The Turkish Drone Industry and Its Geopolitical Significance on Africa[1]

András Málnássy[2]

Abstract:

The study examines a specific segment of the Turkish military industry capabilities in the light of the country's geopolitical aims. In recent years, Türkiye has become one of the best-known and most important global exporters of military unmanned aerial vehicles (UAVs), commonly known as drones, in the world military equipment market. Turkish drone development and warfare have introduced many innovative military operational concepts that have achieved great success in the conflicts of recent years. When talking about military alliance systems, it cannot be neglected from the point of view of the North Atlantic Treaty Organization (NATO) that the robotic warfare solutions of one of its militarily strong member states, Türkiye, are proving to be effective against Soviet-era Russian weapons, thus providing a significant combat advantage to the countries with the given UAV, or for armed groups. The weapons tested in combat have clearly opened up new horizons for the Turkish defence industry in terms of manufacturing and exporting high-tech products. In addition to economic and military benefits, Ankara can also use the expansion of its customer base for its geopolitical purposes. This paper focuses on the Turkish defence industry including the drone industry and its geopolitical driving factors.

Keywords:
Türkiye; Drones; Drone Industry; Defence Industry; UAVs; Geopolitics; Bayraktar.

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[2] Security and Defense Policy Expert, Africa Research Institute, Doctoral School on Safety and Security Sciences, Óbuda University, Hungary; ORCID: 0000-0002-3196-4967; malnassy.andras@gmail.com

1. Introduction

In accordance with its geopolitical concept, Türkiye looks at the world in a realistic paradigm characterized by a constant struggle for power. Therefore, it is present in the strategic culture of Türkiye, which does not shy away from the use of hard power. In the background, lies the Ottoman imperial heritage with the revival of political rivalry and interest-based foreign policy. This study attempts to present a slice of the process of how Türkiye has become a world player in the highly lucrative arms production and sales with its drone industry. The authors' hypothesis is that Türkiye asserts its foreign policy and geopolitical interests through its arms industry especially the drone industry which means Turkish drones are real foreign policy assets. The first part of the study presents Turkish drone diplomacy as a prominent part of the country's geopolitical and military policy toolbox. The second presents the Turkish drone program. The third deals with the Turkish drone acquisitions from Israel, Germany and the US. The fourth part examines the rise of the Turkish drone industry including Anka, Bayraktar and other Turkish drone developments. The fifth deals with some future perspectives and the Turkish drone export. The study concludes with the progress of Turkish drone development and its implications for Ankara's geopolitical thinking.

2. Theoretical Background

Türkiye has always considered the world in a realist paradigm. In realism it may also be possible to reduce the hegemonic influence of a given region (in the sphere of interest), one of the possibilities of which is to emphasize the principle of *regional ownership* (National Security Council Convenes at the Presidential Complex, 2017). The main point of this approach is to find solutions to regional problems; the regional actors directly involved need to work together and address the challenges internally, and not externally. In recent years, the term "regional ownership" has become iterative in Turkish foreign policy. *Ahmet Davutoğlu* has used regional ownership several times in his activity as Foreign Minister, and the regional ownership approach has been the basis for several Turkish initiatives in the Black Sea, the Caucasus, Central Asia, North Africa (Besenyő, 2021, pp. 70-89), and especially in the Middle East. In particular, these initiatives are: The Black Sea Economic Cooperation (BSEC), established in 1992, the Black Sea Forum for Partnership and Dialogue, created in 2006, the Black Sea Harmony, established in 2004, and the Turkish proposal to create a Stability and Cooperation Instrument for the Caucasus, in 2008 (Frappi, 2018, pp. 45-71). The implementation of regional ownership and geopolitical thinking is well demonstrated by the Astana process in the case of the Syrian civil war and Türkiye's mediation efforts in the conflict between Russia and Ukraine.

A realist approach in international relations is perhaps closest to the theory and practice of Turkish foreign policymaking, as for Turkey, the national interest plays a central role. According to neoclassical realism, the interests of a country's foreign policy are driven by its position in the international system and, in particular, its capabilities in

power (Şener, 2013, pp. 3-21). Neoclassical realism is best suited to present recent Turkish foreign policy and geopolitical goals. The neoclassical realist paradigm highlights that a country's foreign policy behaviour is not always in straight relationship with one another (Málnássy, 2022, p. 61). Foreign policy decisions are made by the political leaders in power; thus, their perception of power and security are more important than the capabilities of the state (Gideon, 1998, pp. 144-172).

Neoclassical realists agree that states are situated in anarchical international milieu and states try to control and form their external environment against uncertainties in the international system. In addition, as the material capacity of a state increases, it will tend to make more ambitious geopolitical goals concerning their security and external environment. All states are inclined to have more influence in the international politics, and they can do this in line with the growth of material capability such as military capabilities (Taliaferro et al., 2009, p. 23).

3. Turkish 'Drone Diplomacy' is a Prominent Part of the Geopolitical and Military Policy Toolbox

In the case of Türkiye, increasing the capacity of unmanned aerial vehicles is one of the effective means of achieving geopolitical goals in addition to its military importance. The increasing robotization of military equipment allows the Turkish government to act more boldly beyond the country's borders in pursuit of their interests. For Türkiye, the foreign policy based on the innovation of military equipment and the resulting geostrategic paradigm goes back several decades. Traditionally, Turkish strategic culture has always been characterized by the use of military force or the potential of using it when necessary. The foundations of the current Turkish national security doctrine can be traced back to the 1990s, building on two "pillars". On one hand, the National Military Strategic Concept with the central element of active military deterrence, and, on the other, the military-geopolitical paradigm according to which Türkiye should be able to fight "two and a half wars" at one time. The two pillars are complementary to one another. That is, the former meant diplomatic procedures emphasizing the possibility of deploying military means in case of regional challenges while the latter formulated the requirement for the Turkish Armed Forces to be ready to fight two traditional (conventional) wars, while maintaining the ability to fight a low-intensity conflict against the terrorist threats posed by the Kurdistan Workers' Party (PKK) within and across the country's borders outside as well (Kasapoglu, 2022, pp. 1-2).

As far as the current Turkish foreign policy is concerned, it is said that Türkiye's drone developments, and the military advantage thus obtained, strengthened the more active and bolder strategic thinking of the decision-makers, by making a military intervention less costly by deploying a large number of drones. For instance, the price of the F-16 Fighting Falcon C/D, which is the main fighter aircraft in the Turkish Air Force, is US$18,8 million, compared to a US$5 million for a single Bayraktar TB2 drone (Hwang and Song, 2022). They are also more precise from the point of view of the civilian

population, while they are making the available military potential less burdensome on the defence economy and less dependent on foreign military technical assistance. The development and use of UAVs in large numbers gives Ankara more room for manoeuvre in deploying military forces than before, when the Turkish military did not have such technological solutions. The conflicts of recent years, in which Turkish military forces were deployed, clearly show the possibilities of using Turkish-made drones, their efficiency, speed and survivability (Besenyő and Málnássy, 2022, pp. 11-13).

