training drones in case of an accident rather than a battle-ready model.

The practical stage of UAV pilot training differs across countries: while many prioritize initial training on take-off and landing, others begin with hands-on flight maneuvers (with instructors managing takeoff and landing), before advancing to student-led take-off and landing practice.

Different classes of UAVs and their respective training differences

Typically, once an operator completes flight practice on training drones, this is sufficient preparation to transition directly to combat aircraft; in some cases, as mentioned before, operators even begin their training on operational UAVs rather than on purpose-built trainers and don't need an additional stage of training.

However, if a pilot is to be trained to operate UAVs of the 3rd group - typically large aircraft with wingspans ranging from 5 to 25 meters - he must first gain experience on smaller platforms and gradually progress to larger ones, advancing step by step toward the target group.

It is important to remember that training almost always varies depending on the producer of UAV. The exact number of hours required to operate a specific drone varies and depends on the manufacturer. This is because one drone producer might require slightly more hours of theoretical training to start operating his aircraft, while another might want the pilot to gain more experience on training aircraft before he can start operating the one he desires to fly.

Training practices can vary significantly from one country to another, and the most striking differences are found in the practical phase. The previously mentioned use of training UAVs for a swift and smooth switch to combat UAVs is not the case in the Philippines, where the approach of the practical training process is different.

The PAF (Philippine Air Force) trains its entry-level officers, specifically junior lieutenants, through a Military Pilot Training program. This program includes 120 hours of training on basic trainer aircraft, split into primary training using the T-41 aircraft and secondary training using the SF-260 Marchetti aircraft. After completing 100 hours of training, pilots are then drafted to their specialization, one of which is Unmanned Aerial Vehicle (UAV) flight training.

UAV training focuses on operating the Hermes 450 and Hermes 900, both acquired from Israel. The initial training consists of 30 hours, qualifying trainees as co-pilots. After accumulating 150 hours of flight time, pilots can be upgraded to pilot-in-command (captain) for these UAVs. The training includes autonomous take-off and landings, Intelligence, Surveillance, and Reconnaissance (ISR) profiles, and basic UAV maintenance.

They maintain a so-called "Center of Excellence," where UAV pilots undergo advanced qualification training that also incorporates combined arms exercises and the integration of systems from different UAV manufacturers. The center is designed to facilitate interaction among representatives of the armed forces, the air force, industry producers, and the U.S. Federal Aviation Administration. Similar centers are starting to appear in other NATO countries, however, there is a huge gap in documentation, with little to no manuals describing the modern combat use of UAVs. In the US, there are doctrines regarding the use of unmanned aerial systems, but they are not well designed and as specific in regards to how to use UAVs in combat scenarios as one would have hoped them to be.

Certifications and requirements comparison

International UAV certification frameworks reveal significant variation in standards and mutual recognition agreements. The NATO STANAG 4670/ATP-3.3.7 establishes four Basic UAV Qualification (BUQ) levels that align with aircraft classifications and airspace complexity. BUQ Level I covers operations below 500 feet AGL in uncontrolled airspace, while BUQ Level IV encompasses all airspace including instrument flight rules operations, creating a cumulative progression system where higher levels require mastery of all lower-level competencies.

The European Union's three-category system (Open, Specific, Certified) represents the most risk-based approach globally, with training requirements determined by operational parameters rather than solely aircraft characteristics. Open Category operations under 900 grams require only online training and examination, while Specific Category operations up to 4 kilograms demand practical self-training and on-site theory testing

In Ukraine there are 3 different certifications. The first one is the certification made by the AFU (Armed Forces of Ukraine). There is a special center which trains UAV pilots, and after passing final tests, the person may be appointed to the position “UAV operator” in the AFU. That being said,

https://en.wikipedia.org/wiki/File:SBU_Alpha.jpg

https://en.wikipedia.org/wiki/Elbit_Hermes_450#/media/File:Hermes_450_Hermes_900_in_formation.jpg

a person may still serve in any other field in the AFU even after finishing this training.

