

# BULLETIN

OF "CAROL I" NATIONAL DEFENCE UNIVERSITY

<https://buletinul.unap.ro/index.php/en/>

## The Development and Use of Drones in the Romanian Armed Forces: Current Trends and Operational Perspectives

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### Abstract

This paper explores the integration of unmanned aerial vehicles (UAVs) in the Romanian Armed Forces, particularly focusing on the Bayraktar TB2 system. It evaluates the strategic and tactical impact of drones in modern warfare, especially in coordination with F-16 multirole fighter operations. Through the use of real-time intelligence, surveillance, and laser-guided systems, drones enhance operational capabilities such as target designation and precision strikes. The study references conflict examples like Nagorno-Karabakh and Ukraine to support operational perspectives. The conclusion emphasizes the necessity of a national UAV strategy for Romania aligned with NATO objectives.

### Keywords:

Air-to-Ground Coordination; Drone Integration; F-16 Operations; Romania; UAV Strategy.

### Article info

Received: 30 July 2025; Revised: 29 August 2025; Accepted: 9 September 2025; Available online: 6 October 2025

Citation: Huțan, A. 2025. "The Development and Use of Drones in the Romanian Armed Forces: Current Trends and Operational Perspectives."  
*Bulletin of "Carol I" National Defence University*, 14(3): 278-287. <https://doi.org/10.53477/2284-9378-25-48>



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The rapid evolution of drone technologies is transforming modern military doctrines and national defense capabilities. Romania, as part of NATO, faces increasing security challenges along its eastern flank and has begun integrating unmanned aerial vehicles (UAVs) to enhance its operational flexibility. The use of drones in modern warfare has proven indispensable for reconnaissance, target designation, and even direct engagement. In Romania's case, the acquisition of the Bayraktar TB2 UAVs from Turkey marks a critical step toward modernizing its defense systems. The increasing relevance of hybrid threats in the Black Sea region reinforces the urgency for integration, doctrine adjustment, and technological adaptation, as seen in Baykar Technologies (2023). *Bayraktar TB2 technical overview*.

This paper analyzes the current state and future perspectives of drone use in the Romanian Armed Forces in comparison with neighboring countries and allies, drawing lessons from regional conflicts and NATO doctrine. Emphasis is placed on practical deployment, interoperability, and doctrinal transformation.

The current security dynamics in the Black Sea region, particularly in the context of Russian aggression in Ukraine, demand increased ISR capabilities and airspace awareness. Romania, located on NATO's eastern flank, plays a critical role in regional deterrence and early warning missions.

Integrating UAVs into Romania's national defense architecture is not only a matter of technology adoption but also a doctrinal challenge. A cohesive national drone strategy must address not only procurement, but also operational procedures, personnel training, legal frameworks, and allied coordination. This study aims to contribute to that process by offering an evidence-based comparative assessment and highlighting doctrinal gaps that must be addressed.

## **Literature Review and Conceptual Framework**

Modern literature on unmanned aerial vehicles focuses on their strategic role in shaping asymmetric warfare. Scholars such as P.W. Singer (2009) and Shlapak, D.A., & Johnson, M.W. (2016) have highlighted the way drones are transforming the modern battlefield, shifting the paradigm from traditional, manned systems to remote and autonomous warfare. Sources such as the International Institute for Strategic Studies (IISS 2023) and NATO Air Command (NATO 2022). distinguishes between different classes of drones—from small tactical UAVs to large, armed MALE (Medium Altitude Long Endurance) systems—and underscores their growing role in intelligence, surveillance, and reconnaissance (ISR), strike capabilities, and electronic warfare.

NATO defines UAVs as core components of its intelligence, surveillance, and reconnaissance (ISR) architecture, supporting both deterrence and strike functions as per Genini D. (2025). The Romanian Army Transformation Strategy 2040 echoes these values, emphasizing C4ISR modernization and autonomous capabilities as future pillars of national defense.

Case studies from the Nagorno-Karabakh war (2020), the war in Ukraine (2022–present), and Turkish drone operations in Syria serve as real-world evidence of how effective UAV integration can alter the operational balance of a conflict. These conflicts have demonstrated that low-cost, high-precision UAVs, when properly integrated into command-and-control systems, can replace or complement traditional airpower.

The growing global proliferation of UAVs also raises concerns related to arms control, export restrictions, and the ethical implications of autonomous and semi-autonomous systems. While NATO members focus on UAV integration into conventional force structures, other state and non-state actors increasingly deploy drones for asymmetric warfare.

