

A person wearing a cap and dark clothing is seen from the side, kneeling on a sandy, debris-strewn ground. They are holding a remote control device connected to a tripod-mounted camera. In the background, there is a dark, damaged building with a circular opening. In the upper left corner, a small, dark drone is flying against a bright blue sky with a sun flare.

A Laboratory of Drone Warfare

The role and relevance of uncrewed
aerial systems in the war in Syria

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Colophon

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Cover image: A Coalition Forces member launches an Switchblade-300 kamikaze drone near Hajin, Syria, Jan 8, 2019. Photo by U.S. Army Spc. Christian Simmons

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Introduction

The skies above conflict zones in the 21st century are marked by the presence of Uncrewed Aerial Vehicles (UAVs), better known as drones. The deployment of drones has become commonplace over the last two decades, both within and outside areas of armed conflict. Whether they are armed or not, drones leave their mark on the way contemporary conflicts are fought, and provide both states and non-state actors with new methods of using lethal force. UAVs give warring parties 'eyes in the sky', a 24/7 source of intelligence on the whereabouts of the enemy.¹ Hovering above conflict zones, drones collect information on the battlefield by carrying out Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) with the aid of a wide array of onboard sensor systems and cameras.² These functionalities support the role of drones, linking it either with other weapon systems on the ground or air and using the sensor data for targeting, or by directly engaging the targets with onboard rockets, missiles or bombs. Their application in warfare gives armies multiple advantages, like improved situational awareness and the removal of risk for pilots, whilst being relatively cheap.³

Initially, the United States (US) dominated the production and deployment of armed and unarmed UAVs, with Israel and China following. As the US was using drones over Afghanistan to track down al-Qaeda members shortly after the terror strikes on 11 September 2001, it soon felt the need to add missiles to its Predator drones, which had been unarmed until then.⁴ Armed drones were the hallmark of America's clandestine targeted killing programme under President Obama. Israel was already using armed drones in their targeted killing programme prior to 2011⁵, but never publicly acknowledged this until the summer of 2022⁶. In the last five years, other countries such as Turkey have taken on a leading role with their heavy use of drones in operations in Libya, northern Syria, southern Turkey and Iraq. Drones are becoming the weapons of choice for use in counterinsurgency operations and military interventions, as exemplified by the war in Libya, often called "the biggest drone war theatre in the world".⁷ In such places, one can observe the wide dissemination and proliferation of various types of military drones.

When it comes to the production and export of drones, countries like Turkey, Iran and China have joined the list of drone producers, keen for a large role in the drone market. These new drone powers have been exporting their Bayraktar TB-2s, Mohajer-6s and Orlan-10s to a range of non-Western countries that were not previously drone users, like Ethiopia, Nigeria, Libya and Azerbaijan, but also to non-state armed groups such as Hezbollah and Ansar Allah, better known as the Houthis, in Yemen. According to the Center for the Study of the Drone, there were 95 countries in 2019 with an active military drone programme compared with 60 countries with such a programme in 2010, an increase of 58 per cent. Together, these countries have approximately 30,000 drones.⁸ Similarly, there is an expansion and diversification visible in the number and type of armed drones these countries possess.⁹ Technologically advanced militaries no longer enjoy a monopoly on the use and export of drones; they have been joined by dozens of other countries expanding their uncrewed capabilities. As explained by drone expert Dan Gettinger, this development inevitably impacts the future of armed conflict.¹⁰

Besides the transformation in the domain of state actors using armed drones, there has also been an increase in non-state armed groups (NSAGs) possessing and deploying drones. They have received drone technology and training from their allies; for example, the Houthis in Yemen have received drone components from Iran.¹¹ Furthermore, NSAGs have been able to obtain commercial drones, modifying them to turn them into battle-ready weapons. Armed groups like the Islamic State in Iraq and Syria (ISIS)¹ and Hezbollah have professionalised and industrialised their fabrication of strike-capable civilian drones, revolutionising the drone capabilities of NSAGs. Their knowledge of drone manufacturing and use has been transferred to other NSAGs, broadening the fields in which military drones are deployed. These Commercial Off-The-Shelf (COTS) drones illustrate the blurred distinction between military and civilian drones: a hobby drone can be bought online for only a few hundred euros or even tens of euros but can easily be transformed into a weapon simply by attaching munition to it.¹² The use of consumer technology by NSAGs goes hand in hand with the surge in commercial drone companies, making inexpensive technology available for a diverse range of state and non-state actors. The development of weaponised COTS drones in the hands of NSAGs in combination with the variety of states producing, exporting and using UAVs leads to important legal, ethical and political questions about, for example, export control regulations, the protection of civilians and a lowered threshold for the use of force.¹³

International rules and regulations have, unfortunately, not kept pace with the explosive international growth in UAV production, export and deployment. Even though 63 of the 95 countries with an active military drone programme are thought to primarily have foreign-made UAVs,¹⁴ no multilateral mechanism exists to comprehensively regulate the export and subsequent use of UAVs and UAV technology. Several existing arms control regimes—the Missile Technology Control Regime (MTCR), the Wassenaar Agreement, the EU Common Position on Arms Exports and the international Arms Trade Treaty (ATT)—provide some guidance.¹⁵ However, these agreements all fail to effectively regulate UAV exports, due to the limited participation of drone producers or users, the narrow focus on certain types of drones or a lack of strong, legally binding rules.¹⁶ A first attempt to specifically guide the deployment and export of drones was a US policy of 2015, which led to a Joint Declaration on the export and use of armed drones, signed by 54 states and released in 2016.¹⁷ However, the declaration has been criticised by states, experts and civil society organisations as being non-inclusive because it was drafted by the US with little or no input from other states or experts, it was limited in scope, vague in wording and had no real-world meaning due to the voluntary nature of the declaration. Based on this Joint Declaration, the US has been developing ‘International Standards for Export & Subsequent Use of Armed Unmanned Aerial Vehicles’ in cooperation with a small group of states, however, a full document has yet to be published.¹⁸

How Drones Defined Warfare in Syria

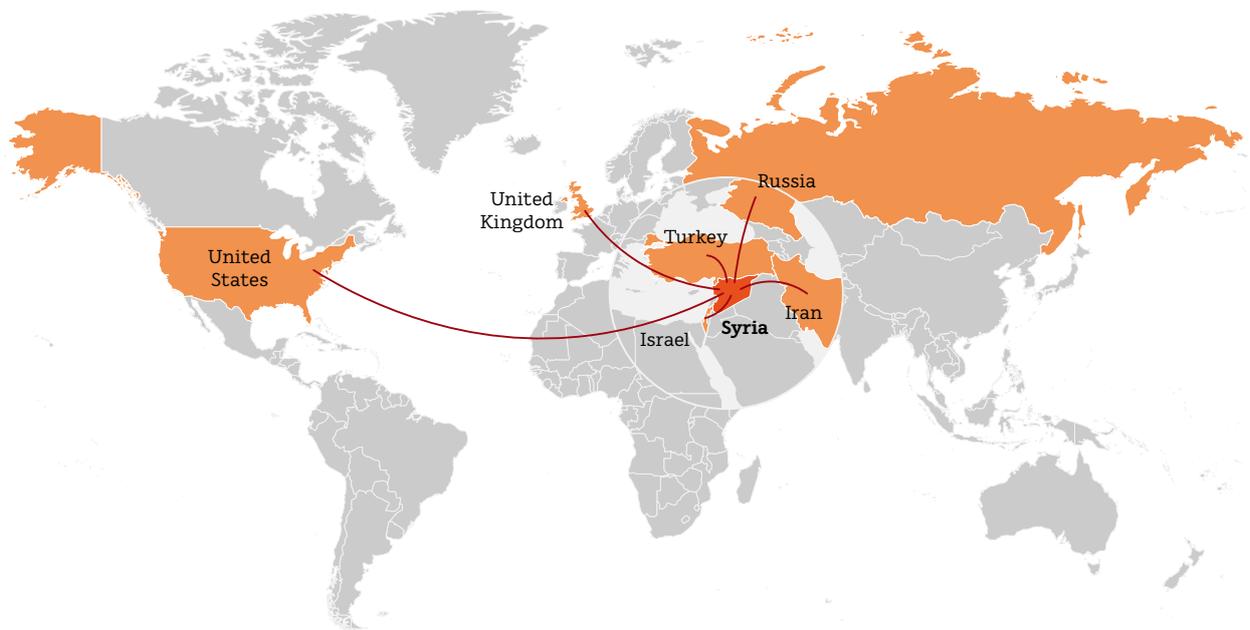
This report will examine the dynamics of drone warfare in the context of the Syrian war. Since the start of the peaceful revolution in 2011 that developed into full armed conflict, the use of armed and unarmed drones by all parties to the conflict has increased rapidly. Syria has been a drone ‘laboratory’, in which countries and NSAGs have tested various new types of drones and explored how their uses can improve military tactics and strategies. Over the last decade, upgraded drones in the Syrian skies have repeatedly shown how military actors have been through a learning process and enhanced their knowledge of the design, production and use of drones.