Several external factors played a role in the changes of the Turkish military industry and defence strategy in recent years, and in the acceleration of military technical developments. Among these factors, the following should be highlighted: Türkiye's changed security perception, the changed regional security situation in the Middle East and North Africa in the wake of the Arab Spring protest waves that started in December 2010, and the strengthening of the political perception that a strong defence industry can have a significant influence on foreign policy. The Turkish security perception was also determined by the Syrian civil war from March 2011 on and its security relations in the region. In this changed security framework, the Turkish drone program and its military effectiveness can provide higher strategic importance thereof for the country. Of course, it cannot be ignored that the deterioration of diplomatic relations between Türkiye and the United States, as well as some Western European countries, contributed greatly to the significant development of the domestic defence industry, including the drone industry, which processes have made Türkiye the world's leading drone manufacturer (Besenyő and Málnássy, 2022, pp. 15-16).

4. Initial Steps of the Turkish "Drone Program"

With respect to the processes of global military industrial development, Türkiye launched a national program for the acquisition of unmanned aerial vehicles (UAV) at the end of the 1980s. Since the country did not have the appropriate technical equipment and production capacities at that time, Ankara had to purchase this military equipment from abroad.

The first foreign drones appeared in the Turkish army in 1989, which was the Meggitt BTT-3 Banshee drone system manufactured by the English Target Technology Ltd. The general characteristics of the Meggitt BTT-3 Banshee drone are that it is 2.84 meters long, has a wingspan of 2.49 meters, a height of 0.86 meters, its weight without weapons is 39 kilograms, while its gross weight is 73 kilograms. In terms of performance, it is said that its maximum speed can reach 200 km/h, it can stay in the air for more than an hour, and its operating altitude can exceed 7,000 meters. The Banshee is built mainly of composite material (Kevlar and glass-reinforced plastic) with a tailless delta wing plain form. The drone is designed to simulate a missile floating at sea or to serve as a reconnaissance UAV with a specially equipped camera (Karaagac, 2016, pp. 33).

The next major purchase came from Germany in 1994. Berlin delivered the Canadair CL-89 surveillance drone, originally developed in Canada, to Türkiye, but it did not serve for long due to the difficulties in procuring parts, as well as the complexity and thus relative reliability of the device. The drone looks and flies like a rocket, can be launched from truck-mounted rails, and flies with jet propulsion. Take-off can be accomplished using a booster rocket that is released when flight speed is reached. A small turbo engine takes over the task for the rest of the flight. Upon arrival at the calculated position, the engine stops and releases a parachute. This slows the drone down enough to change its attitude and allow the parachute to deploy from the bottom of the drone, causing the drone to flip. Before landing, a pair of pneumatic landing bags is released from the top of the drone. The general characteristics of the CL-89 drone are that it is 3.71 meters long, has a very short wingspan of about 0.94 meters, a diameter of 0.33 meters, a weight without weapons of 78 kilograms, while its maximum take-off weight could reach 156 kilograms. In terms of performance, its maximum speed can reach 740 km/h, its range reaches 60 kilometres, and its operating altitude can exceed 3,000 meters (Karaagac, 2016, pp. 33-35).

The next foreign acquisition was linked to the name of the General Atomics company, whose Gnat 750 drone and the I-Gnat drone system were used by the Turkish ground forces for tactical reconnaissance and combat support between 1995 and 2005. The GNAT-750 is a long-range tactical surveillance and support system. The GNAT system is popular in the defence industries of each country due to its long service life, high payload, ease of use and low maintenance. The GNAT-750 type drone can fly for up to 48 hours without landing for fuel, its operating height is more than 7,600 meters, and it can climb at a speed of 330 m/s per minute. Its wingspan is slightly more than 10 meters, the fuselage is 4.8 meters long, and the gross take-off weight, including the 150-kilogram payload, is 517 kilograms. The I-GNAT system is already an improved version, which is also characterized by a long service life, high payload, simple use and low maintenance. Originally designed for tactical observation up to an altitude of about 7,600 meters, the I-GNAT was converted with a turbocharged engine to increase the operating altitude to 9,300 meters with a life of 48 hours (FAS, 1999).

5. Drone Acquisitions from Israeli Suppliers

The development of Türkiye's drone purchases from Israel was greatly influenced by Turkish foreign policy and the current situation of Turkish-Israeli relations. In the early and mid-2000s, Turkish-Israeli relations strengthened, especially in the field of military cooperation, which enabled Ankara to purchase drones from the State of Israel, a country that is known to have a high standard in the development of military equipment. In May 2005, Turkey and Israel signed an agreement[3] with a total value of US$150 million for the purchase of about 10 Israeli drones (Hwang & Song, 2022). The

[3] The agreement was signed by the Israel UAV Partnership (IUP) and the Turkish Ministry of Defence. The IUP is owned by the Israel Aircraft Industries (IAI) and the Elbit Systems.

type of drones was the IAI Heron,[4] detailed later, medium-altitude, long-range (MALE) military equipment. In terms of the payload, equipment that meets Turkish requirements would have been installed. The deadline for the delivery of the systems included in the contract was three years, and the Turkish side designated the Turkish Armed Forces as the user of the drones (DefenceTalk, 2005).

a. *Heron MALE drones*. The first Israeli drones provided by the Israel Aerospace Industry (IAI) to the Turkish army included the Heron MALE and IAI Searcher drones. The IAI Heron is a multi-mission, advanced, long-range, medium-altitude, long-endurance unmanned aircraft system (UAS) developed for strategic missions. Among the strategic tasks, intelligence, surveillance, target collection and reconnaissance using various precision instruments can be highlighted. The drone is equipped with automatic take-off and landing (ATOL), satellite communication (SATCOM) for increased range (IAI, 2019). The Heron can be considered an extremely reliable drone, the technical characteristics of which can be emphasized as having a take-off weight of 5,670 kilograms and a payload capacity of 2,700 kilograms. The total length of the drone is 14 meters, its wingspan is 26 meters, and its engine is the 1,200 HP PT6 Turbo Propeller. In terms of performance, the Heron can spend more than 30 hours in the air, has a range of more than 1,000 kilometres, a maximum speed of 410 km/h, and can fly at an altitude of more than 13,700 meters (IAI, 2019).

Item	Technical Characteristic
Take-off weight	5,670 kg
Payload capacity	2,700 kg
Total length	14 m
Wingspan	26 m
Engine	1,200 HP PT6 Turbo Propeller
Time in the air	30 hours
Range	1,000 km
Maximum speed	410 km/h
Altitude	More than 13,700 m

Figure 1: Heron Drone Technical Characteristics Source: Israel Aerospace Industry (IAI).

[4] A "Shoval" or "Heron 1", or the "Heron 2/Eitan" models.

