THE ASCENSION OF TURKEY AS A DRONE POWER

HISTORY, STRATEGY, AND GEOPOLITICAL IMPLICATIONS

SİBEL DÜZ

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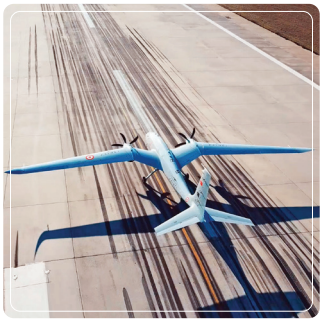

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Sibel Düz completed her BA in International Relations at the Middle East Technical University (METU) in 2013. Her main research interests include Terrorism Studies, irregular warfare, Countering Violent Extremism (CVE), and insurgency. Currently, she is working as a research assistant at the Directorate of Security Studies at SETA Foundation.

ABSTRACT

This analysis historically contextualizes and empirically analyzes Turkey's "drone strategy" by focusing on industrial, military, and geopolitical dimensions.

This paper investigates the trajectories of Turkey's drone program, its historical origins, strategical rationality, and geopolitical implications. The paper historically contextualizes and empirically analyzes Turkey's "drone strategy" by focusing on industrial, military, and geopolitical dimensions. In the first part, it examines the historical evolution of Turkey's drone program. The second part, assesses Turkish companies' successful initiatives and their impacts on Turkey's boosting drone industry. In the third and final part, the paper seeks to unpack the question of how Turkey's robust unmanned aerial systems development program serves Turkey's geopolitical interests and military power projection in conflict zones such as Syria and Libya.

INTRODUCTION

In the last decade, the Turkish defense industry has received a lot of attention. There are many driving factors behind Turkey's changing defense strategy. The changing nature of Turkey's threat perception, the security landscape in the post-Arab Spring era in the Middle East and North Africa, and Turkey's grand strategy in the defense industry can be considered the main drivers behind the rise of Turkey's defense industry. The Syrian civil war and its conflict spillover effect on Turkey's security landscape were particularly important factors as well. In this regard, Turkey's drone program and its effectiveness in the battlefield are strategically important. The strained diplomatic relations between Turkey and Western countries drove Turkey to become one of the world's leading manufacturers and users of unmanned aerial systems. Turkey has made tremendous strides in its national unmanned aerial vehicle development program in the past decades. The tactical effectiveness, strength, and survivability of Turkey's UAVs in Syria, Iraq, Libya, and the southeast of Turkey have enabled Turkey's products to be labeled as "combat proven" and have given Turkey a highly prestigious reputation in the worldwide drone market - as opposed to many of its competitors. Turkey's maximization of its drone power has both led to a transformation in conventional military norms and practices, and turned out to be the new game changer of the global power struggle.

This paper sheds light on the trajectories of Turkey's drone program by taking into consideration historical turning points, the strategic rationality behind its drone industry, and geopolitical implications. More importantly, the paper historically contextualizes and empirically analyzes Turkey's "drone strategy" by focusing on industrial, military, and geopolitical dimensions. In the first part, the paper examines the historical evolution of Turkey's drone program. The second part, assesses Turkish companies' successful initiatives and their impacts on Turkey's boosting drone industry. In the third and final part, the paper seeks to unpack the question of how Turkey's robust unmanned aerial systems development program serves Turkey's geopolitical interests and its military power projection in conflict zones such as Syria and Libya.

HISTORICAL EVOLUTION OF TURKEY'S DRONE PROGRAM

At the end of the 1980s, Turkey initiated the national unmanned aerial vehicle (UAV) procurement program following global technological developments. Due to the absence of local procurement alternatives, foreign procurement was adopted as the basis of its acquisition strategy.

In this sense, the Meggitt BTT-3 Banshee produced by Target Technology Ltd. entered service in the Turkish Army in 1989 as the first

target drone system.[1] Additionally, in 1994, flights with the Canadair CL-89 surveillance drone systems, which were donated by Germany, started. However, the system was removed from the inventory within a short period due to the logistical difficulties and incidents of accidents.[2] The most serious attempt came with the procurement of the Gnat 750 and I Gnat UAVs designed by General Atomics. Those systems entered the stocks in 1995 and were used by the Land Forces until 2005 for tactical surveillance and support missions.[3]

Between 2007-2010, to supply the urgent need for UAVs, a Heron Medium Altitude Long Endurance (MALE) and a Searcher UAV from Israel Aircraft Industries (IAI); a Dominator UAV from Israeli Aeronautics Defense Systems Ltd. were rented and presented to the service of the Land Forces. Additionally, three Aerostar UAVs supplied by Aeronautics Defense Systems Ltd. were taken into the Land Forces inventory in 2008.[4] Ten Heron UAVs from Israel UAV Partnership (IUP), an equally owned partnership between Israel Aircraft Industries (IAI) and Elbit Systems, were taken into the Air Force inventory in 2010 by signing a contract valued at $150 million.[5] The Heron UAV became the first UAV system to enter the Air Force inventory. Some subsystems of the Heron UAV system such as the ASELFLIR 300T camera by ASELSAN, the Satellite Ground Terminal by SAVRONIK, and the Remote Video Terminal and the Portable Image Valuation System by MİLSOFT have been developed by Turkish companies.[6]

The procurement of Heron UAVs was not the least-cost path for Turkey. Indeed, the deal for the unarmed Heron UAVs supplied by Israel Aerospace Industries, was signed in 2005, but major complications emerged while integrating the electro-optical payload and after Israel refused to provide spare parts.[7] Furthermore, between the years 2008 and 2009, Turkey suspended the deal as a response to the Israeli actions in Gaza during Operation Cast Lead, further delaying the delivery.[8] In May 2010, in the aftermath of the Mavi Marmara incident, Turkey cancelled the Israeli participation in the upcoming Anatolian Eagle air maneuvers as well as several other joint training exercises which also had an impact on the delivery, deployment, and maintenance of the ten Heron MALE UAVs.[9] After all these incidents, on June 21, 2010, at an international military conference, the Chief of General Staff Gen. İlker Başbuğ stated that Turkish security forces had begun employing Israeli-made Heron UAVs on surveillance missions over Turkey's mountainous eastern border with Iraq.[10] Conversely, in June 2018, Turkey's Minister of Defence Nurettin Canikli admitted that Turkey couldn't effectively use the Israeli UAVs and claimed that Israel deliberately sold ten defective UAVs, which is why the Turkish air cam-

1. "Türkiye'nin gökyüzündeki başarı imzası: Yerli İHA ve SİHA'lar", *TRT Haber*, 3 March 2020, retrieved from https://www.trthaber.com/haber/gundem/turkiyenin-gokyuzundeki-basari-imzasi-yerli-iha-ve-siha-lar-464449.html

2. Ibid.

3. Cengiz Karaağaç, 2016, "İHA Sistemleri Yol Haritası Geleceğin Hava Kuvvetleri 2016-2050", *STM*, retrieved from https://www.stm.com.tr/documents/file/Pdf/6.İha%20Sistemleri%20Yol%20Haritasi_2016-08-03-10-57-57.pdf

4. Ibid,

5." IAI And Elbit to Supply UAV Systems to Turkish MOD", *Defencetalk*, 7 November 2005, retrieved from https://www.defencetalk.com/iai-and-elbit-to-supply-uav-systems-to-turkish-mod-4726/

6. Karaağaç, 2016, "İHA Sistemleri Yol Haritası Geleceğin Hava Kuvvetleri 2016-2050".

7. "Turkey: The Troubled Acquisition of Israeli UAVs", *Stratcom*, 22 June 2010, retrieved from https://worldview.stratfor.com/article/turkey-troubled-acquisition-israeli-uavs

8. "Turkey Accuses Israel of Selling Them Defective Drones", *Ynetnews,* 24 June 2018, retrieved from https://www.ynetnews.com/articles/0,7340,L-5295266,00.html

9. "Turkey: The Troubled Acquisition of Israeli UAVs", *Stratcom*.

