



DRONE PROLIFERATION

Policy Choices for the Trump Administration

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Cover Photo

Satellite imagery shows several Chinese CH-4 drones (comparable to the U.S. MQ-9 Reaper) based at a civilian airport outside of Zhongwei, China. China has sold variants of the CH-4 to Iraq, Saudi Arabia, and Jordan. (Google, DigitalGlobe)



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Related Publications

"Proliferated Drones: A Technology Primer,"

—Kelley Saylor

"Global Perspectives: A Drone Saturated Future,"

—Kelley Saylor, Ben FitzGerald, Michael C. Horowitz, and Paul Scharre

"Game of Drones: Wargame Report,"

—Alexandra Sander

"Drone Proliferation and the Use of Force:

An Experimental Approach,"

—Michael C. Horowitz, Paul Scharre, and Ben FitzGerald

These reports, as well as the Drone Database developed in partnership with the Center for the Study of the Drone at Bard College, are available at drones.cnas.org.

About Proliferated Drones

This report is the culmination of CNAS' two-year Proliferated Drones project. The project has explored drone technology, perceptions of drones, how different nations will use drones, and how these uses may change conflict dynamics. Additional information can be found at drones.cnas.org.

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Executive Summary

The U.S. monopoly on drones has ended. More than 30 nations already have or are developing armed drones, and at least 90 nations, as well as some non-state actors, possess unarmed drones. Further drone proliferation is inevitable. The technology has already spread widely, with countries such as Israel and China selling drones on the global market, as well as indigenous production increasing in a number of countries. The United States must take proactive measures to come to grips with an increasingly drone-saturated world.

There are gaps and inconsistencies in U.S. policies that harm the United States' ability to shape patterns of proliferation and protect U.S. advantage. U.S. drone export policy has overly prioritized limiting proliferation at the expense of other U.S. interests, including maintaining a technological advantage over competitors, improving the capabilities of key partners, and shaping the behavior of how others use drones. The United States has limited drone transfers abroad, particularly armed drones, even to close partners. When the United States has held back from transferring drones abroad, China has stepped in to fill the void. China has transferred their Reaper-class CH-4 drone to Jordan, Saudi Arabia, and Iraq and has sold armed drones to Egypt, Iraq, Kazakhstan, Myanmar, Nigeria, Pakistan, Saudi Arabia, Turkmenistan, and the United Arab Emirates.

This reluctance to transfer U.S. drones harms U.S. interests in tangible ways. When U.S. partners buy Chinese instead of American drones, the United States loses an opportunity to deepen its defense relationships and interoperability becomes more difficult. Blocking U.S. companies from competing in the global marketplace also stymies American competitiveness and

innovation, making it harder for the United States to maintain its technological edge in this rapidly changing arena. Restricting U.S. sales perversely promotes sales from other nations, since partners who would prefer U.S. drones are forced to turn elsewhere. The Trump administration should engage in targeted, conditional exports to key partners.

Regardless of U.S. actions, drones will continue to proliferate. As they do, inevitably other nations will use them for extraterritorial drone strikes. There is a risk that other actors' uses of drones could undermine legitimacy and political support for U.S. counterterrorism strikes. The United States must anticipate how it would respond to drone strike campaigns conducted by others without invalidating or limiting American counterterrorism strategies that depend on the use of armed drones. The United States will want to be able to clearly distinguish between its actions with drones and those of others that it might see as illegitimate. The United States has not been transparent about its own use of drones, however, perpetuating the perception that U.S. drone strikes outside hot battlefields are illegitimate or, even worse, illegal. The United States should actively work to promulgate the norm that, like all weapons, drones must be used in accordance with applicable international law. U.S. actions must reinforce that message, and the first step in doing so is greater transparency regarding U.S. use of drones.

U.S. policies must continue to adapt to a world where many actors will have access to drones. The Trump administration has an opportunity to change course and take concrete steps to help the United States advance and defend its interests in a world of proliferated drones.

Recommendations

<p>ADAPT EXPORT AND COUNTER-PROLIFERATION POLICY TO KEEP PACE WITH CHANGING TECHNOLOGY</p>	<ul style="list-style-type: none"> ■ The Trump administration should loosen restrictions on drone exports, treating them more like traditional aircraft. The administration should consider targeted exports of uninhabited aircraft, including armed uninhabited aircraft, to close partners and allies provided that they agree to the principles for proper use. Export policy should be supported by a clear set of criteria for assessment so that the process is swift and focused. ■ The Trump administration should adapt its interpretation of Missile Technology Control Regime (MTCR) guidelines to account for changing technology, while working with other MTCR member states to refine and change the MTCR guidelines over time.
<p>PREPARE FOR REALITY OF USE AS DRONES PROLIFERATE</p>	<ul style="list-style-type: none"> ■ The White House and Department of Defense should run a series of DoD and interagency wargames to explore the implications of drones on escalation dynamics, especially in contested or gray zone conflicts. These should include how drones might be used in crisis situations, possible reactions by others such as shooting down drones, and how these actions might affect escalation and perceptions of commitment. These wargames can help policymakers anticipate future challenges and prepare U.S. responses to adversary use of drones or actions against U.S. drones. ■ DoD should explore the potential implications of nuclear-capable uninhabited vehicles, by the United States or other nations, on nuclear stability, crisis escalation, and positive control over nuclear weapons. DoD should explore opportunities to mitigate any potential strategic risks associated with nuclear-capable uninhabited vehicles, even if they are developed by other nations.
<p>SHAPE PERCEPTIONS OF LEGITIMACY AND NORMS OF APPROPRIATE USE FOR DRONES</p>	<ul style="list-style-type: none"> ■ The Trump administration should continue to work with other nations to expand the number of state signatories to the Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enabled Unmanned Aerial Vehicles (UAVs) and encourage responsible use of drones consistent with international law. ■ The Trump administration should increase transparency about its use of drones outside areas of active hostilities, to the extent possible taking into account operational security concerns.

Introduction

More than 30 nations already have or are developing armed drones, and at least 90 nations, as well as some non-state actors, possess unarmed drones. The continued spread of uninhabited aircraft, or drones, introduces new dynamics to international engagements that heighten uncertainty and confront well-understood behaviors, especially in the context of crisis stability, escalation dynamics, and sovereignty norms. To get ahead of these issues, the United States has begun to craft complementary unilateral and multilateral policies to respond to drone proliferation and shape their use in ways that align with U.S. interests.

Further drone proliferation is inevitable. The technology has already spread widely, with countries such as Israel and China selling drones on the global market, as well as indigenous production increasing in a number of countries. While the United States can slow the spread of sensitive military subcomponents, such as stealth, protected communications, advanced autonomy, and other features, basic drone technology is already too widespread to halt its proliferation. However, the United States can influence how other nations use drones by example and by promulgating norms of appropriate behavior.

Over the past two years, the United States has taken significant steps toward establishing policies and building international consensus to manage many of the challenges posed by drone proliferation. In February 2015, the United States issued a new export policy for military unmanned aerial systems, or drones. This policy required that recipients of U.S. drones agree to “principles of proper use.” In October 2016, the United States built upon this policy by spearheading a Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enabled UAVs. This declaration, which has been signed by over 40 countries, lays out important principles for the export and use of armed drones. Combined, these two policies are first steps toward establishing a normative framework on how armed drones are used.

