Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

STRATEGIC INTEGRATION AND OPERATIONAL ANALYSIS OF UNMANNED AERIAL VEHICLE (UAV) SYSTEMS IN THE BORDER DEFENSE ARCHITECTURE OF THE ISLAMIC REPUBLIC OF IRAN

Khujayev Botir Tavakkalovich
Senior Lecturer, Military Security and
Defense University of the Republic of Uzbekistan

Abstract

This article provides a scientific analysis of the role of Unmanned Aerial Vehicle (UAV) systems in protecting the state borders of the Islamic Republic of Iran. The study examines the ISR (Intelligence, Surveillance, and Reconnaissance) and strike capabilities of UAV systems within the context of Iran's diverse geographical landscape, including mountainous, desert, and maritime regions. Furthermore, the article highlights the integration of UAVs, networked sensors, and Electronic Warfare (EW) assets within the "Smart Border" framework, alongside operational models designed to counter asymmetric threats.

Keywords: UAV, ISR systems, border security, asymmetric warfare, Mohajer-6, Shahed-129, network-centric control, A2/AD zone.

Introduction

Traditional border security systems have long relied primarily on stationary observation posts, ground patrol services, and human resources. This model is rooted in the classical military security paradigm, which was oriented toward the physical control of territory and the detection of directly visible threats. However,

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

globalization, transnational threats, the modernization of weaponry, and the emergence of mobile forms of conflict have significantly limited the effectiveness of this traditional approach.

In the 21st-century context, border security is no longer restricted to the function of "territorial defense." Instead, it has evolved into a multi-layered security architecture requiring comprehensive **"situational control," "real-time intelligence,"** and a **"rapid response system."**

This issue is particularly urgent for states situated in complex geopolitical environments, such as the Islamic Republic of Iran, where the traditional model based on human resources has become insufficient in terms of economic efficiency, operational speed, and breadth of coverage.

Consequently, the Iranian border defense strategy has shifted in recent years toward a new technological model based on the concept of **"remote monitoring and rapid response."** In this model, the primary focus is directed toward the integration of real-time data collection, automated analysis systems, and high-precision surveillance tools. The central technological link in this system is Unmanned Aerial Vehicles (UAV/drone systems).

UAV complexes play a vital role in ensuring continuous monitoring in border areas, gathering intelligence, early detection of suspicious movements, and supporting the rapid operational decision-making process. Their application not only reduces risks associated with the human factor but also allows for the coverage of vast geographical areas in a short time. This significantly increases the overall effectiveness of border security.

In Iranian border defense, the UAV strategy is shaped not merely as a technical asset but as a component of a broader military-strategic concept. Specifically, it is regarded as a vital element of the **A2/AD (Anti-Access/Area Denial)** strategy – the strategy of restricting access to territory and complicating operational movement. This approach is aimed at preventing the entry of adversary forces

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

into border regions, limiting their freedom of movement, and protecting strategic depth.

The integration of Unmanned Aerial Vehicles (UAVs) within the border security system of the Islamic Republic of Iran is highly systematized and possesses a multi-layered operational architecture. According to military-sociological and military-technological approaches, the Iranian Border Guard and the **Islamic Revolutionary Guard Corps (IRGC)** categorize UAV systems into three main levels based on functional tasks, flight radius, sensor capabilities, and operational objectives. This classification is based on the principle of a **"multi-layered surveillance doctrine,"** covering the entire spectrum from strategic depth to tactical border control.

The strategic and operational levels include unmanned systems belonging to the **"Medium Altitude Long Endurance (MALE)"** class. These platforms are designed for long-duration flights at high altitudes, wide-area surveillance, and the collection of strategic intelligence. Within the border security system, they fulfill the function of **"early warning and strategic deterrence."**

MALE-category drones are typically deployed in Iran's strategic southern maritime regions, such as the Persian Gulf and the Gulf of Oman. These areas are geoeconomically vital, holding high importance for controlling the transit of energy resources and maritime communication lines.