1 *The acronym ISIS and Islamic State (IS) are both used in this report.*

Our research shows that at least **39 different types of military drones originating from six different countries** have been used in the Syrian war.

The report starts with an overview of the methodology applied in the research, after which the deployment of drones by relevant state actors will be illustrated and analysed. This is followed by a portrayal and analysis of NSAG drone use. **The report will focus on patterns visible among the different actors and the related security implications.** Overall, the Syrian case study will reveal how the use of drones in military contexts has reshaped the manner in which modern wars are fought. It urges us to think about challenges regarding the transparency of military operations, the widespread proliferation and dual-use nature of UAVs, regional power balances and the ease with which parties to a conflict, both state and non-state actors, can resort to lethal force.

States operating military drones in Syria



Methodology

The prime methodology used for this research was the collection of open-source data, gathered from regular media sources and credible social media accounts on the different forms of use and sightings of drones by both state and non-state actors in order to understand the dynamics, scale and patterns of drone use in the Syrian war. Additional insights were collected from analysis published by civilian and military experts. The most relevant actors have been investigated. However, with so many armed groups in the conflict and the lack of visibility ('fog of war'), this study cannot and does not aim to be exhaustive. Even so, the open-source methodology can still provide valuable insights on the way different actors in the conflict have been engaged in drone warfare. The time frame under investigation is from the start of the Syrian conflict in 2011 until August 2022.

The research makes use of the following classification of drones as developed by the North Atlantic Treaty Organization (NATO), which divides drones into classes I to III based on weight and endurance.¹⁹

Class I: unmanned aerial vehicles with a Maximum Take-off Weight (MTW) of 150 kilograms and a maximum endurance of three hours with a range of 80 kilometres. Class I drones are unarmed and are deployed for Intelligence, Surveillance and Reconnaissance (ISR) purposes.

NATO UAS CLASSIFICATION

Class	Category	Normal Employment	Normal Operating Altitude	Normal Mission Radius	Primary Supported Commander	Example Platform
Class III (> 600kg)	Strike/ Combat	Strategic/ National	Up to 65,000ft MSL	Unlimited (BLOS)	Theatre	Reaper
	HALE	Strategic/ National	Up to 65,000ft MSL	Unlimited (BLOS)	Theatre	Global Hawk
	MALE	Operational/ Theatre	Up to 45,000ft MSL	Unlimited (BLOS)	JTF	Heron
Class II (150-600kg)	Tactical	Tactical Formation	Up to 18,000ft AGL	200km (LOS)	Division, Brigade	Watchkeeper
Class I (< 150kg)	Small (>15kg)	Tactical Unit	Up to 5,000ft AGL	80km (LOS)	Battalion, Regiment	Scan Eagle
	Mini (<15kg)	Tactical Sub-unit (manual or hand launch)	Up to 3,000ft AGL	Up to 25km (LOS)	Company, Platoon, Squad	Skylark
	Micro (<6kg)	Tactical Sub-unit (manual or hand launch)	Up to 200ft AGL	Up to 5km (LOS)	Platoon, Squad	Black Widow

Class II: the class II drones have a MTW of 150 to 600 kilograms, they can stay up in the air for roughly ten hours and can travel between 100 and 200 kilometres. Referred to as the tactical category by NATO, class II UAVs are mostly unarmed but they are able to carry lightweight missiles.

Class III: the last class consists of Medium-Altitude Long-Endurance (MALE) and High-Altitude Long-Endurance (HALE) drones. They can be armed with a payload of up to 600 kilograms (which can be made up of a variety of weapons, sensors and/or fuel tanks), travel speed up to 300 kilometres per hour and are capable remaining in the air for more than 24 hours.

Actors, Drones and Type of Use

State Actors

Syria

The Syrian regime does not produce its own drones but it has received material support from Iran and Russia in its fight against armed (opposition) groups, either used by the regime itself or by Hezbollah, which has fought alongside the Syrian army.²⁰ An example of the support these drones offer to the Syrian army is aerial footage of specific locations inside areas like Homs that were then controlled by opposition parties, allowing the army to track, survey and, in combination with other assets, target armed opposition groups and their infrastructure. The Syrian regime and linked militias have also deployed (armed) drones against the US-led coalition against ISIS in Syria.²¹ Unarmed Syrian reconnaissance drones were spotted in 2018 in Israel or near the occupied Golan Heights, but there has been no confirmation whether they were there intentionally or by accident whilst attempting to defeat armed opposition groups in southern Syria. These drones were immediately shot down by the Israeli army.²² There are sources stating that Syria's Scientific Research Centre manufactures drones domestically, but all online footage shows that these are probably either Iranian or Chinese drones or copies assembled in Syria.²³ According to visual media collected by the Center for the Study of the Drone, six types of Iranian drones have been reported



A Syrian government soldier controls a drone to investigate the rebel-held area in Aleppo, Syria on Dec. 18, 2016

in the hands of the Syrian regime. These drones, operated by the Syrian Air Defence Forces, are primarily the class II Mohajer-4 and Ababil-3 drones, but the Shahed 123 and Shahed 129, the small Yasir and Oghab 1 drones have also been spotted. These drones have mostly been sighted over Homs, Hama, Damascus, Aleppo, Deir ez-Zor and Idlib and on air bases in Damascus, Hama and Shayrat.²⁴ The Center for the Study of the Drone has identified the class I Inspire, DJI Phantom Quadcopter and F550 Flame Wheel as Chinese drones or similar models believed to be flown by Syrian regime forces.²⁵ Russian drones confirmed or believed to be flown by the Syrian regime are the small Eleron 3SV and the class II Orlan-10.²⁶

Russia

Russia has been one of the key actors engaged in drone warfare in the Syrian war and has significantly influenced the war's course through the incorporation of drones into its activities. Russia has been keen on keeping the Assad-regime in power and has been engaged in providing up-to-date information on the location, status and strength of groups like ISIS, Jabhat al-Nusra (JaN, nowadays Hay'at Tahrir as-Sham or HTS) and the Free Syrian Army. Therefore, Russia has provided ISR drones to Assad's regime since the beginning of the conflict and has itself deployed ISR drones in opposition-held areas since the start of Russia's intervention in Syria in 2015.²⁷ In late 2017, the Russian Chief of General Staff, General Valery Gerasimov, claimed that the Russian Aerospace Forces (RuAF) had been operating 60 to 70 UAVs in Syria daily. Sergei Shoigu, the Russian Minister of Defence, noted in the same period that Russian UAVs were carrying out monitoring and surveillance tasks 24/7 over Syria.²⁸ Around 2019, combat UAVs became available to the RuAF and have been spotted flying over Syria ever since.²⁹ According to Russia expert Samuel Bendett, Russian UAV missions in Syria in 2020 included aerial reconnaissance, providing target designation, controlling airstrikes and adjusting artillery.³⁰ The Syrian war proved to be the ultimate 'UAV laboratory' for the RuAF³¹ where Russia could evaluate its partners' drone technologies and where its own combat drones and other new weapons could be trialled.

