

The Growing Iranian Unmanned Combat Aerial Vehicle Threat Needs U.S. Action

Peter Brookes

KEY TAKEAWAYS

Augmenting its military might and power projection, Iran's unmanned combat aerial vehicles (UCAV) pose a growing threat to U.S. interests in the Middle East.

Iran has one of the most active drone programs in the world, which supports not only the regime but its allies, proxies, and foreign terrorist organizations.

To counter this threat, the Trump Administration and Congress must work together to ensure U.S. forces are equipped with robust counter-drone capabilities.

There is much talk about Iran's burgeoning missile programs—and rightly so. Tehran has the largest missile arsenal in the Middle East and is developing it into a regional and intercontinental ballistic missile threat that expands Iran's geopolitical influence and military power projection.¹

Less discussed is a factor that supports Iran's international aspirations by augmenting and diversifying Iran's air power and, arguably, missile might: the development and fielding of a variety of unmanned combat aerial vehicles (UCAVs) that can conduct strike missions for both Iran and its Middle Eastern allies and proxies.

Indeed, in mid-September, Iran reportedly attacked Saudi Arabia's expansive Abqaiq oil facility with a barrage of cruise missiles and armed drones. The strike, which was still being investigated as of this writing, decreased Saudi oil output by an estimated 50 percent, affecting global energy security.

This paper, in its entirety, can be found at <http://report.heritage.org/bg3437>

The Heritage Foundation | 214 Massachusetts Avenue, NE | Washington, DC 20002 | (202) 546-4400 | heritage.org

Nothing written here is to be construed as necessarily reflecting the views of The Heritage Foundation or as an attempt to aid or hinder the passage of any bill before Congress.

If news reports are accurate, the attack was a major demonstration of Iranian drone, missile, and military force.

In a period of rising tensions with Iran and significant, ongoing instability in the Middle East, these unmanned combat aerial systems (UCAS) pose a growing threat to a broad range of U.S. political, economic, and security interests in the region. The Iranian UCAV challenge is exacerbated by concerns that U.S. forces in the region may not have the necessary capabilities or sufficient numbers of counterdrone systems to deal with this emerging challenge.

To address this situation, the Trump Administration must maintain a positive military balance against Iran in the Middle East, work to prevent Iran from technologically enhancing its drone capabilities, and improve the comprehensiveness of drone defenses for U.S. forces and regional partners. In addition, Congress should work closely with the Trump Administration to evaluate the Iranian UCAV threat and craft defense programs to quickly and cost-effectively field robust counterdrone capabilities through research and development, procurement, and deployment that include a mix of kinetic and non-kinetic options to provide night and day, all-weather, 360-degree defenses.

This paper briefly surveys Iran's armed drone programs; identifies the Iranian, Iranian allied, and Iranian proxy use of UCAVs; discusses U.S. counterdrone and UCAS capabilities; examines the implications for U.S. national security interests; and recommends specific policies to deal with this growing threat.

Unmanned Combat Aerial Vehicles

Armed unmanned aerial vehicles (UAVs)—or UCAVs—are sometimes called the “poor man’s missile.” Like missiles, UCAVs are unmanned strike platforms, reducing the risks and challenges associated with manned aircraft, such as the loss of a pilot or crewmember during a mission. UCAVs also obviate the need for search and rescue capabilities to recover a downed aviator.

Other advantages of UCAVs include multi-mission capabilities such as reconnaissance and strike options. Other benefits include potential low-observability, significant flight endurance, reuse on future missions if successfully launched and recovered, and even plausible deniability of ownership, depending on the system.

UCAVs can also have lower production, maintenance, training, and use costs compared with other airborne platforms such as manned aircraft and ballistic and cruise missiles. Depending on the weapons systems involved,

another potential advantage is that the cost to defend against aUCAV can exceed the cost of theUCAV platform itself.

Lastly, the terms used to describe UAVs can vary widely and have evolved over time. For this paper, the term “UAV” is used to generally describe these platforms.² “UCAV” refers to armed or attack UAVs. In addition, the term “drone” will be considered synonymous with “UAV” and its variants.

Iranian Ambitions andUCAVs

According to recent U.S. government assessments, Iran has significant strategic ambitions in the Middle East. Specifically, Iran is attempting to spread its political, religious, and military influence across the region from the Persian Gulf to the Mediterranean Sea.

Iran’s push for regional hegemony in the Middle East also targets the United States as an outside power with significant national interests in the region and as the country with, perhaps, the greatest ability to significantly constrain Iran’s power and influence. American interests in the region include the security of its allies and partners, fighting terrorism, the free flow of energy, freedom of navigation, and preventing the proliferation of weapons of mass destruction.

Iran is using several conventional and unconventional instruments of national power to advance its goal of preeminence over its neighbors in the Middle East and to shape American policies and actions in the region. Indeed, according to the 2018 National Defense Strategy of the United States, “[i]n the Middle East, Iran is competing with its neighbors, asserting an arc of influence and instability while vying for regional hegemony, using state-sponsored terrorist activities, a growing network of proxies, and its missile program to achieve its objectives.”³

Of course, Iran is also using other military capabilities, including armed UAVs. Interestingly, the U.S. government viewsUCAVs among the more important military instruments that Iran is using to protect and advance its interests.

In 2019, U.S. Director of National Intelligence (DNI) Daniel Coats told Congress:

Iran continues to develop, improve, and field a range of military capabilities that enable it to target U.S. and allied military assets in the region and disrupt traffic through the Strait of Hormuz. These systems include ballistic missiles, unmanned explosive boats, naval mines, submarines and advanced torpedoes, armed and attack UAVs, antiship and land-attack cruise missiles, antiship ballistic missiles, and air defenses.”⁴

Another issue is that Iranian UCAVs are used not only in support of Iran's defense but also to support a state ally abroad, non-state terrorist groups, and another Iranian non-state proxy. These include the regime of Syrian President Bashar al Assad, the terrorist groups Hamas and Hezbollah, and the Houthi rebels in Yemen. Equally important, according to some assessments, UCAVs are becoming increasingly central to the military strategies of Iran's military and paramilitary forces and non-state proxies.

