

THE IMPLEMENTATION MECHANISM, APPLICATION, AND DEVELOPMENT PROSPECTS OF TURKEY'S DRONE STRATEGY**

Abstract: *Drones possess precise intelligence gathering, casualty avoidance, and remote strikes as an emerging strategic technology. With the rapid development of functionality and application modes, drones have become a new focal point in international military competition. In recent years, the operational contributions of Turkish drones in multiple battles have attracted global attention. This article examines the background formation, implementation mechanisms, and further prospects of Turkey's drone strategy to understand the complex factors behind the particular development patterns. This article adopts the analytic hierarchy process and draws on current literature and case studies, analyzing multiple perspectives of Turkey's drone strategy from two hierarchical levels: domestic politics and international environments. As a latecomer, Turkey has made significant strategic achievements in the field of drones. The analysis of Turkey's strategic planning and practices in domestic and international arenas in different periods hold a certain degree of reference for drone development both in China and in the international society.*

Keywords: *Turkey, Unmanned Aircraft System, Drone Strategy, Reconnaissance and Strike Integrated Drones.*

Introduction

Unmanned aerial vehicles (UAVs), commonly known as drones, are military aircraft controlled remotely or autonomously through navigation systems. They are equipped with sensors, target detection devices, offensive ammunition, and electronic emitters used for reconnaissance, disruption, and destruction of military targets. Drones are not limited by the safety requirements imposed on manned systems and therefore have greater range and endurance, allowing them to perform

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military missions in hazardous environments. The key characteristics of drones include remote control, reusability, and deployment and takeoff in various ways, such as flight runways, catapults, or vertical takeoff and landing. Most drones are operated and monitored through ground control stations, forming a comprehensive unmanned aircraft system (UAS). In history, the British Royal Air Force conducted the first test of a small radio-controlled aircraft in 1917 and then developed the DH82 Queen Bee drone during World War II as a gunnery training target. The United States used drones as aerial decoys and for psychological warfare leaflet drops during the Vietnam War, marking the first operational deployment of drones (Sprengel, 2021). After the Vietnam War, countries such as the Soviet Union and Israel began exploring drone technology. In 1982, Israel shocked the world by using drones in conjunction with fighter jets to successfully destroy 19 Syrian anti-aircraft missile sites without any casualties during the Bekaa Valley War (Prisacariu, 2017). In 1991, the Allied forces achieved success in using drones to target attack objectives during Operation Desert Storm. In the 21st century, drones have evolved from being used for the single function of target practice, reconnaissance, or communication into Reconnaissance and Strike Integrated systems. Major technologically advanced countries consider drones a priority in military development, constantly innovating and investing in research and development.

The military strategy of Turkey has always been driven by geopolitical interests. Traditionally, it had a trust deficit in dealing with great power competition and has been influenced by its past imperial history. In such a strategic scenario, Turkey has experienced a series of regional security events since the end of the Cold War, including the Iraq War, the Syrian Crisis, the Libyan War, and the Kurdish issue, which have triggered a stronger sense of independence in Turkey's political mentality. Since the ruling Justice and Development Party, led by Recep Tayyip Erdoğan, came to power in 2002, Turkey's ambitions in geopolitics and military modernization have converged into a more autonomous military strategy and defense industry development. Among them, the drone program, initiated in the mid-1990s, has become an indicator of strategic practice. It is mainly based on two types of developments: the transformation of military conflict patterns and the evolving perspective on weapon development. These factors are the driving force behind the drone strategy of Turkey, shaping the substantial progress of industrial manufacturing and military fields through a continuous feedback loop. This article analyzes the historical background and development mechanisms of Turkey's drone strategy, presents an overall picture of the drone strategy at the two levels of analysis, domestic and international, and also explores the development prospects of Turkey's drone strategy.