However, U.S. policies have gaps and inconsistencies that harm the United States’ ability to shape patterns of proliferation and protect U.S. advantage. If the United States fails to capitalize on the momentum surrounding new drone policy, others may take the lead in establishing a normative framework contradictory to U.S. national security interests as drones continue to proliferate. The Trump administration has an opportunity to take a new look at U.S. policy with respect to drone proliferation and use, building on existing policies in some areas and changing course in others.



*A U.S. MQ-1C Gray Eagle at Camp Taji, Iraq.
(Spc. Roland Hale, U.S. Army/DVIDs)*

U.S. Policy Objectives

CNAS' Proliferated Drones project identified five key objectives that drive the U.S. policy response to drone proliferation:

1. Preserving legal and political freedom of action for U.S. drone use.
2. Maintaining the U.S. military's technological advantage over potential competitors.
3. Improving the military capabilities of key partners and allies.
4. Preventing or slowing the spread of potentially harmful drone technology.
5. Shaping the behavior of how others use drones.

Some of these objectives are in tension, and current U.S. policies do not adequately resolve those tensions. In two significant policy areas – drone exports and transparency on U.S. drone strikes – the United States has yet to fully adjust its policies to a world where many actors have access to and use drones.

U.S. drone export policy has overly prioritized limiting proliferation at the expense of other U.S. interests, including maintaining a technological advantage over competitors, improving the capabilities of key partners, and shaping the behavior of how others use drones. To date, the United States has sought to slow drone proliferation by restricting U.S. drone exports, particularly armed drones and larger drones that fall under Category I of the MTCR. This has not significantly slowed drone proliferation, however. Other nations can still purchase drones on the global market from countries such as China or Israel.

The current U.S. approach of restricting exports also harms the U.S. military's long-term technological advantage over potential competitors. Non-U.S. drones of comparable sophistication already are available on the global market. Restricting exports does not stop the spread of drone technology, but it does hinder U.S. companies' ability to compete and stay ahead in a fast-moving market. Loosening restrictions to allow targeted exports to close partners and allies could help ensure that U.S. companies continue to stay at the cutting edge of drone technology development. The U.S. military's future technological edge hinges on having a healthy, innovative defense industrial base with the most cutting-edge technologies, and allowing U.S. drone manufacturers to compete in the global marketplace is essential to maintaining the U.S. lead in this emerging technology area.

Finally, restricting U.S. drone exports limits opportunities to shape emerging norms for drone use. Targeted, conditional exports can be a useful tool to influence how others use drones. Under the new drone export policy established in February 2015, any recipients of U.S. drones must agree to certain principles for use, such as only using drones in accordance with international law. The United States also can pair exports with training on tactics, techniques, and procedures for reducing civilian casualties. These steps can help spread norms and practices for drone use that are consistent with U.S. values and the rule of law.

Similarly, the United States has failed to adapt its transparency on its use of drones to a world where many actors have access to drones, including armed drones. The Bush, Obama, and Trump administrations all have used armed drones to strike terrorists abroad, and while they have openly acknowledged broad patterns

U.S. drone export policy has overly prioritized limiting proliferation at the expense of other U.S. interests.

This reluctance to transfer U.S. drones harms U.S. interests in tangible ways. Close allies and partners who otherwise have access to advanced U.S. military equipment, such as fighter aircraft, often find there are steep hurdles to acquiring U.S. drones, particularly armed drones. This runs counter to U.S. interests, since it deprives the United States of an opportunity to bolster partners' capabilities. When U.S. partners eventually acquire drones from other countries, the United States loses an important opportunity to deepen defense relationships, improve interoperability, and influence how other countries use drones.

of use, so-called "drone strikes" outside of hot battlefields have occurred under a veil of secrecy. In a world where the United States was the only actor with armed, militarily-capable drones, this secrecy may have made sense. As drones proliferate to others, however, this secrecy sets a dangerous precedent. The lack of transparency surrounding drone strikes that is intended to preserve U.S. freedom of action has perpetuated the perception that U.S. actions are illegitimate or, even worse, illegal. The perception that normal rules of international law do not apply to actions with drones could incentivize malign behavior by others. If other nations begin using

drones in ways that are widely seen as illegitimate or illegal, it could undermine the legitimacy of U.S. actions. The United States should actively work to promulgate the norm that, like all weapons, drones must be used in accordance with applicable international law. While this will not constrain actors who do not respect the rule of law, it will help differentiate U.S. drone use from others. U.S. actions must reinforce that message, and the first step in doing so is greater transparency regarding U.S. use of drones.

U.S. policies must continue to adapt to a world where many actors will have access to drones.

U.S. policies must continue to adapt to a world where many actors will have access to drones. The Trump administration has an opportunity to change course and engage in targeted, conditional exports to key partners and increase transparency about U.S. drone use. These steps can help the United States advance and defend its interests in an increasingly drone-saturated world.



The Predator has revolutionized modern counterterrorism operations. Its ability to conduct persistent surveillance allows the United States to illuminate and uncover terrorist networks, and its ability to conduct time-critical strike makes it a discriminating weapon in the fight against terrorists. (General Atomics)

Background

Current U.S. policies, particularly on drone exports, are driven by history and bureaucratic inertia. Many policies made sense in a world where drones were available to only a small number of actors. Other policies originally were intended to prevent proliferation, but make little sense today in a world where drone technology is widely available already. As drones have proliferated, the United States has not yet adequately adjusted to the challenges they bring.

Early History

Drone development is rooted in the Cold War demand for persistent surveillance of Soviet capabilities, which fueled interest in drones within the Air Force and intelligence communities.¹ The ability to conduct intrusive surveillance without risk to pilots was one obvious advantage, particularly after the Soviet Union shot down Gary Powers' U-2 while he was conducting a clandestine reconnaissance flight over Soviet territory in 1960.² Drone capabilities were already materializing in the early 1960s. The program was so valuable that the United States at the last minute aborted a drone reconnaissance mission over the newly discovered Soviet missiles in Cuba for fear of revealing the new U.S. capability to the Soviets.³ The United States used reconnaissance drones over Chinese territory starting in 1964 to monitor air defense capabilities and nuclear developments and in the Vietnam War for battle damage assessment.⁴ Reconnaissance drones serviced 93 percent of photo targets after the Vietnam Linebacker II bombing campaign, for example.⁵ These successes were not easily transferred to the European theater, however, due to the state of the technology and existing airspace regulations in Europe.⁶ Despite the United States' limited deployment of drones, the technology continued to mature throughout the 1980s and 1990s, including in the development of aircraft that would be refined in the next decade.⁷ By the mid-1990s, the United States had developed an operationally viable persistent surveillance aircraft that could be controlled via satellite communications: the Predator.⁸

The Predator Age

The modern age of drones began in 1995 in Bosnia, with the first deployment of a squadron of Air Force Predator reconnaissance aircraft.⁹ Predators provided targeting information to fighter jets, information on refugee flows, and battle-damage assessments.¹⁰ While low-flying pilots or ground troops could provide better

quality intelligence, drones provided persistent, real-time surveillance with the ability to stay aloft for 24 hours.¹¹ Predators were able to provide this surveillance even in Bosnia's mountainous and heavily clouded environment. After seeing the operational benefits, Congress more than doubled the Predator budget, from \$50 million to \$115.8 million for the next year, and accelerated follow-on programs.¹² The Air Force's use of Predators in Bosnia was the first step in developing the drone tactics in use today in conflicts around the globe.¹³

The Predators used in Bosnia were unarmed, but their ability to track terrorists quickly sparked a debate about whether to arm them. In October 2000, the United States began using unarmed Predators to surveil terrorists in Afghanistan with the aim of finding Osama bin Laden. The potential for armed drones to shorten the kill chain and strike bin Laden, if he was seen, inspired then-White House counterterrorism chief Richard Clarke to push for arming Predators. The United States tested the first Predators armed with Hellfire missiles in early 2001. Hellfire missiles were slated for deployment to arm Predators by September 1, 2001, but the missiles were delayed because of technical problems. After the September 11 attacks, the United States rushed Hellfires to theater, and the first armed drone strike occurred in November 2001.¹⁴ Their use to kill terrorists from afar started a new pattern of war.