Authors such as Anderson, D. (2018) and Friedman, G. (2019) argue that drone use without proper legal frameworks may undermine long-term stability and violate international humanitarian law. Therefore, conceptual discussions around the legitimacy of targeted strikes, airspace sovereignty, and civilian oversight are now part of most military academic analyses.

In Romania, the legal and ethical framework regarding drone use is still evolving, with current doctrinal references focusing more on interoperability than on the legal conditions for deployment in peacetime or under hybrid threats.

Romania's conceptual framework for drone integration remains in quite early stages, but includes references to NATO STANAGs, joint air-ground interoperability, and peacetime airspace regulation for UAV flights.

In NATO doctrine and Romanian military strategic documents, drones are acknowledged as vital tools for increasing situational awareness, operational flexibility, and rapid deployment capabilities. Their use supports principles of precision warfare and force protection. Theoretical approaches in contemporary security studies also underline the dual-use nature of drones, applicable in both combat and civil operations, necessitating careful regulation and strategic integration.

## Materials and Methods

This paper employs a qualitative research approach based on:

- Documentary analysis of official military strategies, NATO doctrine, and defense reports;
- Comparative case study between Romania, Bulgaria, and Turkey.

Primary sources include the Romanian Ministry of National Defense (MApN 2023), NATO publications, and specialized defense journals. News coverage and press releases regarding acquisitions (e.g., Bayraktar TB2) also provide recent operational insight.

The criteria used in the comparative table below include:

- UAV platform types and origin;
- Operational use (ISR, strike, support);
- Level of domestic defense industry involvement;
- Readiness for combat deployment.

This method helps highlight Romania's positioning within the regional UAV capability spectrum. The study is limited by access to classified operational details and dynamic changes in acquisition policy.

In addition to operational criteria, the study also considers the degree of doctrinal integration of UAVs within NATO standards. This includes referencing relevant NATO STANAGs such as STANAG 4586 (UAV interoperability), STANAG 4609 (motion imagery), and STANAG 5516 (Link 16 communication protocol). These documents provide a framework for evaluating how well Romania's UAV capabilities align with alliance-level interoperability and command-and-control structures.

Although Romania has acquired modern UAV platforms, the lack of a national doctrine or fully institutionalized procedures for integrating drones into joint operations limits their strategic potential. Therefore, this methodological framework also considers doctrinal adaptability and the role of network-centric warfare capabilities in determining UAV readiness.

A critical limitation of this study lies in the classified nature of Romanian defense acquisitions and operational doctrine. While open-source materials, government statements, and press releases provide baseline data, there is a lack of transparency regarding training programs, software architecture, and joint mission planning frameworks. These aspects limit the ability to fully assess doctrinal maturity or compare real-world combat readiness between states.

## Comparative Analysis: Romania, Bulgaria, Turkey

The table below summarizes the key dimensions of UAV integration in the selected countries:

**TABLE NO. 1**

**UAV Capability Comparison – Romania, Bulgaria, Turkey**

Country	UAV Platforms	Operational Use	Local Industry Involvement	Combat Readiness
Romania	Bayraktar TB2, Watchkeeper X	ISR, Target Designation	Partial (Elbit, Aerostar)	Medium
Bulgaria	Hermes 450 (planned), Orbiter	Border Surveillance	Minimal	Low
Turkey	Bayraktar TB2, Akıncı, Anka	ISR, Precision Strike, EW	Full domestic production	High

Interpretation:

- Turkey leads with an integrated UAV-industrial ecosystem;
- Romania shows operational progress but depends on external suppliers;
- Bulgaria remains behind in terms of operational deployment.

Romania's partial industrial capability (Elbit Systems and Aerostar) offers the potential for growth in domestic UAV maintenance, modification, and data-link adaptation — but doctrinal implementation remains at an early stage.

The ongoing war in Ukraine has served as a critical case study for drone effectiveness in modern warfare. In this context, Romania, Bulgaria, and Turkey offer contrasting examples of how UAV capabilities are developed and deployed.

Turkey has emerged as a global leader in drone technology, particularly through its Bayraktar TB2 systems. Turkish drones have played a decisive role in multiple conflicts (e.g., Libya, Nagorno-Karabakh, and Ukraine), establishing Turkey as a key drone exporter and innovator.

Bulgaria, on the other hand, has taken a more conservative approach, investing in surveillance drones but lacking combat-ready UAVs. Recent discussions in Sofia suggest a growing awareness of the need to accelerate drone integration, particularly for border security and NATO operations.