Development Background of Turkey's Drone Strategy

Domestic Level-Proxy Warfare in Military Conflicts and the Techno-nationalism of the Defense Industry

In the past 20 years, Turkey has conducted multiple military strikes against targets both inside and outside borders, establishing a model of using proxy forces for military actions (Outzen, 2021). This strategy has been implemented in two strategic fields: within Turkish territory, the focus of strikes has been on the southeastern border region, against the fighters of the Kurdistan Workers' Party (Partiya Karkerên Kurdistanê, PKK). Under the authority of the Turkish National Intelligence Organization (Milli İstihbarat Teskilatı, MIT), a special department operates as a quasi-military unit and carries out targeted attacks against PKK militias (Stein, 2022). Outside of borders, the Turkish Armed Forces (TAF) and MIT have successively organized and trained local pro-Turkish militias in neighboring countries such as Iraq, Syria, and Libya. These proxy forces serve the interests of Turkey as surrogate military units. The two types of proxy strategies face different challenges. First, PKK armed personnel are stationed in mountainous areas with complex terrain, posing high difficulties for reconnaissance. Second, the use of overseas proxy forces raises issues of loyalty and controversies concerning international humanitarian law. The capture or killing of proxy personnel in conflicts often affects the domestic public's perception of supporting military operations. These challenges have become the driving force behind the adoption of drone applications (Çevik, 2022). Since 2010, Turkey has extensively employed drones in military operations, leading to significant strategic achievements. For instance, between 2018 and 2020, Turkey conducted "Operation Olive Branch" and "Operation Spring Shield" in Syria. In 2018, a joint operation by the TAF and MIT saw the successful destruction of the convoy of PKK leader Ismail Özden by the Bayraktar TB2, becoming a noteworthy example of drones executing precise "surgical strike" operations (Düz, 2020).

The profound conceptual factors influencing the drone strategy behind military operations reflect Turkey's pursuit of core technological autonomy, embodying the theory of techno-nationalism proposed by Robert Reich. According to Reich (1987), technology is a fundamental premise for national security, and a country should adopt a nationalist approach, striving for self-reliance in the field of cutting-edge technology without excessive dependence on external markets. Regarding military strategy, Turkey is fully aware of the necessity of its military-industrial complex to lead the production of key weapon systems. In response to practical needs for maintaining territorial integrity and the security landscape of surrounding areas, Turkey has gradually established one of its niche capabilities in indigenous weapons—the domestically produced drones. As a symbol of domestic

defense technology, drones provide Turkey with geopolitical maneuverability. Furthermore, Turkey has established techno-geopolitical ecosystems centered on drones by exporting technology to neighboring countries (Kasapoğlu, 2022). Due to the deterioration of relations with Western countries, especially the USA, the options for purchasing weapons from abroad have become limited. Consequently, Turkey has accelerated its efforts in the domestic defense industry (Hovsepyan, 2022). In the context of drone strategy, this reflects additional issues from an international perspective.

International Level-Historical Background of Technological Constraints and the Mutual Construction Dynamic of Middle Power Subjectivity

In the late 1980s, Turkey initiated foreign procurement of drones, following the global trend. The Meggitt BTT-3 Banshee, imported from the United Kingdom, was first used by the TAF in 1989. The main supplier countries during Turkey's drone procurement period were the United States and Israel. In 1995, Turkey purchased the Gnat 750 and I Gnat drones from General Atomics of the US, which remained the backbone of the TAF until 2005 (Kahvecioglu, 2014). In 1999, Turkey acquired 108 IAI Harpy drones from Israel. Starting in 2007, Turkey began leasing Israeli-made Heron, Searcher, and Dominator drones. In 2010, the Turkish Air Force purchased 10 Heron drones for \$150 million. The deployment of Heron drones stimulated the development of the domestic drone industry (Kamaras, 2021). Turkish private enterprises developed supporting subsystems for the Heron platform. For example, ASELSAN developed electro-optical targeting systems, SAVRONIK built satellite ground terminals, and MİLSOFT created remote image evaluation systems (Vargemezis, 2017). However, the acquisition of the Heron drones encountered various setbacks, highlighting the deteriorating bilateral diplomatic relations between Turkey and Israel since the beginning of this century. In response to Israel's military operation in the 2008 Gaza War, Turkey froze its military procurement deals with Israel in 2009. After the Gaza flotilla raid in 2010, Turkey excluded Israel from participating in the "Anatolian Eagle" Air Force exercise that year and the subsequent joint training, resulting in delays in the delivery and maintenance of the Heron drones. In 2018, Turkish Defense Minister Nurettin Canikli accused Israel of deliberately selling defective Heron drones, rendering them ineffective for Turkish use. This issue became a major vulnerability in multiple failed campaigns targeting the PKK (Middle East Monitor, 2018).