10. "Turkish Army Using Israeli-Built Drones", *CNN,* 21 June 2010, retrieved from http://edition.cnn.com/2010/WORLD/europe/06/21/turkey.israeli.surveillance/index.html

MODEL	MAKE	ORIGIN	CLASS	INTRODUCTION	QTY	OPERATOR	NOTES
Black Hornet	FLIR	USA	I	2018		Special Forces	
Serçe-1	Aselsan	Turkey	I	2018	500+	Army, Gendarmerie	
Harpy	IAI	Israel	I	1999	100	Army	
Kargu	STM	Turkey	I	2018	160+		
Bayraktar Mini	Baykar	Turkey	I	2007	200+	Army, Gendarmerie	
Bayraktar TB2	Baykar Makina	Turkey	III	2015	86	Army, Gendarmerie, Navy	
Heron 1	IAI	Israel	III	2010	7	Air Force	
ANKA	TAI	Turkey	III	2016	12+	Air Force, Navy, Gendarmerie, MIT	ANKA-A, ANKA-B, ANKA-S variants
Karayel-SU	Vestel Defence	Turkey	III				Leased
Kargu-2	STM	Turkey	I	2019	356		Loitering Munition
Songar	Asisguard	Turkey	I	2019			

Figure 1: Turkey's UAV Stocks. Source: *The Drone Databook*, Center for the Study of the Drone at Bard College.

paign towards the PKK's positions in Iraq failed, missing their targets or hitting rocks.[11]

In other respects, in 2008, Turkey held discussions with the American company General Atomics about the purchase of RQ-1 Predator or MQ-9 Reaper UAVs. However, after refusing the U.S. offer, Turkey had to purchase Israeli drones.[12] Actually, in December 2008, Turkey demanded an FMS (Foreign Military Sales) purchase of ten U.S.-produced MALE UAVs to use in its fight against the PKK: four General Atomics MQ-1 Predators and six MQ-9 Reapers.[13] In June 2010, President Barack Obama told Prime Minister Recep Tayyip Erdoğan that Turkey's diplomatic approach regarding the Iranian nuclear issue would make congressional approval of Turkey's purchase of the UAVs more difficult.[14] Then, with the start of the U.S. military operations in Iraq, a public debate revealed a probable PKK retaliatory targeting of U.S. personnel and equipment in the region as the potential cost of delivering Turkey with more advanced military capabilities and technologies.[15] As a result, in March 2014, upon congressional resistance regarding the Reaper sale, Turkey demanded U.S. congressional approval for the sale of an unarmed version of a U.S.-made drone.[16] Finally, after all ensuing discussions and bargains, in May 2016, by underlining that "Ankara will no longer need U.S. drones," Ismail Demir, presi-

11. "Turkey Accuses Israel of Selling Them Defective Drones", *Ynetnews*.

12. Jim Zanotti, 2011, "Turkey-US Defense Cooperation: Prospects and Challenges", *Congressional Research Service*, retrieved from https://fas.org/sgp/crs/mideast/R41761.pdf; Cengiz Karaağaç, "Geçmişten Geleceğe Türkiye'nin İnsansız Hava Araçları Mücadelesi", *M5*, 7 September 2018, retrieved from https://m5dergi.com/son-sayi/makaleler/gecmisten-gelecege-turkiyenin-insansiz-hava-araclari-mucadelesi/

13. Zanotti, 2011, "Turkey-US Defense Cooperation: Prospects and Challenges".

14. Ibid.

15. Ibid.

16. "Turkey Mulls Unarmed Reaper Drones from US", *Hürriyet Daily News,* 4 March 2014, retrieved from http://www.hurriyetdailynews.com/turkey-mulls-unarmed-reaper-drones-from-us--63143

dent of Turkish Defence Industries, stated that a U.S. restriction on the sale of some weapon systems had driven Turkey to develop its own technologies.[17] Similarly, President Erdoğan said that Turkey started to produce its own UAVs due to the difficulties in procuring unmanned aerial systems experienced with the U.S. and Israel.[18] In brief, strained diplomatic ties between Turkey and Western countries, pushed Turkey to become one of the world's leading manufacturers and users of unmanned aerial systems.

TURKEY'S DRONE INDUSTRY

Turkey has made tremendous strides in its national UAV development program in the past decades. Under the leadership of the Presidency of Defence Industries (SSB), the domestic UAV development and production activities, which started in the early 1990s, have intensified especially after 2004. A large industrial infrastructure began to emerge with projects like the first domestically produced UAV UAV-X1 (1990), the first domestically produced target aircrafts Turna-Keklik (1995), the UAV Technology and Product Development Projects Pelikan-Baykuş (2003), and the Digital Visualization Project Martı (2004).[19]

Turkey made serious progress not only in developing platforms but also in infrastructure. However, a turning point came with the realization of the ANKA Multi-Role ISR (Intelligence, Surveillance and Reconnaissance) System Project conducted by TUSAŞ (Turkish Aerospace Industries, TAI). The project was initiated in 2004 and the first flight was recorded in December 2010. The project aims to develop a national UAV system to meet the requirements of the Turkish Armed Forces (TAF) for reconnaissance, surveillance, target, recognition, and detection. The scope of the project includes the development of three prototypes and the associated ground systems. The research and development process continues for designing a high-altitude long-endurance version of the ANKA UAV named the ANKA +A, an improved version of the ANKA Block A with a greater payload capacity named ANKA Block B, a mass production configuration of ANKA named ANKA-S, another variant equipped with electronic warfare and intelligence systems named ANKA-I, and a twin-engine version of the ANKA-S named ANKA-2 (aka Aksungur).[20]

Following the successful completion of acceptance tests, in 2018, Turkish Aerospace delivered two ANKA-S UAVs to the Turkish Air Forces (TURAF), controlled with Beyond Line of Sight (BLOS) capability, a feature which made ANKA-S a more capable platform with satellite control.[21] A year after, three ANKA armed drones were delivered to the Turkish Naval Forces Command.[22] Moreover, Temel Kotil, CEO of Turkish

17. "Turkey No Longer Interested in Buying US Drones: Turkish Official", *Hürriyet Daily News,* 27 March 2016, retrieved from http://www.hurriyetdailynews.com/turkey-no-longer-interested-in-buying-us-drones-turkish-official---99731

18. "Cumhurbaşkanı Erdoğan: Kötü komşu bizi imkan sahibi yaptı", *Sabah,* 7 April 2018, retrieved from https://www.sabah.com.tr/gundem/2018/04/07/cumhurbaskani-erdogan-kotu-komsu-bizi-imkan-sahibi-yapti

19. For further details about the projects in chronological order, please see "Türkiye İnsansız Hava Aracı Sistemleri Yol Haritası 2011-2030", *SSB*, retrieved from http://ercancinar.com/wp-content/uploads/2017/10/SSM_%C4%B0HA_Sistemleri_Yol_Haritas%C4%B1_2012.pdf

20. "Anka Unmanned Aerial Vehicle", *SSB,* retrieved from https://www.ssb.gov.tr/WebSite/contentlist.aspx?PageID=364&LangID=2;
"Anka", *TAI,* retrieved from https://www.tusas.com/en/product/anka-multi-role-isr-system;
"TAI Anka", *Military Factory,* retrieved from https://www.militaryfactory.com/aircraft/detail.asp?aircraft_id=1007

21. "TAI Delivers the First Anka-S UAV Systems to TuRAF", *Defence Turkey,* 2018, retrieved from https://www.defenceturkey.com/tr/icerik/tai-delivers-the-first-anka-s-uav-systems-to-turaf-2946

22. "Turkish Aerospace Industries Delivers 3 ANKA UAVs to the Turkish Navy", *Navy Recognition*, 15 October 2019, retrieved from https://www.navyrecognition.com/index.php/news/defence-news/2019/october/7588-turkish-aerospace-industries-delivers-3-anka-uavs-to-the-turkish-navy.html

- Type: MALE UAV
- Manufacturer: Turkish Aerospace Industries (TAI)
- Number: 6
- Endurance: Up to 24 hours depending on payload
- Loaded Weight: 1,600 kg
- Payload Capacity: 200 kg
- Range: >1,000 km (SatCom and ground control station modes)
- Sensor Options: EO/forward-looking infrared/laser range finder payload option and SAR/GMTI/inverse SAR payload option
- Weaponry: Likely capacity of at least four Roketsan MAM-L/MAM-C missiles

Figure 2: Features of ANKA-S UAV. Source: "Armed Drones in the Middle East Proliferation and the Norms in the Region", RUSI, retrieved from https://rusi.org/publication/occasional-papers/armed-drones-middle-east-proliferation-and-norms-region

Aerospace, stated that further UAVs will be delivered to the security forces within the first month of 2020.[23] According to open sources, three ANKA-S systems took their place in the inventory of TURAF, and an additional three systems were ordered. In 2019, three ANKA-S systems were delivered to the Gendarmerie General Command, and in addition to that one Block B system and one Block A system were rented and put into service in 2017. In the service of the Turkish Naval Forces, there is one Block B system, while eight ANKA-S and four ANKA-B systems were ordered and will be delivered in 2020.[24]

