



Unmanned Aerial Systems' Influences on Conflict Escalation Dynamics

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THE ISSUE

Large, optionally-armed, long-loiter unmanned aerial systems (UAS) have proliferated. As more UAS operate in conflict areas, more incidents of attack or defense will involve said systems. This CSIS Brief details how escalation and deterrence dynamics change with the increasing use of UAS in conflict areas and examines several cases of how these dynamics might realistically occur.

The study captures three key findings:

- Potential changes to escalation are not well—or consistently—understood.
- Offense and defense calculations are weighed differently.
- Foreign countries are exploring escalation dynamics through real-time tactical operations.

The study concludes that the possibility of a gap between the intended signal and interpretation of that signal leaves room for unintended consequences. However, short of greater U.S. leadership to establish and codify norms of employment, the gap is unlikely to be resolved in the foreseeable future.

DEFINING THE PROBLEM

The global use of UAS by military forces is growing. The Stockholm International Peace Research Institute (SIPRI) has identified at least 68 countries that build or have acquired military unmanned systems.¹ As these systems proliferate to a greater number of actors, the ways in which they are employed will likely grow as well. This is creating a new complication in how leaders and citizens consider the use—and consequence—of UAS in potentially dangerous circumstances. This paper focuses on the potential for current and emerging technology to alter the risk of conflict escalation in UAS incidents that occur cross-border or over international waters.

The increased employment of UAS alters a key element of escalation during a conflict: signaling. Furthermore, it reduces the need to expose one's own personnel to risk when threatening violence against another. This raises three important questions:

- By substantially lowering the risk of harm to the attacker's personnel, do unmanned systems have the potential to change the risks of a crisis escalating into a broader conflict? Does it make conflict initiation more likely or increase the number and severity of strikes by the attacker?
- Does the party being attacked regard a strike differently if it comes from a manned versus unmanned platform?

Is the use of an unmanned platform an implicit form of signaling by the attacker that it is less committed because it is not willing to risk its personnel?

- How does the attacker regard a retaliatory strike against its unmanned systems? Is the threshold for escalation in response to an attack against an unmanned system higher than for attacks against manned systems?

This emerging transformation merits closer examination. The broad proliferation of UAS capabilities and their operational employment is creating new global precedents for what constitutes appropriate behavior that may become a de facto norm before serious thinking occurs on the subject. This could have serious long-term international implications.

For the United States, guidance from the 2018 National Security Strategy (NSS) asserts that the world is returning to an era of great power competition. The 2018 NSS explicitly states that “after being dismissed as a phenomenon of an earlier century, great power competition has returned.”² If this is true, policymakers will have to think more deeply about how UAS will be used in contested areas, as great power competition leads to frequent tension points, and policymakers will therefore need to consider how UAS will be used to send signals in, and resolve, a crisis. Great power competition, unlike the environments the United States has been fighting in since 2001, would feature state actors with sophisticated air defense and electronic attack capabilities to counter UAS operations by the United States. It is also likely that these state actors will employ their own advanced UAS to conduct missions in other contested areas of the world.

The UAS and counter-UAS competition, however, is not just limited to conflicts among great powers. UAS have become a key component of U.S. military operations across the full spectrum of conflicts since the invasion of Afghanistan

2018 Israel-Iran Incident

In a prominent example from early in 2018, Israel shot down an Iranian UAS flying within Israeli air space. Israel then launched a strike—including manned aircraft—against 12 related targets in Syria believed to have been involved with the Iranian UAS. One of Israel’s manned aircraft crashed at the conclusion of the mission on Israeli territory.

in 2001.³ And since that time, numerous other countries have adopted—or expanded—their own UAS fleets. For example, Syria, Russia, the United States, and several insurgent factions have all used UAS in the ongoing conflict in Syria.

The conflicts in Syria, Yemen, and other areas of the world demonstrate that UAS employment is no longer constrained to large, wealthy states. As Figure 1 shows, there have been numerous incidents in which unmanned systems have been used in armed conflict between state actors. These incidents provide at least an initial level of information about how, when, and why countries use UAS as well as how escalatory either the attack by or against a UAS platform is viewed in different countries.