In 2008, Turkey expressed its intention to purchase high-end drones, namely General Atomics' MQ-1 Predator and MQ-9 Reaper, from the US to enhance its efforts against the PKK. However, Turkey held divergent views from the US on the Iranian nuclear issue, and the US aimed to avoid retaliation from the PKK in its

military operations in Iraq (Zanotti, 2011). Consequently, the US Congress vetoed the deal in 2014. In summary, the unstable relationship between Turkey and Western drone powers became a significant obstacle to Turkey's acquisition of advanced drones. However, it also served as an external motivator for Turkey's determination to pursue independent development and aspire to become a drone power.

On the other hand, Turkey is generally regarded as a "middle power" in the context of international politics. In the military field, Turkey has a conventional armed force of 450,000 personnel (CIA, 2023), making it the second-largest force within NATO. Yalçın (2012) argues that the country's potential for military development positions it as a regional hegemon and represents a significant characteristic of Turkey as a middle-power state actor. In terms of technology, middle powers tend to concentrate limited resources on expertized industries. Although they may not lead in cutting-edge research and innovation like superpowers, they can shape niche networks through existing specialization and transnational supply chains (Kim, 2021). Furthermore, superpowers, being indisputable technological leaders with access to resources that other countries cannot obtain, are often incapable of providing effective references and paths for many developing countries seeking basic technologies. This role is often filled by middle powers that offer a balance between cost-effectiveness and practical needs. Turkey's status as a middle power, as it pertains to the realm of international politics and its material capabilities, strongly manifests itself in the trajectory of drone development, both at the national and international levels.

Implementation Path of Turkey's Drone Strategy

Driven by government policies, resource allocation, and the demands of actual combat drones, this has become a core development project in the Turkish defense industry. At the domestic level, major aerospace enterprises effectively provide new models that support military planning. At the international level, Turkish drones have emerged as a new option in the global drone market, extending beyond traditional military powers.

Domestic Level-Development Process of Drones and the National Strategy

Turkish Aerospace Industries (TAI) and Baykar Defense are prominent drone enterprises in Turkey. The former is responsible for producing the Anka and Aksungur drones, while the latter specializes in manufacturing the renowned Bayraktar TB2 and Akıncı drones. Since 2004, TAI has been involved in the development of the Anka series of Medium-Altitude, Long-Endurance (MALE) drones. In 2010, they launched the Anka-A prototype, which has been used in

counter-PKK missions since 2015. Subsequently, these drones have demonstrated combat experience by participating in various cross-border operations. The Anka-A is equipped with smart munitions, has a payload of 250 kilograms, a flight endurance of 24 hours, and a maximum service ceiling of 30,000 feet. It is an integrated drone capable of executing Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) as well as conducting airstrikes (Duz, 2021). TAI has continued to develop advanced models following the unveiling of the prototype, including the High-Altitude Long-Endurance (HALE) Anka +A, the Anka Block A with an increased payload capacity, and the Anka-S equipped with satellite communication. In addition to the Anka series, TAI introduced the Aksungur in 2019, which is a large-scale drone. Aksungur can reach a maximum flight altitude of 40,000 feet and is equipped with sonar buoys, magnetic anomaly detectors, and synthetic aperture radar. It has a payload capacity of 750 kilograms and an endurance of 50 hours. It is positioned as the main drone for the Turkish Navy's maritime patrols and anti-submarine operations (Mevlütöğlu, 2020).

Baykar is Turkey's most prestigious drone manufacturer. It initially established its technical foundation by developing micro-drones. Baykar's unanimous achievement came in 2014 with the introduction of the TB2, the second-generation indigenous Turkish drone following the Anka series. As the tactical drone of the TAF, TB2 meets the needs of miniaturization, intelligence-gathering, and strike capabilities. It is equipped with precise positioning and long-range anti-tank missiles. The small radar cross-section makes it difficult to detect. TB2 has become a highly relied-upon anti-tank weapon. It has a payload of 650 kilograms, a flight endurance of 27 hours, and a service ceiling of 27,000 feet. Due to its relatively low cost, TB2 has been extensively used in military operations both domestically and internationally, carrying out tasks such as counter-terrorism, maritime reconnaissance, and targeted strikes abroad. Since its service entry in 2015, TB2 has accumulated over 350,000 flight hours. The excellent combat performance on the Middle Eastern battlefield has made TB2 the first Turkish drone to be exported (Sözübir, 2021). Following the TB2, Baykar introduced the Akıncı, a large-scale drone, in 2019, with a payload of up to 1350 kilograms. It is equipped with active phased array radar, an electronic warfare system, and missiles with a striking range of 250 kilometers. Its powerful attack capabilities are designed to target high-political value objects deep within enemy territory (Tapia, 2021). Additionally, Turkey's renowned drones include the Alpargu and Kargu, developed by STM for counterterrorism and asymmetric warfare. These miniaturized suicide drones, also known as "loitering munitions", are launched by operators using portable launchers. They are designed to track and engage mobile targets, either causing destruction or self-destructing upon impact (Kasapoğlu,

2021). *Table 1* shows the current models of Turkish indigenous drones in service, along with their main parameters.