Russia has embarked on its drone programme in Syria with the following drones since the start of the Russian intervention in the Syrian war: the small Eleron 3SV drone, the class II Orlan 10, Forpost, Searcher, Pchela-1T and Ptero-G0 drones, the class III MALE Orion drone and the KYB and the ZALA Lancet-3 loitering munitions, which have the specifications of small class I drones with the capabilities of strike class II/III drones.³² There are indications that the predecessor, the ZALA Lancet-1, has been used as well, though more information is needed to confirm this.³³ Syrian local media and Russian sources have also reported on the use of the Russian Korsar, Aileron-3C and Takhyon drones in Syria. This information could however not be verified independently.³⁴

The RuAF tested its first MALE-class target-capable Khronstadt Orion drone in Syria in 2019, a type similar to the US MQ-1 Predator. Based on footage released in February 2021, the Orion is known to have flown 20 ISR missions and 17 combat missions from 2018 onwards. What targets were attacked with the drone remains unconfirmed.³⁵ Despite the Syrian war being an intense period of transformation and development for the RuAF, an absence of sufficient numbers of armed drones created a capability gap for the RuAF in comparison to other actors in Syria with combat drones. During the Syrian conflict, Russia has primarily provided ISR drone support to other artillery and air-force missions.³⁶ Syria has also been a testing ground for Russia's loitering munitions, in particular the small Lancet-3 and KYB drones.³⁷



A rebel holds an crashed Russian Orlan-10 reconnaissance drones. Image posted on Twitter, February 7, 2021

Russia's main larger drone that has been in frequent use in the war is the Forpost, the design of which is based on the Israeli ISR Searcher drone. Russia had received Searcher drones and training on how to operate them from Israel Aerospace Industries (IAI) by 2010; it had requested this in response to the 2008 Russo-Georgian War. Russia also acquired the licence to produce copies of the Searcher drone domestically, which it dubbed the Forpost and deployed in Syria. Photographs and satellite images appear to show the Forpost at the Khmeimim air base in Latakia and at Aleppo Airport.³⁸

According to Syrian local media, the Russian drones that were mainly seen in eastern suburbs of opposition-controlled areas in Idlib and Aleppo take off from bases in al-Ghadfa and Ma'ar Shoreen, whereas larger drones targeting coastal areas fly from the Khmeimim air base near Latakia, the main hub for Russian operations in Syria.³⁹ Russian units have also been operating UAVs from the T4 air base near Palmyra, where the combat Orion drone was tested, for example, and they have drones stationed at the Deir ez-Zor air base in eastern Syria.⁴⁰

Iran

Iran has supplied drones to Syrian armed forces from the start of the Syrian war and to Hezbollah since 2004. During the war, Iran also began providing independent drone capabilities to various Iranian-backed militias in Syria, in the form of reconnaissance or armed drones, the parts and expertise to manufacture copies locally, and drone training programmes. Iran seems to supply such proxies with variants of its existing drones, giving Tehran the possibility of 'plausible deniability', though in practice, the similarities are often too striking to make this a believable argument.⁴¹ Furthermore, Iran has been keen on establishing and using drone bases inside Syria, like the T-4 air base, which it shares with Russia and uses for assembling, operating and storing UAV systems. Iran can supply its proxies through these bases, but they also enable Iran to use Syria as a launch pad from where it can challenge Israel.⁴² Iranian drones, like the Shahed-129, have been spotted at the T-4 air base.⁴³ Iran also uses Syria as a port of transit for its drones and drone components destined for Hezbollah in Lebanon.⁴⁴

The Iranian-backed militias deploy their drones in Syria against US and Israeli forces, ISIS and other armed groups. The rise of ISIS in Syria was the main reason for Iran to deploy its drones outside its borders,⁴⁵ or, at least, the key motivation for Iran to admit it was using combat drones in another country. In 2018, the Islamic Revolutionary Guard Corp (IRGC) claimed to have carried out 700 drone strikes against ISIS in Syria, though this could not be independently verified.⁴⁶ The first drone attack against American forces in Syria occurred in June 2017, when Iranian proxies attacked an American coalition patrol with what was probably a Shahed-129 drone, partly with the aim of showing that the pro-Assad forces were willing to target US forces directly. In return, the US shot down two armed Iranian drones with jetfighters protecting the area.⁴⁷

Iranian and Iranian-supported drone attacks against US military targets would happen more often. In 2021, US officials claimed Iran was behind the drone attack on the American military outpost at al-Tanf in southern Syria as retaliation for Israeli airstrikes, by encouraging, enabling and helping Shia militia groups to carry out the attack.⁴⁸ Attacks by Iranian-backed militias have been claimed by Iranian officials on some occasions, always with the justification of hitting terrorist targets.⁴⁹

The identified ISR and combat drones flown by Iran or Iranian forces in Syria are probably the small Oghab 1 and Yasir drones, the class II Mohajer-4, Mohajer-6, Ababil-3, the Ababil-B, the Saeqeh, the Shahed-123 and the class III MALE Shahed-129.⁵⁰ There have been reports of sightings of the Mohajer-2 in Syria but the available imagery is inconclusive.⁵¹ Iran is also thought to deploy loitering munitions in Syria through its Iraqi proxies.⁵² Of the many Iranian drones spotted over Syria's skies, it is often not clear whether they are operated by the Syrian government, Hezbollah or the IRGC, itself but Iranian supervision is likely.⁵³ The efforts by Iran to strengthen its drone programme are considered to be a threat to their regional adversaries and the US.⁵⁴ Despite the limited sophistication of their technology, some experts claim they excel at taking cheap drones to the next level.⁵⁵ The Syrian war has provided Iran with the possibility to take a closer look at American- or Israeli-designed drones whose wreckages they were able to access, ultimately influencing their own drone development.⁵⁶ For example, the Iranian Saeqeh and Shahed-171 drones, a jet and prop-engine design, seem to be based on a captured American RQ-170 Sentinel drone that crashed in the Iranian desert in 2011. The Syrian war has therefore enabled Iran to experiment with drone technology, just as it has done for Russia.⁵⁷ According to opposition media, Iranian tactical drones primarily depart from Hama Airport whereas loitering munitions take off from Jurin camp in the Al-Ghab Plain, north-west of Hama.⁵⁸ Considering the mobility and short reach of loitering munitions drones, it is likely they can be deployed from multiple sites.⁵⁹



An Iranian Mohajer-6 drone and the command and control station seen on the Hama Air Base, Syria. November 6, 2019

United States

The United States started drone surveillance missions to ISIS positions in Syria in August 2014. At that point, direct military action had not yet been authorised, but the gathering of intelligence was the first step towards the US becoming militarily involved in the Syrian conflict, and the surveillance missions would ultimately support air strikes. The rise of ISIS and the subsequent horrific attacks on non-Sunni communities, specifically Yazidis and the takeover of Mosul signalled a change in President Obama's policy from supporting regime change in Damascus to defeating ISIS.⁶⁰ The Global Coalition against Daesh, led by the US, was formed in September 2014 and started countering ISIS in Iraq in what was termed Operation Inherent Resolve (OIR).⁶¹ Soon after, the coalition started to launch airstrikes against ISIS in Syria.⁶² The first US drone strike against ISIS in Syria was carried out in August 2015, from the Incirlik base in Turkey. The US and Turkey were allies in their fight against ISIS.⁶³ The US ended up using targeted killings of members of ISIS and other jihadist groups as their prime counter-terrorism effort in Syria, but tended not to claim responsibility for such assassinations.⁶⁴



A screengrab from military drone video shows the compound of ISIS Leader Abu Bakr al-Baghdadi moments before a precision-guided munition strike following the US forces raid, northwestern Syria, 26 October 2019.