The possibilities of the Israeli-Turkish cooperation were shown by the fact that some parts of the Heron system were developed by Turkish companies, such as its ASELFLIR 300T camera by ASELSAN, the satellite ground terminals of the drone system by SAVRONIK, and the remote video terminals and portable image evaluation systems by Turkish companies MilSOFT. However, several problems arose with the integration of the previously mentioned electro-optical payloads, and the Israeli side made less and less spare parts available to the Turks. The Israeli Heron drone was the first unmanned aerial vehicle to be integrated into the Turkish Air Force (Düz, 2021, p. 9).

b. *The Searcher*. The other Israeli drone, the Searcher, is a multi-role tactical unmanned aerial system used for surveillance, reconnaissance, target acquisition, artillery targeting and damage assessment. Searcher is a complex system designed for military, law enforcement and internal security tasks; the device's technical parameters enable the collection and transmission of high-quality, real-time intelligence data. Regarding the technical characteristics of the drone, it has a take-off weight of 450 kilograms and a maximum payload of 120 kilograms. The total length of the drone is 5.85 meters, its wingspan is 8.55 meters, its engine is a four-stroke gasoline engine, and it is characterized by an autonomous take-off and landing system. In terms of performance, the Searcher can spend more than 20 hours in the air, has a range of 350 kilometres, and a maximum speed of 203 km/h (IAI, 2019).

Item	Technical Characteristic
Take-off weight	450 kg
Payload capacity	120 kg
Total length	5,85 m
Wingspan	8,55 m
Engine	4 stroke silent gasoline
Time in the air	20 hours
Range	350 km
Maximum speed	203 km/h
Altitude	More than 6,400 m

Figure 2: Searcher Drone Technical Characteristics Source: Israel Aerospace Industry (IAI).

c. *The Dominator*. Türkiye later acquired another Israeli drone, which was used by Turkish ground forces for border monitoring. The name of the drone is Dominator, the production of which was started by the Israeli Aeronautics Defence Systems Ltd. Dominator can be used to conduct intelligence, surveillance and reconnaissance operations. The technical characteristics of the drone are as follows: its gross weight can reach 1,200 kilograms, its total length is 8 meters, its wingspan is 13.42 meters, and the

device is powered by a double Thielert diesel engine. In terms of performance, the maximum speed of the Dominator is 354 km/h, and it can fly at an altitude of 9,100 meters (AVweb, 2009).

Item	Technical Characteristic
Take-off weight	1,200 kg
Payload capacity	300 kg
Total length	8 m
Wingspan	13,42 m
Engine	Double Thielert diesel
Time in the air	28 hours
Range	300 km
Maximum speed	354 km/h
Altitude	More than 9,100 m

Figure 3: Dominator Drone Technical Characteristics Source: AVweb.com.

d. *The Aerostar.* In 2008, Israel's Aeronautics Defence Systems Ltd. provided another drone, the Aerostar, to Turkish ground units. Aerostar is one of the most efficient, reliable and cost-effective systems in its category, one of the world's leading tactical UAV systems. The drone is equipped with a large payload bay and can carry a variety of payloads including advanced stabilized EO/IR sensors, laser designation systems, synthetic aperture radars (SAR)/GMTI, various electronic intelligence sensors (such as the COMINT) and other technical devices. The Aerostar has a take-off weight of 230 kilograms and a maximum payload of 50 kilograms. The total length of the drone is 4.5 meters, and its wingspan is 8.7 meters. In terms of performance, the Aerostart can stay in the air for more than 12 hours, has a range of 250 kilometres, and a maximum speed of 203 km/h (Aeronautics, 2022).

Item	Technical Characteristic
Take-off weight	230 kg
Payload capacity	50 kg
Total length	4,5 m
Wingspan	8,7 m
Engine	A single Zanzottera 498i two-stroke boxer
Time in the air	12 hours

Range	250 km
Maximum speed	203 km/h
Altitude	More than 5,400 m

Figure 4: Aerostar Drone Technical Characteristics Source: Aeronautics.

The delivery of the amount of Heron MALE drones undertaken by Israel, i.e. the additional purchases, as well as the supply of the existing unmanned aircraft systems with parts, was made impossible by the fact that the Turkish government suspended the bilateral agreement in 2008 and 2009, when Israel attacked the Gaza Strip came under the control of Hamas. Turkish President *Recep Tayyip Erdoğan* voiced his displeasure at the political level, during the joint panel discussion at the World Economic Forum held in January 2009 in Davos, Switzerland. He also expressed his concern that the Israeli operation in the Gaza Strip did not spare the civilian population. Statements critical of Israel on the Turkish side further worsened the situation, which eventually led to the Mavi Marmara flotilla incident in May 2010. The Gaza-bound flotilla of the Human Rights and Freedoms and Humanitarian Aid Foundation (IHH) was intercepted by the Israeli armed forces, as it refused to turn back and unload its cargo despite repeated requests. Nine Turks were killed in the incident, which led to a significant deterioration in relations between the two countries. The Turkish ambassador was recalled from Israel, and the Israeli was expelled from Turkey (Egeresi, 2022, p. 5). As a result of these events, Turkey suspended Israel's participation in the upcoming Anatolian Eagle air exercise[5] in 2010, which also delayed the delivery of the Heron drones and made the maintenance and technical supply of the existing ones uncertain. On 21 June, 2010, at an international military conference, General *İlker Başbuğ*, then Chief of Staff of the Turkish Armed Forces, stated that the Turkish security forces would begin the practical use of Israeli Heron MALE drones and use them for reconnaissance tasks in the country's mountainous regions bordering Iraq against the forces of the Kurdistan Workers' Party (PKK) (Düz, 2021, pp. 9-10).

6. American Drone Acquisitions

In addition to the Israeli drone acquisitions, the Turkish leadership began to pursue a kind of soft-push diplomacy with Washington, and in 2008 negotiations were initiated on the acquisition of American drones. The Turkish side started negotiations with the American company General Atomics Aeronautical Systems (GA-ASI) on the purchase of RQ-1 Predator and MQ-9 Reaper drones.

a. *The RQ-1 Predator*. These drones were designed for aerial reconnaissance and forward reconnaissance tasks, and later the device was further developed to carry and launch the well-known AGM-114 Hellfire missiles. The RQ-1 Predator was the first drone

[5] Anatolian Eagle is an air force exercise organized by the Turkish Air Force and held in Konya, Türkiye. Both national and international exercises are carried out in the region, the air forces of the United States, other NATO member countries, and other third countries (such as Asian countries) usually take part in the international exercises.

used by the United States Air Force (USAF) and the Central Intelligence Agency (CIA) for offensive operations. Regarding the Predator's technical characteristics, it has a take-off weight of 513 kilograms and a maximum payload of 387 kilograms. The total length of the drone is 8.23 meters, its wingspan is 14.8 meters, and its engine is a four-cylinder, air-cooled, turbocharged piston engine. In terms of performance, it can be said that the Predator can spend more than 24 hours in the air, has a range of 1,250 kilometres, and a maximum speed of 217 km/h (Airforce Technology, 2022).

Item	Technical Characteristic
Take-off weight	513 kg
Payload capacity	387 kg
Total length	8,23 m
Wingspan	14,8 m
Engine	Four-cylinder air-cooled turbocharged piston
Time in the air	24 hours
Range	1,250 km
Maximum speed	217 km/h
Altitude	More than 7,620 m

Figure 5: RQ-1 Predator Drone Technical Characteristics Source: Airforce Technology

b. *The MQ-9 Reaper*. This is the US Air Force's primary attack strike unmanned aerial vehicle. Due to its stay in the air, long-range sensors, multi-mode communication system and precision weapons, it is capable of strike measurement, coordination and reconnaissance against strategically important, rapidly changing and time-sensitive targets. Reapers are primarily used for intelligence, surveillance, reconnaissance, close air support, combat, search and rescue, precision strike measurement, convoy protection, route clearance, target designation and air control tasks (DOTE Annual report, 2008). The Reaper has a take-off weight of 2,223 kilograms and a maximum payload of 2,537 kilograms. The total length of the drone is 11 meters, its wingspan is 20 meters, and its engine is a turboprop engine. In terms of performance, it can be said that the Reaper can spend more than 14 hours in the air, has a range of 1,900 kilometres, and a maximum speed of 482 km/h (General Atomics, World Missiles & UAVs Briefing 2022, pp. 1-14).