Table 1: Turkey’s active indigenous drones (Source: Gettinger, 2019)

Model	Maker	Type	service time	Quantity
SERÇE-1	Aselsan	micro	2018	500+
Kargu	STM	micro	2018	160+
Bayraktar TB2	Baykar	MALE/Tactical	2015	86
ANKA-S	TAI	MALE	2016	12+
Karayel	Vestel Defense	MALE/Tactical	2014	10

The Defense Industry Agency (Savunma Sanayii Başkanlığı, SSB) is the core institution responsible for managing military technology development and defense trade within the government. With Turkey’s increasing influence in the global defense market, the defense industry has become a national strategic asset. Under the leadership of Erdoğan, the Defense Industry Agency has been directly supervised under the Presidential Office since December 2017, serving as a platform for coordinating relationships between state-owned and private enterprises, the TAF, and the political elites of the Justice and Development Party (Donelli, 2022). In 2011, the SSB and the TAF jointly issued the “UAV Roadmap 2011-2030”, a development plan for the medium to long-term drone strategy. It was Turkey’s first policy document regarding drone development and established strategic objectives to enhance capabilities and reduce dependence on foreign technology. In 2018, SSB published the “2018-2022 Sectoral Strategy Document” (2018-2022 Savunma Sanayii Sektörel Strateji Dokümanı), recognizing drones as one of the most critical technological sectors in the 21st century. Turkey aims to achieve parity with the world’s most advanced countries by engaging in technology exchange and personnel training. Turkey’s goal is to position itself as export-oriented, create significant added value, and strive to exert influence in the global market.

International Level-The Rising Drone Power and the Drone Diplomacy

Currently, more than 90 state and non-state actors around the world possess drones, with 16 countries developing independently and exporting their systems (Ewers et al., 2017). The low cost, military demand, and demonstrated battlefield performances are the main factors contributing to the continuous expansion of Turkish drones in the global arms market. Turkey’s arms exports rose from \$634 million in 2010 to \$3.22 billion in 2021, ranking it as the 12th largest arms

exporting country in the world (Erdemir, 2022). Drones alone account for nearly a quarter of this total. With the remarkable performance image in Nagorno-Karabakh and Russo-Ukrainian Wars, drone exports are expected to grow strongly and continuously in the coming years. The price–performance ratio of Turkish drones makes them particularly appealing to countries in the Middle East, Central Asia, and Africa. The substantial combat experience of Turkey serves as a compelling “endorsement” for countries in these regions that have political authoritarian tendencies or face internal insurgencies.

Turkey’s export-oriented approach to drones is also regarded as a manifestation of its state-led “drone diplomacy” strategy. Drone diplomacy was associated with the US in the past, which utilized drones deployed in military bases worldwide as a tool of deterrence and diplomatic leverage against countries that could potentially challenge the US and its allies, especially in the Middle East. The US showcased its dedication to safeguarding Israel’s security interests through exchange and collaboration in the field of drones (Simons, 2011). For Turkey, the implementation of drone diplomacy involves establishing lucrative and enduring partnerships and strategic connections with recipient countries based on the provision of drones, ammunition, and technical assistance (Borsari, 2022). Alongside trade, Turkey has entered into military-industrial cooperation agreements with neighboring countries to construct a technical network for drone collaboration. Turkey and Ukraine have signed a joint production agreement for the TB2. Baykar and Ukrainian defense company Ukrspecexport formed a joint venture called “Black Sea Shield” to produce drone engines, thereby addressing Turkey’s core technical bottleneck¹. In 2022, Turkey began joint production of the Akıncı with Azerbaijan (Lapaiev, 2020). Drones have also become a diplomatic tool for Turkey’s engagement in Africa. Through drone deals, Turkey has acquired concessions for oil exports and mining rights in Nigeria (Rossiter, 2020). Meeting war demands in Ethiopia and Morocco has established a new form of patronage network between the Turkish government and the leaders of these countries (Hansen, 2022). Drone diplomacy has solidified Turkey’s economic and geopolitical interests in Africa. Ahmet Kasim Han highlighted that drones are no