For a nation once largely reliant on foreign technology to strengthen its military power, indigenous manufacturing solutions have vital importance. In this sense, another important milestone in Turkey's indigenous UAV program was that the Bayraktar mini UAV system, which was launched in 2005 by the Kalekalıp-Baykar Makina Joint Venture, entered the inventory of the TAF as the first domestic UAV in 2007.[25] Bayraktar Vertical Landing Unmanned Aerial Vehicle (DIHA), a mini tactical UAV variant, is also in the development process.[26] Furthermore, the development of Malazgirt rotary wing mini

23. Ibid.

24. İbrahim Sünnetçi, "ANKA+ MALE Yakın Gelecekte Envantere Girecek!", *Defence Turkey,* 8 May 2020, retrieved from https://www.defenceturkey.com/en/content/anka-male-yakin-gelecekte-envantere-girecek-4028

25. "Bayraktar Mini UAV", *Baykar Defence,* retrieved from https://baykardefence.com/uav-16.html

26. "Bayraktar VTOL UAV", *Baykar Defence,* retrieved from https://baykardefence.com/uav-17.html

- Type: Tactical UAV
- Manufacturer: Kale-Baykar, Turkey
- Number: 46
- Endurance: Up to 24 hours depending on payload
- Loaded Weight: 650 kg
- Payload Capacity: 55 kg
- Range: 150 km (limited by control range from ground control station)
- Sensor Options: IR and EO camera, laser designator, laser range finder (LRF)
- Weaponry: Up to four Roketsan MAM-L/MAM-C missiles

Figure 3: Features of Bayraktar TB2 UAV. Source: "Armed Drones in the Middle East Proliferation and the Norms in the Region", RUSI, retrieved from https://rusi.org/publication/occasional-papers/armed-drones-middle-east-proliferation-and-norms-region

UAV was initiated by Baykar Makina in 2006 and delivered to the TAF in May 2009.[27]

The development of the Bayraktar TB2 tactical UAV system prototype by the Kalekalıp-Baykar Makina Joint Venture started in 2007. The first flight of the developed prototype UAV was recorded on June 8, 2009.[28] With over 110,000 operational flight hours, TB2 has been used efficiently in the service of the TAF, Gendarmerie, and the Turkish National Police since 2014.[29] Furthermore, ten Bayraktar TB2 UAVs will be delivered to the Turkish Naval Forces Command.[30] Besides being used operationally by the TAF, Bayraktar UAV system is the first indigenous UAV system that has been exported to countries such as Qatar and Ukraine.

The Bayraktar Akinci ("raider" in Turkish) platform is also in the development process.[31] Bayraktar Akinci is designed as an air-to-ground and air-to-air attack mission aircraft which is capable of carrying Smart Micro Munition MAM-

27. Karaağaç, 2016, "İHA Sistemleri Yol Haritası Geleceğin Hava Kuvvetleri 2016-2050".

28. Ibid.

29. "Bayraktar TB2", *Baykar Defence,* retrieved from https://baykardefence.com/uav-15.html

30. "BAYRAKTAR TB2'nin Deniz Kuvvetlerine de Teslimatı için Gün Sayan Baykar, AKINCI ile Oyunun Kurallarını Bir Kez Daha Değiştirmeye Hazırlanıyor ", *MSI,* 13 September 2018, retrieved from https://www.savunmahaber.com/bayraktar-tb2nin-deniz-kuvvetlerine-de-teslimati-icin-gun-sayan-baykar-akinci-ile-oyunun-kurallarini-bir-kez-daha-degistirmeye-hazirlaniyor/

31."Second Prototype of Turkish Akinci Drone Ready", *Defence World. Net,* 9 May 2020, retrieved from https://www.defenseworld.net/news/26940/Second_Prototype_of_Turkish_Akinci_Drone_Ready#.XsxF2TozZPY

- Type: Tactical UAV
- Manufacturer: Vestel Defence Industry, Turkey
- Number: 2
- Endurance: Up to 20 hours depending on payload
- Loaded Weight: 550 kg
- Payload Capacity: 70 kg
- Range: around 150 km (limited by control range from ground control station)
- Sensor Options: IR and EO, laser designator, LRF
- Weaponry: Up to two Roketsan MAM-L and/or four Roketsan MAM-C missiles

Figure 4: Features of Karayel-SU UAV. Source: "Armed Drones in the Middle East Proliferation and the Norms in the Region", RUSI, retrieved from https://rusi.org/publication/occasional-papers/armed-drones-middle-east-proliferation-and-norms-region

L; Smart Micro Munition MAM – C; Cirit Missile; L-UMTAS Missile; Miniature Laser Guided Munition Bozok; MK-81; MK-82; MK-83 Guided Bombs (JDAM); Wing-Assisted Guided Bomb MK-82; Air-to-Air Missile Gokdogan and Bozdogan; and Standoff Missile SOM-A.[32] Additionally, Bayraktar Akinci will be equipped with indigenously built systems such as a multi-role active electronically scanned array (AESA) radar; a SAR/GMTI radar; a wide-area surveillance system; electronic warfare; an ELINT/SIGINT suite; a beyond-line-of-sight (BLOS) satellite communications systems; CATS FLIR; ESM pod; and a new collision-avoidance system.[33] The Akinci UAV's first flight was recorded in December 2019.[34]

Another pioneering company in developing Turkey's national UAV program was Vestel Defence Industry. The prototype production of Efe Mini UAV System started in 2005; however, there was no mass production of the system. Then, the prototype development of Karayel Tactical UAV System was initiated by Vestel Defence in 2007.[35] It was the first and only tactical unmanned aer-

32. "Baykar Akıncı System", *Baykar Defence,* retrieved from https://baykardefence.com/uav-14.html

33. "Turkey's New Raider Takes to the Air", *AIN Online*, 11 December 2019, retrieved from https://www.ainonline.com/aviation-news/defense/2019-12-11/turkeys-new-raider-takes-air

34. "Akıncı TİHA, ilk uçuş testini gerçekleştirdi", *Anadolu Agency,* 6 December 2019, retrieved from https://www.aa.com.tr/tr/turkiye/akinci-tiha-ilk-ucus-testini-gerceklestirdi/1666269