There is also a second type of certification, made by the producer of UAVs. Yet there is a caveat: the AFU does not always recognize certificates issued by UAV manufacturers. Sometimes AFU states that they are not valid. The third type of certification possible is the one made by private flight schools.

However, it is important to note that the certification process is usually only present in developed countries, while less developed states often lack this process. For example, in the Philippines, a trained UAV pilot does not require a certification from CAAP (Civil Aviation Authority of the Philippines) to fly a UAV.

Moreover, within the PAF, UAV operators remain in this field throughout their entire careers and are not permitted to transition to other platforms. With experience, they can advance to roles such as instructor pilot, test pilot, and flight examiner, requiring approximately 500–600 hours of flight time.

Private schools, industry support and involvement in the training sector

In Ukraine there are several strong private UAV schools, yet a major problem remains with them. Even though the training they provide is outstanding, it is not formalised and communicated well with the AFU. That means that the AFU does not recognize if one has finished UAV pilot school. They treat people who finished those schools as the people who hadn't studied anywhere. This is also the case in the Philippines where they do not recognize training from civilian private schools.

It is important to keep in mind that in some countries, such as in the US, they recognize FAA-certified civilian flight hours, which may shorten or supplement military training.

Another factor to consider is the scale of those private UAV schools. They mostly teach pilots how to operate 2nd class UAVs, since drones of the 3rd class and higher require much more infrastructure. Not every school can afford to build a runway, make hangars and buy 3rd class UAVs due to the colossal amounts of money needed to do that.

Combined arms exercises and pilot readiness

One of the most crucial aspects of war is identifying friendly forces and effectively coordinating engagements against the enemy. Effective combined arms operations are a vital key to victory, however, performing such operations is an arduous task.

Ukrainian armed forces are struggling to integrate drones and drone pilots into the overall combined arms operations. There are many cases of friendly fire, electronic warfare (EW) systems jamming friendly aircraft and other cases of bad coordination present, even though there is an ongoing effort to integrate them into one system.

On the other hand, PAF are training their pilots in conjunction with the U.S. and Australia to do combined arms operations in joint exercises. These exercises often include systems like P-8 Poseidon, T129 helicopter, FA-50 jet working together with UAVs whose primary task is to conduct overwatch, combined maritime patrol missions and ISR. At present, there are no concrete plans to arm UAVs; however, studies are ongoing to evaluate the possibility of equipping them with weapons and procuring dedicated unmanned combat aerial vehicles.

https://en.wikipedia.org/wiki/Baykar_Bayraktar_TB2#/media/File:Bayraktar_TB2_Runway.jpg

Conclusion

All in all, the operator training process is a rigorous one, which varies drastically from country to country. These differences are visible on each stage of training.

Candidate selection differs in its complexity, while some countries such as Ukraine take an easier stance on candidates and their initial capabilities, others like the Philippines treat them as actual fighter pilots and demand that they complete all the tests usually required for them.

Approach to practice differs dramatically depending on the country, the Philippines for example treats their operators as actual fighter pilots and requires them to fly training aircraft before they can fly UAVs while Ukraine teaches future operators immediately on training UAVs.

The certification process and what certificates an operator must receive also varies from state to state, some require multiple certificates to use UAV, and some require none. As for private UAV operator training schools, they are not always recognized. However, in the U.S. they receive some degree of recognition and integration.

Authors:

Viktor Kevliuk - Colonel (retired), former Head of Division at Joint Operative HQ of Armed Forces of Ukraine, C-level director at an UAVs manufacture, Expert board member at DataDriven.

Marvin Ybanez - Pilot of the Philippine Air Force (retired), Major, Head of the Air Force Capability Building Department, Expert board member at DataDriven.

Mark Kuzmenko – Consultant of ‘Defence, Demining and Dual-Use’ Practice of DataDriven.

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