¹ The issue of drone engines remains a challenge that Turkey has yet to resolve. Ukrainian engines do not represent a definitive solution; they can only serve as an option for providing engines for large drones (Erdemir, 2022). Conversely, small drone engines remain a global concern and are currently manufactured by only a select number of countries. In October 2022, Turkish engine manufacturer TEI (TUSAŞ Engine Industries Inc.) announced the delivery of PD170 turbo-diesel aviation engines for the new generation of Bayraktar TB-3 drones, representing Turkey’s first indigenous aviation engines to meet the power requirements of MALE drones (Dangwal, 2022).

longer just weapons systems for Turkey but are viewed as a source of national pride and an unmistakable symbol of the country's competence in managing internal and external affairs (Fahim, 2020).

Application Cases of Turkey's Drone Strategy

The applications discussed in this article are classified based on the actors involved in weapon usage. First, Turkish drone operations are based on national interests (internal/domestic level), which encompass domestic and international actions. Second, the utilization of Turkish drones as strategic tools in conflicts between other countries (external/international level). These applications correspond to the evolution of armed conflicts, spanning from counterterrorism and power games within a country to comprehensive interstate wars, reflecting the impact and significance of Turkish drones as crucial strategic assets.

Counterterrorism against the Kurdistan Workers' Party (PKK)

Established in 1978, the PKK aims to establish an independent state and is considered a terrorist organization and a major domestic security threat by Turkish authorities, leading to decades of armed conflict between the two sides. Due to the PKK's adeptness at utilizing the terrain for guerrilla warfare, the TAF had long relied on attack helicopters to combat them. However, a turning point occurred in 2016 when the PKK shot down a Cobra helicopter, resulting in fatalities among the personnel on board. Consequently, the authority decided to construct drone bases in eastern provinces and introduced Anka and TB2 to conduct reconnaissance and launch real-time attacks on PKK hideouts in the "field cleansing" operations (Eytan, 2020). Since the introduction of drones, the armed strength of the PKK has significantly weakened. Since 2016, the TAF has eliminated a total of 3,391 PKK militants, with 1,129 of them killed directly in drone attacks. The ratio of PKK members to Turkish military personnel killed in military conflicts has increased from 1.5:1 in 2016 to 10:1 in 2020 (Crisis Group, 2023). Due to the exceptional performance of drones in intelligence gathering, the US terminated its 10-year intelligence support to Turkey in targeting the PKK in 2020 (Pranger, 2021).

Military Operations Targeting Neighboring Countries

On March 1, 2020, Turkey initiated the "Spring Shield Operation" in Idlib, Syria, marking the first direct military confrontation involving drones between Turkey and another country. Facing the Assad regime forces supported by Iran and Russia, Turkey employed a significant number of TB2 in the so-called "swarm" tactics (Urcosta, 2021). In a complex battlefield with multiple targets, the reconnaissance systems of the drones swiftly identified the targets and initiated

strikes. Through the firepower unleashed by a fleet of 20 drones, severe damage was inflicted on the heavy weapons and ammunition depots of the Assad regime forces. Throughout the five-day operation, the drone fleet destroyed two SU-24 fighter jets, eight attack helicopters, 156 tanks, and ten Russian air defense systems, resulting in over 3,000 casualties among Syrian personnel (Crino, 2020). Instead of suppressing the enemy's overall air defense capability through intense and large-scale airstrikes, Turkish drones implemented a "drone blitz" strategy - initiating preemptive strikes on Syria's air defense systems, allowing for precise and targeted attacks. Faced with the conventionally armed Assad regime forces, Turkey achieved a significant strategic victory and leveraged an asymmetrical tactical advantage at a manageable cost (Frantzman, 2020). On the other hand, the Russian Pantsir missile defense system, utilized by the Assad regime forces, was previously regarded as an air defense weapon that even the US Air Force found challenging to penetrate. However, when faced with TB2 attacks, its defensive capabilities appeared relatively weak (Frantzman, 2020). The confrontation between Turkish drones and Russian air defense systems has continued beyond the Spring Shield Operation.