Iranian UCAVs

Iran may have one of the oldest drone programs, dating back to the 1980s and the Iran–Iraq War.⁵ Indeed, by some estimates, it has become one of the most active UAV programs globally.⁶ It has been suggested that Iran has invested in its UAV programs to address its shortcomings in air power, including strike and aerial reconnaissance capabilities.⁷ These air power shortfalls have likely been driven by a number of factors including defense program decisions, anemic domestic economic growth, and punitive economic sanctions imposed on Iran for its undeclared nuclear program and its support of terrorism, among other reasons.

Interestingly, today, the drone program seemingly is a source of political, military, and economic pride for the regime, especially since in Tehran's view its UAV achievements showcase its resilience to international punitive economic sanctions.⁸ Indeed, according to one analyst:

But Iran's drones don't just get attention when they're discovered aloft. The country makes sure to display its defense sector's progress routinely; the drone program has become a centerpiece of its military technology exhibits. This allows Iranian leaders to show their domestic constituents that their security is provided for and that, while the region is increasingly volatile, Iranians have nothing to fear. These public drone displays also show foreign adversaries that sanctions and pressure don't slow Iranian progress.⁹

Iran has several models of UCAVs in use. Information about Iran's UCAVs in open-source literature is limited, can be inconsistent, and varies widely. As such, this section briefly addresses only the better-known armed drones. The reader should also be aware that some data on Iranian drones could be originally sourced from Iranian state-controlled media and therefore could contain misinformation or disinformation directed toward both friend and foe for political, economic, and security purposes.

For instance, Iran markets its drones for export, and better performance numbers could mean more attention and better sales. At the same time, Tehran must also be cautious about revealing militarily sensitive information at trade shows. Moreover, overstating the performance characteristics of its UAVs could also be intended to have a deterrent effect on potential adversaries through the development of a more serious threat perception than actually exists from the platforms. Iran's state-owned Aviation Industries Organization, established in 1966, and its subsidiaries are believed to manufacture Tehran's drones.¹⁰

That said, the following brief catalog of Iran's better-known UCAVs and their derivatives provides estimates of each drone's capabilities, gathered from a variety of sources.

Shahed-129. Iran claims that the Shahed-129 UCAV has a 2,000-kilometer range and is capable of conducting both reconnaissance and combat missions.¹¹ It reportedly has a flight endurance of 24 hours and can carry up to eight missiles.¹² The Islamic Revolutionary Guard Corps (IRGC) put the Shahed-129 into service in 2012.¹³ It may be modeled on the U.S. Predator drone or the Israeli Hermes drone.¹⁴ It is propeller driven.¹⁵

Saegheh-2. The Saegheh armed drone and its variants, such as the newer Shahed-171, are believed to be modeled on the U.S. RQ-170 Sentinel low-observable UAV.¹⁶ The Iranians reportedly recovered an RQ-170 in Iran in 2011.¹⁷ The Saegheh is a "medium-range combat reconnaissance" UAV and can reportedly be armed with four bombs or missiles and possibly carry an integrated explosive.¹⁸ Power plants include jet or piston engines, depending on the version of the drone.¹⁹ Iran claims that the Saegheh-2 has seen combat service in Syria.²⁰ A Saegheh-2 or a variant, "armed with explosives," was shot down in Israel in 2018.²¹

Sadegh-1. Iranian official media reports for this UCAV state: "Its flight ceiling is 15,000 feet or 4,000 meters. It has a speed of 200 kilometers per hour, a mass of 242 kilograms, six hours flight endurance, and an operational radius of 200 kilometers."²² This drone can reportedly carry two weapons and was reportedly unveiled in 2014.²³ It appears to be propeller driven.²⁴

Mojaher-6. The Iran Defense Ministry unveiled the Mojaher-6 UCAV in 2016, putting the armed drone into serial production in 2018.²⁵ This medium-altitude, long-endurance drone has an endurance of 16–24 hours, depending on payload, and earlier versions had a range limited to 150 kilometers due to line-of-sight control restrictions.²⁶ The IRGC now claims the latest version of the Mojaher-6 has a range of 2,000 kilometers, a ceiling of 18,000 feet, and a maximum speed of 200 kilometers per hour.²⁷ It can carry at least two weapons and is propeller driven.²⁸

TABLE 1

Iranian Unmanned Combat Aerial Vehicles

| UCAV | Propulsion | Number of Weapons |
|------------|---------------|-------------------------------|
| Shahed-129 | Propeller | Eight |
| Saegheh-2 | Propeller/Jet | Four/ One (Explosive warhead) |
| Sadegh-1 | Propeller | Two |
| Mojaher-6 | Propeller | Two |
| Qasef-1 | Propeller | One (Explosive warhead) |

SOURCE: Heritage Foundation research.

BG3437  heritage.org

Qasef-1. The Houthi Qasef-1 armed drone and its variants are believed to be based on the Iranian Ababil drone, assembled from components acquired from sources outside Yemen, likely Iran.²⁹ It can carry a 100-pound warhead to a range of 150 kilometers and is propeller driven.³⁰

Due to these system’s potential asymmetric military advantage and the increasing confidence Iran places in them, Iran can be expected to continue to add armed drones to its fleet and develop new and improved systems. While there is scant information on entirely new UCAV systems under development, Iran may intend to improve on current airframes for the time being. For instance, over time, some of Iran’s drones have replaced the skids and pneumatic launcher with wheeled landing gear, increasing their durability and service life, according to publicly available photographs.

Iranian UCAVs in Action

Iran is building drones not only for its military and paramilitary forces’ use to defend the country, but also to support its allies and proxies in an effort to advance Iranian political-military interests.

There is cause for concern, as Central Command (CENTCOM) Commander General Joseph F. Votel told Congress in February 2019:

Iran exerts its malign influence throughout the region, through its increased—often unprofessional—activities in the Arabian Gulf and Strait of Hormuz, engaging in proxy warfare through its sponsorship of violent extremist organizations (VEOs), and proliferating advanced conventional weapons, including theater ballistic missiles and weaponized unmanned aerial and maritime systems.³¹

In the case of the Iran-backed Houthi rebels in Yemen, one news report writes:

Yemen's Houthi rebels have launched armed drone attacks with far more precision and reach than the U.S. and its Gulf allies have publicly acknowledged, people familiar with the matter said, showing how readily available technology is creating new dangers for America and its allies in the Middle East.³²

With this in mind, let us look at Iran's use and proliferation of its UCAVs in support of the regime in Syria, the international terrorist groups Hamas and Hezbollah, and the Houthi rebels, its proxy in Yemen.