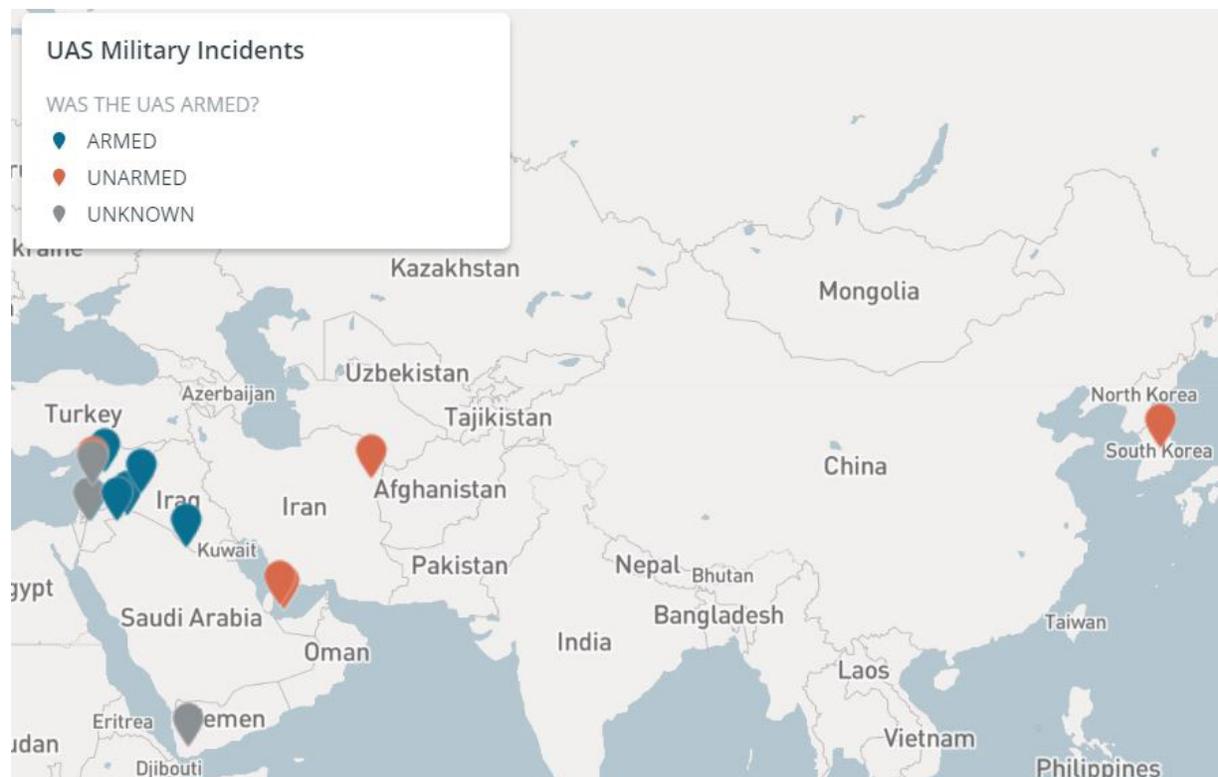


Figure 1: UAS Military Incidents. For an interactive version of this map, view aerospace.csis.org/UASmap.

The number of known incidents occurring is much higher in recent years than in the 2000s. In part, this is likely to have been caused by increased incidents of state conflict over the past four years. It is also likely a result of the proliferation of UAS platforms to a range of new actors and the ability of national militaries to integrate UAS capabilities into their missions.

STUDY METHODOLOGY

To examine these issues, this study developed several vignettes representative of actual or plausible UAS operational scenarios. Each vignette was crafted to incorporate different layers of conflict and levels of escalation.⁴ These vignettes were then discussed with current and former operators and policymakers to understand how various stakeholders in the U.S. decision making system would evaluate the risks of escalation.⁵

The vignettes explored were:

- Operating in foreign airspace with the host nation’s permission to monitor and, as needed, to engage hostile forces.
- Operating in foreign airspace without permission where the host nation has a limited capability to respond, but hostile non-state actors can respond—such as when U.S. forces have been called to assist allied forces operating in a third country.
- Operating in international airspace near a foreign country. In this case, the foreign country has previously operated aggressively toward U.S. forces in the region, but without using kinetic attacks.
- Operating UAS in foreign airspace where permission to operate has been denied and the host state has the capability to respond.

The project narrowed its consideration from all possible UAS to only those that are mentioned in the Missile Technology Control Regime (MTCR) Category I and II, and in the U.S. Department of Defense (DOD) UAS Group 4 and 5 (See Figure 2). Taken together, these different categorizations limit the UAS examined to those that have relatively long ranges (greater than 500 km), payloads greater than 300 kg or weight above 1320 kg, or some combination of these.

The impact of UAS on the risk of escalation has been examined, in part, by several researchers.⁶ Recent scholarship also explores the potential for UAS to be employed for

		DOD UAS GROUP	
		Group 4 <i>Optimal Altitude < 18,000 ft</i> <i>Maximum Gross Takeoff Weight > 1320 lbs</i>	Group 5 <i>Optimal Altitude > 18,000 ft</i> <i>Maximum Gross Takeoff Weight > 1320 lbs</i>
MTCR CATEGORY	Category I <i>Payload ≥ 500kg</i> <i>Range ≥ 300km</i>		R/MQ-9 Reaper R/MQ-4 Global Hawk
	Category II <i>Payload < 500kg</i> <i>Range ≥ 300km</i>	R/MQ-1 Predator	
	Not Controlled <i>Range < 300km</i>	R/MQ-8 Firescout	

Figure 2: UAS categories included in this examination.