35. Karaağaç, 2016, "İHA Sistemleri Yol Haritası Geleceğin Hava Kuvvetleri 2016-2050".

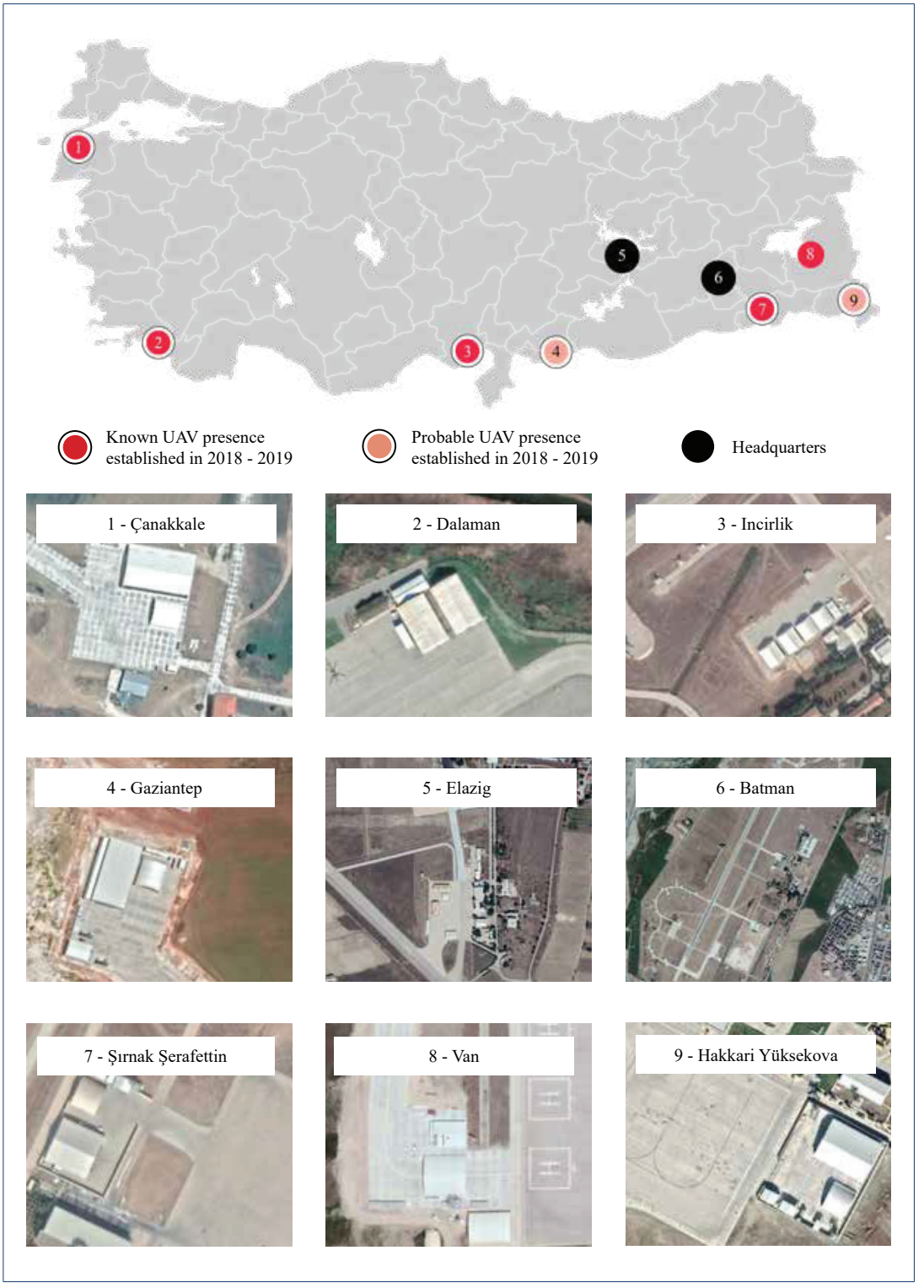

Figure 5: Turkey's UAV posts. Source: "The Drone Databook", Center for the Study of the Drone at Bard College, retrieved from https://dronecenter.bard.edu/projects/drone-proliferation/databook/

ial vehicle designed and produced according to NATO's STANAG-4671 for reconnaissance and surveillance missions.[36] Since 2015, Karayel Tactical UAV System has been operative and its total flight time has reached 10,000 hours.[37] An armed variant of the Karayel UAV, the Karayel-SU by the Vestel Defence Industry, was displayed at the Dubai Airshow in 2017 and flight tests on a partially weaponized Karayel-SU were scheduled to start in January 2018.[38]

Considering recent world trends such as a growing reliance on autonomy and artificial intelligence, the development of autonomous systems and platforms may play a crucial role in diminishing the jeopardies in hybrid battle conditions. In Turkey, which closely monitors industrial advances, KARGU Autonomous Tactical Multi-Rotor UAV,[39] ALPAGU Autonomous Tactical Fixed-Wing UAV,[40] and TOGAN Autonomous Multi-Rotor UAV[41] developed by STM (*Savunma Teknolojileri Mühendislik ve Ticaret*) Inc. became the first examples of loitering munitions with autonomous navigation, surveillance, and reconnaissance abilities. Mass production of these systems, offering numerous advantages especially in urban operational environments, started in 2017.[42] Except for Turkish Aerospace, Baykar Makina, Vestel Defence Industry, and STM, many private companies and universities continue to work on developing UAV systems and subsystems, and on promoting the required human resources and know-how.

	ALPAGU	KARGU
Range	5 km	5 km
Mission Time	10 minutes	10 minutes
Maximum Altitude	400 meters	1000 meters
Top Speed	80 km/h	72 km/h
Dimensions	125 mm x 65 cm	
Weight	3,700 grams	6,285 grams

Figure 6: Technical Features of Alpagu and Kargu Loitering Munitions. Source: "Gökyüzünün Çelik Kanatları: ALPAGU, KARGU VE TOGAN", SavunmaSanayi.org.

THE RISE OF TURKEY AS A DRONE EXPORTER

Turkey's indigenous UAV program gained worldwide attention when a novel and revolutionary combined air and ground operation was conducted in the Idlib province of Syria against the Syrian regime's forces immediately after an attack against a Turkish convoy in which 33 Turkish soldiers were killed in Balyun, Idlib.[43] The tactical effectiveness, strength, and survivability of Turkey's UAVs in Syria, Iraq, Libya, and southeast of Turkey enabled Turkey's products to be labeled as "combat proven." Considering the operational reach of Turkish UAVs, Turkey is among 16 countries that are believed to be currently engaging in overseas military drone deployment.[44] All these features provide Turkey a highly prestigious reputation in the worldwide drone market, as opposed to many of its competitors.

36. "Karayel Tactical UAS", *Vestel Defence Industry*, retrieved from http://www.vestelsavunma.com/en/product-unmanned-aerial-vehicle-systems

37. "Milli İHA Karayel, 10 bin uçuş saatine ulaştı", *Hürriyet,* 15 March 2019, retrieved from https://www.hurriyet.com.tr/teknoloji/milli-iha-karayel-10-bin-ucus-saatine-ulasti-41150333

38. "Turkey's Newest Armed Drone Makes Debut at Dubai Airshow", *Defence News,* 15 November 2017, retrieved from https://www.defensenews.com/digital-show-dailies/dubai-air-show/2017/11/15/turkeys-newest-armed-drone-makes-debut-at-dubai-airshow/

39. "Kargu", *STM,* retrieved from https://www.stm.com.tr/tr/urunler/kargu

40. "Alpagu", *STM,* retrieved from https://www.stm.com.tr/tr/urunler/alpagu

41. "Togan", *STM,* retrieved from https://www.stm.com.tr/tr/urunler/togan

42. "Türkiye'nin "kamikaze drone"ları göreve hazır", *Anadolu Agency*, 22 October 2017, retrieved from https://www.aa.com.tr/tr/turkiye/turkiyenin-kamikaze-dronelari-goreve-hazir/944417

43. "Syria War: Alarm After 33 Turkish Soldiers Killed in Attack in Idlib", *BBC News*, 28 February 2020, retrieved from https://www.bbc.com/news/world-middle-east-51667717

44. Dan Gettinger, "The Drone Databook", *Center for the Study of the Drone at Bard College*, retrieved from https://dronecenter.bard.edu/projects/drone-proliferation/databook/

Figure 7: Countries with armed UAVs. Source: "Drone Proliferation Policy Choices for the Trump Administration", CNAS, retrieved from http://drones.cnas.org/reports/drone-proliferation/

These accomplishments in the defense market are also a result of successful initiatives by Turkish companies in the aviation sector. The ANKA developed by Turkish Aerospace carried out its first mission flight on February 5, 2016 in Turkey's eastern province of Elazığ completing a four-hour exploration and observation flight.[45] Then, the ANKA was armed with a MAM-L mini air-to-surface missile and a CİRİT laser-guided air-to-surface rocket, both made by Roketsan and deployed in Operation Olive Branch in northern Syria.[46] After these successful tasks, in 2018, Turkish Aerospace together with Indonesia's state-owned aerospace firm PT Dirgantara Indonesia (PTDI) agreed on technology transfer and developing a new MALE UAV with an operating altitude of 40,000 feet. According to the framework agreement, Turkish Aerospace will share expertise on PTDI's N219 and N245 small and regional turboprop projects, as well.[47] What is more, the ongoing negotiations with DEFTECH under DRB-HICOM Holding during the International Defence Industry Fair (IDEF) 2017 are proof that the ANKA drew attention in the Asian market.[48] During the International Exhibition of Weapons Systems and Military Equipment KADEX 2018, it was announced that Turkish Aerospace agreed on collaborating with Kazakhstan Aviation Industry (KAI) in the production and supply of the ANKA UAV and HÜRKUŞ new generation training aircraft.[49] At the International Defence Exhibition and Seminar (IDEAS) 2018 in Karachi, it was rumored that the Pakistani Navy was interested in the ANKA-S and started negotiations for it.[50]

45. "Turkish Drone Anka Makes Debut Flight", *Defence News*, 7 February 2016, retrieved from https://www.defensenews.com/industry/2016/02/07/turkish-drone-anka-makes-debut-flight/

46. "Turkey and Indonesia Join Forces on a 'New' UAV", *AIN Online,* 18 January 2018, retrieved from https://www.ainonline.com/aviation-news/defense/2018-01-18/turkey-and-indonesia-join-forces-new-uav