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Over the next 15 years, drone strikes became a vital tool for degrading terrorist networks, particularly in regions where U.S. troops were not deployed on the ground in large numbers. According to estimates from non-governmental organizations, President George W. Bush ordered 50 drone strikes that killed approximately 296 terrorists. President Obama significantly escalated the program, ordering an estimated 506 strikes as of early 2016 that killed approximately 3,040 terrorists.¹⁵

The U.S. use of drones to target terrorists "outside of areas of active hostilities" such as in Pakistan, Somalia, and Yemen has been particularly controversial in part because of the secrecy that surrounds these strikes. The U.S. government did not officially acknowledge the lethal use of drones in these areas until 2012.¹⁶ In 2013, President Obama publicly defended drone strikes as a vital counterterrorism

tool and outlined the rationale for the program.¹⁷ The U.S. government also released an unclassified set of policy guidelines outlining the circumstances under which it would approve such strikes.¹⁸ However, the United States has acknowledged specific strikes only sporadically.¹⁹

Despite the Obama administration's more recent efforts to explain its rationale and approval process, the merits of drone strikes outside of hot battlefields continue to be widely debated.²⁰ The number of civilian casualties and in particular U.S. citizens killed by drone strikes, whether intentionally or incidentally, has been a key point of debate.²¹ To address these concerns, in July 2016 President Obama issued an Executive Order on Pre- and Post-Strike Measures to Address Civilian Casualties in U.S. Operations Involving the Use of Force.²² The order affirmed U.S. commitment to compliance with the law of armed conflict and identified specific steps by which the government would take appropriate measures to protect civilians. Additionally, the executive order required the director of national intelligence (DNI) to compile an annual report detailing the number of drone strikes outside areas of active hostilities and assessments of resulting combatant and civilian deaths. The DNI released the first unclassified summary of this report in conjunction with the July 1 executive order, setting a new precedent for transparency and communication about the use of uninhabited aircraft.²³ The report acknowledged 473 strikes outside areas of active hostilities from 2009 to 2015, resulting in the deaths of approximately 2,300 to 2,600 terrorists and 64 to 116 civilians. The DNI report acknowledged the discrepancy between government figures and those from independent non-governmental organizations, particularly with regard to civilian casualties, which independent organizations estimated to be between 200 and 900 during the same time period.

By any account, however, drones have become a much more discriminate weapon in recent years and civilian casualties have dropped significantly.²⁴ According to independent estimates from non-governmental organizations, the United States conducted in 2016 a total of 50 drone strikes in Pakistan, Somalia, and Yemen, killing an estimated 300 to 425 terrorists and an estimated four to six civilians.²⁵ By the tail end of the Obama administration, drone strikes had evolved into an extremely discriminate counterterrorism tool.

President Trump has vowed to wage an even more aggressive campaign against terrorism. News reports indicate that soon after taking office, President Trump reinstated the authority the intelligence community had before the Obama administration's 2013 Presidential Policy Guidance, including allowing the CIA to carry

out drone strikes.²⁶ This is in line with President Trump's broader delegation of authority to battlefield decision-makers.²⁷ This has led to a significant uptick in drone strikes outside areas of active hostilities, with the Trump administration conducting an average of one strike per day during Trump's first few months in office, which is significantly higher than the average Obama rate of one strike every 5.4 days.²⁸

A Drone-Saturated World

The extent to which the United States' use of drones has dominated international discourse about uninhabited aircraft for nearly two decades has obscured their global proliferation. More than 90 state and non-state actors now possess drones, ranging from small, inexpensive commercial drones to sophisticated military drones.²⁹ Secrecy surrounding some development programs and arms transfers makes it difficult to produce a completely accurate picture of drone proliferation, but open source data indicates at least 16 countries have armed drones and 20 additional countries are seeking to develop armed drones.³⁰ The widespread availability of commercial systems further complicates measures of drone proliferation, as their capabilities often are comparable to small military drones and they can be easily adapted or modified for military use.³¹

Currently, Israel is the top exporter of military drones, accounting for over 60 percent of international transfers over the past three decades, but the United States and China are not far behind.³² The majority of drones transferred abroad are unarmed and intended primarily for reconnaissance. Between 2010 and 2014, only 2.5 percent of drones transferred abroad (11 of 439) were armed.³³ However, as more countries' development programs mature, the frequency and volume of armed drone exports is increasing. Weapons-capable Chinese drones are already becoming a popular choice among many countries looking for quick delivery or cheap prices.³⁴

The affordability, accessibility, and capabilities of available systems shape the global spread of drones. At one end of the spectrum, commercial, hobbyist drones are highly affordable and accessible. They are far less capable, however, than the most advanced large, military-specific, or stealth combat drones that are available to only a few countries.³⁵ Commercial drones are proliferating much more rapidly than their more expensive military counterparts, which not only demand a higher price tag and are subject to international arms trade agreements but also require more sophisticated infrastructure and doctrine to operate effectively.³⁶ Yet as drone technology continues to advance, the distinctions between commercial and military systems are likely to become less clear, affecting the strategic and political implications of proliferation.



Israeli Defense Forces show off an Hermes 450 drone. The Hermes 450 has been sold to numerous countries, including Azerbaijan, Georgia, Croatia, Brazil, Mexico, Colombia, Singapore, the United Kingdom, and the United States. (Israeli Defense Forces/Wiki Commons)



Israeli drones are so ubiquitous on the global market that even the United States flies them. U.S. Customs and Border Protection fly the Israeli-made Hermes 450 in 2004. (U.S. Customs and Border Protection/Wiki Commons)

The MTCR and Drone Proliferation

While there are no specific, international agreements that explicitly regulate the sale, transfer, or use of drones, there are preexisting arms control regimes that apply to drones. The Missile Technology Control Regime is a voluntary, multilateral export control regime that covers missiles and drones. The MTCR was established in 1987 to limit the proliferation of unmanned ballistic missile technology and delivery vehicles that could be used to deliver weapons of mass destruction (WMD) for chemical, biological, and nuclear attacks. The MTCR sets guidelines and promulgates lists of systems, software, technologies, and services that should be controlled due to military and dual-use purposes as they apply to missile development, production, and operation. The list of controlled items can be separated into two general categories:

- Category I items: Complete unmanned systems or subsystems that have the capability to deliver a 500-kilogram payload over a distance of 300 kilometers. This includes: ballistic missiles, space launch vehicles, cruise missiles, target and reconnaissance drones, and remotely piloted vehicles. Category I also includes the technology for design and production facilities.
- Category II items: These are items that could contribute to a delivery system. This includes: inertial navigation and production, flight control systems, avionics equipment, launch support equipment and facilities, test facilities and equipment, software and related computers, and reduced-observables technology, materials, and devices.