Besides the Coalition's strategy of conducting crewed and uncrewed air strikes against ISIS, they also adopted a strategy of advising, training and equipping local partners in order to enable them to plan and execute ground operations against ISIS themselves. Initially this was also to the Free Syrian Army (FSA) in 2012, but was dropped soon due various complexities and failures to establish a coherent fighting force. As a reaction to the siege of Kobani in 2014, the US set up 'train-and-equip' programmes for opposition groups fighting ISIS, such as the Syrian Democratic Forces (SDF), which is mainly led by the People's Protection Units (the YPG, the armed wing of the Kurdish Democratic Union Party (the PYD), which is aligned with Turkey's nemesis the Kurdistan Workers' Party, the PKK). One element of these programmes were drone trainings. This move alienated Turkey from the US, since Turkey is fighting its own battle with these Kurdish groups at home and in Iraq, whom it lists as terrorist organisations. This led ultimately to rising tensions and frustrations

between the two states and an increase in the military involvement of Turkey in the Syrian conflict.⁶⁵ There have been allegations of the YPG flying US-made drones, like the Puma drone, but these reports have not been confirmed.⁶⁶

Since 2017, the US has started attacking Syrian regime forces targets, for example when a Russian tank used by Assad's forces was destroyed by an MQ-9 Reaper drone.⁶⁷ Drones were part of the massive use of force by the US when Syrian troops and Russian mercenaries attacked a US base in eastern Syria in 2018, resulting in the death of hundreds of attackers.⁶⁸ In its ongoing operations against al-Qaeda and ISIS cells, the US also continues to use armed drones for targeted killings⁶⁹ of suspected ISIS and Al-Qaeda militants in north-western Syria. This area also witnessed the first use of the RX-9 Hellfire missile, which is equipped with blades instead of explosives to minimise collateral damage.⁷⁰

The US has been deploying the class III MALE MQ-1 Predator, MQ-1C Gray Eagle and MQ-9 Reaper armed drones, the class II Aerosonde MK 4 and the class I tactical RQ-20 Puma AE ISR drones in Syria. In addition, US Special Forces have deployed the small Switchblade loitering munitions/kamikaze drones. Their prime targets have been rebels and rebel infrastructure, and military targets on the side of the Syrian regime, Iran and militant groups. The US operates its larger drones from bases outside Syria; initially it used the Incirlik air base in Turkey, but later it pulled its troops out. Satellite imagery shows the presence of MQ-1C and MQ-9 armed drones at US bases in Jordan, Iraq, Kuwait and Qatar.⁷¹

Turkey

Turkey started its involvement in the Syrian war by calling for regime change in Damascus and facilitating the establishment of the Free Syrian Army. In 2014, it supported America's call for the formation of a core coalition combating ISIS in Iraq, and Turkey also joined the Global Coalition against Daesh.⁷² But Turkey was not keen on the support the US provided to Syrian Kurdish groups in their fight against ISIS and thought the main priority should be the removal of the Assad regime. The Turkish Armed Forces (TAF) continued to fight the SDF, whose main actor is the Kurdish YPG, whilst they were combating ISIS, and they were less actively engaged in the fight against ISIS in Syria.⁷³ However, Turkey did approve the use by the US-led coalition of its territory for military operations in Syria, but the 2014 coup and fallout between Turkey and US led to US drones pulling out of the Incirlik base.⁷⁴ Turkey's direct military involvement in the conflict began with Operation Euphrates Shield, when Turkish troops were active in northern Syria from 24 August 2016 until March 2017. The campaign's objective was against both ISIS and the SDF and marked the beginning of the Turkish occupation of northern Syria. In the end, Turkey's involvement in the Syrian war primarily revolved around the weakening of the Syrian Kurds, given that Turkey has been willing to strategically realign with Russia instead of battling for the removal of the Assad regime and ISIS. It was during Operation Euphrates Shield that the first sightings were reported of Turkish remotely piloted systems over Syria. Specifically, the domestic class III MALE Bayraktar TB-2 and Anka-S were used for these ISR purposes.⁷⁵ The TB2 started patrolling the skies of Turkey and Syria fully armed with domestically produced ammunition during Operation Euphrates Shield.⁷⁶ Their effectiveness paved the way for expanding use, and the TB-2 became Turkey's best-known combat drone, playing a key role in the conflicts in Libya, Nagorno-Karabakh, Ethiopia and most recently in Ukraine.

The TB-2 really proved its worth in Turkey's next military campaign, Operation Olive Branch in north-western Syria. Turkey embarked on an aggressive air campaign in January 2018 in order to remove the YPG from the district of Afrin, situated on the border with Turkey, and to deter the US from cooperating with Syrian Kurds. The TB-2 played a significant role in this operation with both strikes and surveillance, demonstrating the utility of the continued overhead presence of armed drones for both intelligence collection and direct strike capabilities.⁷⁷ During the following campaign, Operation Peace Spring in October 2019, Turkey also deployed its combat drones to carry out strikes against the Kurdish-led Syrian Democratic Forces, ultimately conquering a strip along the border from Ras al-Ain to Tell Abyad. In both instances, Turkey aimed to reclaim areas under control by the SDF along the Turkish border, ultimately striving to prevent and weaken the establishment of a Kurdish-led autonomous region.⁷⁸ The fourth Turkish military operation in Syria, Operation Spring Shield, in February and March of 2020, marked the breakthrough in awareness of the TB-2 among a wider public, due to the heavy social and traditional media campaign using drone footage to show the destruction of Syrian forces in Idlib. Turkey used both the TB-2 and Anka-S drones to target the forces of the Syrian regime, both as reprisal for an airstrike killing at least 33 Turkish soldiers in Balyun and as a counter-offensive against the Syrian Arab Army, which was eliminating Turkish-backed militants in Idlib. Think tanks monitoring the campaign's impacts reported 405 combat-related deaths among pro-Syrian regime fighters during Operation Spring Shield.⁷⁹



A woman reacts as she mourns the death of civilians killed in a reported Turkish drone strike two days prior, during their funeral procession in the northeastern Syrian city of Qamishli, on November 11, 2021. Detil Souleiman / AFP

A central method used by Turkey in attempting to weaken the military capability of the SDF/YPG in north-east Syria has been its engagement in targeted killings. Turkey's first targeted killing allegedly occurred in south-eastern Turkey, when the TAF publicly reported their first TB-2 kills on 10 September 2016, killing five alleged PKK militants. Whether this concerned Turkey's actual first targeted killings with an armed drone is unknown.⁸⁰ In Syria, the TB-2 has increasingly been deployed by Turkey to kill specific SDF commanders and members of other linked armed groups, e.g. the Syriac Military Council and the Iran-based Kurdistan Free Life Party (PJAK), in addition to providing air assistance to the TAF and engaging in targeting important SDF military positions and infrastructure. Its combat drones target vehicles presumed to be transporting SDF commanders, or SDF buildings, like on 19 August 2021 when the SDF headquarters was targeted in the town of Tal Tamer, killing seven SDF commanders. UAVs have enabled the Turkish military to gather intelligence on the whereabouts and movements of SDF leaders and to kill them.⁸¹ At the time of writing, a surge is being seen in Turkish drone strikes in populated areas in northern Syria.⁸² From the start of 2022 alone, there have been over 65 reported drone strikes in north-eastern Syria, killing 35 people, most of them alleged militants or political figures, and including at least five children, according to local reporting, while this number is likely to be higher at time of publication of this report.⁸³

Turkey has also used its armed drones against Iranian militias and ISIS and its unarmed drones for propaganda and mobilisation purposes, dropping leaflets over areas in the Idlib governorate calling on civilians to support the TAF.⁸⁴ Social media reports⁸⁵ allegedly show that Turkey has also been using the small Kargu loitering munition system in Syria.⁸⁶ According to Turkish media, the TB-2 and Anka-S drones mainly take off from air bases on the border with Syria, while some take off from places further within Turkey, such as Batman⁸⁷; the Kargu drones are likely to be deployed by Turkish troops on the border or inside Syria.

