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Occasional Paper

Armed Drones in the Middle East

Proliferation and Norms in the Region

Aniseh Bassiri Tabrizi and Justin Bronk



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RUSI Occasional Paper, December 2018



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Published in 2018 by the Royal United Services Institute for Defence and Security Studies.



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RUSI Occasional Paper, December 2018. ISSN 2397-0286 (Online).

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RUSI is a registered charity (No. 210639)

Contents

Executive Summary	v
Introduction	1
I. Methodology	5
II. Country Analyses	7
Group 1: Airpower Norms Unaffected by the Acquisition of Armed UAVs	7
Group 2: Airpower Norms Changed Following Acquisition of Armed UAVs	22
III. Key Findings and Implications	39
The Proliferation of Armed Drones in the Middle East	39
The Use of Armed Drones in the Middle East	39
About the Authors	43

Executive Summary

The goal of this project is to contribute to the existing knowledge base on unmanned aerial vehicle (UAV) proliferation and its broader implications by focusing specifically on the Middle East.

The two main research questions addressed in this paper are:

- What are the flows of UAV technology from and to the Middle East and their uses?
- Which norms, practices and methodologies are exported to and/or used by Middle Eastern powers in the deployment of UAV technology?

The focus of the study is on UAVs that fall under the 'Category 1' and 'Category 2' definitions of the Missile Technology Control Regime. In the Middle East, the countries that operate or simply possess these drones are Jordan, Iraq, Israel, Saudi Arabia, the UAE, and Turkey.

This paper thus provides an in-depth inventory of armed drones, as defined under the two categories, possessed by each of these states, assessing how many, which types, how and when they were acquired. It also explores where and how each of these states have used their armed drones.

The main conclusions drawn by this paper are that over the past few years more and more countries across the Middle East have acquired armed drones, either by importing them (Jordan, Iraq, Saudi Arabia and the UAE) or by building them domestically (Israel, Iran and Turkey). China, a no-questions-asked exporter of drones, has played and is likely to continue playing a key role as a supplier of armed UAVs to the Middle East.

In terms of use, the introduction of UAVs into service seems to have affected the employment and understanding of airpower only in the cases of Iran, Turkey and the UAE. For all other countries in this study, while armed drones are still perceived as a matter of prestige and are viewed positively by the political establishment and the population, their acquisition has not resulted in a visible change in the way those countries view their own airpower and the projection of power through strikes.

Introduction

DRONES ARE INCREASINGLY ubiquitous in counterinsurgency and low-intensity conflicts, especially in the Middle East. Their ability to gather covert intelligence and deliver strikes against hard targets relatively cheaply and with impressive endurance, allowing them to remain on station providing continuous support for many hours at a time, has made them the weapon of choice for many militaries.

In the Middle East, a growing number of actors (both state and non-state) have rapidly moved from the development and acquisition of armed drones to regular employment of these weapons for lethal effects.

While technology from the US still leads the way in military unmanned aerial vehicle systems (UAVs), the country has followed a selective drone export policy, intended to prevent drones from 'fall[ing] into hostile hands, be[ing] used to suppress civil unrest or ... erode Israel's military dominance'.¹ The policy has been widely credited with driving the global proliferation of drones by pushing countries that cannot purchase US-made drones towards either domestic drone production or the acquisition of non-US-made drones.²

China, in particular, has become an increasingly influential player, 'taking advantage of that hole in the market'.³ Some within China believe that by implementing a selective export policy on drones, the US was trying to maintain its dominant and exclusive role in the field.⁴ Instead, by capitalising on the gap created in the market, over the past few years, Beijing has supplied armed drones to several countries that are not authorised to purchase them from the US, and at a dramatically cheaper price.⁵

China has often been described as a no-questions-asked exporter of drones,⁶ one 'less encumbered by human rights considerations over its sales of drones'.⁷ The country is not a member of the

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1. Jeremy Page and Paul Sonne, 'Unable to Buy U.S. Military Drones, Allies Place Orders with China', *Wall Street Journal*, 17 July 2017.
 2. Noel Sharkey, 'The Automation and Proliferation of Military Drones and the Protection of Civilians', *Law, Innovation and Technology* (Vol. 3, No. 2, 2011), pp. 229–40; Majed Akhter, 'The Proliferation of Peripheries: Militarized Drones and the Reconfiguration of Global Space', *Progress in Human Geography* (Vol. 2, No. 10, 2017), p. 7.
 3. Sharkey, 'The Automation and Proliferation of Military Drones and the Protection of Civilians', p. 231.
 4. Author interview with specialist on Chinese international relations, Beijing, 23 July 2018.
 5. Sharon Weinberger, 'China Has Already Won the Drone Wars', *Foreign Policy*, 10 May 2018.
 6. Adam Rawnsley, 'Meet China's Killer Drones', *Foreign Policy*, 14 January 2016.
 7. Michael J Boyle, 'The Race for Drones', *Orbis* (Vol. 59, No. 1, 2015), p. 84.

Missile Technology Control Regime (MTCR).⁸ In fact, it is still not clear whether drones fall under the civilian, dual-use or military items category in China.⁹ The country is still debating the issue of export control on UAVs and, while not necessarily opposed to the establishment of a new set of norms created by the UN applying specifically to drones and avoiding proliferation, at the moment it de facto does not abide by any principle that constrains its exports.¹⁰

This is despite the fact that China is aware that drones, like all new technologies which facilitate remote warfare, might inherently lead to unintended consequences, such as civilian casualties or the reduction of the threshold for the escalation of confrontations.¹¹

Beijing follows only two criteria when choosing its clientele. The first is that it deals only with states, which it sees as reliable actors that do not raise any concerns about drone proliferation – this would worry China only if UAVs fall into the hands of terrorist groups and non-state actors, in line with Beijing’s broader view about sovereignty and its opposition to separatist groups and non-state actors.¹² The second is that it prioritises countries that want to use drones for counterterrorism (CT) operations. For China, UAVs that have the capacity to carry out reconnaissance and precision strikes constitute an ideal CT tool, both for its own purposes and for its customers.¹³

In the Middle East, China prides itself on not taking any side, seeing all countries in the region as potential clients and selling armed UAVs, in particular, to those which have a security concern and which, without such aircraft, would not be capable of dealing with the CT threat (Jordan, Iraq, Saudi Arabia, and the UAE).¹⁴ The question of whether China also supplies clients with

8. The MTCR is a 30-year-old agreement that aims to limit the spread of missile technology and is frequently interpreted by members as applying to armed UAVs in addition to cruise missiles. China has informally agreed to abide by the original provisions of the 1987 agreement, but not subsequent revisions. In interviews conducted by the authors in Beijing, China’s opposition to becoming a member was explained as being due to the lack of universality of the legislation. It was also argued that the MTCR is not suitable for drones and should apply only to missiles; author interviews with specialists on Chinese international relations and disarmament, Beijing, 23–24 July 2018.

9. Author interview with practitioners familiar with Chinese defence matters, Beijing, 24 July 2018.

10. Author interviews with specialists on Chinese international relations and disarmament, Beijing, 23–24 July 2018.

11. *Ibid.*

12. Author interviews with specialists on Chinese international relations and disarmament, Beijing, 23–24 July 2018, and London, 24 October 2018.

13. China conducted its first strike against a terrorist target in 2014, see Mathieu Duchâtel, *Terror Overseas: Understanding China’s Evolving Counter-Terror Strategy* (London: European Council on Foreign Relations, 26 October 2016).

14. Author interviews with specialists on Chinese international relations, Beijing, 23–24 July 2018; *Economic Times*, ‘Chinese Armed Drones Now Flying Across Mideast Battlefields’, 3 October 2018; Brenda Goh and Gerry Doyle, ‘U.S., Israeli Drone Makers Keep Wary Eye on Rising Chinese’, *Reuters*, 8 February 2018.

satellite control capabilities using Chinese or commercial satellite networks remains unanswered. Without satellite communications, the operational range of UAVs is limited to line of sight from ground control stations, which varies between around 150km and 200km depending on altitude, topography and other factors. Since the US will not allow the integration of Chinese UAVs into US-designed and/or -operated command, control and communications systems on information security grounds (among others), this is a significant open question as even US-aligned Middle Eastern powers cannot use US/satellite communications to operate their Chinese UAVs.

What this all means for the spread of norms, training, processes and ethical considerations in the Middle East has so far been understudied. There appears to be very little scholarship on the emerging political and operational norms which are being generated by countries in the region.

The goal of this study is twofold: it first aims to provide an in-depth inventory of armed drones possessed by Middle Eastern states, either produced domestically or imported, assessing quantity, types and timeframes; and second, it aims to explore where and how armed drones have been used so far, both by countries that produce their own and those that import them, to assess whether and how their practices and ethical considerations around airpower and airstrikes are affected. The end goal is to contribute to the existing knowledge on UAV proliferation and its broader implications.