Interstate Warfare

The Second Nagorno-Karabakh War

On September 27, 2020, Azerbaijan launched a war against the Republic of Nagorno-Karabakh, which continued until November 9. Azerbaijan utilized drones in combat operations, including the TB2, implementing tactics such as "Suppression of Enemy Air Defense" (SEAD) and "Find, Fix, Track, and Kill" (Postma, 2021). The drones were employed to launch decoys, enticing Armenian air defense systems and ground artillery to disclose their positions. The TB2 then launched smart munitions to engage and destroy a variety of ground targets. After 44 days of fighting, Azerbaijan achieved significant tactical victories, destroying nearly 200 tanks, 146 artillery pieces, and 42 air defense systems, causing more than 4,000 casualties and equipment losses worth over \$1 billion on the Armenian side (Rubin, 2020). Turkish drones neutralized the renowned Russian S-300 air defense and the Repellent-1 anti-drone electronic warfare systems, marking another triumph for Turkish drones in the confrontation with Russian air defense systems. Azerbaijan's success on the battlefield is viewed as an entry into the era of the "dronization" of war (Kasapoğlu, 2021), where drones play a crucial role, especially in the early stages of the low-intensity combat operations before the severe ground fighting (Hecht, 2022). The low cost of drone warfare has increased the risks of armed conflicts worldwide. The technical capabilities of Turkish drones have garnered widespread attention from Western countries, prompting them to

take countermeasures. Shortly after the end of the Nagorno-Karabakh war, Canada became the first country to cite civilian casualties caused by TB2, terminating the export of Electro-Optical/Infra-Red (EO/IR) imaging and targeting sensor systems used in TB2 to Turkey (Gallagher, 2020).

Russo-Ukrainian War

After the outbreak of the Russo-Ukrainian war in February 2022, Ukraine used drones, primarily the TB2, to counter the aggression of the Russian military. Strategically, Ukraine successfully accomplished the objective of deterring Russian forces, making it one of the few bright spots for the Ukrainian military on the battlefield and marking the first direct confrontation between Turkish drones and Russian conventional forces. Within the first four months of the conflict, Ukraine reported over 75 instances of successful TB2 missile launches against Russian tanks, artillery, and logistics trains crossing the eastern plains of Ukraine (Cagaptay, 2022). The drones' built-in imaging capabilities allowed for real-time visual evidence of the strikes' effectiveness. Videos of Russian forces under drone attacks were continuously disseminated worldwide via the internet, resulting in Ukraine's successful cognitive warfare beyond the physical battlefield. The TB2 gained significant attention when it assisted in locating the flagship of the Russian Black Sea Fleet, the 'Moskva', which was sunk in battle. The TB2 helped to spot the exact location of the cruiser in the Black Sea and acted as decoys to disrupt the ship's search radar during the attack, enabling two R-360 Neptune anti-ship missiles to hit the vessel accurately (Tavsan, 2022). In early May, the Ukrainian Air Force launched a raid on Russian forces occupying Snake Island, where the TB2 once again played a crucial role. They destroyed three Strela-10 air defense systems, two patrol boats, and a landing craft belonging to the Russian forces on the island (Kaya, 2022). Furthermore, a TB2 shot down a Mi-8 helicopter while it was hovering for resupply, marking the first recorded instance of a manned aircraft being downed by a drone (Ozberk, 2022).

Further Prospects of Turkey's Drone Strategy

Domestic Level - Development of Unmanned Weapon Systems and the Innovative Strategic Concepts

The TAF completed the comprehensive use of domestic drones in 2017. The achievement of this goal not only signifies the widespread utilization of domestic drones in Turkey-involved military conflicts but also reflects the emerging trend of contemporary asymmetric warfare strategic thought. In practical warfare strategies, the TAF consistently integrates drones into overall operational planning alongside other weapon systems. For example, the effective combination of drones with artillery, rocket systems, and various tactical ballistic missiles enhances their