Shahed-129: The Multi-Role Strategic Asset. The **Shahed-129** is one of Iran's most critical MALE-class unmanned platforms, possessing the operational capability for up to 24 hours of continuous flight with a combat radius of approximately 1,700 km. This system integrates multi-functional intelligence, surveillance, and reconnaissance (**ISR & strike**) capabilities.

From a military-technological perspective, the Shahed-129 features the following functional modules:

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
OPEN ACCESS JOURNALS

Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

- **Strategic ISR:** Long-range strategic reconnaissance;
- **Real-time Data Link Systems:** Instantaneous data transmission to command centers;
- **Precision Strike Capability:** The ability to conduct high-accuracy engagements;
- **Early Target Detection:** Identification of adversary forces in border vicinities.

The primary role of this drone in operational doctrine is to ensure a **"forward deterrence"** strategy by identifying potential threats as they approach the state border and neutralizing them. Thus, it serves not only as a reconnaissance tool but also as an active operational-tactical platform.

Fotros UAV: Maritime Domain Awareness. The **Fotros UAV** is among the largest and heaviest classes of unmanned aerial vehicles developed by the Iranian military industry. It is primarily designed for long-term monitoring tasks along maritime borders and within strategic depth zones.

Its operational characteristics are defined by the following scientific and technical aspects:

- **Endurance-oriented Surveillance:** Long-duration flight modes;
- **Maritime Domain Awareness:** Extensive coverage for naval reconnaissance;
- **Strategic Situational Awareness:** Global monitoring and situational tracking;
- **High Payload and Sensor Integration:** Capacity for advanced technological equipment.

The Fotros system is utilized to establish a **"persistent surveillance architecture"** along Iran's maritime borders, allowing for the early-stage detection of any military or non-military movements through continuous area monitoring. Furthermore, it operates in alignment with the **"network-centric warfare"** concept, integrated with other intelligence and command systems.

MALE-category UAV systems serve as the core component providing **"strategic depth of vision"** in Iranian border defense. Through these systems, the state gains the capability to control not only the borderline but also the operational depth

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

beyond it. This approach corresponds to the modern military theories of **"layered deterrence"** and **"persistent intelligence dominance."** Consequently, the strategic application of UAV systems elevates border security from a traditional defense model to a new paradigm based on proactive, networked, and intelligent management.

Operational-tactical Unmanned Aerial Vehicles (UAVs) act as the "intermediate link" between strategic surveillance and direct combat impact in the Iranian border security system. According to the theory of military systems, this layer is interpreted as the **"operational responsiveness layer,"** and its primary function is to provide a rapid decision-making chain aimed at immediately neutralizing identified threats in real-time.

Systems at this level constitute the **"multi-role combat UAV architecture"** concept, combining ISR and strike capabilities. In this approach, the primary objective is to minimize the time interval between data collection and direct operational action, resulting in an integrated combat management mechanism known as the **"Sensor-to-Shooter loop."**

Mohajer-6: The Backbone of Tactical Response. The **Mohajer-6** is one of the most significant multi-functional platforms at the operational-tactical level in Iranian border defense. Based on a **"dual-use architecture"** principle, it is capable of performing both reconnaissance and strike functions simultaneously.

From a military-technical and operational analysis standpoint, the Mohajer-6 possesses the following key components:

- **Cognitive-optical sensor systems (EO/IR payloads):** High-precision electro-optical and infrared sensors provide real-time monitoring in day and night conditions.
- **Integrated target acquisition system:** The drone is capable of detecting, classifying, and tracking both moving and static targets in the area.

- **Precision strike capability:** Equipped with high-precision weapons such as **Qaem guided bombs**, allowing the platform to unify reconnaissance and strike on a single platform.

The Mohajer-6 systems are actively deployed in several of Iran's strategic border sectors:

- **Eastern Sector (Afghanistan and Pakistan borders):** Primary threats in this region are related to drug trafficking, illegal migration, and the activities of transnational extremist groups.