Syria. Iran has used UAVs extensively in the Syrian civil war, striking ISIS and possibly other targets. Iranian armed drones have threatened Israel and U.S. forces, too. For instance, Iran used UCAVs to conduct retaliatory strikes against ISIS in Syria in 2018. In 2019, the Director of National Intelligence (DNI) testified before Congress that the strike had multiple purposes:

Iran's retaliatory missile and UAV strikes on ISIS targets in Syria following the attack on an Iranian military parade in Ahvaz in September [2018] were most likely intended to send a message to potential adversaries, showing Tehran's resolve to retaliate when attacked and demonstrating Iran's improving military capabilities and ability to project force.³³

That strike was not the only combat drone strike in Syria. Iranian drones reportedly conducted 700 strikes against ISIS in Syria over an unspecified period, according to a news report citing an IRGC commander in 2018.³⁴

Highlighting concerns about Iran staying in Syria long term, Iran has also used Syria as a base to fly at least one UCAV mission into Israel in February 2018. The Israeli military claims the UCAV was armed and intended to carry out a strike in Israel. Israeli Defense Forces shot down the drone and retaliated against the T4 air base in Syria where the UCAV had been launched. Perhaps hinting at the centrality of drones in targeting Israel from Syria, according to a press report citing the IRGC, "This drone was not the first or last drone of the resistance front."³⁵

ISIS and Israel have not been the only targets of Tehran's UCAVs. In June 2017, U.S. fighter jets downed two armed Iranian UCAVs, including at least one Shahed-129 drone that threatened U.S. and allied forces in Syria.³⁶

While Iran has used its armed drones extensively in Syria, it is not entirely clear whether the Syrian regime has used or is using Iranian UCAVs in the ongoing civil war.³⁷

Hamas. Hamas, the Palestinian terrorist group and ally of Iran, has also embraced military drones to add an element of air power to its arsenal, diversifying its threat to its opponents.³⁸ According to an Israeli newspaper:

In one show of power by Hamas, it presented an Iranian Ababil drone that can be launched from a truck. In the past, Hamas claimed to possess three types of UAVs for different purposes: The A1A for intelligence gathering; the A1B for attacks and the A1C for “suicide” attack missions by the aircraft.³⁹

While of seemingly limited military use and effectiveness to date, Hamas’s UAV efforts are likely to continue, undoubtedly influenced and encouraged by Iranian UCAV technological developments, tactics, and operational experiences elsewhere in the Middle East, especially in Syria and Yemen.

Hezbollah. Hezbollah, the Lebanese terrorist group and Iran’s Shia ally and proxy, also poses an armed drone threat, having conducted UAV operations against Israel and in Syria. Hezbollah reportedly uses variants of the Iranian Ababil armed drone. Indeed, Hezbollah may maintain a runway to support Iranian drones and operations in Lebanon.⁴⁰

For example, while not a military strike per se, an Iranian-supplied Hezbollah drone reportedly penetrated Israeli airspace in 2012 to surveil a sensitive nuclear facility at Dimona for several hours, relaying data back to its operators before it was shot down.⁴¹

In 2014, Hezbollah reportedly successfully attacked al Qaeda–linked militants in Syria with a UCAV. This strike is significant in that it may mark the first time that a non-state actor, in this case also a terrorist group, used armed drones against an opposing force.⁴²

Yemen. Prior to the Yemeni civil war, Hezbollah was arguably the most active non-state armed drone actor; today, the Houthi rebels in Yemen are. As is well known, Iran is supporting the Houthi rebels in Yemen in the civil war against the internationally recognized Yemeni government and the Saudi-led coalition. That Iranian support seems to extend to military drones. Using UCAVs, the Houthis are not only striking targets in Yemen but also conducting attacks abroad. This reportedly includes a variety of land-based objectives in Saudi Arabia and the United Arab Emirates.

According to the DNI in early 2019:

In Yemen, Iran’s support to the Houthis, including supplying ballistic missiles, risks escalating the conflict and poses a serious threat to U.S. partners and interests in the region. Iran continues to provide support that enables Houthi

attacks against shipping near the Bab el Mandeb Strait and land-based targets deep inside Saudi Arabia and the U.A.E., using ballistic missiles and UAVs.⁴³

In the words of CENTCOM Commander General Votel: “The ballistic missile threat and armed UASs [Unmanned Aerial Systems] emanating from Yemeni territory continue to pose a significant risk, as the Houthi’s [sic] consider civil infrastructure as legitimate military targets.”⁴⁴

While there is debate on the precise origins of the Houthi’s armed drones, Iran is considered the outside party most likely responsible for the Houthi drone program and its significant growth as a threat.⁴⁵ Indeed, according to one press report, “Saudi and U.S. officials have accused Iran of providing the Houthis with the training and designs to build their drones, while drones recovered in Yemen by United Arab Emirates forces show imported Iranian technology.”⁴⁶

Likely supported by Iranian as well as Hezbollah advisors, the Houthis regularly use Qasef-1 “UAVs with explosive warheads” against a variety of targets in the war with the Saudi-led coalition. While not an Iranian drone per se, the Qasef-1 drone and its variants are reportedly similar to Iran’s Ababil drone, which Iran has proliferated elsewhere.⁴⁷

The Houthi drone arsenal has also progressed “from small, propeller-powered surveillance drones to a larger plane-shaped model, dubbed UAV-X by U.N. investigators.” Some can travel more than 900 miles at a speed of 150 miles per hour.⁴⁸

While certainly not comprehensive, some notable examples of the Houthis reportedly using armed drones for attacks inside and outside Yemen include:

- A high-profile attack on a Yemeni military parade in January 2019 that killed a senior Yemeni military officer.⁴⁹ This reportedly is the first time a non-state actor has assassinated a senior government official with a UAV.⁵⁰
- An April 2018 attack on a Saudi oil refinery in Jizan with an armed drone.⁵¹
- A May 2019 strike on two Saudi oil-pumping stations more than 500 miles from the border with Yemen.⁵² According to some reports, this attack could have been launched from southern Iraq, a known operating area of Iran-backed militias.⁵³
- A July 2018 attack on a Saudi oil refinery near Riyadh.⁵⁴