overall effectiveness (Bekdil, 2020). Drones also provide support to the Turkish Air Force's fighter jet fleet, including F-16 aircraft and attack helicopters, by filling the reconnaissance gaps left by systems like early warning aircraft and land-based radar. Additionally, the TAF actively develops anti-drone directed-energy weapons, such as Roketsan's ALKA system, to counter enemy drones. The TAF has established the Laser Technologies Center of Excellence to advance the development of anti-drone weapons using laser technology. Meanwhile, private enterprises are pursuing cutting-edge breakthroughs. In collaboration with the Turkish Navy, Baykar has developed drone launch and recovery platforms for the newly commissioned amphibious assault ship, the TCG Anadolu, which is Turkey's largest surface attack vessel. These drone deployments aim to compensate for the firepower deficiency caused by the exclusion of the US F-35 fighter jets from the TCG Anadolu due to bilateral diplomatic factors. Baykar has developed the TB3, featuring a carrier-based folding wing design and enhanced attack capabilities, serving as the next-generation model of the TB2. TAI has also invested in the development of the Şimşek, a micro-sized, supersonic target drone. It will be installed on large-scale drones such as Anka and Aksungur for electronic warfare and aerial decoy missions (Bekdil, 2021).

Regarding the future drone strategy, the Turkish academic and think tank communities have proposed key initiatives. Firstly, there is a comprehensive expansion of unmanned armed vehicles based on existing drone applications, including Unmanned Underwater Vehicles (UUVs) and Unmanned Ground Vehicles (UGVs). These vehicles will be utilized for weapon replacement and operational preparedness in the TAF, to establish a joint operational mode for unmanned weapon systems across different military branches. Secondly, the outstanding performance of Israeli Harop suicide drones in the Nagorno-Karabakh war showcased the effectiveness of miniaturized drones with minimal identification capabilities. These drones can efficiently target small, rapidly changing, and repeatedly locatable objectives, offering an economically reliable solution for conducting surveillance and strike missions in high-risk geographical areas. Turkey is currently engaged in the field of miniaturized drones with the aforementioned Alpagu and Kargu. However, in comparison to mature models from other countries, there is still room for Turkey to catch up in terms of durability, payload capacity, and overall capabilities. Turkey's inventory is predominantly focused on MALE platforms. There is a necessity to enhance balanced development across both types of ends (large drones and loitering munition) and diversification (including jet-powered drones such as Baykar Kızılelma) (Iddon, 2022). This entails addressing complex component production

challenges for large drones and facilitating large-scale production for loitering munitions.

Ultimately, a clear outcome of technological competition advantage can only be achieved through the fusion of material capabilities as well as warfare concepts. In the field of drones, the United States not only leads in existing technological advancements but also pioneers the core concepts and discourse of the Revolution in Military Affairs (RMA), which emphasizes robotic warfare and AI-assisted control in the context of drones (Kasapoğlu, 2018). Currently, Turkey's strategic focus primarily revolves around the design, enhancement, and production of existing weapon systems, highlighting certain shortcomings. It is essential to integrate relevant resources from the military, intelligence agencies, business sector, and academia. Active participation in global knowledge and information exchange concerning the next generation of military revolutions is crucial. By leveraging its extensive tactical experience and manufacturing foundation, Turkey can shape its frontier conceptual framework for drone strategy, considering internal needs and external factors.

International Level-The Issue of a Responsible Actor under International Norms and Humanitarian Trends

After gaining significant recognition through involvement in various military conflicts, Turkey's drone strategy has inevitably intertwined with its foreign policy. Furthermore, the role and regulations of unmanned weapon systems in modern warfare have become a major topic of debate within international society. In the face of global attention and challenges, Alper Coşkun, the former Turkish ambassador to Azerbaijan and senior researcher at the Carnegie International Peace Foundation, highlighted measures Turkey could take in its drone strategy (Coşkun, 2022): There is a need to enhance transparency in international drone transactions and technology transfers. Under normal circumstances, Turkish enterprises and the SSB should publicly disclose detailed information regarding drone transactions with recipient countries or political entities to eliminate any gray zones. It is also important to comply with international export control regimes. The multilateral frameworks for controlling arms trade, such as the Missile Technology Control Regime (MTCR) and the Wassenaar Arrangement, explicitly establish norms for drone transfer and related technologies. As a member of both frameworks, Turkey should ensure effective coordination and implementation of international standards between its diplomatic and defense departments. Finally, establishing a national code of conduct is crucial. Turkey should proactively propose standard operating procedures for the decision-making process regarding drone exports. It should also define technical specifications and limitations for recipient countries. These steps

will be instrumental in shaping Turkey's international perspective as a "reliable" and "predictable" actor in the field of drones. They will contribute to enhancing its global reputation, strengthening multilateral relationships with regional partners and NATO allies, and advancing a sustainable drone strategy.