47. Ibid.

48. "ANKA Will Be under Spotlight in Malaysia", *C4 Defence,* 13 April 2018, retrieved from http://en.c4defence.com/Archive/anka-will-be-under-spotlight-in-malaysia/6083/1

49. "Turkish, Kazakh Aviation Firms Seal Deal", *Anadolu Agency*, 24 May 2018, retrieved from https://www.aa.com.tr/en/science-technology/turkish-kazakh-aviation-firms-seal-deal/1155612

50. "IDEAS 2018: PAKISTAN NAVY IS NEGOTIATING FOR ANKA-S UAV", *QUWA,* 29 November 2018, retrieved from https://quwa.org/2018/11/29/ideas-2018-pakistan-navy-is-negotiating-for-anka-s-uav-2/

Finally, in March 2020, it was announced that Turkish Aerospace sealed a deal with Tunisia worth $240 million for the supply of six ANKA-S drones, three ground control stations, and an unspecified level of technology transfer.[51]

Another successfully burgeoning Turkish company is Baykar Makina which achieved the first export of advanced unmanned aerial platforms and auxiliary systems in the history of Turkey. In September 2016, the Bayraktar TB2 recorded its first task against PKK targets in Hakkari Çukurca by neutralizing five terrorists.[52] In the first two years since the appointment of armed UAVs to counterterrorism operations, a total of 405 terrorists have been neutralized in drone strikes.[53] In 2016, in a support mission, Bayraktar UAVs guided Turkish fighter jets to destroy five targets of DAESH terrorists in northern Syria during Operation Euphrates Shield.[54] Bayraktar TB2 with a total flight time of 5,300 hours performed 90% of all flights in Operation Olive Branch, and with a total flight time of 2,000 hours performed 80% of all flights in Operation Spring Shield.[55] Converting into a force multiplier in countering terrorism and cross-border operations, Bayraktar UAV Systems succeeded in being the first domestically produced UAV system to be exported to countries such as Qatar and Ukraine. At the Doha International Maritime Defence Exhibition & Conference (DIMDEX) 2018, a contract was signed between Baykar Makina and Qatar Armed Forces which included the delivery of six Armed Bayraktar TB2 air vehicle platforms and three ground control station systems, equipment, and a UAV training simulator. The contract was perceived as an important step at establishing a bridge between the Qatari and Turkish militaries.[56] In addition, in 2019, Baykar and Ukrspecexport, the Ukrainian state arms trading company, signed a deal on the purchase of six armed drones, three ground control station systems and equipment to Ukraine.[57]

Lastly, at the Unmanned System Exhibition (UMEX) 2016 in Abu Dhabi, Karayel UAV produced by Vestel Defence received considerable interest particularly from Saudi Arabia, the UAE, and Qatar, searching for joint development, production, and procurement options.[58] In 2017, the company signed a memorandum of understanding at the Dubai Airshow with Saudi Arabia's Advanced Electronics Company with the aim of collaboration and localization.[59] In May 2020, the General Directorate of Military Industry of the Kingdom of Saudi Arabia (GAMI) announced that a project to produce

51. "Turkey's TAI Sells Six Anka-S Drones to Tunisia", *Defence News*, 16 March 2020, retrieved from https://www.defensenews.com/unmanned/2020/03/16/turkeys-tai-sells-six-anka-s-drones-to-tunisia/

52. "Yerli İHA ilk harekatında 5 teröristi vurdu", *Yeni Şafak*, 8 September 2016, retrieved from https://www.yenisafak.com/gundem/yerli-iha-ilk-harekatinda-5-teroristi-vurdu-2528552

53. As cited in "Drone Wars the Next Generation", *Drone Wars UK*, 2018, retrieved from https://dronewarsuk.files.wordpress.com/2018/05/dw-nextgeneration-web.pdf

54. "Turkish Drone 'Bayraktar' Guides Warplanes to Destroy Daesh Terrorist Targets in North Syria Operation", *Daily Sabah*, 7 September 2016, retrieved from https://www.dailysabah.com/war-on-terror/2016/09/07/turkish-drone-bayraktar-guides-warplanes-to-destroy-daesh-terrorist-targets-in-north-syria-operation

55. "Akinci Belgeseli", *Baykar Technologies*, 24 May 2020, retrieved from https://www.youtube.com/watch?v=UEec_EbJgfU

56. "Qatar to Procure Armed Bayraktar TB2 UAVs", *Defence Turkey*, 2018, retrieved from https://www.defenceturkey.com/en/content/qatar-to-procure-armed-bayraktar-tb2-uavs-3050;
"Turkey's Baykar to Export Armed UAVs to Qatar", *Anadolu Agency*, 14 March 2018, retrieved from https://www.aa.com.tr/en/middle-east/turkeys-baykar-to-export-armed-uavs-to-qatar/1088587

57. "Turkey Exports Armed Drones to Ukraine", *Anadolu Agency*, 8 November 2019, retrieved from https://www.aa.com.tr/en/turkey/turkey-exports-armed-drones-to-ukraine/1639752;
"Ukraine Gets 3 More Turkish Bayraktar TB2 Combat Drones", *Defence World. Net*, 23 October 2019, retrieved from https://www.defenseworld.net/news/25709/Ukraine_Gets_3_More_Turkish_Bayraktar_TB2_Combat_Drones#.XtEYPDozZPZ

58. "Vestel Defense Showcases "Karayel" UAV at UMEX", *Defence Turkey*, 13 March 2016, retrieved from https://www.defenceturkey.com/tr/icerik/vestel-defense-showcases-karayel-uav-at-umex-2255

59. "Turkey's Newest Armed Drone Makes Debut at Dubai Airshow", *Defence News*, 15 November 2017, retrieved from https://www.defensenews.com/digital-show-dailies/dubai-air-show/2017/11/15/turkeys-newest-armed-drone-makes-debut-at-dubai-airshow/

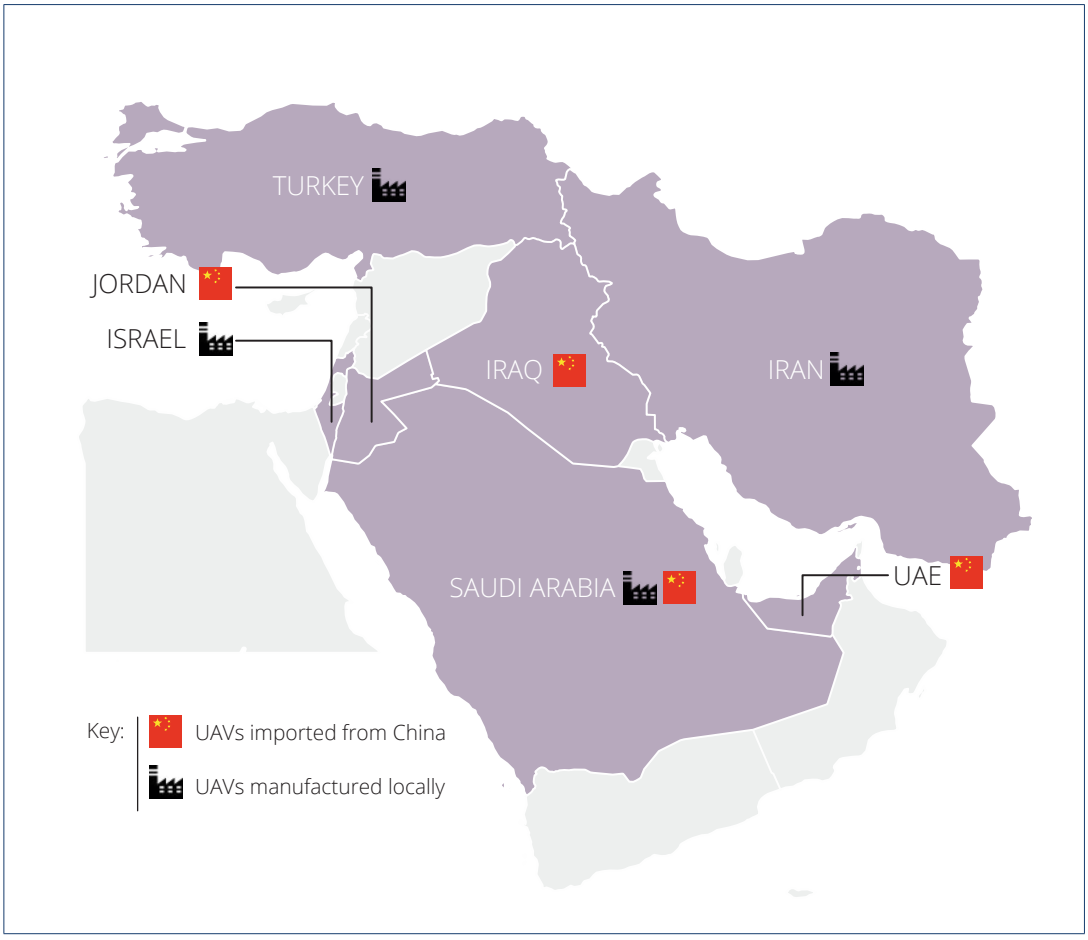

Figure 8: Countries in the Middle East with armed drones and the origin of their manufacture. Source: "Armed Drones in the Middle East Proliferation and the Norms in the Region", RUSI, retrieved from https://rusi.org/publication/occasional-papers/armed-drones-middle-east-proliferation-and-norms-region