Israel

There are two confirmed types of Israeli drones flown in Syria, namely the Skylark and the Searcher/Forpost. Russia is, however, the only party flying the Searcher/Forpost over Syria, as described earlier.⁸⁸ The class I Skylark is a small reconnaissance drone produced by Elbit Systems. It has reportedly been spotted in Quneitra and Shaddadi.⁸⁹ Due to the antagonistic relations between Israel on the one hand and Syria, Iran and Hezbollah on the other, many Israeli activities against Syria since 2013 have been directed against pro-Assad, pro-Iranian and Hezbollah forces or were aimed at strengthening its grip on the Golan Heights. Ironically, the Israeli-designed Forpost is flown by Russia to support the Assad regime (and therefore also Iran and Hezbollah) and Israel has shot it down multiple times in Syria.⁹⁰ There are many claims of armed Israeli drones and loitering munitions popping up in Syria and targeting Iranian, pro-Assad or Hezbollah military forces but these claims have so far not been backed up with evidence.⁹¹

United Kingdom

As part of the US-led Operation Inherent Resolve, the United Kingdom also deployed its MQ-9 Reapers, based in Kuwait, over Syria. These drones were largely used for close-air support

and wider airstrikes against ISIS.⁹² However, the UK carried out several targeted killings,⁹³ including on some of its own citizens who joined ISIS.⁹⁴ British jetfighters were also deployed to shoot down drones that were aimed at US bases in Syria,⁹⁵ while it was recently revealed that UK armed drones have been operated by Australian air force pilots.⁹⁶

Non-state Actors

Islamic State of Iraq and Syria

The use of drones by ISIS is one of the most extensively researched and documented case studies of an NSAG's drone usage. Soon after their rise in 2014, ISIS is known to have deployed both armed and unarmed commercial drones against military targets of the Assad regime, US-led coalition, Russia, YPG and other rebel groups and against energy infrastructure. Identified drones used by the Islamic State in and around cities like Raqqa, Kobani, Deir ez-Zor and Aleppo include the class I Phantom DJI, Skyhunter FPV, Skywalker X8 and X-UAV Talon drones, along with other unidentified varieties of commercial drones. These COTS drones are primarily used by ISIS in the Syrian conflict for ISTAR purposes, with a first video of the group flying a DJI Phantom in August 2014. The intelligence collected using drones was key in guiding ISIS offensives against Syrian forces' positions.⁹⁷ Over the years, the jihadist group has added low-tech and cheap technological components to its stock of commercial UAVs to make them more sophisticated and weaponise them, enabling them to guide indirect fire and to deliver small Improvised Explosive Devices (IEDs). ISIS began weaponising its drones in late 2016 in Iraq and deployed its armed UAVs for the first time in eastern Syria during 2017. ISIS's drone programme reached its peak in the spring of 2017, when between 60 and 100 drone bomb attacks took place in Syria and Iraq on an almost daily basis, amounting close to 9000 attacks in this timespan. One example of their effective use in this period, is when a drone dropped two IEDs onto an ammunition depot belonging to the Syrian Arab Army in Deir ez-Zor, destroying it completely.⁹⁸



Drone footage released by ISIS shows a weaponized commercial drone attack Syrian regime ammunition stockpiles in the Deir ez Zor stadium. October 24, 2017

The modifications ISIS makes to its commercial drones are not particularly difficult in themselves, yet their drone operation stands out because of the scale. ISIS is well-organised and has invested significant financial resources in its drone programme, leading to the industrialised production of munition, drone bomb components and COTS attack drones in both small and large development sites or 'drone factories'. ISIS has used a wide range of materials and types of warheads and tails for their drone bombs. The manufacturing of munitions under IS has improved substantially, increasing their drones' effectiveness and impact. The speedy upscaling and deployment of armed drones by ISIS has most likely been the result of careful, centralised and deliberate planning. The weaponised drones of ISIS are known for their accuracy, primarily targeting vital infrastructure, vehicles and infantry positions, and often creating strategic effects, according to Bellingcat researcher Nick Waters. The General of the US Special Operations Command even called these drones the "most daunting threat" of 2016, with their ability to challenge US air superiority.⁹⁹ Prior to this phase of acquiring and modifying commercial drones, ISIS had allegedly focused on countering drone warfare by the US and its allies by developing UAVs powered by pulsejet engines in 2015. Investigations by Conflict Armament Research suggest that these projects most likely failed and that such jet-driven drones were never used by ISIS on the battlefield.¹⁰⁰

What makes the ISIS drone programme unique compared to other non-state actors is the procurement network for its improvised weapons. Several investigations have mapped out how different weapons and components found their way into Syria. The industrialisation of its UAV production became possible due to the procurement of materials through international supply chains. Imported parts and components were rapidly collected and disseminated through the entire ISIS-controlled territory once they reached Syria or Iraq. Many commodities were procured by the same (family-owned) businesses and individuals, who were mainly based in Turkey near the Syrian border, from where the goods were smuggled into Syria. The Islamic State tended to use the same international retailers for a longer period, leading to a consistent supply chain.¹⁰¹ Of specific influence were two Bangladeshi brothers who ran shadow businesses in the United Kingdom, Spain and Bangladesh through which they moved money and materials to the Islamic State.¹⁰² Other distributors from whom third parties purchased commercial drones for the Islamic State were based in Lebanon, Turkey, Uzbekistan, India and Kuwait. The acquired UAV components and commercial drones were often of Chinese origin. The process in the ISIS drone programme from the acquisition to operation of the drones sometimes took on a 'layered nature', meaning that a commercial drone could be purchased in one country, activated in another country and used in a third country, like Syria. Overall, the ISIS drone supply chain was extremely complex, global and multi-layered, with a range of actors involved.¹⁰³

Besides deploying drones for ISTAR and strike objectives, ISIS was strong in exploiting the propaganda value of the imagery from drone videos. Instead of shrouding its drone use in secrecy, like most state and non-state drone users do, ISIS has sought publicity for its drone programme. ISIS has disseminated many images of its drone activities on Telegram. These images can be divided into different categories: drone strikes (depicting UAVs dropping ordnance), filming of operations (primarily of suicide missions), reconnaissance (images taken by drones flying over territory), drones (images of grounded drones) and infographics. Based on their research on drone imagery from ISIS, academics concluded that these images can be regarded as the demonstration of offensive capabilities, or, in other words, of strength and of territorial control.¹⁰⁴



Members of the US-backed Syrian Democratic Forces (SDF), made up of an alliance of Arab and Kurdish fighters, inspect on March 29, 2017 a downed drone, reportedly belonging to the Islamic State group and being used to spy on SDF positions, at the Tabqa dam.