On the other hand, due to the strategic advantages of drones, such as cost-effectiveness and low risk, they have reduced the political costs of armed conflicts and have become the preferred weapons of many international actors, including both state and non-state entities. As a major global exporter of drones, Turkey often gains attention due to the conflicts involving its trading partners. Apart from the aforementioned military conflicts, the focus is also on the dimension of international humanitarian concerns. For instance, Western countries led by the United States have expressed diplomatic concerns to the Turkish government regarding the use of drones by Ethiopian government forces in the armed conflict with Tigray separatist groups, which resulted in serious civilian casualties (Marks, 2022). Therefore, with regard to humanitarian issues related to drones, Turkey needs to conduct comprehensive assessments of recipient countries and propose specific and appropriate regulatory initiatives. This will help consolidate its international image as a responsible drone exporter. It will also lead to international recognition of Turkey's expertise in the field of drones and establish an intangible, valuable niche in the increasingly competitive global drone arena.

Conclusion

From the perspective of comparative research, Turkey's drone strategy can offer valuable insights and lessons for other nations. Taking China as an instance, the development of drones within the Chinese People's Liberation Army (PLA) has mirrored a trajectory similar to that of Turkey. As significant drone powers within the same context of the Global South, the two countries are both driven by technonationalism and national pride as key factors in their internal development dynamics (Soyaltin-Colella & Demiryol, 2023). Specifically, the PLA's drone evolution has undergone three progressive stages: initially focusing on importation, followed by imitation, and ultimately advancing to independent research and development. This progression underscores the significance of Turkey's strategic approach and offers valuable insights for nations aiming to enhance their drone capabilities.

With high-level attention and resource support from the authorities since the 21st century, as well as the well-rounded domestic scientific research system and component supply chains under the military-civilian integration development policy, the successful deployment of drone series such as "Rainbow" and "Wing Loong" signified that China's independently developed drones have reached an

advanced international level. Chinese drones encompass a comprehensive range of types, spanning from micro to medium-range and large-scale drones. Currently, all series of drones within the PLA are domestically manufactured. The WZ-8, introduced in 2019, has emerged as the world's most advanced supersonic drone (Joe, 2019). In comparison to Turkey, China possesses a superior and well-established level of drone technology and industrial foundation. Among these, the CH-3 Rainbow drone demonstrates similar performance to the TB2 and entered mass production earlier than the Turkish drone. As China's first exported drone, the CH-3 Rainbow has been in active service with the air forces of several countries since 2009, including Nigeria and Pakistan, participating in military operations conducted across various regions (Alden, 2020).

In the field of drone exports, China has adopted a drone diplomacy model similar to that of Turkey. Chinese drones display both cost and technological advantages, making them favored by many developing countries in the global arms market with demands for counter-terrorism, border disputes, and other low-intensity conflicts. This trend is particularly noticeable in countries along the Chinese "Belt and Road" initiative in South Asia, the Middle East, and Africa. In contrast to the United States and Israel, which impose stringent political conditions on drone exports, China maintains an open attitude towards technology transfer, strengthening its diplomatic relations with the purchasing countries (Schaefer, 2015). Unlike Turkey, China's drone technology has long been highly regarded and feared by Western countries. However, behind its drone diplomacy, China faces more concerns from certain countries regarding the perception of the "China Threat" narrative (Chase, 2015). Therefore, China's drone diplomacy needs to attach greater importance to shaping the international discourse. This is especially critical in the current international society, where there is a lack of consensus on international laws pertaining to drone-related issues. China should take the lead in proposing initiatives related to international norms regarding drone exports, usage, technology transfer, and humanitarian responsibilities. It should strive to become a leader in establishing mechanisms for accountability and predictability in the use of drones.

The practical performance of Turkish drones in conflicts such as the Russo-Ukrainian War highlights the increasing importance of the miniaturization and intelligentization of drones and the concept of asymmetric warfare. Consequently, countries need to prioritize the strategic layout and tactical development of anti-drone measures. For China, there is an immediate need to enhance the strategic focus on developing anti-drone technologies and constructing specialized operational systems. On a tactical level, it is crucial to strengthen the deployment of existing comprehensive anti-drone systems, such as the "SpiderWeb" and

“SkyDome”, through practical exercises. Moreover, continuous improvement of the ongoing struggle and development process of the interaction between drones and anti-drone systems is of utmost importance.

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