six UAVs in 2021, and 40 within five years was started. In the statement, it was underlined that Intra Defence Technologies, which has all sales rights of the Karayel UAV, has been granted project approval to produce an unmanned aircraft under license.[60] Expectedly, the firm may direct its marketing efforts for the Karayel towards the Saudi army at the outset, and might export to Brazil and Kuwait.[61]

60. "Saudi Arabia to Produce Turkish Guns from 2021", *Ray Haber*, 1 May 2020, retrieved from https://www.raillynews.com/2020/05/saudi-arabia-will-produce-turk-siha-from-2021/

61."Saudi Arabia to Build Combat Drones from 2021", *Defence World. Net*, 30 April 2020, retrieved from https://www.defenseworld.net/news/26865/Saudi_Arabia_to_build_Combat_Drones_from_2021#.XtO_9jozZPY

STRATEGIC IMPACT AND GEOPOLITICAL IMPLICATIONS

Turkish decision-makers perceive the innovations in unmanned military systems and robotic warfare more as a chance of leading the next geopolitical move than merely a part of a military modernization program.[62] In other words, for Turkey, the military revolution in developing

62. Can Kasapoğlu, Barış Kırdemir,2018, "The Rising Drone Power: Turkey on the Eve of Its Military Breakthrough", *EDAM*, retrieved from https://edam.org.tr/en/the-rising-drone-power-turkey-on-the-eve-of-its-military-breakthrough/

armed tactical drones and indigenously built, precision-guided munitions is the new game-changer of the global power struggle.

Besides Turkey's geopolitical interests, these innovations in Turkey's drone industry also serve Turkey's interests in the national defense industry and in projecting military power. It is worthy of note that the U.S. arms embargo of 1975-1978, the EU countries' agreement to limit arms exports to Turkey over its recent offensive in northern Syria, and Turkey's allies' unwillingness to sell sophisticated weapon systems have pushed Turkey not to rely on foreign procurement. That is why, Turkey has preferred to improve its warfighting capabilities as an efficient user and simultaneously receive the benefit of shaping the market as a competitive manufacturer with its products.

Regarding the impact of Turkey's robust UAV program on the national defense industry, first, it can be said that the program has encouraged the emerging unmanned military platforms and smart systems, and has given a boost in defense exports. The development and production of indigenous unmanned ground vehicles (UGV), resulted in know-how, human resources, and experience sharing. Reaping the benefit of such an experience, among others, unmanned armored combat vehicle Ejder Yalçın, remote-controlled shooting platform UKAP, and TOSUN unmanned ground vehicle may be seen more frequently in Turkey's combat against terrorism in the near future.[63] Secondly, it creates close cooperation between the TAF and the defense industry. To illustrate, required new features are incorporated in emerging UAV models according to combat experience.[64] Nevertheless, in terms of command and control (C2) structure, an integrated approach is required. During military operations, while ANKA-S is mainly used by Turkish Air Force Command, Bayraktar TB2 is under the command of Land Forces and the Intelligence Agency, which may lead to loose coordination between the forces.

Considering the impact on Turkey's warfighting capabilities, between 2016 and 2019, domestically produced UAVs became successfully operative in Operations Euphrates Shield, Olive Branch, and Peace Spring, and in several counterterrorism operations against the PKK in southeast Turkey and northern Iraq. However, it was early 2020, when the maximization of Turkey's drone power led to a transformation of conventional military norms and practices concurrently enabling the TAF's readiness for a future combat environment.

Besides providing advanced intelligence, surveillance, target acquisition, and reconnaissance capabilities, Turkish UAVs have also been instrumentalized as a decisive counterterrorism tool. While providing real-time situational awareness, effective area control, reinforced survivability, the UAVs have generated force protection in hybrid battlegrounds as an expendable asset contrary to fighter jets and attack helicopters. Moreover, since the presence of advanced MANPADS in high-intensity conflicts, armed UAVs have turned into primary strike assets. With the advance of its precision strike capabilities, Turkey gained a new ability to chase and conduct operations in remote areas without utilizing conventional combat aircraft. An example of a surgical operation occurred when İsmail Özden, a senior PKK leader and KCK member, was neutralized in Sinjar in a joint cross-border operation conducted by the TAF and MİT in August 2018. After the MİT's initial surveillance, F-16 jets and Bayraktar TB2s successfully destroyed

63. "Unmanned Land Vehicles to Reinforce Turkish Army", *Anadolu Agency*, 23 February 2018, retrieved from https://www.aa.com.tr/en/economy/unmanned-land-vehicles-to-reinforce-turkish-army/1071972

64. "SİHA'ların saha tecrübesi işin mutfağına da yansıdı", *TRT Haber*, 22 May 2020, retrieved from https://www.trthaber.com/haber/gundem/sihalarin-saha-tecrubesi-isin-mutfagina-da-yansidi-486716.html

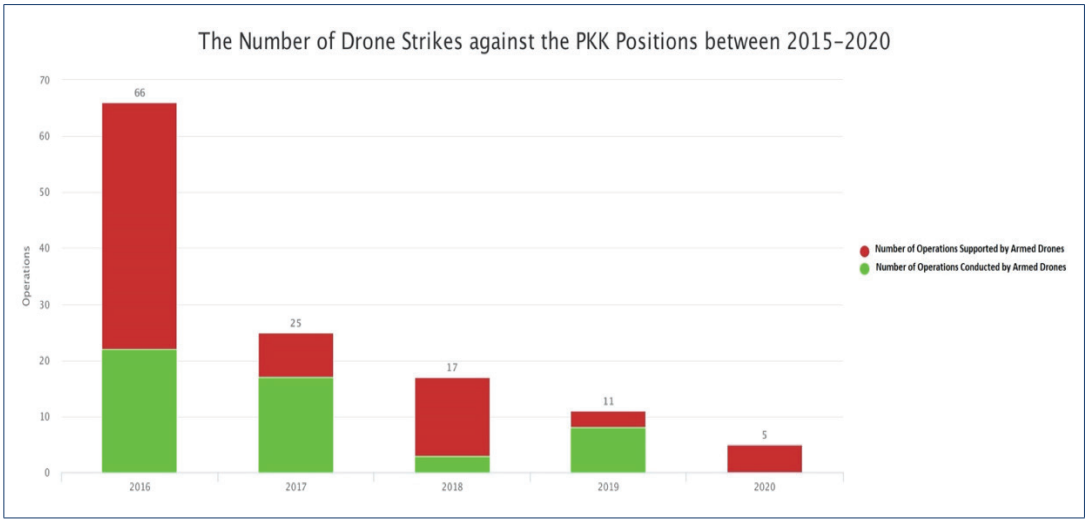

Figure 9: The number of operations conducted by armed drones targeting the PKK. Source: SETA Terrorism Analysis Platform (TAP).