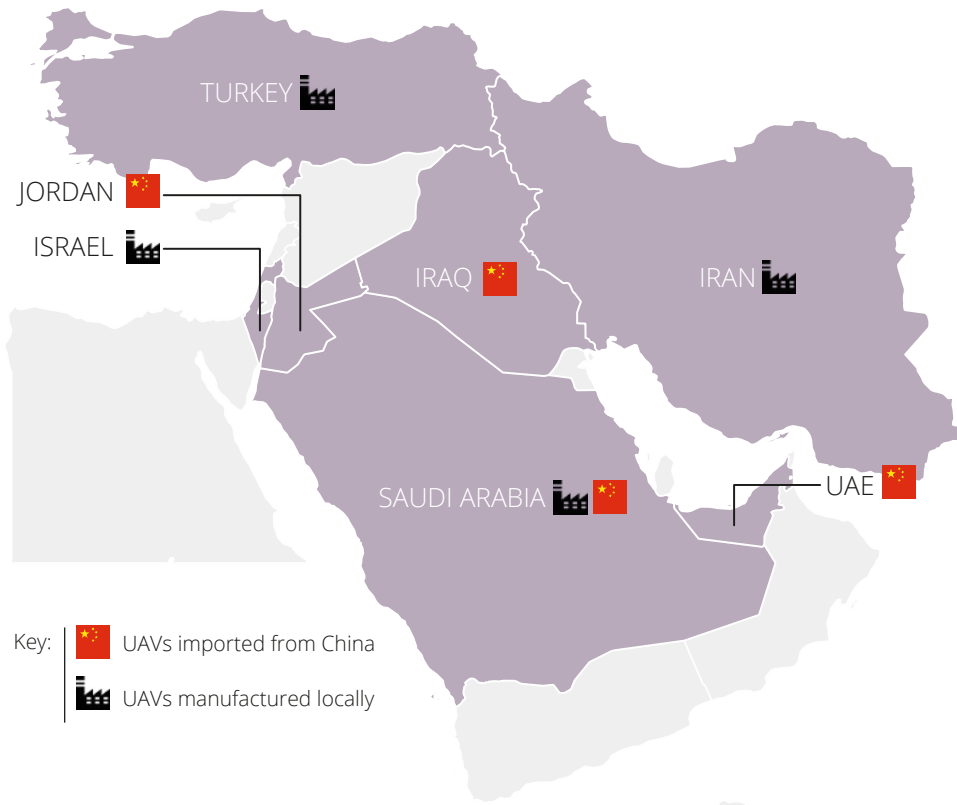
It should be noted that the research findings were not affected by the fact that, in April 2018, the current US administration loosened restrictions on exporting armed drones to allies in the region 'in situations where it will enhance those partners' security and their ability to advance shared security or counterterrorism objectives'.¹⁵ The authors recognise that this change could not only lead to a significant competition between the US and China for influence and access to the regional market, but could also alter the factors influencing the use of drones by Middle Eastern countries.¹⁶ However, at the time of writing, implementation of the regulation was still pending, the status of drones under the MTCR was unchanged, and China was still the only supplier of armed drones to countries in the region.¹⁷ Broader implications are therefore still unclear and are well worth further examination.

15. US Department of State, 'U.S. Policy on the Export of Unmanned Aerial Systems', 19 April 2018.

16. Chinese experts on disarmament and export control argued that the new US regulations do not pose a challenge to China's outreach to the region, given that, unlike Washington, Beijing does not limit its engagement only to allies; author interview with specialists on Chinese disarmament, Beijing, 24 July 2018.

17. Aaron Mehta, 'US to Push New Rules for Drone Agreement in November', *Defense News*, 11 September 2018.

Figure 1: Map of Countries in the Middle East with Armed Drones and their Manufacturing Origin



Source: The authors.

I. Methodology

THE STUDY FOR this paper adopted a qualitative research method, combining both secondary and primary sources. Secondary sources were examined to develop a comprehensive picture of the information available and consisted mainly of research papers, journal articles, academic publications and newspaper articles. Primary sources were comprised mainly of semi-structured individual interviews, conducted between April and September 2018, to fill the gaps identified in the secondary sources.

Key interviewees were met in person in Israel, the UAE, Turkey and China, and contacted by telephone for discussions on Iraq, Saudi Arabia and Iran. They were selected among UAV and air force experts on the specific countries, as well as policymakers and representatives of the companies identified in the secondary literature as responsible for producing or selling armed drones in the region. Most manufacturers, but also several decision-makers, refrained from discussing the research with the authors, given that military development is often a closely kept national security secret. This was broadly anticipated and the potential issue was mitigated by posing specific procurement or policy questions to the experts with whom discussions took place. As requested by those interviewed who highlighted the sensitivity of the topic, quotes and references have been anonymised.

The emerging conclusions were tested at a private roundtable discussion in London at RUSI in November 2018, which brought together the authors and a range of leading country and subject-matter experts. In particular, the roundtable gathered experts on defence and security in Iran, Israel, Saudi Arabia, Turkey and the UAE, based both in the region and in the US, together with experts on lethal autonomy and remote warfare, based in London or the US.

The research questions for this study were:

- What are the flows of UAV technology from and to the Middle East and their uses?
- Which norms, practices and methodologies are exported to and/or used by Middle Eastern powers in the deployment of UAV technology?

In order to bound these research questions and to distinguish the use of UAVs from the widespread adaptation of small 'tactical' drones based on civilian quadcopters and model aircraft by state and non-state groups, this study focuses on UAVs which fit the 'Category 1' and 'Category 2' definitions of the MCTR, where Category 1 is defined as those capable of a range of at least 300km with a payload of at least 500kg, and Category 2 are those capable of a range of at least 300km, regardless of payload.

The research focused on the seven countries in the Middle East that operate or simply possess drones that fall under these categories – Jordan, Iraq, Israel, Saudi Arabia, Iran, the UAE, and Turkey.

Given the nature of the findings, the paper divides these countries into two groups, based on the discernible impact of armed UAVs on the employment and understanding of airpower within each country after introduction into service.

The criteria determining which category countries fall into followed three major lines of enquiry:

- Has the introduction of armed UAVs into service conferred new capabilities that lead to the ability to exhibit new operational norms and behaviours?
- Are armed UAVs seen as useful for dealing with targets in higher-threat operating environments which might preclude the use of more traditional manned fighters due to an unacceptable risk of loss or the lack of available combat search-and-rescue capabilities in the event of a downed airman?
- Are armed UAVs seen as a useful tool for avoiding the political and/or potentially escalatory ramifications of extra-territorial operations? Is the perception that the use of armed drones will not have the same reaction as a manned aircraft? Have operations been conducted that are politically unlikely to have been approved without armed UAVs?

The first group includes countries for which the acquisition of armed drones has not resulted in a visible change in the way they view their own airpower and the projection of power through strikes. These are Jordan, Iraq, Israel and Saudi Arabia, for whom the answer to the questions above is negative.

The second group includes countries which have exhibited changes in the way they employ airpower following their acquisition of armed drones. These are Iran, the UAE and Turkey, for whom the answer to the questions above is mainly positive.

II. Country Analyses

Group 1: Airpower Norms Unaffected by the Acquisition of Armed UAVs

The acquisition of armed UAV capabilities has thus far not fundamentally altered the way in which the countries in this group perceive the utility of airpower, nor the sort of strike operations they conduct. Countries in this category have so far used armed UAVs within similar command-and-control (C2) structures and procedures as those used for manned combat aircraft, such as fast jets and helicopter gunships.

Jordan

Inventory

For many years a country at the centre of a difficult military and political balancing act between its Arab neighbours, Israel, non-state actors such as Hamas and Hizbullah, and strong relationships with Western countries, in particular the UK, Jordan has long maintained modestly sized but highly professional and well-equipped armed forces. With the threat of Daesh (also known as the Islamic State of Iraq and Syria, ISIS) in neighbouring Iraq since 2014, Jordan has been exploring options for purchasing armed UAVs from the US for some years, without success. The US rejected a request from Jordan for unarmed Predator XP drones, despite selling them to the UAE.¹⁸

Likely as a result of this rejection, Jordan is rumoured to have acquired two Chinese CH-4Bs from China, manufactured by China Aerospace Science and Technology Corporation (CASC), sometime around 2016 – following a pattern common to several states in the region.¹⁹ In their standard form, CH-4Bs are capable of delivering guided AKD-10 series Chinese air-to-ground missiles. The AKD-10 is of a similar size and class to the US AGM-114 Hellfire, used as the primary weapon for the US MQ-1 Predator and MQ-9 Reaper. It is uncertain whether the CH-4Bs have yet been cleared for operational service in Jordan. In November 2018, the Assistant Commander of the Royal Jordanian Air Force stated in an interview that the Royal Jordanian Air Force (RJAF) is not happy with the CH-4B and may retire them, without elaborating on why.²⁰ There has been no further confirmation or denial on this since.

18. Kate Brannen, 'U.S. Firm Denied Request to Market Drones to Jordan', *Foreign Policy*, 5 February 2015.

19. See, for example, Page and Sonne, 'Unable to Buy U.S. Military Drones, Allies Place Orders with China'.

20. See Alan Warnes, 'The Assistant AF Commander of the Royal Jordanian Air Force isn't very happy with his Chinese CH-4B armed UAVs. The RJAF looks set to retire them. He wouldn't elaborate on the issues' [Twitter post], 6:25am, 13 November 2018, <<https://twitter.com/warnesyworld/status/1062350646588948480>>, accessed 5 December 2018.

Box 1: CH-4B Rainbow UAV

- Type: medium-altitude, long-endurance (MALE) UAV
- Manufacturer: CASC
- Number: 2
- Endurance: Up to 40 hours depending on payload
- Weight (maximum take-off weight, MTOW): 4,500kg
- Payload Capacity: 345kg
- Range: >1,000km with SatCom, around 150km from ground control station if not
- Sensor Options: infra-red (IR) and electro-optical (EO) cameras, and laser designator in sensor ball
- Weaponry: Up to 345kg of payload on 4–6 wing hardpoints including: the AKD-10 air-to-surface anti-tank missile; BRMI-90 90-mm guided rocket; FT-7/130 130-kg glide bombs; FT-9/50 50-kg bomb; FT-10/25 25-kg bomb; GB-7/50 50-kg precision-guided munition (PGM); and GB-4/100 PGM

Image Source: Screenshot taken from Iraqi state media broadcast, <<https://www.youtube.com/watch?v=q6zYXr5JZ8Q>>, accessed 28 November 2018.²¹

Use

Given the lack of a robust threat and the existence of adequate military capabilities without the introduction of armed drones into service, the acquisition of CH-4Bs has not affected the way in which Jordan perceives the utility of airpower.