Overall, ISIS has shown how an armed group can use DIY weaponised commercial drones to exploit security gaps in states' armed forces. Utilising cheap technology has turned out to be effective in putting pressure on highly sophisticated and organised militaries, ultimately forcing states to invest in their security measures. ISIS has exerted this pressure by striking military targets (both people and infrastructure) and energy infrastructure. ISIS has been able to weaponise civilian drones by means of complex procurement networks. ISIS has made use solely of class I drones for striking, ISTAR and (highly mediated) propaganda purposes. Altogether, drones have provided ISIS with unprecedented capabilities and possibilities to commit violence and exercise power, which in turn pose new challenges for states' military forces.

YPG/SDF

The Kurdish People's Protection Unit (YPG), the armed wing of the Kurdish Democratic Union Party (PYD), has been fighting two battles in the Syrian conflict. At the start of the Syrian conflict the YPG fought primarily against ISIS and al-Nusra, before it became part of the US-supported SDF, a coalition of armed groups fighting ISIS. Yet after 2017, when ISIS was largely defeated and had lost territorial control, the YPG had to face Turkey, which actively opposed the YPG/SDF in Syria. The SDF seems to be the least well-equipped of all major parties in the Syrian war in terms of air defence capabilities and armour vehicles, based upon an inventory of their weapons.¹⁰⁵ It has relied upon captured weaponry and equipment from ISIS, Russia, Turkey and the Syrian Arab Army, armoured vehicles donated by the US and DIY armour. With regard to drones, the YPG/SDF has resorted to the modification of commercially available class I drones for reconnaissance purposes in the fight against ISIS.¹⁰⁶ International volunteers have joined the YPG's fight against ISIS, including the Brit Macer Gifford. He travelled to Syria in 2015 and came to be known as a YPG drone developer and trainer. He contributed to the development of the YPG/SDF's DIY quadcopter drone arsenal, which they have been using since 2016.¹⁰⁷ Currently, social media

report that some of the DIY drones believed to belong to the YPG/SDF and used in the fight against the Turkish-backed militias are weaponised, including the Talon.¹⁰⁸ Most of the YPG/SDF drones have been used (often unsuccessfully) against Turkish military targets in northern Syria, in cities such as Kobani, Aleppo, Tell Abyad, Ain Isa and Ras al-Ain, and in southern Turkey.¹⁰⁹

Al Nusra/HTS

Al-Nusra, and its successor Hay'at Tahrir al-Sham (HTS), is a militant group in Syria that became a major actor in the conflict after 2012 and managed to effectively control parts of the Idlib governorate. HTS is another non-state actor that acquired relatively cheap and readily available class I drone technology. The group not only used drone technology for ISR purposes but also tried to establish legitimacy by celebrating their drone capabilities in propaganda videos.¹¹⁰ Al-Nusra/HTS has primarily been active in the Idlib governorate, where they use civilian drones and convert them into drones capable of serving their military objectives. Drone attacks by the militants have also been reported in Hama and Aleppo. As the rebel group's drone capabilities improved over the years, their drones were increasingly being armed. Their prime targets have been airports/air bases, oil facilities and the positions of states' armies.¹¹¹



Handout photo made available by Syria's official Syrian Arab News Agency (SANA) shows firefighters extinguishing a fire at a gas and oil storage in central Syria, 21 December 2019. The Syrian state agency claims that drone attacks were carried out on gas and oil facilities in the Homs region.

Syrian National Army

The Syrian National Army (SNA), a coalition of 28 armed groups opposed to the Assad Regime and the successor of the Free Syrian Army (FSA), is fighting the forces of the YPG/SDF, Syrian Arab Army and ISIS. Its establishment in 2017 was facilitated and financed by Turkey. The SNA operated alongside the TAF in Operation Euphrates Shield, Operation Olive Branch, Operation Peace Spring and missions outside of Syria. Whilst the SNA conducted ground offensives in several operations, the TAF provided support by means of air strikes. Turkey has been a source of supply in terms of financing, equipment, weapons and military training for the SNA, but it is not clear whether Turkey has also delivered drone training or components to the rebel group.¹¹² SNA militants have allegedly used both armed and ISR drones. Reconnaissance UAVs thought to belong to the SNA have been shot down by other forces or have been used to record operations. There have been reports of drone strikes carried out by the SNA, for example against targets in the Russian military or Syrian forces, but these remain unconfirmed. The drones supposedly used by the SNA are often various types of commercial off-the-shelf class I drones.¹¹³ The Turkish-backed rebel group has also become proficient in shooting down enemy drones, for example Russian and YPG drones.¹¹⁴

Hezbollah

Lebanese Hezbollah's drone support for the Syrian regime has primarily consisted of Iranian-supplied drone systems deployed against armed groups like ISIS, FSA and al-Nusra/HTS and against Israeli targets. Hezbollah has been engaged in accumulating weapons and fighters in Syria in cooperation with its benefactor Iran.¹¹⁵ Hezbollah began its drone war in Syria in 2014 with an aerial strike against an al-Nusra command post using an Ababil-3 UAV (notably the first known deadly drone attack by a non-state actor against another non-state actor). The strike was operated from an air base in the Bekaa Valley, designed to accommodate Iranian drones, in northern Lebanon, merely ten miles from the Syrian border.¹¹⁶ Furthermore, the group has allegedly been carrying out drone missions from bases close to the Syrian-Lebanese border, like the base near Baalbek, and south of Damascus.¹¹⁷ Since the start of the Russian invasion of Ukraine in 2022, Russia has begun pulling troops out from Syria and Hezbollah has allegedly taken over some of its bases in the country.¹¹⁸

Hezbollah has deployed Iranian made or designed class II and III Shahed systems, class II Mohajer and Ababil systems, the small tactical Yasir and class III Ayoub and Karrar drones. Furthermore, the group has also used armed and unarmed class I OTS drones in Syria, confirmed since 2016, to undertake reconnaissance and surveillance missions and remote bombing attacks using Chinese munition (whereas earlier attacks used explosive-laden drones to crash onto the target).¹¹⁹ Hezbollah has a long history of operating UAVs, with its first successful deployment of the ISR Mirsad-1 drone in 2004 in Israel. Research indicates that the group operates over 2000 drones from various origins.¹²⁰ It had already one of the most advanced drone capabilities among rebel groups, and fighting in the Syrian war alongside the IRGC, the Syrian army and the Russian forces has increased its experience in both intelligence and combat drone warfare. The Syrian war has functioned for Hezbollah as a UAV testing ground and as another stage from which to pursue its conflict with Israel.¹²¹ Hezbollah has acknowledged the use of drones and engagement in drone strikes in Syria with the aim of seizing territory from ISIS in Qalamoun.¹²²