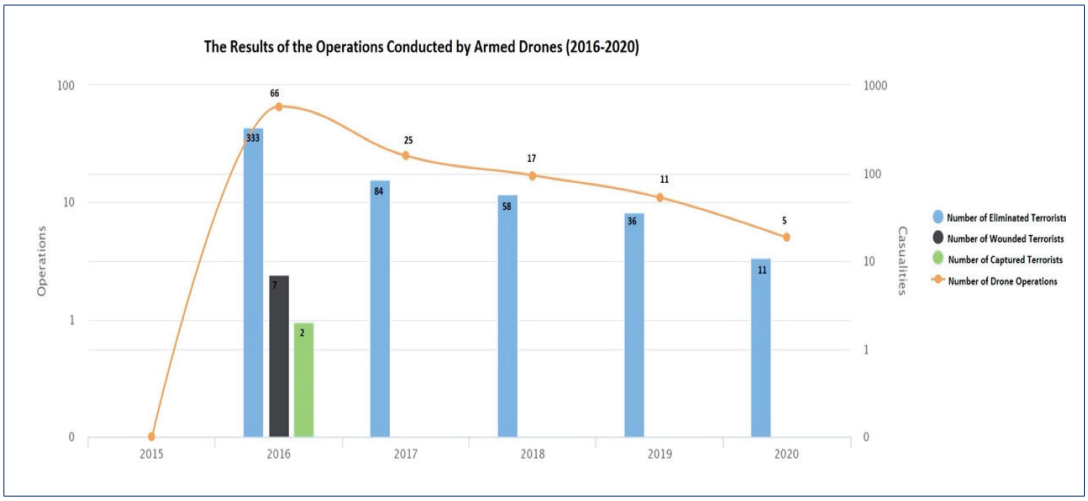

Figure 10: The results of operations conducted by armed drones targeting the PKK. Source: SETA Terrorism Analysis Platform (TAP).

Özden's convoy, exemplifying the pinpoint targeting performance of Turkish UAVs.[65]

Moreover, while operating unmanned systems along with artillery and precision munitions dramatically multiplied lethality, increased target acquisition capabilities enable clear identification of the target and diminish civilian casualties which permits effective employment of lethal means.[66] Interestingly, a potential new role of UAVs in conflict zones was also discovered. Turkey managed to use its UAVs to support information operations in countering disinformation campaigns by terrorist organizations.[67]

65. "3 gün adım adım izlendi, son darbeyi SİHA indirdi!", *Gazete Vatan*, 17 August 2018, retrieved from http://www.gazetevatan.com/3-gun-adim-adim-izlendi-son-darbeyi-siha-indirdi--1191670-gundem/

66. "Türk SİHA'lardan 'mikro cerrahi' operasyon", *TRT Haber*, 4 March 2020, retrieved from https://www.trthaber.com/haber/gundem/turk-sihalardan-mikro-cerrahi-operasyon-464748.html

67. "Bayraktar TB2 SİHA'lar görüntüledi, TSK sivillerin arasına saklanan teröristlerin karargahını havaya uçurdu", *TRT Haber*, 13 February 2018, retrieved from https://www.trthaber.com/haber/gundem/bayraktar-tb2-sihalar-goruntuledi-tsk-sivillerin-arasina-saklanan-teroristlerin-karargahini-havaya-ucurdu-350513.html

Recently, Idlib became a perfect venue for testing the strength of Turkish UAVs and turned out to be an accomplishment in coordinated electronic and network warfare capabilities.[68] In late February 2020, during Operation Spring Shield, Bayraktar TB2 and ANKA-S UAVs along with an array of electronic warfare systems were deployed and intensely used in a coordinated attack against regime forces, in retaliation for an attack against a Turkish convoy in which 33 Turkish soldiers were killed in Balyun, Idlib.[69] During the operation, Turkey destroyed 3,400 regime forces; three aircraft including two SU-24s and a L-39; eight helicopters; eight air defense systems including Pantsir S-1 and Buk missile systems; 156 tanks including T-55, T-62, and T-72 MBTs; 108 cannons and MLRS; 24 armored vehicles; 49 improvised vehicles; 99 military vehicles; ten ammunition depots; and two airports.[70]

In the operation, while ANKA-S and Bayraktar TB2s served as fighter aircraft, they also performed the task of acquisition and designation of targets for the TAF and TURAF. In such a narrow operation area like Idlib and its surroundings, a squadron of armed UAVs were employed simultaneously. ANKA-S through SATCOM and Bayraktar TB2s through the line of sight (LOS) data link, conveyed the image and coordinate data they obtained to the air and artillery elements via the TAF Integrated Communication System (TAFICS). Fire planning, coordination, and execution were also managed with the domestically developed ADOP-2000 Fire Support Automation System. In brief, it can be said that armed UAVs served as artillery forward observers, forward air controllers, and fighter aircraft.[71]

Furthermore, a primary electronic warfare asset KORAL was employed extensively by the TAF against the Syrian air defense systems.[72] Moreover, the TURAF made a demonstration of network-centric warfare without using Syrian airspace via Boeing 737 airborne early warning and control aircraft, F-16 fighter jets, and AMRAAM beyond visual range air-to-air missiles which facilitating the downing of the Syrian Air Force's Su-24s blocking the maneuver of Turkish UAVs.[73]

In contrast to Idlib, in Libya, which is another theater of war where Turkey deployed UAVs in 2019 to support the UN-recognized Government of National Accord (GNA) under the framework of MoU signed between Turkey and Libya, the Turkish drones' operational reach has been tested and so far has resulted in accomplishing remote aerial assistance missions. So much so that Turkish UAVs were labeled "Pantsir Killers" in social media because of discrediting Russia's air defense technologies.

In June 2019, it was reported that the Libyan Government of National Accord (GNA) employed Bayraktar to strike Mitiga International Airport that is controlled by Khalifa Haftar's

68. "SİHA'ların 'yeni çağı' Türkiye ile başladı", *TRT Haber*, 3 March 2020, retrieved from https://www.trthaber.com/haber/gundem/sihalarin-yeni-cagi-turkiye-ile-basladi-464465.html ; "Türk SİHA'ları elektronik harbe karşı da çok güçlü", *TRT Haber*, 28 May 2020, retrieved from https://www.trthaber.com/haber/gundem/turk-sihalari-elektronik-harbe-karsi-da-cok-guclu-487784.html

69. "Damage Caused to Assad Regime Assets Demonstrates Turkey's High UAV Capabilities", *Daily Sabah*, 1 March 2020, retrieved from https://www.dailysabah.com/business/defense/damage-caused-to-assad-regime-assets-demonstrates-turkeys-high-uav-capabilities; "Syria War: Alarm After 33 Turkish Soldiers Killed in Attack in Idlib", *BBC News*, 28 February 2020, retrieved from https://www.bbc.com/news/world-middle-east-51667717

70. "Erdoğan: İdlib'de 59 şehit verdik", *Sözcü*, 8 March 2020, retrieved from https://www.sozcu.com.tr/2020/gundem/erdogan-idlibde-59-sehit-verdik-5667724/

71. Arda Mevlütoğlu, "Bahar Kalkanı Harekatı'na Dair Gözlemler 1: Türk Tipi Keşif-Taarruz Kompleksi mi?", *Siyah Gri Beyaz*, 31 March 2020, retrieved from https://www.siyahgribeyaz.com/2020/03/bahar-kalkan-harekatna-dair-gozlemler-1.html

72."How Turkey Won the Electronic Warfare Battle against Syria in Idlib", *Defence World. Net,* 2 April 2020, retrieved from https://www.defenseworld.net/news/26643/How_Turkey_Won_the_Electronic_Warfare_Battle_Against_Syria_in_Idlib#.XtYb5TozZPY

73. Can Kasapoğlu, "Turkey's Drone Blitz over Idlib", *Jamestown Foundation*, 17 April 2020, retrieved from https://jamestown.org/program/turkeys-drone-blitz-over-idlib/#:~:text=Between%20February%2027%20and%20March,Moscow%20into%20brokering%20a%20ceasefire.