The Mohajer-6 performs **"persistent surveillance"** and rapid identification functions.

- **Northwestern Sector (Iraq border):** This zone is characterized by the movement of armed groups, hidden logistical routes, and risks of cross-border infiltration. Here, the UAV system serves to mitigate threats through operational-tactical monitoring and target detection.

The most critical operational feature of the **Mohajer-6** system is the implementation of the **"Sensor-to-Shooter" (S2S)** chain. In military management theory, this concept encompasses the following stages:

1. **Sensor Stage:** Collection of real-time reconnaissance data (EO/IR surveillance).
2. **Identification Stage:** Classification of targets and assessment of threat levels.
3. **Decision-making Stage:** Rapid authorization by the operational command.
4. **Strike Stage:** Destruction of the target using precision-guided weaponry.

The primary scientific significance of this chain lies in its transformation of the classical "reconnaissance–decision–strike" cycle into a digitized and automated system. Consequently, operational time is significantly reduced, facilitating the formation of a **proactive** rather than a reactive model of border security.

UAV systems at the operational-tactical level, particularly the Mohajer-6 platform, serve as core elements providing **"real-time operational superiority"** in modern border defense. They dissolve traditional boundaries between

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

reconnaissance and combat actions, establishing an integrated **sensor-strike model**. This represents a clear example of transitioning from a classical defense model to an intelligent, networked, and digitized security system.

In the modern border security paradigm, the effectiveness of technical assets is defined not by their independent capabilities but by their role and interoperability within an integrated system. In the experience of the Islamic Republic of Iran, UAVs are not formed as solitary functional units but as integral elements of a complex **"Smart Border"** ecosystem.

In the theory of military systems, this approach is explained through the **"System-of-Systems"** (SoS) model. In this framework, all sensors, reconnaissance tools, communication channels, and strike platforms are unified through a single digital management architecture.

1. Cyber-Physical Synthesis and AI Integration. The core innovation of the "Smart Border" ecosystem is **cyber-physical synthesis**. In this model, sensor data from the physical world is seamlessly integrated with digital systems. Specifically, visual, infrared, and geolocational data from unmanned platforms are fused with ground-based radar stations and acoustic sensors.

This multi-source data stream is processed using **Artificial Intelligence (AI)** algorithms, enabling real-time functions such as:

- **Object Detection:** Automated identification of entities;
- **Predictive Tracking:** Forecasting movement trajectories;
- **Anomaly Detection:** Early-stage identification of suspicious activity.

From a military-cognitive perspective, this system ensures **"situational awareness superiority,"** providing command centers with a significantly higher level of understanding compared to traditional surveillance systems.

2. Electronic Warfare (EW) Integration. A second vital component is the integration with **Electronic Warfare (EW)** systems. In this approach, UAV

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

control centers perform not only ISR tasks but also active electronic countermeasures, utilizing:

- **GPS Spoofing:** Falsifying navigation signals;
- **Jamming Systems:** Overloading signal frequencies;
- **Signal Disruption & Interference:** Breaking and redirecting communication channels.

This approach is based on the concept of **"electromagnetic dominance,"** achieving operational superiority by establishing control over the electromagnetic spectrum on the battlefield.

3. Mobile Command and Control (C2). Another innovative element is the use of **Mobile Command Centers**. Unlike traditional static bases, these centers are situated on highly mobile platforms (e.g., trucks or container systems) to increase **survivability**.

This mobile architecture allows for:

- Reducing detection risks through frequent relocation;
- Implementing command near the front lines in real-time;
- Rapid deployment and relocation of UAV systems.

The effectiveness of UAV employment is directly linked to the degree of adaptation to the geophysical environment and operational landscape. Iran employs a **"terrain-adaptive UAV deployment doctrine,"** where specific technological and tactical configurations are applied to each unique geographical environment.