The MTCR is not a treaty and does not impose any legally binding restrictions on members. It is an “informal political understanding” among members, and MTCR members voluntarily and unilaterally agree to adhere to MTCR guidelines.³⁷ Under these guidelines, members agree to an “unconditional strong presumption of denial” of transfer of Category I items, which should occur “only on rare occasions.” This strong presumption of denial applies to Category I transfers to members and non-members, regardless of the purpose of export. Transfers require binding and vigorous government-to-government assurances on end-use. Transfers of Category I production facilities are “absolutely prohibited.” For Category II items, members can make case-by-case decisions to transfer and seek additional end-use assurances if deemed necessary.



The United States has not transferred MTCR Category I drones beyond NATO and major non-NATO allies, but has transferred unarmed versions of the Category II Predator XP to some U.S. partners, including the United Arab Emirates. (General Atomics)

Members expanded the MTCR in 1993 to include all chemical and biological WMD, and in 2002 they made terrorism an explicit focus. The expansions broadened the scope of the regime as more missiles and drones became capable of carrying lighter chemical and biological payloads. This introduced some degree of subjectivity in assessing an importer’s intention as opposed to denying a specific technological capability (e.g., a missile able to deliver a 500-kilogram payload at least 300 kilometers). In 2004, UN Security Council Resolution (UNSCR) 1540 endorsed the MTCR guidelines and list, designating the proliferation of WMD delivery systems as a threat to international peace and security and requiring all UN member states to establish proliferation-sensitive export controls. The MTCR list also formed the basis of the list of missile-related items prohibited from being transferred to Iran under UNSCRs 1737 and 1929 and to North Korea under UNSCR 1718.

The MTCR has a mixed record over its 30-year existence and not all key arms exporters are members – most notably China and Israel, though both claim to follow its general guidelines. Despite its voluntary nature, the MTCR has had a normative, quasi-coercive effect on nonproliferation activities, in part because there is really no comparable regime. In fact, MTCR members give the regime credit for several countries forgoing or eliminating various types of ballistic missile or space launch vehicle programs. On the other hand, the MTCR has failed to keep the world’s most problematic actors – China, Pakistan, and, of course, North Korea and Iran – from advancing their missile programs and proliferating technology. Yet overall, the MTCR has had remarkable success in creating a more challenging and costly environment for proliferators to produce or acquire WMD-capable missiles.

The central challenge with the MTCR today, however, is that the MTCR treats drones like missiles, not aircraft. The MTCR’s 500-kilogram payload and 300-kilometer range limits apply to “complete unmanned aerial vehicle systems (including cruise missiles, target drones, and reconnaissance drones).” In 1987 when the MTCR was founded, this classification made sense since most drones were one-way target drones. Today, however, it seems hopelessly outdated. Classifying uninhabited aircraft like missiles does not consider the ultimate function of the aircraft as a recoverable platform, nor does it take into account the varied non-military uses for uninhabited aircraft, such as agriculture, border control, or critical infrastructure protection. (The MTCR does not distinguish between military or civilian use, speed, engine size, or other specifications.) Today’s drones are more like aircraft, which the MTCR does not regulate, than missiles. Even though this distinction has become outdated by evolving technology, it nonetheless continues to shape U.S. policy.

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U.S. Export Policy

Informed by the MTCR guidelines and broader concerns about armed drone proliferation, the United States has limited drone transfers abroad, particularly of armed drones. The United States has approved transfers of category I drones, such as the RQ-4 Global Hawk and MQ-9 Reaper, to a limited number of NATO and major non-NATO allies, such as Japan, Australia, and South Korea.³⁸ The United States has been particularly reluctant to transfer armed drones, only authorizing transfers to Italy and the United Kingdom.³⁹ Even in those narrow cases to close allies, approval has been fraught. The State Department took four years to approve Italy’s request to purchase armed Reaper drones.⁴⁰ (As of May 2017 the transfer had been approved, but not yet been completed.)

This hesitation to transfer drones has even extended in some cases to transfers of unarmed, category II systems to close U.S. partners. In 2014, the Obama administration rejected Jordan’s request to acquire unarmed Predator XP drones, which fall below the MTCR’s 500-kilogram, 300-kilometer category I limit.⁴¹ The denial was particularly surprising given that Jordan receives over \$300 million annually in foreign military aid from the United States and operates U.S.-supplied F-16 fighter aircraft.⁴²

MTCR Signatory States

MISSILE TECHNOLOGY CONTROL REGIME SIGNATORY STATES AND YEAR OF ENTRY INTO THE REGIME

Argentina (1993)	Japan (1987)
Australia (1990)	Luxembourg (1990)
Austria (1991)	Netherlands (1990)
Belgium (1990)	New Zealand (1991)
Brazil (1995)	Norway (1990)
Bulgaria (2004)	Poland (1998)
Canada (1987)	Portugal (1992)
Czech Republic (1998)	Russia (1995)
Denmark (1990)	South Africa (1995)
Finland (1991)	South Korea (2001)
France (1987)	Spain (1990)
Germany (1987)	Sweden (1991)
Greece (1992)	Switzerland (1992)
Hungary (1993)	Turkey (1997)
Iceland (1993)	Ukraine (1998)
India (2015)	United Kingdom (1987)
Ireland (1992)	United States (1987)
Italy (1987)	

China and Israel, two of the world’s leading drone exporters, are not MTCR members.

Source: *Missile Technology Control Regime*, <http://mtcr.info/partners/>.

Jordan turned to China instead. Satellite images of a Jordanian air base in 2016 showed a Chinese-made CH-4 surveillance and strike drone, comparable to a U.S. Reaper.⁴³

When the United States has held back from transferring drones abroad, even to key partners, China has stepped in to fill the void. China has transferred their Reaper-class CH-4 drone to Jordan, Saudi Arabia, and Iraq. Many of China's sales have been armed. (The MTCR does not distinguish between armed vs. unarmed drones.) China has sold armed drones to Egypt, Iraq, Jordan, Kazakhstan, Myanmar, Nigeria, Pakistan, Saudi Arabia, Turkmenistan, and the United Arab Emirates.⁴⁴ In fact, every international transfer of an armed drone to date with the exception of the U.S. transfer to the United Kingdom has been from China. Over time, this is likely to change as the United States and Israel transfer more armed drones abroad as well. In addition to the pending U.S. transfer to Italy, Israel reportedly has approved but not yet delivered transfers of armed drones to Germany and India.⁴⁵

U.S. hesitation to transfer drones abroad has not stopped proliferation. It has, however, weakened U.S. relationships with key partners by forgoing opportunities to build interoperability and deepen defense relationships. U.S. reluctance to transfer drones abroad also has meant the United States has missed out on opportunities to shape how others use drones and influence emerging norms of behavior for drone use.