Item	Technical Characteristic
Take-off weight	2,223 kg

Payload capacity	2,537 kg
Total length	11 m
Wingspan	20 m
Engine	Turbo Propeller
Time in the air	14 hours
Range	1,900 km
Maximum speed	482 km/h
Altitude	More than 15,000 m

Figure 6. MQ-9 Reaper Drone Technical Characteristics Source: Dote.osd.mil (Annual report).

In December 2008, Turkey requested ten US-made MALE UAVs from General Atomics to support the fight against the PKK. The agreement would have involved the purchase of four MQ-1 Predators and six MQ-9 Reapers. However, in June 2010, President *Barack Obama* told Erdoğan that "Türkiye's diplomatic approach to the Iranian nuclear issue" would make it difficult for the US Congress to approve the purchase of UAVs from Türkiye.[6] There was also a debate about whether the Turkish government would use the American drones in carrying out retaliatory operations against the PKK (Zanotti, 2011, pp. 19-22).

Anatolian Eagle is an air force exercise organized by the Turkish Air Force and held in Konya, Türkiye. Both national and international exercises are carried out in the region, the air forces of the United States and other NATO member countries usually take part in the international exercises. As a result, in March 2014, the US House of Representatives refused to sell the Reaper to Türkiye. Ankara then raised the idea of handing over unarmed versions of US-made drones as a possible alternative. Sensing the American delay in the decision, in May 2016 *Ismail Demir*, the president of the Turkish Defence Industry, stated that Ankara would no longer need American drones, because of the American restrictions on the sale of weapon systems. This prompted Türkiye to develop unmanned aerial vehicle systems with its own technology. President Erdoğan also confirmed that Türkiye will begin its own UAV production program, learning from the US and Israel's difficulties in acquiring unmanned aerial systems. The strained diplomatic relations between Türkiye and the Western countries, as well as Israel, in terms of the procurement of military equipment, therefore led Ankara to make the Turkish drone industry one of the world's leading developers and manufacturers. (Düz, 2011, pp. 10-11).

[6] At this time, a kind of rapprochement of Turkish-Iranian relations could be observed, as a result of which many high-level visits took place.

7. Rise of Turkish Drone Industry

Türkiye has made a huge progress in its domestic UAV development program in recent decades. Under the leadership of the Defence Industries Bureau (SSB), UAV development and production activities, whose initial steps began in the early 1990s, became increasingly intense after 2004. The Turkish military developed a 30-year strategy plan that was backed up by a US$150 billion investment in its modernization program, of which US$60 billion was dedicated to the revitalisation of its land forces. The Turkish military industrial infrastructure slowly began to develop with such rudimentary projects as the first Turkish-made UAV-X1 launched in 1990, the Turna-Keklik drones in 1995, the Pelikan-Baykuş drone projects in 2003 and the Martı digital in 2004 visualization project. These projects were the forerunners of the technological innovation that later defined Turkish drone production. Within a period of 20 years, Türkiye was reputed to be a drone superpower that only trailed countries such as the US, China and Israel in drone technology (Kaya, 2022).

a. Production of TAI ANKA UAV

At the beginning of the 2000s, there were significant advances in the development of Turkish unmanned systems. In 2004, one of the best-known Turkish projects, the ANKA multifunctional system project,[7] was initiated by the state-owned Turkish Aviation Industries (TUSAŞ) company.[8] The first aircraft connected to the project was tested in December 2010. The objective of the project was actually to develop a national UAV system that meets the Turkish Armed Forces' (TAF) reconnaissance, surveillance, target designation, recognition and intelligence requirements. At first, the developments covered three prototypes (ANKA-A, ANKA-B, and ANKA-S), as well as ground service systems connected to UAVs. The research and development processes later continued towards the development of a high-altitude and long-range (HALE) ANKA unmanned aircraft, the ANKA +A. The development also affected the ANKA Block A drone, which was equipped with a larger payload and was thus named ANKA Block B. The most popular and well-known ANKA product to the general public is the ANKA-S, which is currently mass-produced. ANKA-S is equipped with a SATCOM antenna and a national flight control computer. The ANKA-S previously had a Thielert Centurion 2.0S engine, which was further developed and installed the TEI PD170 and PD180st engines developed by Turkish Engine Industries (TEI), which can operate with diesel and JP-8 jet fuel (Karaagac, 2016, p. 36).

ANKA-S can already have a maximum take-off weight of 1,750 kilograms. The total length of the drone is 8.6 meters, its wingspan is 17.5 meters, and its height is 3.25 meters. In terms of performance, ANKA-S can stay in the air for more than 30 hours,

[7] Intelligence, surveillance and reconnaissance.
[8] Turkish Aerospace Inc. (TAI; Turkish: Türk Havacılık ve Uzay Sanayi A.Ş., TUSAŞ) is a technology centre for the design, development, manufacturing, integration, modernization and after-sales support of aerospace systems in Turkey.

has a range of 4,896 kilometres, and a maximum speed of 217 km/h. The S model was regularized in the Turkish navy, land forces, security agencies, and the gendarmerie. In addition to all this, Türkiye and Tunisia signed a cooperation agreement in March 2020, according to which the Tunisian Air Force will receive ANKA-S unmanned aerial vehicles from Ankara. In terms of that agreement, Tunisia would buy three (3) ANKA-S drones for US$80 million (Düz, 2021, p. 13; Hwang & Song, 2022).

Item	Technical Characteristic
Take-off weight	1,750 kg
Payload capacity	2,700 kg
Total length	8,6 m
Wingspan	17,5 m
Engine	Diesel engine rated at 155-hp
Time in the air	30 hours
Range	4,896 km
Maximum speed	217 km/h
Altitude	More than 9,200 m

Figure 7: ANKA-S Drone Technical Characteristics Source: Düz (2021); Hwang & Song, 2022.