deterrence, the threat of force, and not just as a means to use force.⁷ In general, the findings indicate that based on current technology, practice, and patterns of behavior, decisionmakers from both offensive and defensive sides in an incident see UAS as less escalatory than platforms that put operators at risk. This has been borne out in a range of border incidents, including Israel-Syria, India-Pakistan, Ukraine’s defense against Russia’s invasion, and the demilitarized zone between South Korea and North Korea. Similar incidents have also occurred at sea in the Persian Gulf.⁸

As more countries operate more sophisticated UAS, it is likely that long-endurance systems will be employed by multiple actors in a conflict, rather than the one-sided employment the United States has grown accustomed to since 2001. Amy Zegart discusses the potential for such two-way engagement to lead to new dynamics in deterrence. UAS use, Zegart argues, lowers the cost of coercion across three key areas: “blood, treasure, and reputation.”⁹ This is because UAS pilots are not at risk of being shot down (blood); the cost to acquire and operate a UAS are lower than an equivalent manned capability (treasure); and because the public in the operating country is more likely to be supportive of employing UAS over manned platforms (reputation). She assesses that within the current operating dynamic of slow, long-loiter UAS, deterrence will be most effective when deployed against states that do not have an effective response capability—including lacking their own UAS.¹⁰

The position that UAS employment lowers deterrence costs across “blood, treasure, and reputation” may also impact the willingness of political and military leaders to use UAS relative to their willingness to use manned systems and how they are likely to regard an attack against a UAS. This study asked

a similar range of questions of policymakers and operators, examined through the lens of escalation risk.¹¹

CURRENT ROLES FOR REMOTELY PILOTED AIRCRAFT/UNMANNED SYSTEMS

Operational data suggests that the role of UAS in future U.S. military operations will continue to expand. As seen in Figure 3, the share of intelligence, surveillance, and reconnaissance (ISR) flight-hours by long-endurance UAS as compared to manned aircraft grew steadily from FY 1997 to FY 2014.

However, this number masks a broader reality, namely that unmanned systems did not replace manned systems for ISR. Instead, unmanned systems supplemented manned systems by their ability to undertake new missions and offer capabilities that manned platforms could not perform. The total flight hours in FY 2016 for ISR aircraft is approximately nine times greater than in FY 2002, yet the number of manned ISR flight hours remained relatively constant during that period.

This data highlights the fact that the current role for UAS in the U.S. inventory has evolved over the past 20 years. UAS began modern operations as platforms for intelligence, surveillance, and reconnaissance (ISR). The long-endurance platforms focused on in this study are well-suited to provide persistent visibility on a given location for nearly 24 hours. This capability was highly effective in conducting the counterterrorism missions that became a high-priority following 9/11, as seen in

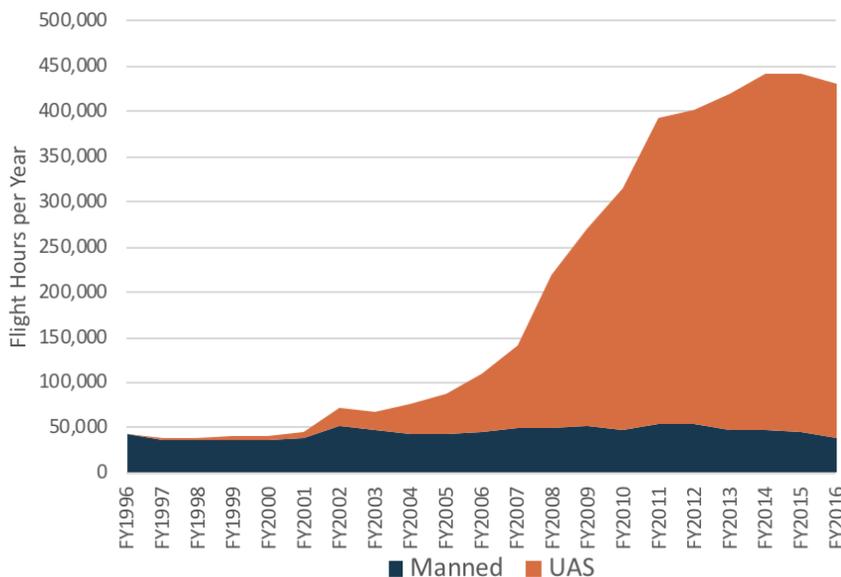


Figure 3: Total ISR Flight Hours, Manned and Unmanned, FY1996 – FY2016

Figure 4. The ISR mission gradually evolved to include air-to-surface strike options, as MQ-9 availability and employment overtook that of the MQ-1. Blending the ISR and strike missions is logical from force-planning, force-management, training, and procurement perspectives. It may, however, complicate signaling and escalation management efforts. Additionally, military forces are currently exploring options to expand UAS roles to include manned-unmanned and optionally manned platforms, among others; it will likely be some time before these capabilities can be deployed.¹²