Iraqi militias

Iran-backed Iraqi militias started travelling quietly to Syria in 2012 to support the Assad Regime, but their presence became more overt over the years. Iraqi Shiite volunteers flew to Damascus International Airport on Iranian flights to join the fight, while others entered Syria by road from Iraq, riding in pilgrim buses or commercial trucks.¹²³ During the conflict, they have moved in and out of Syria and frequently returned to Iraq.¹²⁴ The proxies are armed with, and trained to operate Iranian-made drones from the IRGC and Hezbollah in Iran, Lebanon and Iraq. Iran also ships drone components to Iraq for its proxies to assemble and deploy drones there.¹²⁵ The IRGC Quds Force Commander Qassem Soleimani provided surveillance drones to Iraqi Shiite militias in response to the rise of ISIS, for them to monitor ISIS positions in Syria and Iraq.¹²⁶ Media coverage suggests that Iraqi militias such as the Badr organisation and Harakat Hezbollah al-Nujaba have been using the class I Oghab-1 and Yasir drones.¹²⁷ The militia Kata'ib Hezbollah (KH) has been supplied with the class II Ababil-3 drone, which the group has dubbed the Basir-1.¹²⁸ KH is thought to store its drones at Camp Speicher, an Iraqi Air Force academy and former US military base near Tikrit in Iraq but now dominated by multiple Iraqi Shiite groups.¹²⁹ When the threat of ISIS receded in 2017, Iran mobilised the Iraqi militias to help secure the survival of the Assad regime and to fight against America's presence in Syria.¹³⁰ In the spring of 2019, the military leader Soleimani instructed the Iraqi militias to prepare for a proxy war with the US,¹³¹ only to be killed in a daring US drone strike at Bagdad International Airport in January 2020. At the time of writing, Iraqi militias are still active in Syria and they are influential players. They are accused of using suicide drones¹³² and of targeting US bases in Syria, such as the US base at the Omar oil field and the al-Tanf base.¹³³

Unidentified actors

Since New Year's Eve 2017, the Russian air base at Khmeimim has been subject to repeated drone strikes. On 31 December 2017 a suspected drone attack killed two Russian soldiers and allegedly damaged a Russian aircraft, followed by another attack thwarted by Russia on 6 January 2018.¹³⁴ In September 2019, the Russian army stated it had downed 58 drones that year from insurgents attacking Khmeimim air base.¹³⁵ Who carried out the strikes is unknown. They were probably unidentified militant groups from Idlib. There are accusations of the group Tahrir-al-Sham being responsible for drone attacks on the base. HTS, however, denies the accusations.¹³⁶ Despite the high-profile character of the target—a core air base in Russia's military efforts in Syria and an essential source of support for the Syrian regime—no NSAG has claimed responsibility for the attacks, indicating an understanding of the strategic value of secrecy and discipline. It cannot even be said with absolute certainty that the first attacks in 2017 and 2018 involved drones. Nonetheless, the discovery of two commercial OTS drones near the air base on 1 January 2018 and an open-source investigation on the events conducted by Bellingcat suggest that the involvement of drones is a credible possibility. A unique feature of this specific drone attack is the tactic used. The drones were most likely flying completely unguided with a flight plan towards their target. When reaching the given GPS coordinate, they probably dropped their payload en masse. A massed drone attack had not been seen among rebel groups before, not even during the entire drone programme of ISIS. Notwithstanding the seemingly cheap design of the drones, using duct

tape and plastic sheeting, they were able to breach the Khmeimim perimeter. Over the years, the designs of the commercial drones used to attack the Khmeimim base have become more and more sophisticated. Taken as a whole, the attacks show an attempt by NSAGs to suppress the air assets of a state actor, in this case Russia, by means of improvised weaponised commercial drones. Whoever is responsible for the attack came close to effectively striking a blow on Russia's air forces in Syria.¹³⁷

Another recurring target in Syria of drone attacks enacted by NSAGs is energy infrastructure facilities, whereby the actor behind the attack often remains unknown. For example, the oil and gas facilities in Homs have been subjected to multiple drone attacks over the years. In December, 2019, one governmental oil refinery and two gas facilities in the Homs province were targeted and damaged by armed drones. The attacks remain unclaimed, but it is thought ISIS cells were responsible for the strikes.¹³⁸ During February 2020, the Homs oil refinery and gas facilities witnessed multiple weaponised drone attacks by unknown armed groups.¹³⁹

By and large, the Syrian war has shown that NSAGs are willing to use weaponised commercial drones to target key energy infrastructure facilities owned and/or used by state actors in addition to military targets.



Aerial footage shows Russian airstrikes against armed groups in Idlib that are about to launch several drones in Idlib. Screenshot from video posted on Russian Telegram, September 10, 2022

Concluding Remarks: the Dynamics of Drone Use in the Syrian War

The growing relevance of drones on the battlefield has become ever more apparent in the Syrian war. Drones of all sizes and types fill the skies of Syria and they have proved to be crucial assets for both states and non-state armed groups alike. The Syrian conflict has been a fertile ground for the evolution of drone capabilities. The assessment in this report of actors deploying military drones shows a wide array of applications, ranging from traditional functions as seen in other armed conflicts and counter-terrorism operations, such as ISR and targeted killings, to new applications, such as the wide use of loitering munitions and drones as a threat amplifier by armed groups targeting states. Syria has in particular been used as a staging ground of state-supported armed groups for attacks, most notably Iran-linked militias targeting US bases in Syria and targeting Israel from Syria with long-range single-use explosive drones. At the same time, Iran-supported Hezbollah has used Syria to obtain more drones, while also improving their battlefield experience by deploying the drones against armed opposition groups.

The rapid proliferation of both military and commercial drone technology is clearly resulting in new military tactics and strategies, while also influencing political calculations and foreign-policy decision-making. The shift towards fighting contemporary conflicts from a distance by means of drones, among others, requires us to rethink the ethical, political and security implications of 'remote warfare'. In order to properly address the unique challenges posed by the proliferation of drone technology, as well as their deployment in conflict, we need to understand better how they are being used. This report has taken the Syrian war as a case study, in which the following patterns can be discerned.

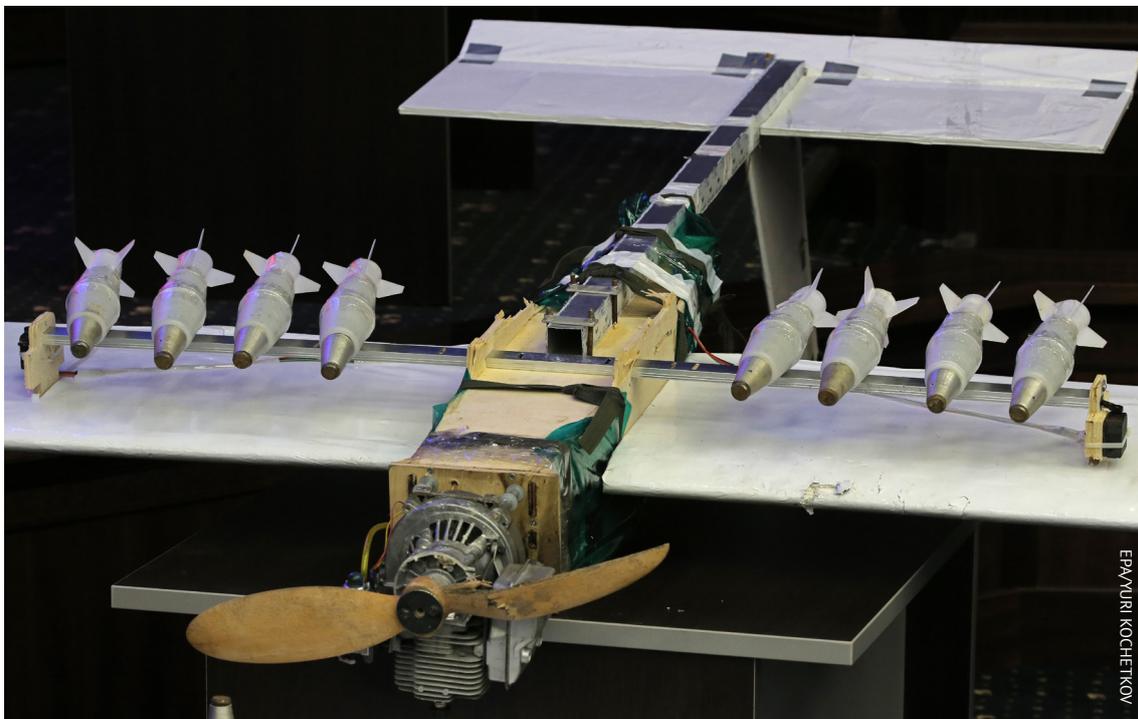
Syria Has Become the New Extrajudicial Killing Zone