21. Due to the secretive nature of most military programmes in the Middle East, high-quality open-source images of some of the UAVs discussed in this paper were unavailable or inaccessible to the authors. To provide a rudimentary depiction of these UAVs to allow for the comparison of their basic features, lower-quality images have been obtained from publicly available sources where possible and from other sources where needed.

For a small, highly specialised force that must spend most of its resources on combat operations and state-on-state deterrence capabilities, the CH-4Bs are likely to be more of a demonstration of armed UAV country status rather than a core front line asset.

Chinese CH-4Bs are not interoperable with Western C2 systems, and the RJAF is heavily designed around being able to take part in US-led coalition operations with its F-16 and F-5 fast jets. Its personnel make much use of training arrangements with France, the UK and the US, and most of its electronic systems conform to Western standards. Although the CH-4Bs' claimed endurance of up to 40 hours would undoubtedly be useful for surveillance against hostile activity on Jordan's borders by non-state actors, the fact that the data they collect cannot be easily fed into the RJAF's C2 systems limits them to a niche role. Much like the UAE, the primary goal of acquiring Chinese-armed UAVs may be to convince the US to sell Jordan the MQ-9 Reaper or MQ-1 Predator, which are more capable and would be much easier to integrate into the RJAF's mission-planning, intelligence, surveillance and reconnaissance (ISR), and C2 architectures.²²

The threat from Daesh is also much reduced, especially in Iraq, making the immediate operational imperative to induct the CH-4B into front line operations for border policing and security less pressing.

Given that military capabilities in Jordan are tightly controlled within the armed forces under the monarchy, it is unlikely that armed UAVs would in any case be employed outside the normal air force C2 structures and hierarchies, making it extremely unlikely that, even if and once they came into service, armed UAVs would lead to new operational norms and behaviour.

Iraq

Inventory

The Iraqi Air Force, reconstructed with US guidance and support following its destruction during the 2003 invasion, is a young force, but has already seen a great deal of combat following the rise of Daesh in 2014.

Since the invasion, Iraq has pursued a very flexible strategy towards combat aircraft – acquiring them from Russia, the US, Iran and China. This has resulted in an eclectic mix of aircraft types ranging from Soviet-era Su-25 'Frogfoot' ground-attack aircraft to modern US F-16 Vipers, light and heavy pattern attack helicopters, and even the AC-208 Combat Caravan (converted Cessna 208 light aircraft fitted with a sensor ball and hardpoints for twin AGM-114 Hellfire missiles). All these capabilities were acquired at high speed in a desperate rush to increase Iraq's capability to support its ground forces in the battle to drive out Daesh – and strikes with all types were as heavy and frequent as supplies of munitions would permit throughout much of 2014–2017.

22. Confirmed by multiple author telephone interviews with experts in Middle Eastern geopolitics, July/August 2018.

During this period, the US and the UK deployed significant numbers of MQ-9 Reaper UAVs for ISR and strike missions to aid Iraqi forces, alongside large numbers of fast jets. However, Iraq was refused permission to buy either MQ-1 or MQ-9 UAVs from the US, and therefore, in 2015, purchased at least three CH-4B armed UAVs from China (manufactured by CASC) as a rapid way to improve the air force's persistence and ability to provide fire support to ground forces. Iraq may have subsequently acquired one or two additional airframes, although this is unconfirmed.

Box 2: CH-4B Rainbow UAV



- Type: MALE UAV
- Manufacturer: CASC
- Number: 4
- Endurance: Up to 40 hours depending on payload
- Weight (MTOW): 4,500kg
- Payload Capacity: 345kg
- Range: >1,000km with SatCom, around 150km from ground control station if not
- Sensor Options: IR and EO cameras, and laser designator in sensor ball
- Weaponry: Up to 345kg of payload on four to six wing hardpoints including: the AKD-10 air-to-surface anti-tank missile; BRMI-90 90-mm guided rocket; FT-7/130 130-kg glide bombs; FT-9/50 50-kg bomb; FT-10/25 25-kg bomb; GB-7/50 50-kg PGM; and GB-4/100 PGM

Image Source: Screenshot taken from Iraqi state media broadcast, <<https://www.youtube.com/watch?v=q6zYXr5JZ8Q>>, accessed 28 November 2018.

Use

In general, the acquisition and introduction into service of the CH-4B has not changed Iraq's airpower norms and behaviours, nor the way in which the Iraqi Air Force employs its strike

aircraft, even though armed UAVs were perceived as a useful tool considering the higher-threat operating environment engendered by Daesh.

Iraq's CH-4Bs have only ever been observed being controlled directly via ground stations as the country does not have satellite communication capabilities and the CH-4B is not interoperable with Western systems. Chinese specialists have been instrumental in early operations and training Iraqi operators to use the system since it was first unveiled at Al-Kut Airbase in October 2015.²³ The extent to which Chinese operators followed Chinese operational procedures and standards (which are still embryonic) or were directed to follow Iraqi rules of engagement is an important question that this study has not been able to answer.

Since October 2015, the CH-4Bs have been in regular use against both static targets, such as munitions caches and artillery pieces, and the extremely dangerous vehicle-borne improvised explosive devices which are heavily used by Daesh. As of mid-2018, the Iraqi Air Force claimed more than 260 strikes had been carried out by its CH-4Bs.²⁴ As well as being comparatively inexpensive to purchase and operate, the Iraqi Air Force appreciated the ability to purchase large numbers of low-cost Chinese AR-1 and FT-9 munitions for their CH-4Bs as needed. The slower, more formal US foreign military sales process left the country short of AGM-114 Hellfire missiles for its AC-208s early in the fight against Daesh.²⁵

However, since the US considers Chinese UAVs to be a potential information security threat, the Iraqi CH-4Bs are not integrated into the coalition ISR and air operations picture, rendering them unsuitable for use in operations where Western special forces and advisers might be near Iraqi forces on the ground – such as during the Battle of Mosul.

The pressing operational imperative presented by Daesh meant that the UAVs were rapidly employed for strikes in support of friendly forces on the ground as soon as they were delivered, with little opportunity to explore specialised C2 or tasking architectures. Due to the broad range of Soviet/Russian, American, Iranian and Chinese platforms in the Iraqi Air Force inventory, the lack of CH-4B compatibility with Western C2 systems is less of a handicap than for other US-aligned countries in the region. The Iraqi Air Force is already accustomed to operating a range of platforms that are similarly not interoperable.

In terms of extra-territorial operations, it is notable that in April 2018 the Iraqi Air Force carried out strikes against Daesh targets across the border in Syria, but chose to employ its F-16s rather than armed UAV capabilities. This may be due partly to the fact that in late 2016, Iraq's CH-4B force was moved to sit under army command, primarily due to political concerns over key air

23. Arnaud Delalande, 'Iraq's Chinese Made Killer Drones are Actually Pretty Good', *War Is Boring*, 21 February 2018.

24. *Ibid.*

25. For example, see Martha Raddatz, 'Iraqi Military Out of Hellfires in Battle Against ISIS', *ABC News*, 21 June 2014.

force and army leadership personalities.²⁶ However, since the personnel operating the UAVs have not changed – simply rebadged – this is unlikely to have a major effect on current operational norms. In general, the CH-4Bs were acquired and have been used for the same purposes as Iraq's other airpower capabilities: to rapidly increase the firepower available to combat Daesh on Iraqi soil as fast as possible. With the diminishing threat from Daesh, it remains to be seen how the Iraqi army will use its armed UAVs, but so far there are no indications of major changes.

Israel

Inventory

Precise numbers of Israeli UAVs are extremely hard to come by, as databases and reference publications that are usually most reliable on inventories, such as the Stockholm International Peace Research Institute and the International Institute of Strategic Studies' Military Balance, contain no solid figures. However, as one of the world's leading UAV users and manufacturers, and as a country with a very high average operational tempo, it is fair to assume that Israel is one of the largest operators of armed UAVs in the Middle East.

In mid-2017, it was estimated that Israel accounted for more than 60% of international UAV exports over the previous three decades and had delivered 165 UAV units to foreign buyers in that time.²⁷ All known exports have been supplied unarmed. The vast majority of the Israeli Defense Forces' (IDF) UAV inventory is also unarmed since their primary function in Israeli doctrine remains the provision of real-time situational awareness for ground forces. However, although it is official Israeli policy to not discuss armed UAV operations, the country does operate at least three types of UAVs which can be armed and have been used to conduct regular strikes against suspected militant targets – the Heron TP, the Hermes 450 and the Hermes 900.

Israel is also a major innovator in anti-drone systems. Its radar-based system, known as the Drone Dome, can identify targets and use a laser to neutralise them from several kilometres away.²⁸

26. Author telephone interview with Iraqi Air Force expert, 15 October 2018.

27. Elisa Catalano Ewers et al., 'Drone Proliferation: Policy Choices for the Trump Administration', Center for a New American Security, June 2017.