Moreover, Secretary of State Michael Pompeo noted the threat to Americans and other civilians from Houthi drone attacks on Saudi airports in a June 2019 statement:

Yesterday, Iran-backed Houthi rebels launched a drone attack on the Abha airport in Saudi Arabia for the second time in less than two weeks. Initial reports suggest one person was killed and twenty-one were wounded. These Iranian-backed attacks are unacceptable, and all the more reprehensible given that they targeted innocent civilians. They also put Americans living, working, and transiting through Saudi Arabia at risk.⁵⁵

The Saudis estimate that its military has shot down more than 140 Houthi drones as of the spring 2019.⁵⁶

The Houthis have also claimed to have conducted armed drone raids in the United Arab Emirates.⁵⁷ While seemingly unconfirmed by the government, Houthi drone attacks have reportedly included strikes on the Abu Dhabi airport and Dubai airport, the world's busiest airport.⁵⁸ Interestingly, some analysis claims that the Houthi military strategy appears to be moving from a preference for ballistic missile attacks to armed drone attacks.⁵⁹

Also of interest is the Houthi claim that it has "successfully deployed swarming [drone] technology in a series of attacks."⁶⁰ A drone swarm attack involves launching a large number of drones at a target to overwhelm its defenses and increase the likelihood of a successful strike. While details are minimal, especially on the types of drones involved, this could be the first time a non-state actor has accomplished this technological feat.⁶¹

Persian Gulf. Iran has also flown UAVs in the Persian Gulf in international airspace. According to the DNI,

Most IRGC interactions with U.S. ships are professional, but in recent years the IRGC Navy has challenged U.S. ships in the Persian Gulf and flown UAVs close to U.S. aircraft carriers during flight operations. Moreover, Iranian leaders since July [2018] have threatened to close the Strait of Hormuz in response to U.S. sanctions targeting Iranian oil exports.⁶²

The DNI may be referring to an August 2017 incident when an Iranian UCAV made several passes by the aircraft carrier USS *Nimitz* while it was conducting nighttime flight operations in the Persian Gulf.⁶³ The Pentagon did not indicate whether the UCAV was armed at the time. Another incident earlier that month involved a reportedly unarmed Iranian Sadegh-1 UCAV that came within 100 feet of a Navy F-18 fighter, forcing the F-18 to take evasive action.⁶⁴

In a more recent case, a U.S. Navy warship downed an Iranian drone because it was considered a threat to the ship's safety and security during a tense transit of the Strait of Hormuz in July 2019. As of this writing, it is unclear whether the UAV was armed.⁶⁵

In March 2019, Iran conducted a large drone exercise involving as many as 50 drones, including a number of UCAVs, in a demonstration of force, reportedly spread over a large operational distance. Senior IRGC officers attended the "offensive operation," which was meant to demonstrate Iran's air power and its national resilience despite international sanctions.⁶⁶ In addition, some experts believe that any military conflict between the United States and Iran will involve "waves" of Iranian UCAVs, potentially increasing the challenges of U.S. military operations.⁶⁷

In addition, Iranian-backed militias in Iraq have reportedly surveilled U.S. forces with commercial drones, which complicates the process of determining drone ownership and responsibility for these intelligence missions as well as the level of threat. Although no UCAVs have been mentioned in these incidents, the IRGC and Hezbollah may have trained some of these groups on the use of drones while battling the Islamic State, including using drones for aerial attacks.⁶⁸ This clearly presents a potential threat to U.S. forces and other American interests in Iraq.

U.S. Counterdrone Capabilities

American forces and interests in the Middle East clearly face an armed drone threat from Iran and potentially from its allies and proxies. U.S. warships, military bases, troops, and diplomatic facilities in the Middle East could all be the targets of Iranian or other UCAVs. The armed drone threat from Iran and others is not likely to decrease considering current tensions in the Middle East.

Fortunately, U.S. forces have several kinetic and non-kinetic systems that can counter and kill armed drones, depending on the flight profile, weather, and other variables. For instance, in terms of hard-kill options, a drone can be destroyed using an air-to-air missile, such as a Sidewinder Advanced Medium-Range Air-to-Air Missile (AMRAAM), or a 20-millimeter gun on a fighter. Attack helicopters can also be equipped for air-to-air engagements against drones.⁶⁹ Naval weapons systems such as the Phalanx Close-In Weapon System (CWIS), the RIM-7 Sea Sparrow, Standard Missile-2 (SM-2), and SeaRAM surface-to-air missiles are available to U.S. warships for drone defense.⁷⁰ The Navy is also experimenting with a hypervelocity projectile system.⁷¹

MAP 1

Iranian UCAV Threat

Iranian UCAVs (Unmanned Combat Aerial Vehicles) are found across the Middle East, including near U.S. military forces and bases. U.S. Army bases in Iraq and Kuwait, plus a Navy base in Bahrain, Air Force bases in Qatar and the UAE, and Naval forces in the Persian Gulf are all at risk.



SOURCE: Heritage Foundation research.

BG3437 heritage.org

Ground-based counterdrone systems include man-portable air defense systems such as the Stinger and the vehicle-mounted, multi-weapon Indirect Fire Protection Capability (IFPC), which is currently under development.⁷² The Israeli Iron Dome air defense system is also being looked at as a ground-based system.⁷³ The Patriot Advanced Capability-3 (PAC-3) and the National Advanced Surface-to-Air Missile System (NASAMS) missile defense systems can also engage drones.⁷⁴

Further, in terms of other hard-kill options, at some point technological progress may allow for drone-on-drone engagements in the air. There are certainly preventive and preemptive military options earlier in the kill chain

as well such as air and missile strikes on idle UCAVs, air bases, runways, and command, control, and communications facilities.