The ANKA-I is an improved version of the ANKA-S, which is also equipped with other means of electronic warfare and intelligence. ANKA-2, also known as Aksungur[18], is also a two-engine improved version of ANKA-S. The Aksungur has a maximum take-off weight of 3,300 kilograms. The drone can stay in the air for more than 50 hours and can fly at a height of more than 12,000 meters. The ANKA-3 is expected by 2023, in which case the Turkish designers and developers would already use so-called stealth techniques in order to be more difficult to detect and for greater security. ANKA-3 would have a special water surface surveillance system, anti-submarine weapons, radio electronic intelligence (SIGINT) and electromagnetic signal interception (ELINT) technology. The UAV would also be capable of satellite communication (SATCOM), synthetic aperture (SAR) and ground moving target tracking (GMTI), which would increase its ability to combat moving ground targets (e.g. convoys, off-road carrier vehicles). The ANKA-3's armament would include JDAM-type missiles and anti-tank ammunition produced by Roketsan. With the ANKA-3 drone, Turkish manufacturers can also target Asian markets, where they plan to expand and develop maritime patrol and anti-submarine special defence capacities (Okuyan, 2012).

b. Development of Bayraktar drones

The other significant Turkish drone development is linked to the name Bayraktar. The Kalekalıp-Baykar Makina joint venture started developing the Bayraktar mini unmanned aerial vehicle system in 2005, which was put into use by the Turkish Air Force in 2007. At the same time, another so-called mini-UAV, the Bayraktar DIHA tactical drone, was launched. In 2006, Bayraktar Makina began the development of another mini-UAV, the Malazgirt, which entered the service of the Turkish Air Force in 2009 (Besenyő and Málnássy, 2022, pp. 15-16).

The development of Bayraktar, the Bayraktar TB2 tactical UAV was started in 2007 by the Kalekalıp-Baykar Makina joint venture. The first prototype of Bayraktar TB2 took off for the first time on 08 June 2009. The Bayraktar TB2 is a medium-altitude, long-range (MALE) unmanned combat aircraft (UCAV) capable of remotely piloted or autonomous flight operations. Unmanned aerial vehicles are monitored and controlled, including the use of weapons, by aircrew at a ground control station. The development of the TB2 UAV was largely spearheaded by Selçuk *Bayraktar*, a former graduate student at the American MIT (Kandemir, 2023, pp. 19-21). The Bayraktar TB2 is controlled by three ground controllers, its total length is 6.5 meters, its wingspan is 12 meters, its maximum take-off weight is 700 kilograms, of which the payload is 150 kilograms. The engine is powered by a 100 hp (75 kW) Rotax 912-iS internal combustion engine and two bladed, variable-pitch propellers, with a fuel capacity of 300 litres and runs on gasoline. In terms of performance, TB2 has a maximum speed of 220 km/h, a range of 4,000 kilometres, an operating altitude of 5,500 meters, but it can even go above 7,000 meters, and its operating time can be up to 27 hours (Armed Forces, 2023).

In terms of armament, the Bayraktar TB2 can be equipped with MAM-C and MAM-L laser-guided smart bombs, L-UMTAS long-range anti-tank missiles, Roketsan Cirit 70mm missile, TUBITAK-SAGE BOZOK laser-guided missile, TUBITAK-SAGE TOGAN GPS/INS guided 81 mm mortar and Advanced Precision Kill Weapon System 70 mm laser guided missile. In terms of avionics, an exchangeable EO/IR/LD imaging and targeting detection system or a multi-mode AESA radar can be installed, among which the Aselsan CATS EO/IR/LD imaging and targeting detection sensor, the Hensoldt ARGOS-II HDT, the Wescam MX-15D EO can be highlighted EO/IR/LD imaging and targeting sensor, and the Garmin GNC 255A navigation and communication transceiver (Baykar Catalog, 2023).

The Bayraktar TB2 unmanned aerial vehicle has been used by the Turkish Air Force as part of the Turkish Armed Forces since 2014, as well as by the Gendarmerie and the Turkish National Police, for example, in anti-terrorist operations. The drone was also adopted by the Turkish Navy. Turkey has used and continues to use drones extensively in air strikes against Iraqi and Syrian targets of the Kurdistan Workers' Party (PKK) and the People's Protection Units (YPG). In addition to domestic use, Bayraktar TB2 drones were also exported by Turkey to other countries, including Qatar and Ukraine (Soyaltin-Collela and Demiryol, 2023, p. 2). Bayraktar drones have also been used by other countries in various wars, for example in the Syrian civil war in 2020, Azerbaijan in the Nagorno-Karabakh war in 2020, and the armed forces of Russia – Ukraine war in

2022.They were also used by the national defence forces of various African countries such as Burkina Faso, Djibouti, Libya, Nigeria, Niger, , Mali, Morocco, Niger, Nigeria, Rwanda, Somalia. The countries with TB2 drones include Turkmenistan, Pakistan and members of the Turkic Council (Azerbaijan, Kazakhstan, Kyrgyzstan and Uzbekistan). As the first NATO and EU member state, Poland first ordered TB2 drones from Turkey in 2021, the delivery of which began in 2022. Other potential buyers of these drones include Romania, Albania, and Iraq (Kandemir, 2023, pp. 4-5).

Another Bayraktar type is the Bayraktar Akinci, which is an air-to-ground or air-to-air attack drone with high firepower. The Akinci can carry the following weapons: MAM-L, MAM-C intelligent "micro" ammunition, as well as the heavier MAM-T anti-tank ammunition, Cirit type missile, L-UMTAS missile, laser-guided Bozok ammunition, MK-81, MK -82, MK-83 guided missiles (JDAM), cruise missiles, Gökdogan air-to-air missile, Bozdogan air-to-air missile, Standoff SOM-A cruise missile, and the TRG-230 tactical ballistic missile. In addition, Bayraktar Akinci can be equipped with Turkish-made systems such as multi-functional active electronic scanning radar system (AESA), SAR/GMTI radar, large area surveillance system, technical solutions to support electronic warfare defence, beyond-line-of-sight (BLOS) satellite communication systems, CATS FLIR camera system, electronic support ESM module and collision avoidance system. Akinci can fly at an altitude of up to 12,000 meters and will be equipped with special reconnaissance capabilities (ISTAR) in the future (Kasapoglu and Ozkarasahin, 2022, pp. 35-39).

c. Other Turkish drone developments

The company Vestel Defence played a key part in the development of Türkiye's national UAV program. Among the developments, the production of the prototype of the Efe Mini UAV system began in 2005, but the mass production of the system did not take place. Then, in 2007, the military industrial company started developing the Karayel tactical UAV prototype. It was the first and only unmanned aerial vehicle designed and manufactured according to the NATO STANAG-4671 standard for intelligence and reconnaissance tasks. The Karayel tactical drone has been used in Turkey since 2015, and the structure's total flight time exceeded 10,000 hours. There is a version of the device without a weapon as well as with a weapon. An example of the latter is the Karayel-SU drone, which was presented at the Dubai Air Show in 2017. In 2018, Vestel Defence launched a new drone development, which aims to further develop and market a partially armed Karayel-SU drone (Düz, 2021, p. 16).

d. Future outlook

With regard to the military technology trends of the past years and the concepts of warfare, it is envisaged that the role and importance of autonomous systems and artificial intelligence is increasing. The development of autonomous systems and

platforms can play a crucial role in reducing threats in hybrid warfare. KARGU autonomous tactical multi-engine UAV (kamikaze drone), ALPAGU autonomous tactical fixed-wing UAV (kamikaze drone) and TOGAN autonomous multi-engine UAV developed by STM Inc. (Savunma Teknolojileri Mühendislik ve Ticaret) in Türkiye, which closely follows industrial development and developments, are the first prototypes of military equipment with autonomous navigation, surveillance and reconnaissance capabilities. Mass production of these systems, which offer many advantages especially in urban operational environments, began in 2017. In addition to military developers Turkish Aerospace, Baykar Makina, Vestel Defence Company and STM, several private companies and universities in Turkey continue to work on the development of UAV systems and subsystems, as well as promoting the necessary human resources and know-how (Özdemir, 2022, pp. 3-5).