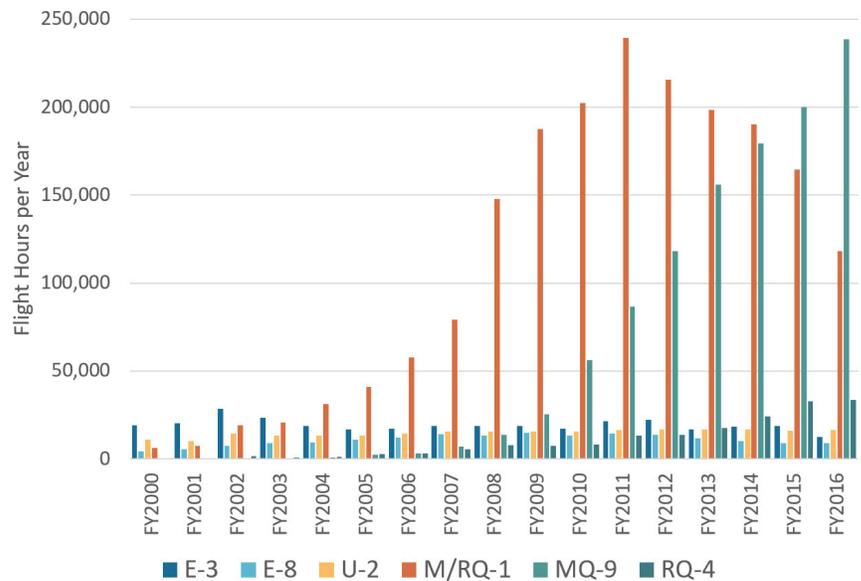


Figure 4: U.S. Air Force ISR hours by platform, FY2000 – FY 2016

CHANGING ESCALATION DYNAMICS

In one sense, just as UAS provide new capabilities for military commanders, UAS also provide policymakers with additional messaging options for signaling and deterrence. A repeated theme through this study is that the employment of UAS may offer policymakers a “new rung” on the escalation ladder.

To explain the question of how UAS impact risk assessment and political signaling, the study team gathered experts and practitioners to discuss the four vignettes described earlier.¹³ In the discussion, former practitioners and policymakers were asked how they would expect to make escalation and signaling decisions. Throughout the discussion, most participants began their comments by stating that manned and unmanned aircraft would (holding capabilities



U.S. Air Force RQ-4 Global Hawk.

Source: U.S. Air Force photo by Yasuo Osakabe

constant) be used in the same way, and if they were fired upon it would result in the same degree of retaliation. However, as the discussion explored the questions in greater depth, distinctions emerged as to how the participants believed UAS would be employed and how U.S. commanders would likely respond to potentially threatening UAS approaches to U.S. facilities or platforms.

The discussion revealed a gap in current U.S. concepts of UAS use and how the employment of UAS may differ from manned aircraft. Similarly, there was not a consensus about how to engage or counter foreign UAS should they be used against the United States. The issue emerged in two ways during this study: first, in recognizing the discrepancy between U.S. policy and apparent U.S. practice; and, second, the U.S. policymakers' and military leaders' uncertainties about how to respond in the event of a UAS incident.

DISCREPANCIES BETWEEN U.S. POLICY AND PRACTICE

Manned and unmanned aircraft are, arguably, subject to the same laws and policy. What is unclear, however, is whether U.S. commanders, policymakers, or political leaders follow the same thought process or risk calculus when considering where or how to employ UAS and how to respond to attacks on or by UAS. It is well understood that attacking a manned aircraft is a provocative act and likely an act of war. Under current U.S. policy, UAS operated by the U.S. military are considered military aircraft. This suggests that an attack on a UAS should provoke the same response as an attack on a manned

aircraft.¹⁴ For example, shooting down a UAS over international waters should be just as provocative as attacking a manned aircraft. If U.S. political and military leaders interpret this as deliberate escalation, it is possible that an equivalent U.S. attack against the offending country would follow. However, it is increasingly clear that commanders and policymakers often rely on UAS for missions that could be high risk if conducted by a manned platform specifically because the consequences of losing a UAS are lower. This causes uncertainty in how attacks from and against UAS are perceived by both the United States and other countries.

A collection of crucial questions emerges from this line of thinking, including but not limited to:

- If a UAS is employed in a situation in which a manned system would not be employed, does the conventional escalation signaling system remain the same?
- If a UAS is attacked, does the United States follow the same escalation calculations as an attack made against a manned system, or would the United States be more willing to take alternative responses because it weighs the risk of a UAS differently than a manned platform?
- Are there more options for response when a UAS is attacked than if a manned platform is downed?
- What is a proportional response to an attack on an unmanned system?
- If the United States does not respond to an attack against a UAS, how does that influence an adversary's calculations regarding future attacks against U.S. forces, specifically U.S. unmanned systems?