28. Richard Tomkins, 'Rafael Unveils Drone Dome Anti-Drone System', *United Press International (UPI)*, 23 June 2018.

Box 3: Heron TP UAV

- Type: MALE UAV
- Manufacturer: Israel Aerospace Industries
- Number: Likely 10–15
- Endurance: 30+ hours
- Loaded Weight: 5,670kg
- Payload Capacity: 2,700kg
- Range: 1,000km+
- Sensor Options: IR and EO cameras; ground moving target indicator (GMTI); synthetic aperture radar (SAR); electronic intelligence (ELINT); electronic warfare (EW) and laser designator
- Weaponry: Potentially capable of carrying Rafael Spike anti-tank missiles or other weaponry

Image Source: Wikimedia.

Box 4: Hermes 450 UAV

- Type: MALE UAV
- Manufacturer: Elbit Systems, Israel
- Number: Likely 20–30
- Endurance: 17–35 hours depending on model and payload fit
- Loaded Weight: 450kg
- Payload Capacity: 180kg
- Range: 300km (limited by line of sight to ground control station)
- Sensor Options: IR and EO cameras; GMTI; SAR; ELINT; EW and laser designator
- Weaponry: Option for four Rafael Spike anti-tank guided missiles

Image Source: Wikimedia.

Box 5: Hermes 900 UAV

- Type: MALE UAV
- Manufacturer: Elbit Systems, Israel
- Number: Likely 10–15
- Endurance: 36 hours depending on payload
- Loaded Weight: 970kg
- Payload Capacity: 300kg
- Range: 1,000km+
- Sensor Options: IR and EO cameras; GMTI; SAR; ELINT; EW and laser designator
- Weaponry: Internal bay and wing hardpoint options, including four Rafael Spike anti-tank guided missiles

Image Source: Wikimedia.

In terms of proliferation, more than 50 countries are known to be operating Israeli-made reconnaissance UAVs, although, save for Turkey, none are Middle Eastern and all are unarmed.²⁹ Israel is not an official member of the MTCR but has unilaterally agreed to abide by its principles and rules (in much the same way that China has). However, Israel's interpretation of the provisions has not prevented global sales of UAVs which could theoretically be armed and fit the MTCR's Category 1 or 2 definitions in terms of range. Despite that, integration of non-Israeli munitions would be challenging, and the usable payload of Israeli UAVs is significantly lower than the larger US Predator/Reaper family and China's Wing Loong and CH-5 offerings.

Use

Israel has a strong claim as the global pioneer in the development, integration and use of UAVs of a wide variety of classes into its armed forces.

The country's pursuit of UAVs on a mass-produced scale dates back to the operational analysis and lessons learned from the Yom Kippur War in 1973 about the urgent need for significantly improved situational awareness for all land formations.³⁰ Since the mid-1970s, Israel has been a world leader in the development and use of all sorts of UAVs and has aggressively pursued their introduction into service with combat units. The production of UAVs capable of carrying and launching munitions and then recovering to a runway for reuse, such as the Heron TP and Hermes 450, began in the 1990s and is therefore a reasonably recent phenomenon in Israeli UAV developments.

Armed UAVs also seem not to have affected the sort of strike operations that Israel conducts. The country has a policy of never confirming or denying reports of the use of armed UAVs, and Israeli sources in both the industrial and military communities do not discuss the development or use of such weapons. However, there have been many credible reports and even footage over the past decade to support the widespread assumption that in recent years Israel has made regular use of armed Hermes 450 and potentially Hermes 900 UAVs in strikes against suspected militant targets, especially in the Gaza Strip.³¹ There are also unconfirmed reports of Israeli drones carrying out strikes against targets in southern Lebanon, Egypt, Syria and even Sudan.³²

These patterns support the adoption of two distinct operational norms by the Israeli Air Force (IAF) in terms of armed UAV operations. The first is similar to one developed by the United

29. Rob O'Gorman and Chris Abbott, 'Remote Control War: Unmanned Combat Air Vehicles in China, India, Iran, Israel, Russia and Turkey', Open Briefing, September 2013, p. 11.

30. Author interview with senior specialist on IDF technology development, Tel Aviv, 24 July 2018.

31. See, for example, Mark Garlasco et al., 'Precisely Wrong: Gaza Civilians Killed by Israeli Drone-Launched Missiles', Human Rights Watch, 30 June 2009; *Middle East Monitor*, 'Israeli Army Document Confirms Use of Hermes 450 Drones in Assassinations', 7 April 2016.

32. See, for example, Jack Houry, Noa Shpigel and Gili Cohen, 'Syrians Report Israeli Drone Strike Kills Commander of Pro-Assad Militia', *Ha'aretz*, 19 March 2017; Rebecca Tinsley, 'Why Israel Has Bombed Sudan', *Huffpost*, 30 December 2012; *Jerusalem Post*, 'Report: Sudan Shoots Down Israeli Drone', 6 May 2015.

States Air Force (USAF) and RAF in counterinsurgency campaigns using MQ-1 Predator and MQ-9 Reaper UAVs. It consists of employing armed UAVs to conduct interdiction and close air-support strikes as part of their main task of providing long-endurance overwatch and ISR coverage over known trouble spots or active operational areas. In this role, the armed UAV performs much the same tasks as traditional air support using manned ISR platforms and fast jets, except at lower cost and with much greater endurance on station.³³

A second Israeli operational norm, however, is suggested by reported strikes against high-value personnel and weapons shipment targets in Lebanon, Syria and Sudan as part of deniable strikes where ground forces and/or manned strike aircraft are not involved.³⁴ This is using the lower political and human risk associated with armed UAVs, compared with manned strike aircraft, to conduct deniable strikes in areas beyond zones of active armed conflict in situations where they otherwise might not be risked. This is more similar to the CIA/USAF targeted assassination programme, which exploited the lower political and operator risk profile offered by armed UAVs to conduct airstrikes against suspected terrorist targets in Pakistan, Yemen, Somalia and elsewhere.³⁵ Due to the opacity of the Israeli security sector, it is not clear whether this sort of strike, when conducted by Israeli drones, are commanded through the usual IAF structures or fall under intelligence agency direction.

It is important to bear in mind, however, that for the IDF and IAF, the operational possibilities offered by arming UAVs are considered a very useful additional capability to their primary mission, which remains ISR. The Hermes 450 and Hermes 900 can carry ordinance, but their primary role is battlefield surveillance and reconnaissance, and within this role they fit into a large family of UAVs manufactured by Elbit and Israel Aerospace Industries, which range from quadcopters to small ISR UAVs that can be carried in a soldier's backpack, up to the Brigade-level Hermes 900. All can be controlled by common ground stations and passed up and down the levels of ground forces and IAF command depending on the tactical situation.

The general feeling in Israel is that if the benefits of UAVs are seen as primarily centred on armed strikes as opposed to ISR and electronic warfare-focused tasks to enable the wider force, this is indicative of a poor national understanding of UAV operations. For dedicated strike UAVs, Israel has a range of loitering munitions for battlefield strike and suppression of enemy air defences, such as the Harby, Harop and Skystrike. However, these do not fit into the bounds of this study as they have more in common with cruise missiles or precision-guided munitions than UAVs.

It is interesting to note that, although the Law of Armed Conflict and international humanitarian law require that military aircraft be marked as such and that their national allegiance be easily identifiable, Israeli UAVs do not typically carry markings or transponders.

33. Author interviews with specialists on Israeli UAVs, Tel Aviv, 23–24 July 2018.

34. For example, see *BBC*, 'Sudan Arms Factory Blast: Khartoum to Report Israel to UN', 25 October 2012, *Al Jazeera*, 'Israel Says it Launched 200 Strikes in Syria Since 2017', 5 September 2018.

35. On targeted killings and signature strikes, see Dan de Luce and Paul Mcleary, 'Obama's Most Dangerous Drone Tactic is Here to Stay', *Foreign Policy*, 5 April 2016.

The relationship between Israel's UAV industry and the IDF is extremely close compared to other countries examined in this study (except perhaps Turkey), or indeed competitors globally. Part of the reason for this is the very high proportion of senior personnel in the UAV industry who are either retired or still active duty reserves in the IDF. This helps to ensure that there is a deep commonality of understanding of operational priorities and requirements between UAV developers and the IDF. Israel's high tempo of operations and perceived threat levels also foster an environment where the IDF regularly adopts UAV technology, which is not fully mature, to test its initial operational utility and then works closely with the defence industry in the field to refine, mature and develop the platform. This ensures that by the time a UAV becomes visible and available for the world to see from Israeli defence industries, it has probably been in active field and potentially combat testing and spiral development with the IDF for many years.³⁶

Saudi Arabia

Inventory

With a fast jet fleet second only in capability terms to Israel in the Middle East, the Royal Saudi Air Force (RSAF) is not short of traditional means to conduct its long-running air campaigns. However, Saudi Arabia has also joined those countries that look at drone capability as an additional asset. In 2014, the country purchased two Chinese CH-4s, although these may well be the unarmed 'A' variant rather than the armed 'B', and five larger and more heavily armed Wing Loong IIs. In terms of imports, therefore, the Kingdom has purchased remarkably few armed UAVs in comparison to its huge purchases of fast jets and other high-end military equipment.

Nonetheless, it has announced ambitious plans to manufacture its own armed drones, obtaining a licence from the Chinese state-owned Chengdu Aircraft Industry Group (CAIG) to develop up to 300 Wing Loong and potentially CASC's new heavyweight CH-5 armed UAVs.³⁷

36. Author interview with senior specialist on IDF technology development, Tel Aviv, 24 July 2018.

37. Joanna Frew, 'Drone Wars: The Next Generation', *Drone Wars UK*, May 2018, pp. 19–20; Stockholm International Peace Research Institute (SIPRI), 'SIPRI Arms Transfers Database'.