In terms of soft-kill options, a drone's command, control, and communications facilities or uplink could be manipulated or disabled using offensive cyber tools if accessible. Directed-energy weapons are also being considered such as the vehicle-mounted laser of the Maneuver Short-Range Air Defense Deployable (MSHORAD), which is under development.⁷⁵ Additionally, high-power microwave systems are being examined for drone defense. Electronic warfare systems such as the vehicle-mounted Light Marine Air Defense Integrated System (LMADIS) can jam command-and-control signals and can be deployed with ground forces or at sea as it was in the USS *Boxer* drone engagement.⁷⁶

Operational Risks and Threats

The growing Iranian UCAV arsenal and the proliferation of Iranian armed drones and its variants to its allies and proxies threaten American interests in the Middle East, including U.S. allies and partners. Armed drones enhance Iran's air power and power projection. Iranian UCAVs also could cause increased instability, which could lead to broader regional conflict in a part of the world already fraught with insecurity.

Tehran is providing armed drones, technology, or support to the Syrian regime, the terrorist groups Hezbollah and Hamas, and the Houthi rebels in Yemen. UCAVs increase the range of the threats posed by these non-state actors, and they certainly could be employed in acts of terror involving a range of weapons.

As has been experienced, UCAVs are a threat to any number of targets, including innocent civilians, military forces and leadership, and energy and transportation nodes. Besides conventional explosives, armed drones could also deliver weapons of mass destruction.

Regular operational use of these armed drones, such as in Syria and Yemen, also provides Iran and its partners with an important operational feedback loop that could aid future UCAV technological, tactical, and doctrinal development, increasing the lethality of these systems. Iran may also be interested in developing its own counterdrone technologies for offensive and defensive purposes, based on a counterintelligence arrest in France involving U.S. technology.⁷⁷

Despite a variety of U.S. counterdrone capabilities and research and development initiatives, there are still reasonable concerns about the ability of fielded counterdrone systems to meet the emerging threat and finding cost-effective responses to it.⁷⁸

For instance, while the USS *Boxer* successfully downed the threatening Iranian drone, it did so with an embarked Marine Corps combat vehicle system using electronic warfare deployed on the deck of the ship, perhaps exclusively, for the transit of the Strait of Hormuz. It begs the bigger question: Do all U.S. units and bases in the Middle East have sufficient, permanent, night and day, all-weather, 360-degree defenses for the Iranian and other armed drone threat?

Further, while U.S. forces would have positive kinetic exchange ratios with Iranian UCAVs, these engagements may not have positive economic exchange ratios, such as when high-cost, high-performance surface-to-air missiles are used to kill low-cost, low-performance UCAVs.⁷⁹ Another potential concern is the use of a large number of low-performance UAVs or UCAVs to engage high-performance counterdrone systems with the purpose of depleting on-hand stocks of the high-performance weapons.⁸⁰ It follows that, beyond the economic cost of such an engagement for the defending forces, the possible ensuing shortage of reloads for some high-performance weapons systems used in counterdrone engagements could leave U.S. forces vulnerable to follow-on attacks from enemy high-performance systems, such as ballistic or cruise missiles or other advanced air threats.

Recommendations

To address Iran's armed drone challenge, the Trump Administration should:

- **Maintain a positive military balance of power against Iran, its allies, and proxies** to oppose Iran's malign activities in the region and deter the use of armed drones against U.S. forces and interests. Drones are only one way that Iran could strike U.S. forces in the region, but the use of any weapon system is a political decision by Iranian leaders. These decisions can possibly be shaped before a hostile act is undertaken. Iran must understand that it will be held accountable for the use of force by itself, its allies, or its proxies against U.S. interests.
- **Expand state membership of the 2016 Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enabled UAVs.**⁸¹ This 54-nation agreement in 2016 promotes the responsible export of armed and strike-enabled UAVs, taking into consideration the effect the potential transfer and retransfer would have on peace and stability. For instance, China, a major drone power, is not currently a member

of the agreement—nor is Iran. The agreement should also be expanded to include international standards that address concerns about the transfer of armed drone enabling technologies to countries that threaten international security and the proliferation of armed drones to non-state actors.

- **Highlight the Iranian drone threat in bilateral security meetings and forums**, encouraging countries to consider the proliferation problems of transferring commercial and dual-use drone-supporting high technology to Iran. Clearly, systems, parts, and equipment for UAVs are now commonplace and may include technologies with dual civilian-military uses. Given Iran's growing threat to international security, countries should take extra efforts to stop direct and indirect transfers of possibly military-related UAV equipment and technologies to Iran.
- **Work with regional allies and partners on drone defenses.** There are concerns that the air and missile defenses deployed in the region are not as effective or efficient as possible against drones based on a number of recent Houthi armed UAV strikes in Saudi Arabia. Engaging regional partners closely will not only improve their defenses against drones but reduce the destabilizing political, economic, and security effects of these weapons. This international engagement could also inform U.S. counterdrone research and development, doctrine, and programs.

In addition, Congress should:

- **Hold open- and closed-door hearings on CENTCOM's ability to defend against the growing drone threat in the Middle East.** There are concerns that current CENTCOM forces may not have sufficient, cost-effective defenses to adequately protect U.S. assets against the Iranian and the Iranian ally and proxy drone threat. Congress should specifically inquire about the current state of defenses against drone swarm tactics.
- **Require the Pentagon and the intelligence community to assess the ongoing drone war on the Arabian Peninsula in the next National Defense Authorization Act.** This report, which should be made available to Congress, should identify lessons learned and best practices for U.S. and allied forces in developing drone and

counterdrone technologies and doctrine that can be applied to the Iranian drone problem set and to other emerging armed drone challenges outside the Middle East.

- **Provide adequate funds for U.S. forces to procure and field capable counterdrone capabilities in the most expeditious manner possible.** The United States is considering a number of different air defense counterdrone systems, both hard-kill and soft-kill options. Congress should not only ensure that all important options are investigated—including cyber, directed-energy, and radio-frequency systems—but also exercise rigorous oversight of this process to ensure the most efficient and effective use of taxpayer dollars in delivering the necessary counterdrone systems to U.S. forces.

Conclusion

UCAVs are capable, multi-mission platforms that can be both low-observable and reusable. Armed drones can diversify and augment air power capabilities beyond manned aircraft and missiles, providing lethal power projection potential to their users. UCAVs can also be relatively inexpensive compared with the life cycle and training costs of more sophisticated aircraft and missile systems.