8. Türkiye in Exporting Drones

Türkiye's national UAV program gained worldwide attention in October 2017, at the start of the country's intervention in Syria. Ankara carried out a new and combined air and ground operation against Syrian regime forces in Syria's Idlib province, demonstrating the combat advantages of using unmanned aerial vehicles. The tactical effectiveness, power and "survivability" of Turkish UAVs in theatres other than Syria, such as in Iraq, Libya and the Kurdish-populated southeast of the country, have allowed Turkish drones to attract the interest of other countries. Considering the operational range of Turkish UAVs, the Minor Asian state is among those ones which are currently involved in deploying military drones overseas. On the one hand, all these characteristics provide Turkey with great authority on the world drone market, on the other hand, competitors may feel threatened by the military technical developments and thus the practical realization of battlefield successes (Kandemir, 2023, p. 6).

The achievements in the defence sector have resulted in greater investments by Turkish companies in the domestic aviation industry. ANKA, developed by Turkish Aerospace, performed its first mission flight on February 5, 2016, in Elazığ Province, eastern Turkey, where it performed a reconnaissance and surveillance flight. ANKA was then equipped with a MAM-L mini air-to-surface missile and a CİRİT laser-guided air-to-surface missile, both military equipment developed and manufactured by Roketsan. ANKA was then deployed in the Oil Branch operation in northern Syria, which achieved significant success in the field of operational support. After these successful tasks, in 2018 Turkish Aerospace, together with the Indonesian state-owned aerospace company PT Dirgantara (PTDI), agreed with Indonesia on the transfer of technology and the development of a new MALE UAV. According to the Turkish-Indonesian framework agreement, the Turkish Aerospace company also shares know-how related to PTDI's N219 and N245 small and regional turboprop projects. The ongoing negotiations with DEFTECH during the 2017 International Defence Industry Fair (IDEF 2017) within the framework of DRB-HICOM Holding proved that ANKA attracted the attention of the Asian market. During the International Exhibition of Weapons Systems and Military

Equipment, KADEX 2018, it was announced that Turkish Aerospace has agreed to cooperate with the Kazakhstan Aviation Industry (KAI) in the production and delivery of ANKA UAV and HÜRKUŞ new generation training aircraft. According to reports at the 2018 International Defence Exhibition and Seminar (IDEAS) held in Karachi, the Pakistan Navy has shown interest in the ANKA-S and has begun negotiations in that aspect. In March 2020, Turkish Aerospace also signed an agreement with Tunisia. The contract was worth 240 million dollars, for six ANKA-S drones, three ground control stations and the transfer of technology (Düz 2021, p. 18).

Baykar Makina was the first in the history of Türkiye to export advanced unmanned aerial platforms and systems. The Bayraktar TB2 was deployed against PKK targets for the first time in September 2016. The use of armed UAVs in counter-terrorism operations has proven to be an effective military activity. In 2016, Bayraktar UAVs guided Turkish fighter jets in a support operation to destroy Islamic State targets in northern Syria as part of Operation Euphrates Shield. The Bayraktar TB2 carried out 90% of all flights in Operation Oil Branch against the Kurdish-dominated Afrin in northwest Syria in 2018, and 80% of all flights in Operation Spring Shield in Syria's Idlib region in 2020. In the fight against terrorism and cross-border operations, Bayraktar UAV systems have been successfully tested, and this is the first Turkish-made UAV system that has been exported to other countries such as Qatar and Ukraine. During the Doha International Maritime Defence Exhibition and Conference (DIMDEX 2018), an agreement was signed between Baykar Makina and the Qatari Armed Forces, which included the delivery of six-armed Bayraktar TB2 aerial vehicle platforms, three ground control station systems, other equipment and a UAV training simulator. The contract was seen as an important step in establishing cooperation between the Qatari and Turkish armies. In 2019, Baykar signed a contract with Ukrspecexport, Ukraine's state arms trading company, to purchase six-armed drones, three ground control station systems and equipment (Düz, 2021, pp. 18-19).

At the Unmanned Systems Exhibition (UMEX) held in Abu Dhabi in 2016, the Karayel UAV manufactured by Vestel Defence received significant interest, especially from Saudi Arabia, the United Arab Emirates and Qatar, which countries were looking for joint development, production and procurement opportunities. In 2017, the Vestel Defence company signed a memorandum of understanding (MoU) with Saudi Arabia's Advanced Electronics Company for the purpose of cooperation at the Dubai Air Show. In May 2020, the General Directorate of Military Industry (GAMI) of the Kingdom of Saudi Arabia announced that they would launch a project to produce six UAVs in 2021 and 40 within five years. Saudi Arabia's Intra Defence Technologies, which holds all sales rights for the Karayel UAV, has been granted project approval to manufacture the unmanned aerial vehicle under a Turkish license. In addition to the Saudi army, the company can also expand the distribution of Karayel to Brazil and Kuwait (Düz, 2021, p. 19).

STM's mini-UAV system attracted a lot of interest at the Africa Aerospace and Defence Exhibition (AAD) held in the Republic of South Africa from September 21 to 25, 2022.

At the exhibition, STM presented its tactical mini-UAV systems, including the KARGU rotary-wing attack UAV, the ALPAGU fixed-wing autonomous tactical attack UAV and the TOGAN reconnaissance UAV. The Turkish company announced during the event that it is already working with more than 20 countries in technology transfer and business development activities (Kasapoglu and Ozkarasahin, 2022, pp. 31-35).

9. Türkiye-Africa Industrial Relations in the Drone Sector

The expansion of Türkiye's defence industry has increasingly intersected with Ankara's Africa policy, with unmanned aerial vehicles (UAVs) emerging as a key element of bilateral industrial and political relations. Since the announcement of Türkiye's 'Opening to Africa' strategy in 2005, and its relaunch as a fully-fledged Africa Partnership Policy in 2013, Ankara has framed Africa as both a political partner and a market for Turkish industrial instruments (Besenyő and Málnássy, 2024, pp. 4-5). While this engagement encompasses trade, infrastructure and education, the defence sector – and within it, drones in particular – has acquired disproportionate significance. UAVs represent a dual tool for Ankara: an export commodity with clear commercial value, and an instrument of foreign policy projection designed to expand Türkiye's presence and influence on the continent (Besenyő and Málnássy, 2024, pp. 6-8).

Several African countries have turned to Turkish drones in recent years, driven by acute operational needs and the relative affordability of Turkish systems. Morocco, Ethiopia, Somalia, and Niger have all procured the Bayraktar TB2, which has become the flagship of Türkiye's drone exports. Additional interest has been reported from states such as Tunisia, Rwanda, and Burkina Faso. The appeal of Turkish UAVs lies not only in their comparatively low cost but also in their proven combat performance in conflicts ranging from Libya and Nagorno-Karabakh to Ukraine (Yasar, 2022, pp. 2-3.).