Even in situations where manned aircraft are attacked, the appropriate response is often a judgement call. There were numerous incidents during the Cold War where U.S. and Soviet aircraft fired upon one another.¹⁵ Despite this sometimes leading to a loss of life, the United States and the Soviet Union did not immediately escalate to a full scale nuclear war. This can largely be attributed to signaling and interpretation. Even in those incidents in which a pilot died, the countries' respective command authorities did not perceive the acts as a deliberate or sufficient reason for the escalation of conflict

made by the commanding authority in the other country, leading to local retaliation or no action at all.

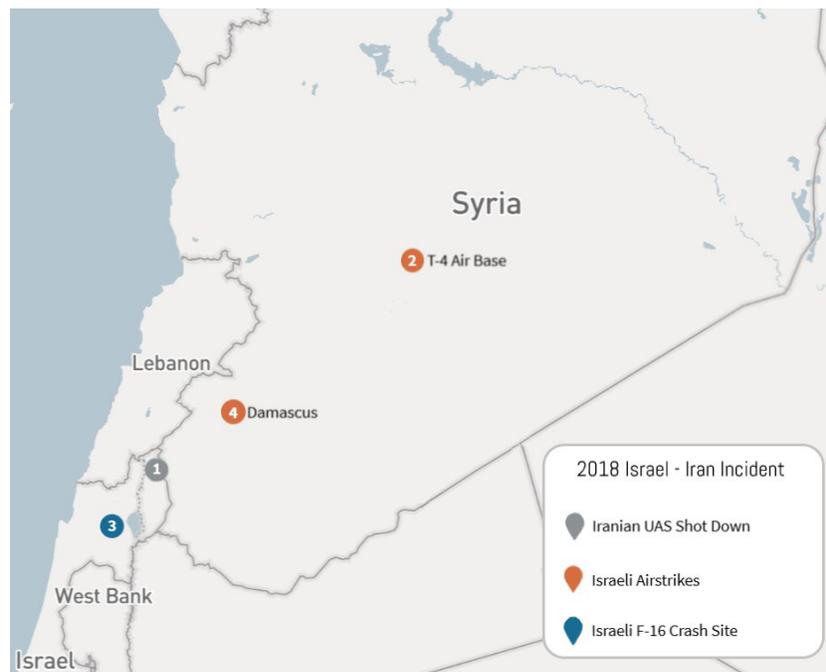
CASE STUDY: SYRIA

The ongoing conflict in Syria offers a real-world case study of the ways in which countries are operating—and responding to—UAS in conflicts and how the use of UAS may alter the escalation dynamics of a conflict. Since the beginning of the conflict in Syria in 2012, there have been numerous incidents in the airspace over Syria and its neighboring countries—both manned and unmanned. These incidents have increased in frequency as more actors have become entangled in Syria’s civil war and are able to use UAS. The UAS used include a broad range of platforms from the large optionally-armed UAS that this study is focused on to small, homemade UAS created by groups such as ISIS.¹⁶ The ubiquity of UAS in the Syrian conflict has resulted in numerous incidents in which UAS have been fired upon or shot down. Despite this, until recently UAS incidents have not resulted in obvious signs of escalation.

In what may be the most well-known UAS incident in the Syria conflict, on February 10, 2018, Israel’s air defense system shot down an Iranian UAS operating in Israeli airspace. The UAS was launched from a Syrian airbase; Israel claimed that the UAS was armed and that it intended to carry out an attack.¹⁷ Following the downing of the UAS, Israeli fighters struck Iranian targets inside Syria. Most notably, Israel targeted T-4, an air base near Palmyra from which the Iranian drone took off and that is believed to be an organizational hub for Iranian forces used to coordinate Iran-supported groups within Syria.¹⁸

During the Israeli counter-strike, Syria fired surface-to-air missiles at the eight Israeli jets as the jets returned to Israel. One Israeli F-16 was downed by the Syrian missiles and “is believed to be the first Israeli plane lost under enemy fire in decades.”¹⁹ The aircraft crashed in Northern Israel and the two pilots ejected from the aircraft and made it to safety.²⁰

In response to the downed aircraft, Israel carried out another set of attacks on 12 Iranian and Syrian targets, largely near Damascus. These targets included Syrian air defense systems, Syrian army bases, and Iranian defense positions.²¹ Israel claims to have successfully hit 8 of these 12 targets. This attack brought in another player, the Russian government. Per an official Russian statement, the Israeli attack appeared to have inhibited Russian activities in Syria as well.²² The escalation of this incident into a much greater exchange of fire indicates that while the direct risk to an operating state may be low, an incident that begins with an unmanned system can quickly



escalate into a conflict involving multiple manned systems and bases. For Israel, merely downing the offending Iranian UAS was not a sufficient retaliation as it did not cost the Iranians enough to deter such provocations in the future. Instead, Israel decided to attack the UAS’s base of operations, which broadened the scope of the incident and resulted in further escalation of the situation.