In 2013, motivated by some of these problems, the United States initiated a broad review of its approach to drone exports that culminated in the February 2015 U.S. Export Policy for Military Unmanned Aerial Systems.⁴⁶

The policy itself was not publicly releasable, but the State Department did release a fact sheet outlining the basic tenets of the policy. While the export policy recognized the applicability of existing arms control agreements, such as the MTCR, it also linked drone transfers to conditions on their use. Under the new policy, states desiring U.S. drones would have to agree to abide by “principles for proper use” of U.S.-origin drones. These principles include complying with applicable international law, not using drones for unlawful domestic surveillance or use of force, and encouraging “technical and doctrinal training ... to reduce the risk of unintended injury or damage.”

This new policy is a significant step toward targeted, conditional drone exports to key partners. The conditions for proper use, along with training on how to avoid civilian casualties, are key tools for shaping emerging norms for the responsible use of drones. The United States has not fully capitalized on these tools to date, however. Despite the official policy change, the United States still has been reluctant to transfer drones abroad.

Various members of Congress have spoken out in favor of increasing targeted drone exports to key partners. In March 2017, the Republican and Democratic chairs of the U.S. Senate India Caucus sent letters to Secretary of State Rex Tillerson and Secretary of Defense James Mattis expressing support for India's request to purchase the Guardian drone, an unarmed maritime version of the MQ-9 Reaper.⁴⁷ The following month, a bipartisan group of 22 Congressional representatives signed a letter to President Trump asking him to permit sales of MQ-9 Reaper drones to Jordan and the United Arab Emirates.⁴⁸ (Both the Guardian and Reaper are Category I MTCR systems, and unarmed Reapers have been approved for



The U.S.-developed MQ-9 Reaper flies, displaying its weaponized status. The United States has transferred an armed version to the United Kingdom and has approved, but not yet transferred, armed Reapers to Italy. China has sold a similar armed drone, the CH-4, to Iraq, Jordan, and Saudi Arabia. (General Atomics)



This Iraqi CH-4 armed drone was imported from China. China's CH-4 drone is comparable to the U.S. MQ-9 Reaper. If the United States limits exports, nations have other options on the global market. China has already sold armed drones to 10 countries. (Iraq Ministry of Defense)

Countries With Armed Drones



Map includes countries with an armed drone capability, as well as originating nation for the technology, if armed drones have been purchased in the global market. In some cases, such as the Russian Altius-M drone, the capability may be developed but not yet fielded operationally. Pending transfers of armed drones (the United States to Italy; Israel to Germany and India) are not included.

Source: Matt Fuhrmann and Michael C. Horowitz, "Droning On: Explaining the Proliferation of Unmanned Aerial Vehicles," International Organization, 71 no. 2 (Spring 2017), 397-418; and Stockholm International Peace Research Institute (SIPRI) Arms Transfers Database, <https://www.sipri.org/databases/armstransfers>.

transfer to several NATO and major non-NATO allies.) The lawmakers cited concerns that countries would turn to China instead for their drone purchases – concerns that have materialized in reality.

U.S. Efforts to Shape International Norms on Drone Use

In October 2016, the United States built on its new export policy and spearheaded the Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enabled UAVs. The declaration, signed by more than 40 countries, aimed to start a process by which the international community may identify “appropriate transparency measures” to manage the proliferation of armed or strike-enabled drones.⁴⁹ The declaration laid out five principles that recognize the applicability of international law and existing arms control and disarmament norms while calling for the consideration of specific standards to cope with the rapid development and spread of drone technology. Similar to the United States’ 2015 export policy, the declaration emphasizes the importance of “responsible” export of uninhabited aircraft, recognizing the scope of potential recipient behavior. While the declaration currently does not bind signatories to

specific transparency or import and export measures, it is designed to serve as the foundation for future international policy discussions.⁵⁰

International Armed Drone Transfers

RECIPIENT COUNTRY	ORIGINATING COUNTRY
Egypt	China
Iraq	China
Jordan	China
Kazakhstan	China
Myanmar	China
Nigeria	China
Pakistan	China
Saudi Arabia	China
Turkmenistan	China
United Arab Emirates	China
United Kingdom	United States

The joint declaration is interesting in that it is not aimed at halting drone proliferation. Rather, it is intended as a tool for shaping proliferation to encourage responsible use of armed drones as they spread to additional countries. The joint declaration and the “principles for proper use” required for U.S. exports are attempts to influence not only how others use drones, but, more importantly, what uses are perceived as legitimate. Recent efforts at greater transparency, such as the July 2016 executive order on civilian casualties and requirement for DNI reporting on strikes, similarly should be seen as both responding to domestic calls for greater transparency and shaping emerging international norms for use.

Patterns of Use

As drones have proliferated, they have increased the options available to state and non-state actors, particularly in contested environments and gray zone conflicts. Drones may give non-state groups military capabilities they did not otherwise have. For states, drones can lower the barrier to certain actions, since drones can operate in hazardous areas without placing a pilot at risk. At the same time, the lack of a human onboard lowers the barrier to other nations using force against drones.⁵¹

Drones frequently have been used to penetrate contested regions or sovereign airspace. These drones often have been shot down with little other escalatory action taken. Hamas and Hezbollah have used drones to penetrate Israeli airspace; Israel has shot down those drones.⁵² In 2015, Syria reportedly shot down a U.S. Predator drone that

had ventured into a part of western Syria where U.S. airplanes did not normally operate.⁵³ Later that year, Turkey shot down a suspected Russian drone that penetrated Turkish airspace near Syria.⁵⁴ In 2016, Pakistan shot down in the disputed Kashmir region a small quadcopter that it claimed was an Indian surveillance drone (India denied the claim).⁵⁵ None of these incidents have incited escalatory retaliation. This pattern of behavior is consistent with a CNAS survey of drone experts and samples from the U.S. and Indian general public. Survey respondents generally were more risk-accepting with drones than comparable human-inhabited aircraft and more willing to use force against adversary drones. However, respondents were less inclined to escalate in response to hostile acts against drones than against human-inhabited aircraft in comparable scenarios.⁵⁶

Drones also have increased attack options for non-state groups, often leveraging commercially available technology. In late 2016 and early 2017, ISIS launched a wave of air attacks against Iraqi troops using small armed drones.⁵⁷ Groups with access to state sponsorship can acquire more capable drones. Hezbollah has added grenade-sized submunitions to drones to attack Israel.⁵⁸ Hamas has boasted of drones that could be armed or used for kamikaze attacks.⁵⁹ Houthi rebels have used Iranian-supplied kamikaze drones in Yemen to attack Patriot missile defense batteries.⁶⁰ While relatively unsophisticated technologically, these air attacks could pose significant problems for U.S. military ground forces, who have enjoyed freedom from enemy air attack for decades. The widespread availability of commercial drones similarly poses significant counterterrorism and homeland security challenges.⁶¹



A variety of Chinese drones are on display in a military parade. China has played an increasing role in the international drone market. Over 90 percent of armed drone proliferation to new countries has come from China. China is not a signatory to the MTCR or to the 2016 Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enabled UAVs. (Xinhua News Agency)



The Israeli Air Force took down a Hezbollah drone, pictured here. Proliferation continues as non-state actors increasingly acquire drones, threatening the airspace above ground units and possibly changing norms of engagement as states shoot them down. (Israel Defense Forces/Wikimedia Commons)

The Challenges Ahead

U.S. policy must not only respond to today's problems – it should be flexible enough to adapt to tomorrow's challenges. Many of today's policy dilemmas are due to the fact that drone technology has proliferated and evolved since the MTCR's founding, sometimes in surprising ways. Policymakers must anticipate emerging challenges in order to ensure they are developing policies that best safeguard U.S. interests in a rapidly changing area.