The acquisition of Turkish drones allows African governments to address pressing challenges in counterterrorism, insurgency suppression, and border surveillance. For example, Somalia has employed Turkish UAVs in operations against al-Shabaab, while Ethiopia reportedly used them during the Tigray conflict (Zelalem, 2025, pp. 2-9).

Unlike traditional arms exporters, Türkiye has sought to frame its defence exports as part of broader industrial cooperation packages. This often entails agreements for pilot training, the establishment of maintenance and repair facilities, and, in some cases, promises of localized assembly. These initiatives are designed to appeal to African governments eager to develop defence-industrial capabilities and reduce long-term dependence on foreign suppliers. Although the extent of technology transfer remains limited in practice, the discourse of partnership is significant. Türkiye presents itself as a supplier that does not merely sell equipment but also engages in capacity building. This differentiates Ankara from Western states, whose arms transfers are typically transactional and embedded in rigid regulatory frameworks (Yasar, 2022, pp. 4-5.).

The diffusion of Turkish drones in Africa carries wider geopolitical implications. At the bilateral level, UAV exports reinforce Ankara's political partnerships with recipient

states, embedding Türkiye within their security architectures. At the regional, drone exports contribute to Ankara's broader ambition of positioning itself as a global actor, capable of projecting influence beyond its immediate neighbourhood (Besenyő and Málnássy, 2024, pp.2-6). The visibility of Turkish drones in African conflicts strengthens Türkiye's international image as an autonomous defence producer. This positioning is particularly relevant given the relative retrenchment of Western powers in parts of Africa and the diversification of African foreign policy choices. By supplying drones, Türkiye not only fills a market gap but also secures political goodwill, which can translate into support in multilateral forums such as the United Nations or the African Union.

Despite these advantages, Türkiye's engagement in the African drone market is not without risks. The operational use of UAVs in civil conflicts, most notably in Ethiopia's Tigray war, has drawn criticism for contributing to civilian casualties and escalating violence. Furthermore, the sustainability of industrial cooperation remains uncertain. Many African states lack the technical infrastructure, trained personnel, and financial resources required to maintain and operate UAV systems over the long term (Besenyő and Málnássy, 2024, pp. 6). Without significant investment in domestic capacities, African partners risk becoming dependent on Turkish technical assistance and spare parts, thereby reproducing patterns of dependency that Ankara claims to challenge. Finally, the proliferation of drones on the African continent could contribute to regional arms races, as rival states seek to match each other's capabilities. While drones offer short-term tactical advantages, their diffusion may inadvertently destabilize fragile security balances (Zelalem, 2025, pp. 1-25).

10. The Progress of Turkish Drone Development and its Implications for Ankara's Geopolitical Thinking

The Turkish political leadership sees the development of unmanned military systems and robotic warfare tools not only as part of the modernization program of the Turkish army, but also as an important factor for geopolitics. Türkiye sees the development and further development of armed tactical drones as an important tool in global power struggles. In addition to Ankara's geopolitical interests, military innovations in the Turkish drone industry also serve the country's defence industrial interests and the possibility of projecting military power. The US arms embargo of 1975-1978, an agreement by EU member states to limit arms exports to Türkiye due to the country's recent offensive in northern Syria, and the reluctance of allies to sell precision weapons and weapon systems prompted Ankara to build a domestic high-tech manufacturing base. Türkiye has significantly improved its military technical capabilities in the last decade. As a result, the country is now able to produce competitive military products not only as a user but also as an exporter in the world market of arms (Zanotti, 2011, p. 2).

Türkiye's UAV program has had a significant impact on the national defence industry has encouraged the emergence of unmanned military platforms and intelligent systems,

as well as boosted military technology exports. The development and production of unmanned vehicles resulted in know-how, qualified human resources and the exchange of experience. This kind of experience has significantly increased Türkiye's capacity and opportunity in the fight against terrorism. The developments resulted in close cooperation between the Turkish Armed Forces, including the Turkish Air Force, and the defence industry. However, there are difficulties in terms of the Command and Control (C2) structure. In this respect, all national forces need an integrated approach, but it is only partially realized in the Turkish defence structure, since ANKA-S is primarily under the command of the Turkish Air Force, Bayraktar TB2 is under the command of the ground forces, and the National Intelligence Organization (MIT). This structure requires a high degree of coordination between organizations. The domestic drone program also had a significant impact on the military warfare employed by Ankara (Düz, 2021, p. 20).

During the military operations launched between 2016 and 2019 (Euphrates Shield, Olive Branch, Spring of Peace, as well as several other anti-terrorist operations), domestically produced UAVs proved successful and had an impact on the transformation of the Turkish Air Force and its combat doctrines. UAVs provide effective intelligence, surveillance and reconnaissance capabilities to Turkish law enforcement and military forces. That is why this military equipment is increasingly used in the fight against terrorism and making almost indispensable components of this type of low-intensity operations. Unmanned vehicles are considered as "expendable assets" due to their non-existent human resource requirements compared to fighter jets and combat helicopters. At the same time, drones can perform the same tasks, i.e. real-time monitoring, effective area control, reconnaissance and target destruction, as fighter jets or helicopters. With the development of advanced MANPADS (Man-portable air-defence systems) type missile systems and their portability by drones, armed UAVs have become primary strike devices in high-intensity conflicts (Özdemir, 2022, pp. 3-4). Advances in precision strike capabilities have helped Türkiye conduct military operations in remote areas without having to deploy fighter jets. Providing unmanned systems with greater firepower and precision munitions increased the possibilities of destroying targets. The increased targeting capabilities of drones enable more accurate target identification and reduce the number of civilian casualties and collateral losses as well. Modern UAVs are also capable of supporting information operations and can help in the fight against disinformation, for example in the detection and prevention of disinformation campaigns used by terrorist organizations (Düz, 2021, pp. 21-22).

In recent years, Idlib in Syria has made a suitable field for testing the capabilities of Turkish UAVs, as well as for analysing and evaluating the possibilities of electronic and network-centric warfare. In February 2020, Türkiye deployed Bayraktar TB2 and ANKA-S UAVs and several electronic warfare systems in Syria during Operation Spring Shield. During the operation, Turkish military equipment destroyed 3,400 militants; three aircrafts, including two Su-24s and one L-39; eight helicopters; eight air defence systems, including the Pantsir S-1 and Buk missile systems; 156 tanks, including T-55, T-

62 and T-72 MBTs; 108 guns and MLRS; 24 armoured personnel carriers; 49 other vehicles; 99 military vehicles; ten ammunition depots and two airfields. During the operation, the ANKA-S and Bayraktar TB2s also carried out the reconnaissance and designation of targets for the Turkish Air Force and the Turkish Ground Forces. Since it is a small operational area, Ankara deployed a squadron (about 10-15) armed UAVs for the targets in Idlib. ANKA-S used the previously mentioned SATCOM, and Bayraktar TB2s used the LOS data transmission to transmit the image and coordinate data they acquired through the integrated communication system of the Turkish Land Forces (TAFICS) for the purpose of carrying out air and artillery operations. Fire control and coordination jobs were carried out by the Turkish army with the help of the ADOP-2000 automated fire support system, also developed domestically. In combat operations, an armed UAV can function as an advanced artillery observer and air traffic controller or perform tasks that typically associated with a fighter aircraft (Mevlütoglu, 2020).