FINDINGS

Based on discussions with current and former operators, policymakers, and analysts, three main findings are evident:

Potential changes to escalation dynamics are not well—or consistently—understood. Across the four vignettes (see Vignettes detailed at the end of this brief), and in private discussions, experts highlighted that the ways in which U.S. forces would operate is consistent with U.S. policy and international law, and that UAS are military instruments and therefore afforded the same rights as other platforms. However, experts also generally agreed that UAS, even when equivalent to manned platforms, provided a lower risk, a smaller footprint, and sent a less provocative political signal. These differences create room for commanders and policymakers to be more willing to use UAS offensively rather than manned systems, because the risk of consequence is viewed as lower relative to manned platforms.

Offense and defense calculations are weighed differently. Operating UAS changes risk calculations differently when making decisions offensively versus defensively. UAS provide a commander engaged in offensive operations with a lower-risk option for employing force in a conflict while



U.S. Navy MQ-8 Firescout.

Source: U.S. Navy photo by Mass Communication Specialist 3rd Class Deven Leigh Ellis/Released

limiting risk to one's own forces. This phenomenon could simultaneously make a commander more willing to use a UAS, whereas before, he or she may not have employed any force. Despite the different risk profile for offensive UAS employment, a commander under threat from UAS is exposed to the same risk as when threatened by a manned platform. However, response options against UAS are limited in that a pilot operating a UAS may not feel threatened by a show of force to exit the airspace—and may not even be able to observe such a demonstration. Therefore, there may be few options to deter or remove the threat from a UAS short of firing upon it. For example, the participants in this study largely agreed that naval commanders operating in international waters, when confronted with a potentially threatening inbound aircraft, would be more likely to engage or shoot down an incoming UAS than if the threatening platform was manned. Israel's response against the Iranian UAS also supports the idea that shooting down a UAS is less escalatory than firing upon manned platforms or facilities, and Iran's willingness to use UAS platforms to breach Israel's airspace suggests Iran views UAS employment to involve less risk than employing a manned platform. The pattern demonstrated in this interaction runs counter to stated U.S. policy that unmanned aircraft retain the same privileges and immunities as other military aircraft.

Recent incidents suggest that foreign countries are also exploring these new escalation dynamics through tactical operations. Iran claimed to have forced an American UAS

(which it asserted was a stealthy RQ-170) to crash in Iran after the aircraft had been conducting reconnaissance activities within Iranian airspace.²³ In this episode, and despite having possibly lost a military aircraft to a foreign country which claimed credit for downing the aircraft, the U.S. response to the incident was muted. The limited response could have resulted from the largely (then) classified nature of the airframe, the nature of the mission it was on, or because the loss of the aircraft was not significant enough to warrant a strong response. Regardless of the reason, the U.S. response to this incident stands in stark contrast to the Israeli response to an Iranian UAS violating its airspace in February 2018.

QUESTIONS FOR FUTURE EXAMINATION

Even as the United States and other countries continue to employ UAS in new and innovative ways, the degree of international agreement about how, where, and the purpose for which they are used is being established in real time, often by local commanders. Identifying current and emerging challenges and beginning discussions of those issues now, before divergent understandings of appropriate behavior are played out at a tactical level, will require asking difficult questions and establishing boundaries in ways that may be constraining for states seeking to maximize their own military advantages.

Important questions for future examination that emerged from this research include:

- How can norms and laws for unmanned aircraft be adopted by—or at least harmonized with—the much less well-developed body of work on unmanned maritime vessels?
- Should international law recognize a lower threshold for the employment of force against a UAS than a manned platform?
- What is a proportionate response if an adversary uses a UAS to conduct reconnaissance in another country's sovereign airspace, to cause physical destruction of facilities with no loss of life, or to cause physical destruction and loss of life?
- What is a proportionate response to an attack on a UAS? Does it depend on the type of mission the UAS was conducting?

- It is currently relatively straightforward to identify whether a platform is manned or unmanned. What are the appropriate rules of engagement for optionally manned platforms?

CONCLUSION

The low cost, ease of use, and lower risk to operators suggests that the proliferation of UAS capabilities will continue. As additional actors employ UAS platforms with different objectives and risk tolerances, the role for UAS in managing escalation (whether to dominate or to de-escalate) will continue to evolve. Policymakers and military leaders in the United States and other governments do not yet have a shared understanding for how UAS employment affects crisis and conflict escalation. The possibility of a gap between the intended signal and interpretation of that signal leaves room for unintended consequences. However, short of greater U.S. leadership to establish and codify norms of employment, the gap is unlikely to be resolved in the foreseeable future.