Box 6: CH-4(A/B) UAV

- Type: MALE UAV
- Manufacturer: CASC
- Number: 2
- Endurance: Up to 40 hours depending on payload
- Loaded Weight: 4,500kg
- Payload Capacity: 345kg
- Range: >1, 000km with SatCom, around 150 km from ground control stations if not
- Sensor Options: IR and EO cameras and laser designator in sensor ball
- Weaponry: 'A' variant is unarmed; 'B' variant carries up to 345kg of payload on four to six wing hardpoints including: the AKD-10 air-to-surface anti-tank missile; BRMI-90 90-mm guided rocket; FT-7/130 130-kg glide bombs; FT-9/50 50-kg bomb; FT-10/25 25-kg bomb; GB-7/50 50-kg PGM; and GB-4/100 PGM

Image Source: Screenshot taken from Iraqi state media broadcast, <<https://www.youtube.com/watch?v=q6zYXr5JZ8Q>>, accessed 28 November 2018.

Box 7: Wing Loong II UAV

- Type: MALE UAV
- Manufacturer: CAIG
- Number: 5
- Endurance: Up to 32 hours depending on payload
- Loaded Weight: 4,200kg
- Payload Capacity: 480kg
- Range: >1,000km with SatCom, around 150km from ground control stations if not
- Sensor Options: IR and EO cameras and laser designator in sensor ball
- Weaponry: Up to 480kg of payload on 12 wing hardpoints which can include: AKD-10 air-to-surface anti-tank missile; BRMI-90 90-mm guided rocket; FT-7/130 130-kg glide bombs; FT-9/50 50-kg bomb; FT-10/25 25-kg bomb; GB-7/50 50-kg PGM; and GB-4/100 PGM

Image Source: Wikimedia

Use

Saudi Arabia operates the largest and most modern air force in the Arab world, with hundreds of state-of-the-art fast jets in the shape of modernised F-15S/SA Eagles and Eurofighter Typhoons. Consequently, the acquisition of armed drones seems to have been mainly driven by a matter of prestige and is linked to the Vision 2030 national development plans being spearheaded by the Saudi leadership to create a domestic defence industry, as part of a broader economic reform.³⁸ Armed UAVs, at least for now, have thus not led to a change in the way airpower is viewed in the country and their acquisition does not seem to be triggered by an existing operational requirement due to conceptual future operations.

38. Interview with expert on Saudi Arabian defence matters, London, 2 November 2018.

Saudi Arabia has been heavily involved in air campaigns over the past four years against Daesh in Iraq as part of the US-led coalition and its own campaign against Iranian-backed Houthi rebel fighters in Yemen. It is the latter campaign which has absorbed most of the RSAF's attention in recent years, and some of its growing drone forces have been seen stationed at Sharurah and Jizan airbases near the Yemini border.³⁹

However, there is not a great deal of evidence of the RSAF's use of Wing Loongs for regular operations over Yemen, with most attributing strikes suspected of being carried out by UAVs rather than fast jets to the UAE or the CIA's own targeted assassination programme against Al-Qa'ida affiliates in parts of the country. This may be due partly to stiffening air defences being supplied to the Houthis by Iran – man-portable air defence systems (MANPADS) and even adapted Russian R-27T air-to-air missiles have been fired by ground forces with some regularity against Saudi fast jets and helicopter gunships, causing losses and damaged aircraft.⁴⁰ A CH-4 UAV was filmed crashing in Yemen in August 2018, and another UAV in September 2018, both after being hit with a suspected MANPADS, although it is unconfirmed whether these were Saudi or Emirati airframes.⁴¹

As a large conventional air force, the RSAF appears to be mostly content with the status symbol of drone operator while in practice continuing to rely mostly on their tried-and-tested fast jets for strike operations in Iraq and Yemen, leaving most UAV operations in Yemen to the UAE and the CIA. As in Jordan, the Wing Loongs and CH-4s that have been imported and which are now being produced by Saudi Arabia are not compatible with the RSAF's Western-supplied C2 architecture. Therefore, it would be very difficult to integrate UAV operations into the day-to-day operations at the combined air-operations centre from where the RSAF's campaign against the Houthis is planned and coordinated. Due to their Chinese programming and systems, Wing Loongs and CH-4s are also not interoperable with the RSAF's F-15 and Typhoon fleets, or their E-3 Airborne and Control Warning System aerial C2 platforms. Therefore, the surveillance data they collect and any strikes they might undertake must take place largely in a vacuum – greatly limiting their operational utility.

The belief that Saudi Arabia is not conducting large-scale drone strikes is further supported by the distributed command chain ownership of UAVs in the Kingdom, with armed and unarmed versions appearing somewhat haphazardly in the inventories of regional commanders in both the RSAF and ground forces.⁴² Given the power and funding structures within the Kingdom, successfully securing funds and procurement authority for drones is likely to be seen as a symbol of status within the Saudi armed forces. As such, the distribution and control of these assets

39. Author telephone interview with expert on Royal Saudi Air Force operations, 31 May 2018.

40. Jeremy Binnie, 'Saudi Arabia Says F-15 Survived SAM Hit over Yemen', *Jane's 360*, 22 March 2018.

41. For August 2018 shootdown, see Zen Adra, 'Video: Houthis Shoot Down Saudi Coalition Drone in Northern Yemen', *Almasdar News*, 30 August 2018. For September shootdown, see Leith Aboufadel, 'UAE Drone Downed Over Yemen's Marib Province', *Almasdar News*, 19 September 2018.

42. Author telephone interview with expert on Royal Saudi Air Force operations, 31 May 2018.

may have more to do with a regional commander's level of favour and connections than any grand operational strategy on the part of the RSAF or the Saudi Ministry of Defence.

Furthermore, the capabilities and limitations of such prestige assets may not be fully understood by those regional commanders, but operational experimentation and improvisation with new assets at tactical unit levels is very unusual in the rigid C2 structures of the Saudi armed forces. However, if Saudi Arabia realises its stated ambition to produce up to 300 armed UAVs,⁴³ current norms are likely to change as they become a more routine and less prestigious asset, and their sheer availability forces an increase in operational use.

Group 2: Airpower Norms Changed Following Acquisition of Armed UAVs

Countries in this group, although to different degrees and for diverging reasons, view drones as a tool conferring on them new military capabilities. Drones are perceived variously as: a tool to compensate for the weakness of conventional airpower; a more expendable asset compared to fast jets for operations in high-threat environments; or a useful tool to avoid the potentially escalatory ramifications of extra-territorial operations.

The introduction of armed UAVs into service, therefore, has led these countries to adopt new operational norms and behaviours. They have used armed UAVs for missions in which they would not normally risk manned combat aircraft, such as fast jets and helicopter gunships, either due to threat levels or political concerns around attribution and/or escalation. As a result, the acquisition of armed UAV capabilities is judged to have altered the way in which these countries perceive the utility of airpower in certain situations.

Iran

Inventory

Identifying reliable information about Iran's unmanned systems is challenging, given conflicting reports.⁴⁴ However, what is certain is that despite years of sanctions and export restrictions, Iran has managed to develop and manufacture its own UAVs, designing and building its own drone parts so as not to rely on foreign suppliers.⁴⁵

43. Frew, 'Drone Wars: The Next Generation'; SIPRI, 'SIPRI Arms Transfers Database'.

44. As reported in *Drone Wars*, for instance, although *Jane's Unmanned Yearbook*, seen as an authoritative source on unmanned systems, does not list the Shahed-129 as part of Iran's armed drones. However, this was seen conducting strikes in both Syria and Iraq, as discussed below.

45. *Iran Project*, 'Official: Iran Manufacturing Drone Parts', 18 July 2018.

There are two Iranian-made armed UAVs: the Shahed-129, first unveiled in 2012, and the Mohajer 6, mass produced since 2018. The design of the Shahed-129 is heavily based on the Israeli Hermes 450,⁴⁶ which suggests that Iran may have had access to one or more Israeli models, possibly lost on a covert mission, and, in line with the broader tendency of the country, it could have reverse-engineered the foreign design.⁴⁷ It is in service today, operated by the Islamic Revolutionary Guard Corps (IRGC), and it was assessed as capable of carrying out strikes in February 2016.⁴⁸ The Mohajer 6 is said to have been delivered to the IRGC's ground forces in early 2018.⁴⁹

Iran aims at becoming a UAV supplier and does not differentiate between state and non-state actors.⁵⁰ In particular, it seems that Iran might have supplied armed drones to Hamas, Hizbullah and the Houthis as well as the regime of Bashar Al-Assad in Syria, although evidence and details are still feeble.⁵¹

Hizbullah has, or at some point had, a Shahed-129 model carrying Sadid-1 missiles,⁵² but it appears that, despite evidence that the group has military drones, it has used them sparingly and has recently demonstrated a preference for commercial drones.⁵³

46. O'Gorman and Abbott, 'Remote Control War', p. 9.

47. The technological improvements made by Iran are also believed to have been possible by reverse-engineering the hardware of the US RQ-170 Sentinel spy drone downed in 2011, see Scott Peterson, 'Downed US Drone: How Iran Caught the "Beast"', *Christian Science Monitor*, 9 December 2011.

48. *UPI*, 'Iran Claims Breakthrough with Israeli-Lookalike Combat UAVs', 7 October 2013.