Romania has taken steps to modernize its forces by procuring TB2 drones from Turkey and exploring partnerships with NATO allies. However, its domestic production capabilities remain limited compared to those of Turkey. The proximity to the Ukrainian conflict has spurred faster integration of UAVs into Romanian defense strategy, with a focus on ISR and operational deterrence along its eastern border.

This comparative approach reveals Romania's intermediate position—more advanced than Bulgaria in UAV deployment, but still dependent on foreign suppliers, unlike Turkey. It is also worth noting that while Turkey achieves full-spectrum drone autonomy, Romania's current lack of payload integration capability and indigenous AI systems highlights the need for technological transfer partnerships or local development funding. Bulgaria, by contrast, has not operationalized any combat drone capability as of 2025.

Another significant dimension in comparing the three countries is their approach to defense-industrial development and sovereign production capacity.

Turkey's success stems from long-term investment in its defense ecosystem, with companies like Baykar, Aselsan, and Roketsan enabling full-cycle development — from airframes to EO sensors and munitions. In contrast, Romania relies primarily on foreign technology integration, with limited UAV production or R&D at the national level, despite capabilities at firms like Aerostar Bacău and Romaero.

Additionally, the absence of a consolidated governmental policy for drone-industry growth limits public-private partnerships and technology transfer. Regional cooperation projects, such as participation in PESCO (Permanent Structured Cooperation) or NATO DIANA (Defense Innovation Accelerator), remain underutilized.

Bulgaria's delays in procurement stem partially from procurement bureaucracy and a lack of industrial partners capable of sustaining even low-end ISR platforms. In contrast, Turkey has become not just a regional UAV power but a net exporter of strategic drone capability, changing the balance of influence in areas like Libya, Syria, and the Caucasus.

## **Results and discussions**

Drones are altering the character of war at both the tactical and operational levels. The comparative analysis conducted in this paper highlights three key findings regarding UAV integration in the Romanian Armed Forces, as benchmarked against Turkey and Bulgaria.

A relevant case study that demonstrates the effectiveness of tactical drone employment is the war in Ukraine. During the early phases of the 2022 Russian invasion, Ukrainian forces made extensive use of Bayraktar TB2 UAVs to target supply convoys, command posts, and short-range air defense systems.

What proved most effective was not merely the UAV platform itself, but the flexibility of the Ukrainian doctrine, which allowed decentralized units to operate drones autonomously with real-time battlefield awareness. In contrast, more hierarchical and rigid structures — such as those employed by Russian forces — delayed adaptation and suffered greater losses.

This comparison reinforces the idea that Romania must not only acquire UAV platforms but also invest in doctrinal modernization, C2 integration, and decentralized mission planning to fully exploit the potential of its drone assets in future conflicts.

### **a) Strategic Positioning**

Romania is currently positioned in the middle of the regional spectrum: it has made significant acquisitions (e.g., Bayraktar TB2 and Watchkeeper X), but lacks the fully integrated industrial ecosystem Turkey benefits from. Unlike Bulgaria, which is still in the planning phase with limited capability, Romania is operationalizing drones in ISR and targeting roles, albeit without indigenous production or autonomous doctrine.

### **b) Operational Use Cases and Joint Air Operations**

UAVs are currently being used primarily for intelligence, surveillance, and reconnaissance (ISR), as well as target designation for strike missions. In a NATO context, drones are expected to support multirole fighters such as the F-16.

One of the major tactical advantages of UAV deployment is air-to-ground coordination. Bayraktar TB2 systems, for instance, can laser targets for fighter aircraft, providing real-time battlefield information without exposing pilots to ground-based air defenses. This technique, tested in Turkish operations in northern Syria, can be

replicated within the Romanian Air Force by integrating UAVs into command-and-control architecture and tactical data links (e.g., Link 16).

### **c) Operational Advantages of Drone–Fighter Coordination**

Coordination between UAVs and fighter aircraft, especially in SEAD and CAS missions, enables layered strike capabilities. UAVs can identify and laser targets while F-16s engage from standoff ranges, minimizing pilot exposure and increasing mission efficiency. This tactic, as explained in the Romanian Air Force (2022), was successfully implemented in Turkish operations in Syria and can be adapted to Romanian air doctrine with appropriate data link and C2 integration.

### **d) Doctrinal and Technical Challenges**

Despite the procurement of modern UAV platforms, Romania still lacks an institutionalized drone doctrine. There are no unified operational procedures for integrating UAVs in combined arms operations. Additionally, issues such as limited access to secure satellite communications (SATCOM), insufficient airspace regulation for autonomous systems, and a lack of trained drone operators hinder full operational capacity.