EXPERT VIGNETTES

To assess these and other questions, this study developed four brief hypothetical vignettes to focus a discussion by experts on how UAS might be employed in conflict areas and how U.S. policymakers and military commanders make escalation and signaling decisions. Throughout the discussion, most participants began their comments by indicating that UAS and manned platforms would be operated and regarded in the same way—aligned with U.S. policy. However, as the discussion explored the questions in greater depth, distinctions became apparent both in how the participants believed UAS would be employed and in how U.S. commanders would be likely to respond to potentially threatening UAS approaches to U.S. facilities or platforms.

VIGNETTE 1: OPERATING IN FOREIGN AIRSPACE WITH PERMISSION AND POTENTIAL HOSTILES ARE PRESENT (E.G. AFGHANISTAN)

A U.S. aircraft is ordered to conduct a mission in a country, such as Afghanistan, where the United States has received explicit agreement to operate airborne ISR and strike platforms for ongoing missions. The aircraft departs from an airfield in a nearby country and enters Afghanistan's airspace. The platform is being used to monitor potential targets and, if appropriate, to strike. The potential targets are aware they may be monitored or attacked and are taking precautions. It is also believed that they are seeking to develop or acquire counter-

air measures such as man portable air defense systems (MANPADS) to provide an increased level of defense.

VIGNETTE 2: ENTERING FOREIGN AIRSPACE WITHOUT PERMISSION AND WITHOUT THE FOREIGN COUNTRY'S CAPABILITY TO RESPOND (E.G. MALI)

France has been involved in a weeks-long, ground-based, counterterrorist campaign in an African country at the invitation of the host government. France's success in the first few days has receded to a much more complicated game of cat and mouse as the terrorist organization quickly recalibrated its tactics, techniques, and procedures to avoid being detected or engaging French forces. Instead, the adversary moved to traditional guerilla tactics, massing for attacks and quickly dispersing to limit the ability of French forces to engage. Earlier today, the commander of the French force called the U.S. AFRICOM Commander to request ISR and strike support for a unit pinned down by terrorists. The terrorist units have shot down two French helicopters sent in to extract the pinned-down unit. It is unclear whether the terrorists used small arms or anti-aircraft weapons to bring down the French helicopters. The AFRICOM Commander has manned aircraft and unmanned aircraft available and needs to present a recommendation to the secretary of defense as to whether and how to respond.

VIGNETTE 3: ENTERING DISPUTED INTERNATIONAL AIRSPACE NEAR A FOREIGN POWER WITH THE CAPABILITY AND CAPACITY TO RESPOND (E.G. EAST CHINA SEA RECONNAISSANCE)

The United States continues to conduct regular surveillance and reconnaissance patrols throughout the East China Sea and the South China Sea. The United States maintains its position that under the United Nations Convention on the Law of the Sea all waters and airspace beyond territorial waters (12 nm) are international waters. China asserts a position that all waters and airspace out to 200 nm are sovereign, aligning its position with the limits of exclusive economic zones. China's establishment of military facilities on landing strips created in the South China Sea—and China's expectation that it now has sovereignty over contiguous airspace and waters—expands the areas where a U.S.-China confrontation could occur. China is increasing patrols by its navy and air force along all of its claimed waters in the South China Sea and the East China Sea, and the United States intends to continue conducting freedom of flight and freedom of navigation exercises in the area.

VIGNETTE 4: ENTERING FOREIGN AIRSPACE WITHOUT PERMISSION AND THE FOREIGN COUNTRY HAS THE CAPABILITY TO RESPOND (E.G. IRAN, PAKISTAN)

The U.S.-Pakistan relationship has taken a turn for the worse. The United States has conducted strikes from unmanned platforms against terrorists in Pakistan for many years. While this has created tensions, the relationship was generally on an even course. Recently, however, a strike resulted in the deaths of over 25 people gathered for a wedding, including a cousin of Pakistan's chief of the army staff. Media attention and public outcry were nearly instantaneous.

The prime minister announced that the United States' violation of Pakistan's sovereignty must stop, and that future attempts by the United States to strike individuals

within Pakistan would be met with force. In a diplomatic note, Pakistan's foreign ministry indicated that the United States could continue to use Pakistan's airspace for transit to and from Afghanistan, but that any use of weapons on individuals within Pakistan would result in Pakistan targeting the U.S. platform and the suspension of overflight access.

The commander of U.S. forces in Afghanistan has credible evidence that a group of terrorists is organizing in the border region, though deliberately on the Pakistan side of the border, to conduct attacks against U.S. bases in Afghanistan. ■

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Photo: U.S. Air Force photo/Staff Sgt. Vernon Young Jr.