49. Jeremy Binnie, 'Iran's Mohajer 6 Armed UAV Goes into Production', *Jane's 360*, 7 February 2018.

50. Ariane Tabatabai, 'Decades in the Making: The Iranian Drone Program', *Bulletin of the Atomic Scientists*, 12 October 2017.

51. Reports about the delivery of the Shahed-129 to Iran-backed groups under the Popular Mobilisation Front in Iraq have so far not been confirmed.

52. Michael C Horowitz, Sarah E Kreps and Matthew Fuhrmann, 'Separating Fact from Fiction in the Debate Over Drone Proliferation', *International Security* (Vol. 41, No. 2, 2016), p. 36.

53. Peter Bergen et al., 'Non-State Actors with Drone Capabilities', *New America*, <<https://www.newamerica.org/in-depth/world-of-drones/5-non-state-actors-drone-capabilities>>, accessed 30 May 2018.

Box 8: Shahed-129 UAV

- Type: MALE UAV
- Manufacturer: Shahed Aviation Industries
- Number: 25–40
- Endurance: 15–24 hours depending on model and payload fit
- Loaded Weight: estimated at 400kg
- Payload Capacity: estimated at 150kg
- Range: 150km (limited by line of sight to ground control station)
- Sensor Options: IR and EO and laser designator
- Weaponry: Option for four Sadid 345 anti-tank guided missiles (unlicensed copies of Rafael Spike)

Source: Wikipedia.

Box 9: Mohajer-6 UAV

- Type: MALE-type UAV
- Manufacturer: Ghods UAV Industries
- Number: 5–10
- Endurance: estimated at 16–24 hours depending on payload carried
- Loaded Weight: estimated at 1,000kg
- Payload Capacity: estimated at 200kg
- Range: 150km (limited by line of sight to ground control station)
- Sensor Options: IR and EO and laser designator
- Weaponry: At least two Sadid 345 anti-tank guided missiles (unlicensed copies of Rafael Spike)

Source: Jane's 360 via Tasnim News Agency. Jeremy Binnie, 'Iran's Mohajer 6 Armed UAV Goes Into Production', Jane's 360, 7 February 2018.

Use

Armed UAVs are viewed in Iran as a way to compensate for the vulnerabilities of its conventional air force, which dates to the 1970s and struggles to keep up with the times given the sanctions still imposed on the country, as well as to enhance the prestige of Iran as a state capable of fielding modern military capabilities in the eyes of domestic and international audiences.⁵⁴ The use of low-cost, low-risk tools such as drones is also in line with Iran's defence doctrine, which prioritises asymmetrical warfare to project long-distance reconnaissance or offense capabilities to deal with enemies without risking Iranian lives.⁵⁵ This is especially the case in a scenario in which Iran perceives that it has to operate in an environment of high threat, for which its conventional military capabilities are not sufficient. The acquisition and introduction into service of armed UAVs thus led Iran to change its airpower norms and behaviours.

Much of Iran's drone development has been driven by the IRGC's Aerospace division, with the IRGC, the army and the defence ministry being the main beneficiaries of this technology.⁵⁶

The IRGC is very proud of the country's UAV capabilities. For instance, the Shahed-129 was described by them as a major technological breakthrough, while drones in general are deemed to be a 'smart, accurate and inexpensive technology' that makes it 'easy to handle the work of thousands of soldiers, checkpoints, and various borderline structures that face a lot of hardship and vulnerabilities'.⁵⁷

Iran deploys UAVs mainly to deal with counterterrorism threats, especially in its border areas, as well as in neighbouring countries which Tehran deems are unable or unwilling to tackle terrorism.⁵⁸ The Shahed-129, in particular, has been used to hit targets in Syria and Iraq.⁵⁹ In Syria, where Iran has not deployed any manned combat aircraft, strikes have been conducted against Daesh and rebel forces but also, at least on one occasion, against coalition forces.⁶⁰

54. O'Gorman and Abbott, 'Remote Control War', p. 9; *Iran Project*, 'Iran Among Top Seven Powers in Military Drone Industry: Top General', 10 October 2018.

55. Ariane Tabatabai, 'Containment and Strike: Iran's Drone Program', *Terrorism Monitor* (Vol. 15, No. 17, 11 September 2017).

56. *Ibid.*; O'Gorman and Abbott, 'Remote Control War', p. 9.

57. *Iran Project*, 'Commander: Iran's Ground Force Expanding Drone Fleet', 12 April 2017; *Young Journalists Club*, 'The Construction of UAV Shahed-129 has Security Implications for Iran's Islamic Republic/Construction of Iran's RQ170', author's translation, 27 September 2013, <<https://www.yjc.ir/fa/news/4570397>>, accessed 20 September 2018.

58. Tabatabai, 'Containment and Strike'.

59. Albin Szakola, 'Iran Admits Conducting Drone Strikes in Syria', *Business Insider*, 26 September 2016; Dan Gettinger, 'Drones Operating in Syria and Iraq', Center for the Study of the Drone, December 2016, <<http://dronecenter.bard.edu/files/2016/12/Drones-in-Iraq-and-Syria-CSD.pdf>>, accessed 29 September 2018.

60. Julian Borger, 'US Shoots Down Second Iran-Made Armed Drone over Syria in 12 Days', *The Guardian*, 20 June 2017.

In Iraq, where combat aircraft (Su-25 and F-4) were deployed in 2014 to fight the war against Daesh, Shahed-129 UAVs have been used since 2016 to deal with this threat without risking pilots' lives.

Iran has also repeatedly violated Israeli airspace with armed UAVs from bases in Syria, in several cases provoking armed Israeli responses against those airbases (such as the T4 airbase).⁶¹ Even though these appear to be single-use reduced-radar signature-guided munition-type UAVs based on reverse-engineering of the airframe of a captured American RQ-170 Sentinel spy drone, rather than the types used for strikes in Iraq and Syria, the incident led to a worrying escalation of tensions between Iran and Israel.⁶²

The UAE

Inventory

The UAE has invested heavily in the capabilities of its armed forces over the past two decades and has managed to develop one of the most modern and capable militaries in the region, which operates advanced air capabilities even when compared to other wealthy Gulf states.

The UAE's interest in UAVs emerged in 2013, when it reached a deal to purchase a number of MQ-1 Predator XP and related ground systems from General Atomics, which were delivered in 2017.⁶³ These were a variant of the MQ-1 Predator specifically modified so that they could not carry weapons. However, soon after the US refused to sell armed drones to the UAE, the country purchased two Wing Loongs, China's equivalent to the Predator.

In early 2017, the UAE also acquired Wing Loong IIs from CAIG.⁶⁴ Although neither China nor the UAE have confirmed the purchase, these UAVs have been spotted at the remote Qusahwurah Air Base.⁶⁵

61. Natasha Turak, 'Israel "Will be Punished" for its Strike on Iranian Drone Base, Tehran Says', *CNBC*, 18 April 201.

62. *Ibid.*

63. Stanley Carvalho, 'UAE Signs \$1.4 Billion Defense Contracts, Including Drones', *Reuters*, 18 February 2013.

64. Christopher Biggers, 'UAE Revealed as Wing Loong II Launch Customer', *Jane's 360*, 26 January 2018.

65. Both the Emirati and Chinese interviewees have been particularly vague and secretive about their relations with the other country, especially when it came to the issue of armed drones. This differed substantially from interviews on the armed drones' capability and procurement of other countries.

Box 10: Wing Loong UAV



- Type: MALE UAV
- Manufacturer: CAIG
- Number: 5
- Endurance: 20 hours
- Weight (MTOW): 1,100kg
- Payload Capacity: 100kg
- Range: >1,000km with SatCom, around 150km from ground control station if not
- Sensor Options: capable of being fitted with a variety of sensors, including a forward-looking infrared turret and synthetic aperture radar
- Weaponry: Up to 100kg of payload on two wing hardpoints which can include: AKD-10 air-to-surface anti-tank missile; FT-9/50 50-kg bomb; FT-10/25 25-kg bomb; GB-7/50 50-kg PGM

Image Source: Wikimedia.

Box 11: Wing Loong II UAV

- Type: MALE UAV
- Manufacturer: CAIG
- Number: 5
- Endurance: Up to 32 hours depending on payload
- Loaded Weight: 4,200kg
- Payload Capacity: 480kg
- Range: >1,000km with SatCom, around 150km from ground control stations if not
- Sensor Options: IR and EO cameras and laser designator in sensor ball
- Weaponry: Up to 480kg of payload on twelve wing hardpoints which can include: AKD-10 air-to-surface anti-tank missile; BRMI-90 90-mm guided rocket; FT-7/130 130-kg glide bombs; FT-9/50 50-kg bomb; FT-10/25 25-kg bomb; GB-7/50 50-kg PGM; and GB-4/100 PGM

Image Source: Wikimedia.

Use

The initial reason for the UAE's interest in the acquisition of armed UAVs was, similarly to other countries in the region, prestige. However, once acquired, armed drones progressively started being viewed as conferring new military capabilities on the country, enabling it to deal with targets in high-threat operating environments without the same risks and political ramifications.

The UAE has been trying to establish itself as the West's primary counterterrorism partner in the region since 2016. It has focused particularly on enhancing coordination with the US, which, for instance, used the Al-Dhafra Air Base near Abu Dhabi to fly its own armed UAV sorties over Iraq and Syria targeting Daesh.⁶⁶ At the same time, the UAE has also tried to bolster its own military capabilities by engaging in substantial arms' deals with Beijing, particularly for armed drones.