Libyan National Army (LNA). It was claimed that at least three Bayraktar TB2s were operative over Tripoli airspace to prevent Haftar's forces from seizing Tripoli.[74] Moreover, in April 2020, it was reported that near Tarhuna, one of the supply lines from Al Jufra Airbase, an Antonov An-26 cargo plane carrying ammunition for LNA forces was destroyed in an airstrike by the GNA forces.[75] Pantsir-S1 air defense systems along with the Krasuhka Electronic Warfare System were destroyed during the operations carried out on May 17-18, 2020. These systems were provided to the Russian private military company Wagner to support their activities in Libya.[76] At the time of writing this paper, Bayraktar TB2 armed UAVs under the control of GNA forces are continuing to neutralize the air defense systems, logistic support vehicles (truck, cargo aircraft, etc.), and armored vehicles of Haftar's forces.[77] Also, KARGU Autonomous Tactical Multi-Rotor Attack UAV developed by STM was spotted on May 27, 2020 in the Ain Zara region, for the first time.[78] A critical location, Watya Airbase was captured with the assistance of Turkish UAVs on May 18, 2020. While the retreat of Haftar's forces has stopped nowadays, military cargo planes have made multiple flights between Libya and Turkey that was referred as Turkey is preparing for an operation to show the flag.[79] This break is referred to as a "tactical pause" which paves the way for the reorganization of the combatants.[80]

Despite these proven combat achievements in highly intense conflict areas, it should be born in mind that Turkish UAVs are not immune to shortcomings. For example, at low altitudes, both ANKA and Bayraktar UAV systems are vulnerable to surface-to-air missiles (SAM). Therefore, prolonged wars may raise losses. Under those conditions, maintaining an effective operational tempo depends on the country's production rate and capabilities to replace lost aircraft. Furthermore, limited control of the terrain may affect the range of the operation, as well. To illustrate, in Libya, Turkey has overcome the hardships in the communication systems of Bayraktar UAVs by using ground relay stations to broaden the range of the UAVs operating 150 km from Mitiga International Airport. Likewise, the development of a SATCOM communication link contributed toward ANKA UAVs being able to fly deeper into Syria.[81] Indigenous manufacturing solutions play a significant role in coping with the challenges. To exemplify, the employment of MAM-L and MAM-C smart munitions, contributed to overcoming the shortcomings related to the firepower and payload capacity, and increased the accuracy of the strikes.[82] Similarly, the domestically produced KORAL Electronic Warfare System also

74. "Libya: Turkish-Made Bayraktar TB2 UAV Seen at the GNA-Held Airbase", *African Military Blog*, 11 June 2019, retrieved from https://www.africanmilitaryblog.com/2019/06/libya-turkish-made-bayraktar-tb2-uav-seen-at-the-gna-held-airbase?v=65d8f7baa677

75. "Libyan Army Hits Cargo Plane Carrying Arms for Haftar", *Anadolu Agency*, 7 May 2020, retrieved from https://www.aa.com.tr/en/africa/libyan-army-hits-cargo-plane-carrying-arms-for-haftar/1831970

76. "Rus medyası: Pantsir- S1 Libya'da Bayraktar TB2'nin şöhretine ciddi zarar Verdi", *Defence Turk. Net*, May 2020, retrieved from https://www.defenceturk.net/rus-medyasi-pantsir-s1-libyada-bayraktar-tb2nin-sohretine-ciddi-zarar-verdi

77. Ibid.

78. "Indigenous Kamikaze Drone KARGU by STM Appears in Libya", *Defence Turk. Net,* 28 May 2020, retrieved from https://en.defenceturk.net/indigenous-kamikaze-drone-kargu-by-stm-appears-in-libya/

79. "Air Bridge between Libya and Turkey", *Defence Turk. Net,* 1 June 2020, retrieved from https://en.defenceturk.net/air-bridge-between-libya-and-turkey/; "Cargo Flights from Istanbul to Libya per Week", *Twitter*, 1 June 2020, retrieved from https://twitter.com/Gerjon_/status/1267463770659524616?s=20

80. Scott Crino and Andy Dreby , "Drone Losses Impact Turkey's Fighting in Libya", *Small Wars Journal*, 10 May 2020, retrieved from https://smallwarsjournal.com/jrnl/art/drone-losses-impact-turkeys-fighting-libya

81. Ibid.

82. Can Kasapoğlu, "Turkey's Drone Blitz over Idlib", *Jamestown Foundation*, 17 April 2020, retrieved from https://jamestown.org/program/turkeys-drone-blitz-over-idlib/#:~:text=Between%20February%2027%20and%20March,Moscow%20into%20brokering%20a%20ceasefire.

MAM-L SMART MICRO MUNITION

Smart Micro Munition MAM-L has been developed for unmanned aerial vehicles (UAV), light attack aircrafts and air-ground missions for low payload capacity air platforms. MAM-L can engage both stationary and moving targets with high precision.

Technical Specifications

Diameter	160 mm
Length	1 m
Weight	22 kg
Range	8 km (14 km with Inertial Navigation System/Global Positioning System Option)
Seeker	Semi-Active Laser Seeker
Warhead Types	Tandem Effective Against Reactive Armor High-Explosive Blast Fragmentation Thermobaric
Fuse	Impact Proximity
Platforms	(Tr) İHA

Figure 11: MAM-L Smart Micro Munition. Source: Roketsan, retrieved from https://www.roketsan.com.tr/en/product/mam-l-smart-micro-munition/

MAM-C SMART MICRO MUNITION

Smart Micro Munition MAM-C has been developed for unmanned aerial vehicles (UAV), light attack aircrafts and air-around missions for low payload capacity air platforms. MAM-C can engage both stationary and moving targets with high precision.

Technical Specifications

Diameter	2.75″ (70 mm)
Length	970 mm
Weight	6.5 kg
Range	8 km
Seeker	Semi-Active Laser
Warhead Types	Multi-Purpose Warhead (Blast Fragmentation, Incendiary and Armor Piercing) High-Explosive Blast Fragmentation
Platforms	(Tr) İHA

Figure 12: MAM-C Smart Micro Munition. Source: Roketsan, retrieved from https://www.roketsan.com.tr/en/product/mam-c-smart-micro-munition/

assisted in jamming and deceiving the hostile radars intercepting Turkish UAVs.[83]

Lastly, it can be assumed that sustainable sectoral development in Turkey's robust UAV program may contribute to Turkey gaining strategic independence. Even in highly contested battlegrounds like in the Middle East, the Eastern Mediterranean, and North Africa, indigenous solutions provided operational flexibility to the TAF. For example, Turkey has deployed Bayraktar TB2s to Northern Cyprus amid growing tensions between Cyprus and Turkey recently. Bayraktar TB2s provided surveillance for Turkish drilling vessels in the disputed zones.[84] Thanks to the advances in the drone industry, Turkey can make its military presence felt on multiple battlegrounds simultaneously while guaranteeing and protecting Turkey's geopolitical interests - without boots on the ground.

CONCLUSION

For a nation once largely reliant on foreign technology to maximize its military power, the development of indigenously built technologies is crucial in terms of gaining strategic independence not only in combating terrorism but also in gaining strategic leverage against Turkey's rivals. In the past decades, serious progress has been achieved in developing UAV systems, subsystems, and promoting the required human resources and know-how.

Turkey's domestically introduced drone program contributed to improving Turkey's warfighting capabilities as an efficient user, while concurrently Turkey benefitted from shaping the market as a competitive manufacturer. Most importantly, Turkey's drone program has paved the way for a transformation in conventional military norms and practices. Turkish UAVs have been materialized as a decisive counterterrorism tool and have served as artillery forward observers, forward air controllers, and fighter aircraft in highly contested operational environments. What is more, Turkey seized the opportunity to demonstrate its coordinated and network-centric warfare capabilities with the help of these innovative products.

Serving as a guarantor and protector of Turkey's geopolitical interests, Turkish drones may become more operative in the ongoing conflict zones in the near term. The efficient utilization of such a multifaceted and multitasking technological asset depends on the generation of new military norms and C2 regulations. Otherwise, in a world in which there is a growing tendency for autonomous systems and artificial intelligence, the TAF's readiness for the future combat environment will remain questionable.

83. "İdlib'de rejim unsurlarını 'Koral' kör etti", *TRT Haber*, 1 March 2020, retrieved from https://www.trthaber.com/haber/bilim-teknoloji/idlibde-rejim-unsurlarini-koral-kor-etti-464085.html

84. "KKTC semaları Türk İHA'larına emanet", *Savunma Sanayii Dergilik*, 16 December 2019, retrieved from https://www.savunmasanayiidergilik.com/tr/HaberDergilik/KKTC-semalari-Turk-iHA-larina-emanet

THE ASCENSION OF TURKEY AS A DRONE POWER

HISTORY, STRATEGY, AND GEOPOLITICAL IMPLICATIONS

SIBEL DÜZ

SETA | ANALYSIS

This paper investigates the trajectories of Turkey's drone program, its historical origins, strategical rationality, and geopolitical implications. The paper historically contextualizes and empirically analyzes Turkey's "drone strategy" by focusing on industrial, military, and geopolitical dimensions. In the first part, it examines the historical evolution of Turkey's drone program. The second part, assesses Turkish companies' successful initiatives and their impacts on Turkey's boosting drone industry. In the third and final part, the paper seeks to unpack the question of how Turkey's robust unmanned aerial systems development program serves Turkey's geopolitical interests and military power projection in conflict zones such as Syria and Libya.

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