ENDNOTES

1. Data from the Stockholm International Peace Research Institute.
2. The White House, National Security Strategy (2017), p. 27.
3. For simplicity, this report uses unmanned aerial systems (UAS) to describe the platforms in question, acknowledging and setting aside that various military services and other scholars have a different preferred taxonomy.
4. For full descriptions of the vignettes please see Vignettes.
5. This study does not address ethical questions or the legality in using UAS—whether remotely piloted or autonomous—for conducting strike missions. While these are important areas of consideration for legal, ethical, and operational purposes, it is beyond the scope of this study.
6. Michael C. Horowitz, Sarah E. Kreps, and Matthew Fuhrmann, “Separating Fact from Fiction in the Debate over Drone Proliferation,” *International Security* 41, no. 2 (October 2016): 7–42, https://doi.org/10.1162/ISEC.a_00257.
7. Amy Zegart, “Cheap Fights, Credible Threats: The Future of Armed Drones and Coercion,” *Journal of Strategic Studies*, February 28, 2018, 1–41, <https://doi.org/10.1080/01402390.2018.1439747>.
8. Refer to figure 1.
9. Amy Zegart, “Cheap fights, credible threats: The future of armed drones and coercion.”
10. *Ibid.* p. 26–27.
11. This examination also establishes similar findings to a Center for Naval Analysis report, a summary of which was published in 2017, that found six areas (deliberate escalation, inadvertent escalation, accidental escalation, internal errors, rational consideration of escalation in decision-making, and likelihood of response) where UAS can impact escalation dynamics. Larry Lewis and Anna Williams, “Summary Impact of Unmanned Systems to Escalation Dynamics” (CNA Center for Autonomy and AI, 2017), https://www.cna.org/CNA_files/PDF/Summary-Impact-of-Unmanned-Systems-to-Escalation-Dynamics.pdf.
12. “United States Air Force RPA Vector: Vision and Enabling Concepts 2013–2038,” February 17, 2014, p. 47, <http://www.af.mil/Portals/1/documents/news/USAFRPAVectorVisionandEnablingConcepts2013-2038.pdf>.
13. Full descriptions of the vignettes are available in Vignettes.
14. See, for example, “The Memorandum of Understanding between the Department of Defense of the United States of America and the Ministry of National Defense of the People’s Republic of China Regarding the Rules of Behavior for Safety of Air and Maritime Encounters,” including the amended Annex I and Annex III. Available at: https://www.defense.gov/Portals/1/Documents/pubs/141112_MemorandumOfUnderstandingRegardingRules.pdf and https://www.defense.gov/Portals/1/Documents/pubs/US-CHINA_AIR_ENCOUNTERS_ANNEX_SEP_2015.pdf.
15. David F. Winkler, “When Air Intercepts Turned Deadly,” Naval Historical Foundation, April 21, 2017, <https://www.navyhistory.org/2017/04/when-air-intercepts-turned-deadly/>.
16. The study team utilized the great resource that is the Live Universal Awareness Map. Their Syria map covers more than just UAS, and within a UAS filter records UAS incidents of all sizes and categories. Live Universal Awareness Map, “Map of the Syrian Civil War,” accessed June 12, 2018, <https://syria.liveuamap.com/en>.
17. “IDF intercepts Iranian UAV,” Israeli Defense Forces, February 10, 2018, <https://www.idf.il/en/minisites/press-releases/idf-intercepts-iranian-uav/>; “Israel says Iranian drone it shot down in February was carrying explosives,” Reuters, April 13, 2018, <https://www.reuters.com/article/us-israel-iran-drone/israel-says-iranian-drone-it-shot-down-in-february-was-carrying-explosives-idUSKBN1HK2LU>.
18. “IDF intercepts Iranian UAV”
19. Isabel Kershner, Anne Barnard, and Eric Schmitt, “Israel Strikes Iran in Syria and Loses a Jet,” *The New York Times*, February 10, 2018, <https://www.nytimes.com/2018/02/10/world/middleeast/israel-iran-syria.html>.
20. Maayan Lubell, Lisa Barrington, “Israeli jet shot down after bombing Iranian site in Syria,” Reuters, February 10, 2018, <https://www.reuters.com/article/us-israel-iran/israeli-jet-shot-down-after-bombing-iranian-site-in-syria-idUSKBN1FU07L>.
21. Loveday Morris and Ruth Eglash, “Israel carries pit ‘large-scale attack’ in Syria after Israeli jet crashes under anti-aircraft fire,” *The Washington Post*, February 10, 2018, https://www.washingtonpost.com/world/israel-carries-out-large-scale-attack-in-syria-after-israeli-jet-crashes-under-anti-aircraft-fire/2018/02/10/89e0ca2c-0e33-11e8-95a5-c396801049ef_story.html?noredirect=on&utm_term=.bfba5d7adf45.
22. “Creating threats to life and security of Russian service personnel, who are in the Syrian Arab Republic at the invitation of its legitimate government in order to assist the fight against terrorists, is absolutely unacceptable.” Press release on Israeli air strikes in Syria, The Ministry of Foreign Affairs of the Russian Federation, February 10, 2018, http://www.mid.ru/en/foreign_policy/news/-/asset_publisher/cKNonkJE02Bw/content/id/3068784.
23. “Iran shows film of captured US drone,” BBC News, December 8, 2011, <http://www.bbc.com/news/world-middle-east-16098562>. Also see Figure 1.