Technology

Drone technology continues to advance, driven by both military and commercial investment. This not only affects drones' capabilities and military relevance but also potentially reshapes proliferation in terms of who can purchase, develop, manufacture, or operate drones. Advances in drone technology are leading to next-generation systems that operate more like traditional military and commercial aircraft, as well as systems that exploit novel operational concepts such as swarming. Drone policy must be adaptive to technological change; otherwise at best it will be irrelevant, unable to impact the spread of uninhabited systems or shape their use, and at worst it will be counterproductive to U.S. interests.

Next-generation concepts for commercial and military drones harness advances in a host of aeronautical engineering, power, communication, and computing areas. At their core, though, drones depend on software. Software is the enabling technology that allows the airframe, network, and payload (from sensors to precision guided missiles) to create a system capable of operating without



Boeing Scan Eagle program members launch a drone from the flight deck of the USS Ponce during the International Mine Countermeasures Exercise. The Scan Eagle, initially designed for commercial fish-spotting, is currently being used by the U.S., Australian, Canadian, and Tunisian militaries. Smaller drones are available to a wider range of actors. They have less payload and endurance than larger drones, but may have equal or greater autonomous capabilities. (U.S. Navy/DVIDs)

a human onboard. Therefore, while drones will always at a certain level be constrained by the physical limitations of their hardware, the proliferation and capabilities of uninhabited and autonomous systems are really about software.

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Importantly, this means that the global spread of drones presents a new and different type of proliferation problem compared with what the United States has faced in the past. Software is more diffuse and advances more rapidly than hardware. Software is effectively costless to replicate and transmit, making it easily copied, stolen, and produced at scale. Slowing the spread of physical hardware like missiles and drones is difficult, but stopping the proliferation of software is nearly impossible. Further complicating attempts to control proliferation, drone autonomy is independent of the size and cost of physical hardware. Small, relatively low-cost commercially available drones have a high degree of autonomy. A DJI Mavic, for example, a compact quadcopter available for less than \$1,000, can autonomously take off and land, fly a GPS-programmed route, track and follow moving objects without a beacon, and sense and avoid obstacles. That's a greater level of autonomous flight than an Air Force MQ-9 Reaper drone.⁶²

Automation can be applied to vehicles of any shape and size, making the definition of what constitutes a "drone" increasingly blurry. Optionally piloted aircraft, such as Aurora Flight Sciences' Centaur, which "boasts three modes of operation (manned, unmanned, and augmented)," complicate the evolving drone technology landscape.⁶³ Optionally piloted vehicles have a cockpit for a human, but also have onboard software that enables autonomous flight or remote piloting. This means the aircraft can be a traditional human-inhabited aircraft one minute and uninhabited the next. Commercial development largely has focused on the hobbyist market to date, but once regulators open up the airspace to drones, the result could be an explosion in large-scale uninhabited or optionally piloted commercial aircraft.

The MTCR has been slow to adjust to technological progress, and it is not clear if it has the flexibility to adapt to these developments. The MTCR's treatment



While it looks like a private twin-engine passenger aircraft, the Israeli Hermes 1500 UAV is a twin engine, medium-altitude, long-endurance system. Israel has been a leading exporter of drones. (Israel Defense Forces/Wiki Commons)

of drones, already outdated today, appears increasingly untenable given the direction of future technology evolution. Under the MTCR, a large (Category I) optionally piloted commercial aircraft presumably would require a “strong presumption of denial” for transfer. States who chose to abide by these restrictions would be effectively locking themselves out of any future global marketplace for large-scale commercial drones. While uninhabited aircraft undeniably could be used as WMD delivery vehicles, so could human-inhabited commercial airliners. Commercial airliners are already highly automated, and the steady growth of autonomy will make future aircraft optionally piloted by default.

Even more paradigm-bending are “applique kits” that users could apply to any aircraft, regardless of size, in order to enable autonomous flight. These kits consist of sensors and control systems added to existing vehicles to convert them for remote or autonomous operation. The MTCR will not be able to prevent the proliferation of these technologies, which are effectively software and sensors rather than physical airframes. Indeed, the entire paradigm of the MTCR – restricting the proliferation of unmanned physical platforms capable of WMD delivery – is ill-suited to a future where software can enable any aircraft to operate uninhabited.

The MTCR has been slow to adjust to technological progress, and it is not clear if it has the flexibility to adapt to these developments.

Use

As drones proliferate, state and non-state actors will use them in novel ways, presenting challenges for the United States. The past 15-plus years of U.S. deployment of drones in counterterrorism operations, coupled with the lack of explicit international policies for drone use, have resulted in norms of behavior that prize strategic ambiguity, allowing states to deploy or respond to uninhabited aircraft in whatever manner is expedient in the moment. Despite this ambiguity, international perceptions of the use of drones in crisis and conflict scenarios are significantly different from perceptions of the use of inhabited aircraft in the same setting, indicating that wider drone use is likely to reshape how states engage in conflict.⁶⁴ Although U.S. behavior may have helped to establish these norms in the first place, some of these norms may look different in a world where others have drones as well.

The core challenge in shaping future international norms of drone use and appropriate response will be maintaining U.S. political freedom of action. From a policy perspective, the United States must anticipate how it would respond to drone strike campaigns conducted by others without invalidating or limiting American counterterrorism strategies that depend on the use of armed drones. While only the United States and the United Kingdom have conducted extraterritorial drone strikes to date, a number of countries, including Iraq, Israel, Nigeria, Pakistan, and Turkey, have conducted drone strikes against militants within their own territory.⁶⁵ Russia has used drones extensively in the Ukraine to spot for artillery strikes.⁶⁶ It is not unlikely that operators of armed drones will look to strike beyond



A U.S. Army officer launches a Puma drone on a reconnaissance mission in Ghazni Province, Afghanistan. The Puma is a small, battery-powered, hand-launched drone produced by AeroVironment. (U.S. Army/DVIDs)

their borders in the future. The United States will want to be able to clearly distinguish between its actions with drones and those of others that it might see as illegitimate.

The use of drones in hybrid and gray zone conflicts that fall short of full-scale, interstate warfare presents another challenge. Uninhabited systems give states the ability to take military action against an adversary without risking or taking a human life. While many incidents of drone breaches of sovereignty and subsequent drone shootdowns by adversaries have not led to escalation, norms of behavior are still evolving in this area, opening the potential for miscalculation. This particularly could be the case in contested areas, where multiple parties claim control over airspace. Uncertainty over how states might respond to drone incursions and shootdowns can heighten the opportunity for miscommunication and misperception in already unstable environments.