Türkiye also successfully deployed (and tested) Turkish UAVs in the Libyan conflict in 2019 to support the UN-recognized Libyan Government of National Unity (GNA). In June 2019, the GNA deployed Bayraktar to attack the forces of the Libyan National Army (LNA) led by *Khalifa Haftar* in the area of the Mitiga International Airport (Málnássy, 2022, pp. 67-68). At least three Bayraktar TB2 drones were deployed over Tripoli airspace to prevent Haftar's forces from capturing the capital. In April 2020, an Antonov An-26 cargo plane delivering ammunition to the LNA forces was destroyed by the deployment of GNA Bayraktars near Tarhuna, on one of the supply lines of Al-Jufra Air Base. During the air operations carried out by Turkish drones on May 17-18, 2020, most of the Pantsir-S1 air defence and Krasuhka electronic warfare systems were destroyed in Libya. In several cases, Bayraktar TB2 UAVs destroyed the air defence systems, logistical support vehicles (trucks, cargo planes) and armoured personnel carriers of Haftar's forces. The STM-developed KARGU tactical multi-engine attack UAV was first spotted on May 27, 2020 in the Ain Zara area. On May 18, 2020, the GNA occupied the Watya air base, which is considered a critical infrastructure, with the help of Turkish UAVs (Thomas, 2020, pp. 3-15).

Despite the successes and combat results achieved in the world's conflict zones, it should not be forgotten that Turkish UAVs have shortcomings, too. Such one is that both ANKA and Bayraktar UAV systems are vulnerable to surface-to-air missiles (SAMs) at low altitudes. Furthermore, the extent of control over the given area can also affect the operational range of the drones. In Libya, Ankara overcame the difficulties of Bayraktar UAVs' communication systems by using ground relay stations to extend the drones' range. Likewise, the development of the SATCOM communication system made it possible for ANKA UAVs to fly deep into Syria (Mevlütoglu, 2020).

The use of MAM-L and MAM-C smart munitions helped overcome deficiencies in firepower and payload and increased the accuracy of strike capabilities. The Turkish-made KORAL electronic warfare system helped Turkish UAVs jam and deceive the radars of enemy assets. Türkiye's military technological development has contributed to

increasing the country's strategic and geopolitical room for manoeuvre. Practical experience shows that drone developments and domestic solutions have provided the Turkish Armed Forces with operational flexibility in the Middle East, the eastern part of the Mediterranean Sea, and North Africa. Türkiye recently deployed Bayraktar TB2s to Northern Cyprus due to rising tensions between Cyprus and Türkiye (Málnássy, 2022, p. 106). Bayraktar TB2s also provide surveillance of Turkish oil and gas drilling vessels in disputed Exclusive Economic Zones (EEZ) in the Mediterranean Sea. Another legacy of the development of the drone industry is that with the help of this special military equipment, Turkey can be present on several battlefields at the same time, which can strengthen the country's geopolitical positions (Málnássy, 2022, p. 107).

The Turkish drone diplomacy continued to play a role in the impasse between Türkiye and the Nordic countries that want to join NATO. The President of Finland expressed a desire to engage Türkiye on the purchase of drones once Finland joined NATO. However, this would be subject to Türkiye not exercising its veto rights within NATO to block Finland from joining the security organisation (Milne and Pitel, 2022).

11. Future Outlook - Further Possible Development of Turkish Drones

In 2021, one of the major players of the Turkish defence industry, Bayraktar, announced that it would produce a new combat drone called Kizilelma, with the first prototypes to be tested in 2023. The Kizilelma will have an engine with a special turbofan, its payload capacity exceeds 1,500 kilograms, in terms of its offensive armament, it will have air-to-air, air-to-ground missiles, cruise missiles, and special manoeuvrability, as well as the ability to take off from a short runway. According to Bayraktar, two types of Kizilelma will be produced, MIUS-A and MIUS-B, in which different types of engines will be installed. The Kizilelma can function as a complement to the combat activities of the 4th and 5th generation fighter planes (Kasapoglu and Ozkarasahin, 2022, p. 40).

Another big announcement by Bayraktar was that the Bayraktar TB3 type development will be used in maritime deployments in support of Kizilelma in order to implement the geostrategic vision of the "blue homeland" (mavi vatan). The Bayraktar TB3 drone will be launched from the TCG Anadolu (L-400) flight deck support ship, which can carry up to 80 drones. In 2023, Baykar will continue the integration of the Bayraktar TB3 aircraft with wing tips that can be folded up for storage to the aforementioned Anadolu ship. The TB3 will have a higher payload capacity than the TB2, which could increase the effectiveness of attacks in a maritime environment. The TB3 will be equipped with the PD-170 type engine, and its reconnaissance capabilities will be developed by Aselsan. If these developments are realized in the near future, Turkey will be equipped with new generation drones with very serious combat value, which can significantly increase the possibilities of Turkish naval warfare and land power projection (Kasapoglu and Ozkarasahin, 2022, p. 41).

Conclusion

For Türkiye, which previously relied heavily on foreign technologies, the development of its own military equipment and equipment systems has now become crucial for ensuring the country's strategic independence. This is reflected not only in the fight against terrorism, but also in gaining strategic advantages over Ankara's geopolitical rivals. Within the development of domestic military technology in Türkiye, major progress has been made in recent decades in the development of UAV systems and subsystems, as well as in the promotion of the necessary human resources and know-how. The Turkish Armed Forces are one of the strongest forces within NATO in terms of drone capacities and capabilities.

Türkiye's drone program contributed to the improvement of Ankara's warfare capabilities, while at the same time, as a competitive manufacturer, it also benefited economically from the export of military technological developments. The Minor Asian country's drone program has paved the way for the transformation of traditional military practices and doctrines. In recent years, Turkish UAVs have been deployed mostly as "anti-terrorism tools", serving as advanced observers, aerial controllers, target identification and target destruction tools in difficult operational environments. Through its military technology developments and innovative tools, Türkiye has created the conditions to effectively increase its coordinated and network-centric warfare capabilities.

Türkiye subordinated its drone technology developments to its geopolitical interests and used and is currently using it as a tool to influence military and political processes through the so-called "drone diplomacy". In this study the authors verified their hypothesis that Türkiye asserts its foreign policy and geopolitical interests through its drone industry. Turkish drones may also play an important role in the conflicts and crisis zones of the coming years. Due to their versatility and multi-tasking parameters, these technological tools enable the effective execution of difficult military operations. In a security environment in which the tendency for autonomous systems and artificial intelligence to play an ever-increasing role prevails, further developments in Turkish drone technology and the Turkish military industry can increase the readiness of the Turkish Armed Forces for future warfare.

Conflicts of Interest

The author declares that he has no competing interest.

Notes on Contributor

András Málnássy holds a PhD in Engineering Science from the Doctoral School of Safety and Security Sciences at Óbuda University, Hungary. He graduated from Zrínyi Miklós National Defense University, Budapest Business School, and the University of Public Service (Hungary). He is a security and defense policy expert with over 15 years of

experience as an analyst in various positions. He is currently a researcher at the Africa Research Institute at Óbuda University in Budapest. His research interests include Türkiye and its defence industry, security and defence policy, and geopolitics.

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