At least part of the reasoning behind the UAE's recent purchases of armed UAVs from China appears, besides prestige, to be to convince the US to sell armed versions of its iconic MQ-9 Reaper and MQ-1 Predator UAVs, which are more technically advanced and could be integrated into the UAE air force's American mission-planning, ISR and C2 systems. This would be in line with the overall Emirate's desire 'to maintain the strongest link with the US military sphere'.⁶⁷ The recent decision by US President Donald Trump's administration, following pressure from Congress, to relax some of its restrictions on the export of armed drones might eventually lead to the UAE's progressive move away from China.⁶⁸ However, for the time being, dealing with Beijing allows Abu Dhabi to have quick access to armed UAVs.⁶⁹

Once acquired and introduced into service, armed drones have increasingly been used by the UAE, which has deployed them not only in support of friendly forces on the ground in Yemen, but also to conduct strikes in 'politically sensitive areas', such as Libya.⁷⁰ On the other hand, for sensitive ISR and target cueing, the unarmed Predator XP is likely to remain the UAV platform of choice since it offers a superior sensor picture and, more crucially, is integrated into the US-supplied C2 and targeting architecture through which the UAE air force runs its operations. The UAE's Predator XPs may also benefit from US-facilitated satellite control uplinks, allowing them to operate beyond line-of-sight control range of ground stations – unlike the Chinese-supplied Wing Loongs. As with other users in the Middle East with strong military links to the US, concerns about information security preclude American permission for integrating Chinese UAVs into Western command, control, communications and computers architectures, which limits their usefulness beyond self-contained ISR strike missions.

66. Rajiv Chandrasekaran, 'In the UAE, the United States has a Quiet, Potent Ally Nicknamed "Little Sparta"', *Washington Post*, 9 November 2014.

67. Author interview with specialist on the UAE's military and defence, Abu Dhabi, 10 May 2018.

68. Rob Crilly and Taimur Khan, 'US Lawmakers Ask Trump to Approve Armed Drone Sales to UAE and Jordan', *The National*, 19 April 2017.

69. Author interview with EU diplomat, Abu Dhabi, 10 May 2018.

70. Rawan Shaif and Jack Watling, 'How the UAE's Chinese-Made Drone Is Changing the War in Yemen', *Foreign Policy*, 27 April 2018.

In Yemen, where the Emiratis have been involved in military operations conducted by the Saudi-led coalition against the Houthis since 2015, Wing Loongs have been used mainly in conjunction or in similar ways to the UAE air force's F-16 fighter jets. Given the coordination with the US, in some cases UAE strikes have been encouraged, since they reduced the pressure and risks taken by US forces.⁷¹ In Libya, on the other hand, while the UAE has denied involvement, it was identified in 2016 as having deployed manned aircraft and Wing Loongs to a base in the east of the country.⁷² Wing Loongs appear to also have been provided to Khalifa Haftar's forces,⁷³ the Libyan National Army, breaching an international arms embargo.⁷⁴

Unlike other countries in the region, the UAE has been very secretive about its purchase, deployment and use of armed drones. This technology is in fact perceived by high-ranking officials and the military to be a testament to the country's military capability in the Middle East, as well as a powerful tool to achieve the goal of projecting power in the region, while minimising risks.⁷⁵ Troops and equipment losses, in particular, are perceived by the UAE as highly damaging given the limited resources and population of the country. Any new technology which reduces such risks is welcomed by the establishment.⁷⁶ In Yemen, for instance, Wing Loong Is and IIs enable the reduction of risks for their pilots and F-16 fighter jets, through the reliance on UAVs to conduct airstrikes.⁷⁷

The UAE is particularly wary of the reputational costs involved in using armed drones and do not want to be viewed as misusing them or causing civilian casualties, 'want[ing] criticism to go away by doing the right thing'.⁷⁸ In practice, this means that while they showcase their interest in meeting benchmarks of international good practice, these are not often translated into their modus operandi. There is no clarity about the C2 procedures in place when using armed drones and, while there is a general sense that a process does exist (precisely to avoid mistakes and consequent criticism), this has not been disclosed, likely to avoid the identification of the responsible decision-makers.⁷⁹

71. *Ibid.*

72. Arnaud Delalande, 'Forces on the Libyan Ground: Who is Who', Istituto per gli Studi di Political Internazionale, 28 May 2018, <<https://www.ispionline.it/it/pubblicazione/forces-libyan-ground-who-who-20640>>, accessed 19 November 2018.

73. International Institute of Strategic Studies, *The Military Balance: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2017), p. 392.

74. Aidan Lewis, 'Covert Emirati Support Gave East Libyan Air Power Key Boost: UN Report', *Reuters*, 9 June 2017; Frew, *Drone Wars*, p. 21.

75. Author interview with specialist on the UAE's military and defence, Abu Dhabi, 10 May 2018.

76. Author interview with EU diplomat, Abu Dhabi, 10 May 2018.

77. The crash and death of UAE pilots facilitated this progressive transition, see *The Guardian*, 'Two UAE Pilots Killed as Fighter Jet Crashes in Yemen', 14 March 2016.

78. Author interview with senior EU official, Abu Dhabi, 10 May 2018.

79. *Ibid.*

The fact that armed drones seem to be perceived as a double-edged sword by the UAE might be the reason they are still viewed as tactical, rather than strategic, for the time being. However, they could increasingly be considered a more affordable and risk-free force, especially in protracted campaigns and counterinsurgency warfare in general.⁸⁰

Turkey

Inventory

Turkey's interest in armed drones emerged in 2008, when they sought permission to purchase the MQ-1 Predator from the US, and instead were offered the non-armed version of the Reapers. After refusing the US offer, Turkey purchased unarmed Heron TPs from Israel in 2010, and has since taken an ambitious approach to domestic production of armed UAVs.

Ankara is rapidly expanding its fleet of armed and domestically produced UAVs, having developed two main types for series production – the Anka-S and Bayraktar TB2 – and with a third, the Karayel, thought to be in the prototyping and testing phase. The TB2, which have been in the inventory of the Turkish armed forces, the gendarmerie and the police since 2014, currently makes up the majority of the Turkish air force fleet, with almost 50 already delivered.⁸¹ The larger and more capable Anka-S, on the other hand, which was envisioned in the early 2000s for tactical surveillance and reconnaissance missions only, has been operational since 2013, but only in relatively small numbers.⁸²

80. Author interview with specialist on the UAE's military and defence, Abu Dhabi, 10 May 2018.

81. Author interviews with Turkish UAV experts, Istanbul, 13–14 September 2018.

82. *Ibid.*

Box 12: Anka-S UAV

- Type: MALE UAV
- Manufacturer: Turkish Aerospace Industries (TAI)
- Number: 6
- Endurance: Up to 24 hours depending on payload
- Loaded Weight: 1,600kg
- Payload Capacity: 200kg
- Range: >1,000km (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

Image Source: Wikimedia.

Box 13: Bayraktar TB2 UAV

- Type: Tactical UAV
- Manufacturer: Kale-Baykar, Turkey
- Number: 46
- Endurance: Up to 24 hours depending on payload
- Loaded Weight: 650kg
- Payload Capacity: 55kg
- Range: 150km (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

Image Source: Image reproduced with permission from the photographer.

Box 14: Vestel Karayel-SU UAV

- Type: Tactical UAV
- Manufacturer: Vestel Defence Industry, Turkey
- Number: 2
- Endurance: Up to 20 hours depending on payload
- Loaded Weight: 550kg
- Payload Capacity: 70kg
- Range: around 150km (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

Image Source: Wikimedia.

Use

Turkey perceives drones as a matter of domestic pride and a 'game-changer' weapon.⁸³ Once its allies had rejected requests to provide Ankara with drones or attached conditions by which they could not be used within Turkey, the country started to produce domestically to send a political signal and reduce external dependency, while at the same time jumping ahead of the curve in the field of autonomous systems.⁸⁴ While they were perceived as providing additional capabilities compared to manned aircraft since the beginning of their introduction into service, recently their use appears to have changed Turkey's airpower norms and behaviours.

Armed UAVs have been pioneered by the private sector rather than the military in Turkey. The normal bureaucratic process involving the tender, development and procurement structure is usually bypassed when armed UAVs are involved, with direct industry engagement with the president and the highest-level decision-makers.⁸⁵ The first operational type of drones – the Bayraktar TB2 – is an armed UAV which does not have satellite link or other beyond-line-of-sight control capabilities, and as such is limited to operations within around 150km of its ground station. It entered service in 2016 and was soon taking part in strike operations against the Kurdistan Workers' Party (PKK) separatist movement inside Turkey and across the border in Kurdish areas in neighbouring Syria, despite the threat of Daesh being commonly cited in Turkey as a key driver behind the rush to develop armed drones.

The same pattern was repeated with the larger and more capable Anka-S in 2017, which was reportedly being used for strikes even before it had officially entered service.⁸⁶ Engineers from TAI and Kale-Baykar also regularly deploy with operational units to provide support and ensure that design changes required as a result of combat experience are quickly incorporated in later models. This pattern of close cooperation between the military and defence industry to combat-test new UAVs before the design is finalised is also common in Israel.

The Anka-S bears an external resemblance to the Israeli Hermes 900 and has been designed to be controllable by satellite link to extend its operational range to well beyond 1,000km. It is also interesting to note that both the Anka-S and Bayraktar TB2 employ domestically designed Turkish PGMs, rather than relying on Israeli, Chinese or American imports. Turkey's drone

83. Can Kasapoğlu and Barış Kırdemir, 'The Rising Drone Power: Turkey on the Eve of its Military Breakthrough', Centre for Economics and Foreign Policy Studies, June 2018, <<http://edam.org.tr/en/the-rising-drone-power-turkey-on-the-eve-of-its-military-breakthrough/>>, accessed 20 August 2018.