Soldiers of the Skylark I-LE unit in the Israeli Defense Force learn how to operate the Skylark drone in the Negev Desert. The Skylark is a miniature drone designed for tactical surveillance and reconnaissance. The Israeli-made Skylark is in service with the Australian, Canadian, Croatian, Czech, Hungarian, Israeli, Macedonia, Dutch, Polish, Slovakian, and Swedish militaries. (Israel Defense Forces/Flickr)

of operating uninhabited.⁶⁷ Although it is not explicitly stated in any official U.S. policy, it seems highly unlikely that the U.S. Air Force ever would be comfortable placing nuclear weapons on board an uninhabited aircraft. The 2013 Air Force *Remotely Piloted Aircraft (RPA) Vector* states, “nuclear strike, may not be technically feasible unless safeguards are developed and even then may not be considered for UAS operations” and calls for “ethical discussions and policy decisions” to address these concerns.⁶⁸ U.S. Air Force officials have been more forward leaning in public remarks, however, stating, “We’re planning on [the B-21] being manned. ... I like the man in the loop.”⁶⁹

However, not all countries necessarily see the issue in the same light. In 2012, a Russian Air Force lieutenant general stated that Russia could field an uninhabited nuclear bomber in the 2040s.⁷⁰ Other countries may not have the same risk calculus with respect to positive control over nuclear weapons. Nations that do not have long-range strategic bombers also may have more to gain by leveraging uninhabited aircraft as nuclear delivery vehicles.

Nuclear-armed uninhabited aircraft would pose novel risks with regard to maintaining “positive control” over nuclear weapons. Unlike nuclear-armed cruise missiles or ballistic missiles, uninhabited nuclear bombers could be sent on patrol in a crisis. This would entail placing an enormous amount of trust in the aircraft’s onboard autonomy and communications links in order to maintain effective human control. The implications of this potential development merit further exploration, along with opportunities to mitigate any risks.



A Chinese military parade showcases new drone technology. The Chinese are a major provider of drones around the world, including selling armed drones to Egypt, Iraq, Jordan, Kazakhstan, Myanmar, Nigeria, Pakistan, Saudi Arabia, Turkmenistan, and the United Arab Emirates. (Xinhua News Agency)

Drones as Nuclear Delivery Vehicles

The intersection of uninhabited aircraft and nuclear weapons is another challenge looming on the horizon. Even though the MTCR is an imperfect vehicle for adapting to changing technology, the core concern of the MTCR – WMD delivery – remains valid. Drones are proliferating, including to nuclear-armed states, meaning nuclear powers will have the option to use uninhabited aircraft as nuclear delivery vehicles. Whether they will do so remains to be seen.

The United States is building a new bomber, the B-21 Raider, which will be nuclear capable. According to defense officials, the B-21 also will have the option

Recommendations

The United States cannot stop drones from proliferating abroad, nor can it stop nefarious actors from using drones in harmful ways. The United States does have tools at its disposal, however, to help protect American national security interests in a world of proliferated drones. The Trump administration should adapt U.S. policy to help achieve U.S. objectives: preserving legal and political freedom of action for U.S. drone use; maintaining the U.S. military's technological advantage over potential competitors; improving the military capabilities of key partners and allies; preventing or slowing the spread of potentially harmful drone technology; and shaping the behavior of how others use drones.

Adapt Export and Counter-proliferation Policy to Keep Pace with Changing Technology

Export policy: The Obama administration's approach of strictly limiting drone exports, including to close partners such as Jordan, has been counterproductive and harms American interests. The diverse global marketplace means that drones are proliferating regardless of what the United States does. When U.S. partners buy Chinese instead of American drones, however, the United States loses an opportunity to deepen its defense relationships and interoperability becomes more difficult. Blocking U.S. companies from competing in the global marketplace also stymies American competitiveness and innovation, making it harder for the United States to maintain its technological edge in this rapidly changing arena. Even worse, the current process perversely promotes sales from other nations, since partners who would prefer U.S. drones are forced to turn elsewhere. While in its final years the Obama administration moved to increase exports, the current case-by-case process for review within the U.S. bureaucracy is slow and marred by vague guidance and competing priorities.

Recommendation: The Trump administration should loosen restrictions on drone exports, treating them more like traditional aircraft. The administration should consider targeted exports of uninhabited aircraft, including armed uninhabited aircraft, to close partners and allies provided that they agree to the principles for proper use. Export policy should be supported by a clear set of criteria for assessment so that the process is swift and focused.

MTCR: As the gap between MTCR guidelines and evolving drone technology widens, it may make sense to

consider how to adapt and clarify MTCR guidelines. One way to do this would be for the United States to unilaterally interpret the MTCR's guidance on "unmanned aerial vehicles (including cruise missiles, target drones and reconnaissance drones)" as applying to non-recoverable vehicles that function like missiles, rather than recoverable platforms that function like aircraft. Another alternative would be for the United States simply to be more willing to overcome the MTCR's "strong presumption of denial" for drone exports to key partners. There are legitimate concerns over the risks of loosening MTCR restrictions and setting a negative precedent for international interpretation of MTCR guidelines and for other non-proliferation regimes. The reality, however, is that the current MTCR guidelines are ill-suited to adapt to the future of drone technology.

Recommendation: The Trump administration should adapt its interpretation of MTCR guidelines to account for changing technology, while working with other MTCR member states to refine and change the MTCR guidelines over time.

Prepare for Reality of Use as Drones Proliferate

As drones proliferate, they will open up opportunities for state and non-state actors to use military force in novel ways, such as in gray zone conflicts or air attacks by non-state groups. Anticipating which capabilities drones enable will be a continuous challenge as commercial and military drone technology advances and adds to the variety of possible uses. Wargames and tabletop exercises are valuable analytic tools to help elucidate these various uses. Wargaming will stimulate the kind of creative thinking that can help policymakers anticipate challenges and possible responses, and can help inform future U.S. strategy and policy.

Recommendation: The White House and DoD should run a series of DoD and interagency wargames to explore the implications of drones on escalation dynamics, especially in contested or gray zone conflicts. These wargames should include how drones might be used in crisis situations; possible reactions by others, such as shooting down drones; and how these actions might affect escalation and perceptions of commitment. These wargames can help policymakers anticipate future challenges and prepare U.S. responses to adversaries' use of drones or actions against U.S. drones.

Recommendation: DoD should explore the potential implications of nuclear-capable uninhabited vehicles, by

the United States or other nations, on nuclear stability, crisis escalation, and positive control over nuclear weapons. DoD should explore opportunities to mitigate any potential strategic risks associated with nuclear-capable uninhabited vehicles, even if they are developed by other nations.

Shape Perceptions of Legitimacy And Norms of Appropriate Use for Drones

As drones proliferate, other nations will use them according to their own national interests. Inevitably, this will include extraterritorial drone strikes. There is a risk that other actors' uses of drones could undermine legitimacy and political support for U.S. counterterrorism strikes.

The United States should take steps now to more clearly communicate what it sees as legitimate and lawful uses of drones for counterterrorism in order to distinguish itself from illegitimate or unlawful uses. The United States has a steep hill to climb in shaping international perceptions about the use of drones. The core challenge is not that drone technology yields radically new capabilities but is instead that drones' uninhabited nature yields new perceptions of military action by actors on the global stage. The secrecy surrounding U.S. drone strikes has contributed to a perception that they must be illegitimate or unlawful and therefore that drones are not beholden to international law. Approving targeted, conditional exports to responsible partners who agree to the principles for proper use is one way to encourage an international norm of responsible

use of drones. Additionally, adding more signatories to the October 2016 Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enabled UAVs could help reinforce this norm of responsible use. Finally, greater transparency in U.S. drone use could help the United States dispel myths and more clearly articulate the rationale for its actions.