Iran's fleet of UCAVs enhances Iran's military might and geopolitical influence. In a period of rising tensions with Iran and the significant ongoing instability in the Middle East, these unmanned combat aerial systems pose a growing threat to U.S. interests in the region, especially deployed U.S. military forces. The proliferation of Iranian armed drones and their variants to Tehran's allies and proxies is also a challenge to American interests in the Middle East, including those of U.S. allies and partners. In the possession of non-state actors, Iranian UCAVs or variants increase the range of the conventional and unconventional threats these groups pose, including terrorist acts.

As such, the growing threat of Iranian UCAVs and their proliferation merit the immediate attention and action of the Trump Administration and Congress to protect American forces and advance U.S. interests in the Middle East.

Peter Brookes is Senior Research Fellow for Weapons of Mass Destruction and Counter Proliferation in the Center for National Defense, of the Kathryn and Shelby Cullom Davis Institute for National Security and Foreign Policy, at The Heritage Foundation.

Endnotes

1. Tom O'Connor, "U.S. Says 'Iran Has the Largest Ballistic Missile Arsenal in the Middle East' and Can Target Europe," *Newsweek*, December 12, 2018, <https://www.newsweek.com/us-iran-missile-force-middle-east-target-europe-1255834> (accessed July 10, 2019).
2. The Department of Defense prefers the term "unmanned aircraft" over UAV. U.S. Joint Chiefs of Staff, *Joint Air Operations*, Joint Publication 3-30, February 10, 2014, https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp3_30.pdf (accessed June 7, 2019).
3. U.S. Department of Defense, "Summary of the 2018 National Defense Strategy of the United States of America," <https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf> (accessed June 3, 2019).
4. Daniel R. Coats, "Worldwide Threat Assessment of the US Intelligence Community," Office of the Director of National Intelligence, January 29, 2019, <https://www.dni.gov/files/documents/Newsroom/Testimonies/2018-ATA---Unclassified-SSCI.pdf> (accessed June 4, 2019).
5. Ariane Tabatabai, "Decades in the Making: The Iranian Drone Program," *Bulletin of the Atomic Scientists*, October 12, 2017, <https://thebulletin.org/2017/10/decades-in-the-making-the-iranian-drone-program/> (accessed June 6, 2019).
6. *Ibid.*
7. Naveed Ahmad, *The Advent of Drones: Iran's Weapon of Choice*, Rasanah International Institute of Iranian Studies, May 30, 2019, <https://rasanah-iiis.org/english/centre-for-researches-and-studies/the-advent-of-drones-irans-weapon-of-choice/> (accessed June 11, 2019; unavailable September 2, 2019).
8. Seth J. Frantzman, "50 Iranian Drones Conduct Massive 'Way to Jerusalem' Exercise—Report," *The Jerusalem Post*, March 14, 2019, <https://www.jpost.com/Middle-East/50-Iranian-drones-conduct-massive-way-to-Jerusalem-exercise-report-583387> (accessed July 31, 2019).
9. Tabatabai, "Decades in the Making."
10. Bloomberg, "Aerospace and Defense: Company Overview of Iran Aviation Industries Organization," <https://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=561688839> (accessed June 18, 2019; unavailable September 2, 2019).
11. BBC News, "Iran Unveils 'Indigenous' Drone with 2,000km Range," September 20, 2012, <https://www.bbc.com/news/world-middle-east-19725990> (accessed July 25, 2019).
12. Aaron Mehta, "Check Out a Crashed Iranian Drone," *Defense News*, August 15, 2015, <https://www.defensenews.com/opinion/intercepts/2015/08/13/intercepts-check-out-a-crashed-iranian-drone/> (accessed July 25, 2019).
13. BBC News, "Iran Unveils 'Indigenous' Drone with 2,000km Range."
14. Frantzman, "50 Iranian Drones Conduct Massive 'Way to Jerusalem' Exercise," and RUSI, "Armed Drones in the Middle East," <https://drones.rusi.org/countries/iran/> (accessed June 28, 2019).
15. RUSI, "Armed Drones in the Middle East."
16. Seth J. Frantzman, "Iran Is Becoming a Drone Superpower," *The Hill*, July 19, 2019, <https://thehill.com/opinion/international/453437-iran-is-becoming-a-drone-superpower> (accessed July 31, 2019).
17. *Ibid.*
18. Jeremy Binnie, "Iran Unveils New Version of Armed Stealth UAV," *Jane's Defense Weekly*, <https://www.janes.com/article/86085/iran-unveils-new-version-of-armed-stealth-uav/> (accessed June 13, 2019).
19. Barbara Opall-Rome, "Israel Air Force Says Seized Iranian Drone Is a Knockoff of US Sentinel," *Defense News*, February 12, 2018, <https://www.defensenews.com/global/mideast-africa/2018/02/12/israel-air-force-says-seized-iranian-drone-is-a-knockoff-of-us-sentinel/> (accessed June 13, 2019).
20. Binnie, "Iran Unveils New Version of Armed Stealth UAV."
21. *Ibid.*
22. Press TV, "Iran's Progress in Drone Manufacturing," October 10, 2018, <https://www.presstv.com/Detail/2018/10/10/576574/Irans-progress-in-drone> (accessed June 13, 2019).
23. Andrew deGrandpre, "Iranian Drone That Harassed Navy Fighter Jet Is Capable of Carrying Missiles, but Was Unarmed, Official Says," *The Washington Post*, August 9, 2017, <https://www.washingtonpost.com/news/checkpoint/wp/2017/08/08/an-iranian-drone-just-threatened-a-u-s-fighter-as-it-tried-to-land-on-an-aircraft-carrier/> (accessed August 6, 2019), and Dan Lamothe, "Iranian Drone Approaches Navy Aircraft Carrier in Second Dangerous Encounter in a Week," *The Washington Post*, August 14, 2017, <https://www.washingtonpost.com/news/checkpoint/wp/2017/08/14/iranian-drone-approaches-navy-aircraft-carrier-in-second-dangerous-encounter-in-a-week/> (accessed June 10, 2019).
24. deGrandpre, "Iranian Drone That Harassed Navy Fighter Jet."
25. Jeremy Binnie, "Iranian Army Deploys Armed UAVs," *Jane's Defense Weekly*, July 18, 2019, <https://www.janes.com/article/89947/iranian-army-deploys-armed-uavs> (accessed July 31, 2019).
26. RUSI, "Armed Drones in the Middle East."