A. Mountainous Regions (Western Border): Adaptive Flight Systems. Mountainous sectors are characterized by high vertical differentials, narrow valleys, limited line-of-sight, and meteorological instability. In such conditions, the effectiveness of traditional reconnaissance tools drops sharply.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
OPEN ACCESS JOURNALS
Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

Consequently, **VTOL (Vertical Take-Off and Landing)** unmanned systems are primarily utilized here. The primary advantage of VTOL platforms is their ability to perform vertical start/landing in complex terrain without the need for runways. Additionally, **miniature fixed-wing UAVs** are used for:

- Low-altitude ISR;
- Monitoring narrow geographical corridors;
- **Covert Movement Detection:** Identifying hidden infiltrations.

B. Maritime Borders (Southern Border): Maritime Domain Awareness. The Persian Gulf and the Gulf of Oman are among the most critical operational zones. Here, UAV systems become the primary component of the **"Maritime Domain Awareness"** (MDA) concept.

Drones perform strategic functions such as:

- **Persistent Maritime Surveillance:** Continuous 24/7 monitoring;
- **Vessel Tracking and Classification:** Identifying ship movements;
- **Target Designation:** Acting as a **"sensor-guidance node"** for anti-ship missile systems.

From a military-strategic perspective, these systems provide real-time reconnaissance for anti-ship missile batteries and naval defense platforms, effectively forming an **"integrated coastal defense network."**

The geographical differentiation of Iran's border UAV strategy embodies one of the vital principles of modern military geography and operational art: **"terrain-driven force structuring."** The use of VTOL and mini-UAV systems in mountainous regions, alongside a multi-layered reconnaissance architecture based on continuous monitoring in maritime zones, demonstrates a high degree of system adaptivity. Consequently, the geographical flexibility of UAV systems transforms Iranian border defense from a static protection model into a dynamic, context-based operational system capable of responding to environmental variables.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas

Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

The border security model of the Islamic Republic of Iran, built upon Unmanned Aerial Vehicle (UAV) systems, puts forward several critical scientific conclusions from the perspective of modern military-strategic theory. This model is interpreted as an **"integrated sensor–decision–action framework,"** which has significantly transformed traditional border defense approaches.

1. Economic Efficiency and Resource Optimization. System analysis indicates that a border coverage model relying entirely on human resources is associated with high operational costs, logistical pressure, and personnel supply challenges. Alternatively, a model based on the **UAV–sensor–operational group triad** ensures a much higher **cost-efficiency ratio**.

- The number of human patrols is reduced;
- Technological surveillance coverage expands;
- Operational resources are optimized;
- **"Persistent surveillance"** is maintained with minimal expenditure.

Ultimately, the border security system transitions from a **"labor-intensive"** model to a **"technology-intensive"** model.

2. Operational Speed and OODA Loop Optimization. In military decision-making theory, the **OODA loop** (Observe–Orient–Decide–Act) serves as the core operational concept. In the Iranian experience, the integration of UAV systems significantly accelerates this cycle.

According to scientific analysis, through automated reconnaissance and real-time data transmission:

- **Observe:** This stage operates almost continuously;
- **Orient:** The stage is automated based on artificial intelligence;
- **Decide:** Acceleration occurs at the command level;
- **Act:** The stage is shortened through **Sensor-to-Shooter** integration.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

As a result, the total cycle of decision-making and operational response can be reduced by **50–70%**, establishing a **“real-time deterrence capability”** in border security.

3. Technological Independence and Logistical Resilience. A vital aspect of the Iranian experience is the formation of a UAV ecosystem based on domestic production. This model is aimed at reducing import dependency, strengthening technological sovereignty, and simplifying logistical chains. Key scientific conclusions include: localization of spare parts and service infrastructure, minimization of complex technical maintenance requirements, shortening of the production-exploitation cycle and increasing the level of military-technological independence. This approach is evaluated as a **“resilient defense industry model.”**

Given the geostrategic location of the Republic of Uzbekistan, its mountainous and desert terrains, and trans-border risk factors, UAV-based border management systems hold significant practical importance. Adapting the Iranian experience may involve: adapting tactical and operational drone platforms (similar to Mohajer and Ababil) for localized production, development based on a modular technological architecture and integration with a unified **Battlefield Management System (BMS)**.