The data suggests that Romania must move beyond acquisition and focus on conceptual integration, local R&D, and NATO-compliant procedures to truly benefit from UAV capabilities.

Another important matter to consider is the ethical and regulatory framework in drone use. The use of drones raises critical ethical and legal questions, especially when employed in offensive operations. International Humanitarian Law (IHL) and the Geneva Conventions govern the use of force, and drones must comply with principles of distinction, proportionality, and necessity.

Romania, as a NATO and EU member, is bound by these norms and has developed military regulations regarding the lawful use of drones. Challenges include:

- Accountability for actions taken by autonomous or semi-autonomous systems;
- Protection of civilian populations in conflict zones;
- Transparency in rules of engagement;
- Cybersecurity and data privacy, particularly for surveillance operations.

The debate extends to the risk of over-reliance on drones, potentially lowering the political threshold for initiating military actions. These concerns demand robust regulatory frameworks, operator training, and public oversight.

## **Conclusions**

The integration of drones in the Romanian Armed Forces represents more than a technological modernization — it is a strategic necessity in today's hybrid warfare environment. While Turkey demonstrates what a fully sovereign UAV doctrine and

industrial base can deliver, Romania remains at an intermediary stage: procuring performant platforms but relying heavily on foreign technology.

UAVs already enhance Romania's ISR capacity and target acquisition capabilities in support of the F-16 fleet. However, the full potential remains underexploited due to doctrinal delays, limited C2 (Command & Control) integration, and underdeveloped airspace regulations.

In the long term, Romania must not only adopt foreign UAV platforms but also work toward doctrinal and industrial independence. By investing in secure communication systems, indigenous UAV design, and NATO-standard mission planning tools, Romania can transform drones from tactical assets into strategic force multipliers.

Several key lessons emerge from Romania's experience and global trends, so the following actions could be considered:

- Diversify sources of UAV systems to avoid overdependence on single suppliers.
- Invest in domestic R&D to build a national drone ecosystem.
- Enhance training and integration of UAVs into multi-domain operations.
- Develop ethical and legal guidelines aligned with NATO and EU frameworks.
- Given Romania's geostrategic position, a compelling proposal would be the creation of a NATO Drone Hub in the Black Sea region. This hub could:
  - Support joint training and interoperability among NATO forces;
  - Facilitate drone testing and innovation;
  - Serve as a regional command center for ISR missions.

A National Drone Strategy should also be established, outlining clear procurement, innovation, and operational goals for the next 10–15 years, ensuring Romania remains a credible actor in the age of autonomous warfare.

Drones are altering the character of war at both the tactical and operational levels. The traditional battlefield is increasingly populated by autonomous and semi-autonomous systems, requiring adaptations in military doctrine and force structure.

Studies such as those made by NATO (2020) show that drones contribute to:

- Increased battlefield transparency and real-time decision-making;
- New forms of hybrid warfare, blending conventional and irregular tactics;
- Force dispersion and mobility, allowing smaller units to operate independently with air support;
- Operational tempo acceleration, reducing the time between target detection and engagement.

Having introduced new forms of asymmetry in military confrontations, the NATO scene must take into consideration the fact that even non-state actors can now acquire or build drones, challenging the traditional dominance of state militaries, as shown by Biddle, S. (2021).

Other case studies illustrate this:

In Ukraine, drones have enabled smaller units to destroy armored vehicles and command posts at a fraction of the cost of traditional weapons.

In Nagorno-Karabakh, Azerbaijani drones overwhelmed Armenian defenses, proving that air superiority can be achieved without manned aircraft, also stated by Gibbons-Neff, T. (2020) and Bronk, J., & Gady, F.S. (2021)

These examples demonstrate how drones shift the power balance by lowering entry barriers to high-impact operations. For Romania, this means developing both offensive and defensive drone strategies to protect critical infrastructure and deter aggression, especially near the Black Sea.

The integration of drones into the Romanian Armed Forces is not just a technical modernization but a strategic necessity. While Romania has made commendable progress, continued effort is needed to fully leverage UAVs in both national defense and NATO operations. Through balanced investments in technology, regulation, and doctrine, and by capitalizing on regional partnerships, Romania can ensure that it remains resilient and agile in the face of 21st-century security threats.

#### ACKNOWLEDGEMENTS

The author expresses his sincere gratitude to Associate Professor, Ph.D. NATE Silviu, for his valuable guidance and continuous support in the preparation of this academic paper.

Special thanks also go to the teaching staff of the „Nicolae Bălcescu” Land Forces Academy and to the publicly available resources provided by the Romanian Ministry of National Defense and NATO doctrine centers.

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