84. Author interview with Turkish defence expert, Berlin, 19 August 2018. Turkey believes it needs to catch up with what was domestically perceived as a broader industrial revolution in the region, which the country missed.

85. Author interview with Turkish defence expert, Berlin, 19 August 2018. It is interesting to note that the son-in-law of Turkish President Recep Tayyip Erdoğan is head of the company that provides armed drones to the Turkish army.

86. Frew, *Drone Wars*, p. 15.

programme may lack some of the sophistication of its US and Israeli counterparts at present, but it is evidence of how fast a modern state can develop functional armed UAVs and an industry to produce them if the political willpower and funding is behind the effort.

The government in Ankara plans to build at least 100 armed UAVs for surveillance and strikes against the Kurds inside and outside Turkey, with a secondary role as border surveillance and counterterrorist assets in the wider region in uncontested airspace.⁸⁷ For a population largely inured to large-scale airstrikes by fast jets against the PKK within Turkey, as well as to regular acts of terrorism by the PKK and other groups, the use of armed UAVs is unlikely to raise significant political concerns or even excite much comment beyond pride in Turkish industry's success in producing them.⁸⁸

In terms of command arrangements, the divide between political actors, intelligence and law enforcement agencies and the military is somewhat blurred since the crackdown and purges following the attempted coup in 2016. Nonetheless, as a rule the larger, the SatCom-controlled Anka-S is under the command of the Turkish air force while the Bayraktar TB2 is a tactical asset under army and agency ownership.⁸⁹ Both are large enough and fly at sufficient altitude to require integration with the standard recognised air picture during operations, which falls under air force control. Internal security forces also have their own UAV units.

Both the Turkish air force and army employ armed UAVs in much the same way as fast jets and rotary-wing gunships in strikes on militants and in support of friendly forces. For the army, the Bayraktar TB2 is now widespread and considered one of the primary strike platforms for tactical operations. A notable difference is the lower escalation risk and risk to life from using UAVs instead of fast jets in the contested skies over Syria, meaning that the Bayraktar TB2, and especially the Anka-S, are increasingly the tool of choice for the Turkish air force in cross-border operations, such as Operation *Olive Branch* in Afrin during early January 2018, where they were reportedly highly effective.⁹⁰ Furthermore, as the presence of advanced MANPADS in Kurdish- and Daesh-held areas has increased, the traditional role of attack helicopters has diminished in favour of less vulnerable and more expendable armed UAVs.

In terms of rules of engagement, the geographical limitation is only dictated by the type of operations, meaning that there is no limit in targeting Turkish or foreign citizens, if they are designated as terrorists. Drones are also regularly used for positive identification of targets for indirect fire during conventional combat operations. Civilian casualties, albeit not a primary concern of Turkey, have been reduced through the integration of UAV surveillance with artillery systems.⁹¹

87. Author interviews with Turkish UAV experts, Istanbul, 13–14 September 2018.

88. *Ibid.*

89. *Ibid.*

90. *Ibid.*, Operation *Olive Branch* was a Turkish military offensive against Kurdish forces in northern Syria, successfully conducted between January and March 2018.

91. Author interview with Turkish defence expert, Berlin, 19 August 2018.

Although most of the strikes in Afrin were carried out in support of advancing friendly ground forces in much the same way they would have been by more traditional fast jets, a dual strike on 15 August 2018 in Sinjar, Iraq tells a different story. Here, Turkish UAVs were used to assassinate a prominent leader of the Sinjar Resistance Units (Yekîneyên Berxwedana Şengalê, or YBS) and the PKK, İsmail Özden. The strike involved an initial precision attack on Özden's vehicle and a subsequent strike on a second vehicle which had retrieved casualties from the first. The incident was much celebrated in the Turkish media, and the apparent public support for this extra-national, extra-judicial killing using armed UAVs is likely to encourage the authorities in Ankara to conduct more operations along similar lines, especially given the recent posture towards conducting more surgical operations to respond to what is perceived in Ankara as asymmetrical warfare.⁹²

While previous operations would have placed Turkey in the category of countries whose employment of airpower had not been changed by the acquisition of armed UAVs, the Sinjar strike is a significant departure from previous operational norms. Turkey would not have conducted a strike so far into Iraqi territory with manned combat aircraft.

92. Author interviews with Turkish UAV experts, Istanbul, 13–14 September 2018; Burak Ege Bekdil, 'Unmanned Tech Ambitions Shape Turkey's Future Military', *Defense News*, 6 March 2018.

III. Key Findings and Implications

The Proliferation of Armed Drones in the Middle East

DESPITE THE SELECTIVE drone export policy upheld by the US, over the past few years several countries across the Middle East have acquired armed drones either by purchasing them from China (Jordan, Iraq, Saudi Arabia and the UAE) or by building them domestically (Israel, Iran and Turkey).

China sees UAVs as an ideal tool to deal with counterterrorism threats and views all countries in the Middle East as potential clients. The countries buying armed drones from Beijing all recognise the superior benefits of UAVs from the US, in terms of both performance and ISR integration; however, they still deal with China to acquire this technology, circumventing US restrictions and getting fast results for a lower price.

Furthermore, purchasing armed drones from China, a country which does not abide by the MTCR, enables them to gain access to this technology without being barred by international norms. Although Chinese operators often conduct initial sorties, including combat ones, they do not appear to insist on particular procedures but instead enable and teach new users to employ their armed UAVs as they wish. The perception is that this would not be the case if armed UAVs were provided by countries such as the US or the UK.

Beijing is thus likely to continue playing a key role as a supplier of armed UAVs to the Middle East. It remains to be seen whether and how the loosening of restrictions on the exportation of armed drones by the current US administration will alter dynamics in the region. Nonetheless, proliferation in armed UAVs in the Middle East is unlikely to stop and could, in fact, even accelerate, either through domestic production or reliance on external suppliers, such as Beijing.

Prestige and country-status seemed to be the main drivers for acquiring armed drones for all states in this study. Those that produce their own drones (Iran, Israel and Turkey) stress the importance of industrial and operational self-sufficiency, and view UAVs as a way to enhance national prestige even further.

The Use of Armed Drones in the Middle East

Whether countries purchase their armed drones from China or produce them domestically does not seem to influence how they are used by states in the Middle East. Only in the case of Turkey was domestic production openly advanced with the additional aim of avoiding constraints imposed by external suppliers on their use.

The impact of armed UAVs on the employment and understanding of airpower after initial introduction into service seems on the other hand to be determined by:

- whether or not it conferred new capabilities;
- whether or not drones are seen as useful for dealing with targets in high-threat operating environments; and
- whether or not drones are perceived as a useful tool for avoiding political and/or potentially escalatory ramifications of extra-territorial operations.

Jordan and Saudi Arabia both have adequate military capabilities without the introduction of armed drones into service and, at least for now, lack a robust threat. They continue to rely on their tried-and-tested fast jets, and UAVs are simply a way to gain status rather than a core front line asset. Such a perception, however, could change, especially in the case of Saudi Arabia, should the country realise its stated ambition to produce up to 300 armed drones with the help of China.

All other countries, albeit for different reasons, have introduced armed drones into service, but this has led to a change in the way in which airpower has been employed only in some states.

Iraq and Israel have principally deployed armed UAVs to complement, rather than substitute, the functions carried out by manned aircraft. In both cases, armed UAVs have not changed the way in which their air forces employ strike aircraft: to conduct interdiction; in support of friendly forces on the ground to provide long-endurance overwatch; and ISR coverage. In the case of Iraq, armed UAVs were perceived as a useful tool in light of the higher-threat operating environment engendered by Daesh, but this was not enough to change the country's airpower norms and behaviours. Israel has adopted armed drones also to conduct strikes against high-value personnel and weapons shipment targets in instances where ground forces and/or manned strike aircraft are not involved. In the country's view, however, armed UAVs remain a useful addition to their primary mission, which is ISR.

Iran, Turkey and the UAE, on the other hand, albeit for different reasons, have exhibited changes in the way in which they employ airpower following the acquisition of armed UAVs. For Iran, these conferred new capabilities, operating as it does in a higher-threat environment. The UAE, despite its adequate military capabilities, perceives armed UAVs as an ideal tool to deal with targets in high-threat operating environments without the same risks and political ramifications of manned airpower and airstrikes. Turkey only recently appears to have changed its airpower norms and behaviours, despite having had armed drones in operation for a few years.

For all three states, armed UAVs are an efficient and low-risk tool to project power while reducing the risk of casualties and the loss of manned aircraft, and their operational value appears to have so far been interpreted as residing in their cheaper cost and significantly improved time on station compared to conventional fast jets. Iran, the UAE and Turkey have conducted extra-territorial strikes as part of covert and/or agency-led assassination missions, which are unlikely to have been considered acceptable in terms of political risk level if carried out with

manned aircraft. For these actors, the acquisition of armed UAVs has altered political and operational perceptions of how to project power using airpower.

Other states in the Middle East and beyond that want to increase their military capabilities, deal with targets in higher-threat operating environments, or avoid the political ramifications of extra-territorial operations, might follow the trend shown by Iran, the UAE and Turkey.

This is even more the case because for all countries examined in the research for this paper, including those in the second group, UAVs with the capacity to carry out reconnaissance and precision strikes constitute an ideal tool to deal with counterterrorism threats and, because of that, they are mainly viewed positively not only by the political establishment but also by the population.

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