27. Tasnim News Agency, "Iran's Army Furnished with New Drones," July 17, 2019, <https://www.tasnimnews.com/en/news/2019/07/17/2056567/iran-s-army-furnished-with-new-drones> (accessed July 18, 2019).
28. RUSI, "Armed Drones in the Middle East."
29. Jon Gambrell, "How Yemen's Rebels Increasingly Deploy Drones," *Defense News*, May 21, 2019, <https://www.defensenews.com/unmanned/2019/05/21/how-yemens-rebels-increasingly-deploy-drones/> (accessed June 13, 2019).
30. Aaron Stein, "Low-Tech, High-Reward: The Houthi Drone Attack," Foreign Policy Research Institute, January 11, 2019, <https://www.fpri.org/article/2019/01/low-tech-high-reward-the-houthi-drone-attack/> (accessed June 28, 2019); Gambrell, "How Yemen's Rebels Increasingly Deploy Drones"; and David Hambling, "Change in the Air: Disruptive Developments in Armed UAV Technology," U.N. Institute for Disarmament Research, 2018, <http://www.unidir.org/files/publications/pdfs/-en-726.pdf> (accessed June 28, 2019).
31. General Joseph Votel, "Great Power Competition: The Current and Future Challenges in the Middle East," testimony before the Committee on Armed Services, U.S. Senate, February 5, 2019, <https://www.centcom.mil/ABOUT-US/POSTURE-STATEMENT/> (accessed June 4, 2019).
32. Dion Nissenbaum and Warren P. Strobel, "Mideast Insurgents Enter the Age of Drone Warfare," *The Wall Street Journal*, May 2, 2019, <https://www.wsj.com/articles/mideast-insurgents-enter-the-age-of-drone-warfare-11556814441> (accessed June 12, 2019).
33. Coats, "Worldwide Threat Assessment of the US Intelligence Community."
34. Agence France-Presse, "Iran Says It Has Carried out 700 Drone Attacks in Syria," *The Daily Star*, October 16, 2018, <https://www.dailystar.com.lb/News/Middle-East/2018/Oct-16/466533-iran-says-it-has-carried-out-700-drone-attacks-in-syria.ashx> (accessed June 11, 2019).
35. Isabel Kershner, "Iranian Drone Launched from Syria Was Armed, Israel Says," *The New York Times*, April 14, 2018, <https://www.nytimes.com/2018/04/14/world/middleeast/syria-iran-israel-drone.html> (accessed June 11, 2019).
36. W. J. Hennigan, "U.S. Forces Shoot Down Iranian Drone over Syria as Fighting Escalates," *The Spokesman-Review*, June 20, 2017, <https://www.spokesman.com/stories/2017/jun/20/us-forces-shoot-down-iranian-drone-over-syria-as-f/> (accessed September 3, 2019).
37. RUSI, "Armed Drones in the Middle East."
38. Yaniv Kubovich, "Mortars, Rockets and Drones: A Look at Hamas' Arsenal," *Haaretz*, May 5, 2019, <https://www.haaretz.com/israel-news/.premium-mortars-rockets-and-drones-a-look-at-hamas-arsenal-1.7061438> (accessed June 10, 2019).
39. Ibid.
40. Avery Plaw and Elizabeth Santoro, "Hezbollah's Drone Program Sets Precedents for Non-State Actors," The Jamestown Foundation, November 10, 2017, <https://jamestown.org/program/hezbollahs-drone-program-sets-precedents-non-state-actors/> (accessed June 12, 2019).
41. Ibid.
42. Ibid.
43. Coats, "Worldwide Threat Assessment of the US Intelligence Community."
44. Votel, "Great Power Competition."
45. Nissenbaum and Strobel, "Mideast Insurgents Enter the Age of Drone Warfare."
46. Jared Malsin, "Iran-Allied Houthis Expose Holes in Saudi Arabia's Missile Defense," *The Wall Street Journal*, June 25, 2019, <https://www.wsj.com/articles/iran-allied-houthis-expose-holes-in-saudi-arabias-missile-defense-11561455002> (accessed June 25, 2019).
47. Michael Knights, "The Houthi War Machine: From Guerrilla War to State Capture," *CTC Sentinel*, Vol. 11, no. 8 (September 2018), <https://ctc.usma.edu/houthi-war-machine-guerrilla-war-state-capture/> (accessed June 12, 2019).
48. Nissenbaum and Strobel, "Mideast Insurgents Enter the Age of Drone Warfare."
49. Patrick Wintour, "Houthis Threaten More Drone Strikes After Yemen Airbase Attack," *The Guardian*, January 13, 2019, <https://www.theguardian.com/world/2019/jan/13/houthis-threaten-more-drone-strikes-after-yemen-airbase-attack> (accessed June 12, 2019).
50. Nissenbaum and Strobel, "Mideast Insurgents Enter the Age of Drone Warfare."
51. Reuters, "Yemen's Houthis Say Launched Drone Attack on Saudi Aramco Facility," April 11, 2018, <https://www.cnbc.com/2018/04/11/saudi-aramco-says-jizan-facilities-safe-after-houthis-claim-attack.html> (accessed September 3, 2019), and Reuters, "Yemen's Houthis Say They Attacked Aramco Refinery in Riyadh with Drone," July 18, 2018, <https://www.reuters.com/article/us-yemen-security-aramco-idUSKBN1K8262> (accessed September 11, 2019).
52. Sudarsan Raghavan, "Saudis Say Oil Pipeline Was Attacked by Drones, Possibly from Yemen," *The Washington Post*, May 15, 2019, https://www.washingtonpost.com/world/saudis-say-oil-pipeline-was-attacked-by-drones-possibly-from-yemen/2019/05/14/bb7917e6-7652-11e9-a7bf-c8a43b84ee31_story.html (accessed June 12, 2019).
53. Nasser Karimi and Qassim Abdul-Zahra, "Supreme Leader Says Iranians Won't Budge over US Sanctions," Associated Press, June 26, 2019, <https://www.apnews.com/e58f5a9a12b547859377fd39e5398ed> (accessed September 3, 2019).
54. Ibrahim al Marashi, "It's a Game of Drones over Saudi Arabia," TRT World, May 20, 2019, <https://www.trtworld.com/opinion/it-s-a-game-of-drones-over-saudi-arabia-26805> (accessed June 12, 2019).