The US has scaled down its own drone use in counter-terrorism operations in Pakistan, Somalia and Yemen, though it has continued to carry out over a dozen drone strikes in north and west Syria against suspected ISIS and al-Qaeda militants in the wake of the defeat of ISIS in

2017. To do this, the US used a newly developed non-kinetic missile, and in most cases provided a public clarification for the strikes conducted. Turkey has intensified its own extrajudicial killings of suspected militants in Syria, taking over from the US as the most active drone power applying this lethal tool in cross-border strikes. From January to September 2022, more than 60 Turkish drone strikes took place in northern Syria, which also resulted in the death of civilians, including children. Turkey has so far not released any legal position that justifies the use of lethal force outside of an armed conflict, nor did it provide compensation to families of civilians who were killed or wounded. This concerning development seems to be building upon the absence of strong international pushback against the US's drone wars, which caused thousands of civilian casualties but at the same time lacked transparency or clear accountability mechanisms and were conducted under tenacious interpretations of international legal frameworks. Activists and human rights campaigners have long warned that the lack of response to this could open the door for other states to use drones in a similar way, and the current Turkish operations in Syria (and northern Iraq) clearly vindicate these concerns.

Drone Testbed and Staging Area

The battlefield in Syria and Iraq marked the breakthrough for the use of weaponised commercial drones, spearheaded by ISIS and copied by other armed groups. The drone use by various armed groups in Syria saw a lot of 'firsts'. ISIS set up a professional DIY drone programme on a factory-like scale, which had not been seen with NSAGs before. ISIS was the first NSAG to manufacture the munitions for commercial drones on an industrial scale; this munition production has since been replicated by other armed groups.



A drone allegedly used by militants acting in Syria on early hours of 06 January 2018 to strike Russian bases in Syrian Hmeimim and Tartus is on display at the Russian Defence Ministry headquarters in Moscow, Russia, 11 January 2018.

Commercial drones not only had added propaganda value for armed groups and boosted intelligence, surveillance and reconnaissance; arming the drones with small bomblets and explosives also turned them into a real and deadly nuisance for states. In particular the use of larger, home-built drones equipped with small bomblets targeting the Russian air base at Khmeimim in Latakia demonstrated that with cheap and simple methods, an armed group could ground jetfighters and helicopters, as Russia needed to boost its air defences after the attacks.

The conflict has also been a battleground for several states already involved in conflicts with one another and has therefore increased regional security challenges. One example is Israel and Iran, which continued their struggles in Syria by deploying ISR and armed drones against each other or their proxies, aggravating already existing tensions. Iran exploited a stronger US presence in the east of Syria by providing Iraqi militias with drones that were then launched against US bases, while also staging drone flights to Israel. This also had an escalatory effect, as both Israel and the US carried out airstrikes on locations suspected of storing and launching drones.

In addition to the larger type of military drones used by Iran, Syria also saw the first use the Lancet suicide drone, by Russia, and further use by the US of the Switchblade, a similar type of drone, and allegedly also the Turkish Kargu loitering munitions. Easy to carry and deploy, these precision drones with small but effective payloads have since been deployed on a larger scale in the Ukraine war. Considering the potential effective use by ground forces and their cheap production and easy use, we are likely to see wider development and deployment of such small but lethal military drones in the near future.



An Iranian Shahed-129 drone at the Syrian T-4 airbase. Photo released by the Israeli Ministry of Defense in February 2018.

When comparing the different drone classes used by each actor, several elements stand out. Almost all state actors in the Syrian conflict, namely the Syrian regime, Russia, the United States, the United Kingdom and Iran, have made use of drones from classes I, II and III. The exceptions are Turkey and Israel. Whereas Turkey has solely made use of class III systems and loitering munitions, Israel seems to have relied only on class I drones. In the case of non-state armed groups, most of them solely make use of class I drones. The only exceptions are Hezbollah and the Iraqi militias, which have also used class II drones and, in the case of Hezbollah, even class III drones. It is striking that only the Iranian-supported militant groups have been able to use not only class I drones but also class II and III drones.

Beyond Syria's Drone Wars

The peak of drone use by armed groups in Syria has passed, but the conflict has shown how militias are able to challenge the superiority of states' armed forces and to achieve significant strategic advantages with the cheap and creative use of drone technology. The use of smaller drones is here to stay and they are expected to further impact the future of warfare. Not only will this reshape military decision-making, but it will also require a reinvigorated international debate on the risks of uncontrolled exports of drone technologies and their subsequent use. The findings of this report reaffirm the necessity of the last report by the UN Special Rapporteur on Extrajudicial Killings from 2020, who stressed, among other things, the need to "establish a transparent multilateral process for the development of robust standards in the use of drones". With over a hundred states and increasing numbers of non-state armed groups deploying drones, a strong international approach is essential for building international norms and standards, minimising civilian harm and preventing the escalatory effects of uncontrolled drone proliferation.

Annex: Drone Database

The data set is a non-exhaustive list of the drones used in the Syrian war. It does not specify all variants of the commercial OTS drones used and does not include alleged but non-confirmed types of drones.

	Type of Drone	Country of origin	User
1	Anka-S	Turkey	Turkish Armed Forces (TAF)
2	Bayraktar TB2	Turkey	TAF
3	Orlan 10	Russia	Russian Aerospace Forces (RuAF), Syrian regime
4	Orion	Russia	RuAF
5	Forpost	Russia	RuAF
6	Lancet-1	Russia	RuAF
7	Lancet-3	Russia	RuAF
8	KYB	Russia	RuAF
9	Eleron 3SV	Russia	RuAF, Syrian regime
10	Pchela-1T	Russia	RuAF
11	Ptero-G0	Russia	RuAF
12	Searcher	Israel	RuAF
13	Skylark	Israel	Israel Defense Forces (IDF)
14	Switchblade	United States	United States Armed Forces (USAF)
15	MQ-1 Predator	United States	USAF
16	MQ-1C Gray Eagle	United States	USAF
17	MQ-9 Reaper	United States	USAF
18	RQ-20 Puma AE	United States	USAF
19	Aerosonde MK 4	United States	USAF
20	Ababil-3	Iran	Islamic Revolutionary Guard Corps (IRGC), Iraqi militias, Syrian regime, Hezbollah
21	Ababil-2B	Iran	IRGC, Iraqi militias, Syrian regime, Hezbollah
22	Oghab-1	Iran	Iraqi militias, Syrian regime
23	Mohajer-6	Iran	IRGC, Syrian regime, Iraqi militias (possession confirmed, use unconfirmed)
24	Mohajer-4	Iran	Syrian regime
25	Shahed-129	Iran	IRGC, Syrian regime, Hezbollah
26	Shahed-123	Iran	IRGC, Syrian regime
27	Yasir	Iran	Hezbollah, Syrian regime, Iraqi militias
28	Mirsad-1	Iran	Syrian regime, Hezbollah
29	Saqeah	Iran	IRGC
30	Karrar	Iran	Hezbollah
31	Ayoub	Iran	Hezbollah
32	Mini-variant of the Shahed drone	Iran	Syrian regime
33	Mig-21 fighter jet	Russia	Syrian regime
34	Inspire	China	Syrian regime
35	F550 Flame Wheel	China	Syrian regime
36	DJI Phantom	China	Syrian regime, ISIS, Hezbollah, Syrian National Army
37	Talon	China	YPG, ISIS
38	Skyhunter FPV	China	ISIS
39	Skywalker X8	China	ISIS

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