Such integration would facilitate the formation of a **"network-centric border defense"** model, transforming the decision-making process into a centralized, real-time, digital management system.

The UAV-based border security model manifests three primary transformations in modern military strategy: **economic optimization, operational speed, and technological independence.** This model not only increases military effectiveness but also strengthens the overall strategic stability of the state.

Eureka Open Access Journals
Open Access | Peer Reviewed | International Journals | Multidisciplinary Areas
Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

References:

1. Mirziyoyev, Sh. M. Milliy taraqqiyot yo‘limizni qat’iyat bilan davom ettirib, yangi bosqichga ko‘taramiz. – Toshkent: O‘zbekiston, 2017. – 592 b.
2. Mirziyoyev, Sh. M. Yangi O‘zbekiston strategiyasi. – Toshkent: O‘zbekiston, 2021. – 464 b.
3. O‘zbekiston Respublikasi. Mudofaa to‘g‘risida Qonun. – Toshkent: Qonunchilik ma’lumotlari milliy bazasi, 2018.
4. O‘zbekiston Respublikasi. Yoshlarga oid davlat siyosati to‘g‘risida Qonun. – Toshkent: Qonunchilik ma’lumotlari milliy bazasi, 2016.
5. O‘zbekiston Respublikasi Prezidenti. Yoshlarni harbiy-vatanparvarlik ruhida tarbiyalashga oid farmon va qarorlar. – Toshkent: Qonunchilik hujjatlari milliy bazasi, 2022.
6. Amir Temur. Temur tuzuklari. – Toshkent: Yangi asr avlodi, 2018. – 192 b.
7. Asqarov, A. (tahr.). Jaloliddin Manguberdi faoliyati va harbiy san’ati. – Toshkent: Fan, 2020. – 256 b.
8. Karimov, I. A. Yuksak ma’naviyat – yengilmas kuch. – Toshkent: Ma’naviyat, 2008. – 176 b.
9. Karimov, I. A. Vatan sajdagoh kabi muqaddasdir. – Toshkent: O‘zbekiston, 1996. – 278 b.
10. Turayev, B. Harbiy pedagogika asoslari. – Toshkent: Akademnashr, 2021. – 320 b.
11. Akhmedov, Q. Modern methods of educating youth in the spirit of military patriotism // Military Education. – Toshkent, 2023. – №2. – B. 45–52.
12. Rasulov, A. Problems of hybrid warfare and information security // Modern Security Analysis. – Toshkent, 2022. – №4. – B. 33–41.
13. Huntington, S. The Soldier and the State: The Theory and Politics of Civil-Military Relations. – Cambridge: Harvard University Press, 1957. – 534 p.
14. Clausewitz, C. On War / trans. M. Howard, P. Paret. – Princeton: Princeton University Press, 1984. – 752 p.

Eureka Journal of Computing Science & Digital Innovation (EJCSDI)
ISSN 2760-4993 (Online) Volume 2, Issue 5, May 2026

https://eurekaoa.com/index.php/10

15. Nye, J. Soft Power: The Means to Success in World Politics. – New York: Public Affairs, 2004. – 191 p.
16. Castells, M. Communication Power. – Oxford: Oxford University Press, 2009. – 608 p.
17. Smith, A. D. National Identity. – Reno: University of Nevada Press, 1991. – 226 p.
18. Bell, D. Cyberculture Theorists: Manuel Castells and Donna Haraway. – London: Routledge, 2007. – 184 p.
19. Ministry of Defense of the Republic of Uzbekistan. Official materials and reports. – Tashkent, 2023.
20. Lex.uz. O‘zbekiston Respublikasi qonunchilik hujjatlari milliy bazasi [Elektron resurs]. – URL: https://lex.uz