55. Michael R. Pompeo, Secretary of State, "Houthi Attack on Abha Airport," U.S. State Department, June 24, 2019, <https://www.state.gov/houthi-attack-on-abha-airport/> (accessed June 24, 2019).
56. The number was not broken by type of drone or location of intercept, nor was the time period for these intercepts indicated. Nissenbaum and Strobel, "Mideast Insurgents Enter the Age of Drone Warfare."
57. Sudarsan Raghavan, "Saudis Say Oil Pipeline Was Attacked by Drones, Possibly from Yemen," *The Washington Post*, May 15, 2019, https://www.washingtonpost.com/world/saudis-say-oil-pipeline-was-attacked-by-drones-possibly-from-yemen/2019/05/14/bb7917e6-7652-11e9-a7bf-c8a43b84ee31_story.html (accessed June 12, 2019).
58. Nissenbaum and Strobel, "Mideast Insurgents Enter the Age of Drone Warfare."
59. *Ibid.*
60. Hambling, "Change in the Air."
61. *Ibid.*
62. Coats, "Worldwide Threat Assessment of the US Intelligence Community."
63. Lamothe, "Iranian Drone Approaches Navy Aircraft Carrier in Second Dangerous Encounter in a Week."
64. Helene Cooper, "Iranian Drone Buzzes U.S. Fighter Jet over Persian Gulf," *The New York Times*, August 8, 2017, <https://www.nytimes.com/2017/08/08/world/middleeast/iran-drone-navy-fighter-persian-gulf-close-call.html> (accessed June 11, 2019), and Lamothe, "Iranian Drone Approaches Navy Aircraft Carrier in Second Dangerous Encounter in a Week."
65. Rory Jones, "USS Boxer Crew Describes Tense Moments in Strait of Hormuz," *The Wall Street Journal*, July 20, 2019, <https://www.wsj.com/articles/uss-boxer-crew-describes-tense-moments-in-strait-of-hormuz-11563637632> (accessed July 22, 2019).
66. Frantzman, "50 Iranian Drones Conduct Massive 'Way to Jerusalem' Exercise."
67. Arie Egozi and Colin Clark, "For Israelis, War with Iran Looms; Iran Denies Drone Downed," *Breaking Defense*, <https://breakingdefense.com/2019/07/for-israelis-war-with-iran-looms-iran-denies-drone-downed/> (accessed July 22, 2019).
68. Babak Dehghanpish and Phil Stewart, "From Iraq to Yemen, Drones Raise U.S. Alarm over Iranian Plans," Reuters, July 17, 2019, <https://www.reuters.com/article/us-mideast-iran-drones/from-iraq-to-yemen-drones-raise-u-s-alarm-over-iranian-plans-idUSKCNIUC1X4> (accessed July 18, 2019).
69. Raytheon, "US Army Soldiers to Receive Enhanced Stinger Missiles for Counter-Drone Missions," June 18, 2019, <http://raytheon.mediaroom.com/2019-06-18-US-Army-soldiers-to-receive-enhanced-Stinger-missiles-for-counter-drone-missions> (accessed July 25, 2019).
70. Sam LaGrone, "Navy Quietly Fires 20 Hyper Velocity Projectiles Through Destroyer's Deckgun," USNI News, January 8, 2019, <https://news.usni.org/2019/01/08/navy-quietly-fires-20-hyper-velocity-projectiles-destroyers-deckgun> (accessed July 25, 2019), and U.S. Navy, "MK 15-Phalanx Close-In Weapon System (CIWS)," January 15, 2019, https://www.navy.mil/navydata/fact_display.asp?cid=2100&tid=487&ct=2 (accessed July 25, 2019).
71. LaGrone, "Navy Quietly Fires 20 Hyper Velocity Projectiles Through Destroyer's Deckgun."
72. Sydney J. Freedberg, "Army Boosts Investment in Lasers," *Breaking Defense*, October 16, 2018, <https://breakingdefense.com/2018/10/army-boosts-investment-in-lasers/> (accessed July 25, 2019), and Raytheon, "US Army Soldiers to Receive Enhanced Stinger Missiles for Counter-Drone Missions."
73. Sydney J. Freedberg, "Army Reboots Cruise Missile Defense: IFPC & Iron Dome," March 11, 2019, <https://breakingdefense.com/2019/03/army-reboots-cruise-missile-defense-ifpc-iron-dome/> (accessed July 25, 2019).
74. Jen Hudson, "House Panel Wants Cheaper Patriot Missile," *Defense News*, June 5, 2019, <https://www.defensenews.com/land/2019/06/05/house-panel-wants-cheaper-patriot-missile/> (accessed July 25, 2019), and Raytheon, "National Advanced Surface-to-Air Missile System," <https://www.raytheon.com/capabilities/products/nasams> (accessed July 25, 2019).
75. Freedberg, "Army Boosts Investment in Lasers."
76. Joshua Karsten and Chad Garland, "USS Boxer Pulls into Bahrain a Week After Iranian Drone Incident," *Stars and Stripes*, July 25, 2019, <https://www.stripes.com/news/uss-boxer-pulls-into-bahrain-a-week-after-iranian-drone-incident-1.591806> (accessed July 25, 2019).
77. Wisconsin Project on Nuclear Arms Control, "Iran Watch Newsletter: June 2018," June 21, 2019, <https://www.iranwatch.org/our-publications/newsletters/iran-watch-newsletter-june-2019> (accessed June 28, 2019).
78. Meghann Myers, "It Doesn't Take a Missile to Shoot Down a Drone, So the Army Is Rethinking Battle Across Domains," *Defense News*, March 13, 2017, <https://www.defensenews.com/digital-show-dailies/global-force-symposium/2017/03/13/it-doesn-t-take-a-missile-to-shoot-down-a-drone-so-the-army-is-rethinking-battle-across-domains/> (accessed August 7, 2019).
79. *Ibid.*
80. *Ibid.*
81. Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enabled Unmanned Aerial Vehicles (UAVs), October 28, 2016, <https://2009-2017.state.gov/r/pa/prs/ps/2016/10/262811.htm> (accessed June 23, 2019).