Recommendation: The Trump administration should continue to work with other nations to expand the number of state signatories to the Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enabled UAVs and encourage responsible use of drones consistent with international law.

Recommendation: The Trump administration should increase transparency about its use of drones outside areas of active hostilities, to the extent possible taking into account operational security concerns.

The rapid proliferation of drones and continued advancement of drone technology pose challenges for the United States. In some areas, such as the Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enabled UAVs, the United States has been proactive in shaping international perceptions about responsible use. In other areas, such as drone exports, U.S. policy has yet to sufficiently adapt to a world of proliferated drones. The U.S. monopoly on drones has ended. The United States must now take proactive measures to come to grips with an increasingly drone-saturated world.

APPENDICES

State Department Fact Sheet: U.S. Export Policy for Military Unmanned Aerial Systems

February 17, 2015

The United States is the world's technological leader in the development and deployment of military Unmanned Aerial Systems (UAS). As other nations begin to employ military UAS more regularly and as the nascent commercial UAS market emerges, the United States has a responsibility to ensure that sales, transfers, and subsequent use of all U.S.-origin UAS are responsible and consistent with U.S. national security and foreign policy interests, including economic security, as well as with U.S. values and international standards.

As a result, the United States has established a new policy designed specifically for U.S.-origin military and commercial UAS. This new policy, governing the international sale, transfer and subsequent use of U.S.-origin military UAS, supplements and builds upon the U.S. Conventional Arms Transfer Policy and is consistent with the requirements of the Arms Export Control Act and the Foreign Assistance Act which govern all U.S. military transfers. The new policy also governs the international sale, transfer and subsequent use of U.S.-origin commercial UAS, supplementing and building upon the Export Administration Regulations which govern all U.S. commercial transfers.

The new export policy is part of a broader United States UAS policy review which includes plans to work with other countries to shape international standards for the sale, transfer, and subsequent use of military UAS.

Enhanced Controls on the Export of U.S.-Origin Military UASs

The United States is committed to stringent standards for the sale, transfer, and subsequent use of U.S.-origin military UAS. The United States' new UAS export policy establishes the standards by which the United States will assess, on a case-by-case basis under the U.S. Conventional Arms Transfer Policy, potential exports of military UASs, including armed systems. The new export policy puts in place stringent conditions on the sale or transfer of military UAS, including potential requirements for:

- Sales and transfers of sensitive systems to be made through the government-to-government Foreign Military Sales program;

- Review of potential transfers to be made through the Department of Defense Technology Security and Foreign Disclosure processes;
- Each recipient nation to be required to agree to end-use assurances as a condition of sale or transfer;
- End-use monitoring and potential additional security conditions to be required; and
- All sales and transfers to include agreement to principles for proper use.

The new policy also maintains the United States' long-standing commitments under the Missile Technology Control Regime (MTCR), which subjects transfers of military and commercial systems that cross the threshold of MTCR Category I (i.e., UAS that are capable of a range of at least 300 kilometers and are capable of carrying a payload of at least 500 kilograms) to a "strong presumption of denial" for export but also permits such exports on "rare occasions" that are well justified in terms of the nonproliferation and export control factors specified in the MTCR Guidelines.

Principles for Proper Use of U.S.-Origin Military UAS

As the most active user of military UAS, and as an increasing number of nations are acquiring and employing UASs to support a range of missions, the United States has an interest in ensuring that these systems are used lawfully and responsibly. Accordingly, under the new UAS export policy, the United States will require recipients of U.S.-origin military UAS to agree to the following principles guiding proper use before the United States will authorize any sales or transfers of military UASs:

- Recipients are to use these systems in accordance with international law, including international humanitarian law and international human rights law, as applicable;
- Armed and other advanced UAS are to be used in operations involving the use of force only when there is a lawful basis for use of force under international law, such as national self-defense;
- Recipients are not to use military UAS to conduct unlawful surveillance or use unlawful force against their domestic populations; and
- As appropriate, recipients shall provide UAS operators technical and doctrinal training on the use of these systems to reduce the risk of unintended injury or damage.

Enhanced Controls on the Export of U.S.-Origin Commercial UAS

The United States is equally committed to stringent standards for the sale, transfer, and subsequent use of U.S.-origin commercial UAS, to include future commercial MTCR Category I systems. All commercial UAS will be reviewed under the requirements and licensing policies described in the Export Administration Regulations.

Implications of the New Policy

The new U.S. UAS export policy provides a disciplined and rigorous framework within which the United States will exercise restraint in sales and transfers and advance its national security and foreign policy interests, which includes enhancing the operational capabilities and capacity of trusted partner nations, increasing U.S. interoperability with these partners for coalition operations, ensuring responsible use of these systems, and easing the stress on U.S. force structure for these capabilities. It also ensures appropriate participation for U.S. industry in the emerging commercial UAS market, which will contribute to the health of the U.S. industrial base, and thus to U.S. national security which includes economic security.

The United States is committed to working with other countries to adopt similar standards for the sale, transfer, and subsequent use for military UAS.

Joint Declaration for the Export and Subsequent Use of Armed or Strike-Enable Unmanned Aerial Vehicles (UAVs)

October 6, 2016

An increasing number of States are acquiring and employing Unmanned Aerial Vehicles (UAVs) to support a range of missions, including military missions that promote peace and security. Individual States may already have laws and policies in place to ensure the responsible export and use of UAVs that are armed, or that include equipment related uniquely to the deployment or delivery of weapons. However, recognizing that misuse of armed or strike-enabled UAVs could fuel conflict and instability, and facilitate terrorism and organized crime, the international community must take appropriate transparency measures to ensure the responsible export and subsequent use of these systems. In this context, we continue to recognize the following principles, none of which should be construed to undermine the legitimate interest of any State to indigenously produce, export, or acquire such systems for legitimate purposes:

- a. The applicability of international law, including both the law of armed conflict and international human rights law, as applicable, to the use of armed or strike-enabled UAVs, as with other weapon systems;
- b. The importance of engaging in the responsible export of armed or strike-enabled UAVs in line with existing relevant international arms control and disarmament norms that help build confidence as to the peaceful intention of States;
- c. That the export of armed or strike-enabled UAVs should be done consistent with the principles of existing multilateral export control and non-proliferation regimes, taking into account the potential recipient country's history regarding adherence to its relevant international obligations and commitments;

- d. The importance of appropriate voluntary transparency measures on the export of armed or strike-enabled UAVs including reporting of military exports through existing mechanisms, where appropriate, and with due regard to national security considerations; and
- e. That in light of the rapid development of UAV technology and the benefit of setting international standards for the export and subsequent use of such systems, we are resolved to continue discussions on how these capabilities are transferred and used responsibly by all States.

We call upon other governments to support this declaration.

Signatories: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Colombia, Czech Republic, Estonia, Finland, Georgia, Germany, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malawi, Malta, Montenegro, Netherlands, New Zealand, Nigeria, Paraguay, Philippines, Poland, Portugal, Republic of Korea, Romania, Serbia, Seychelles, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Ukraine, United Kingdom, United States, and Uruguay.

Endnotes

1. Thomas P. Ehrhard, "Air Force UAVs: The Secret History," July 2010 Mitchell Institute Study, 5.
2. Ibid, 9.
3. Ibid, 8.
4. Ibid, 9.
5. Ibid, 28.
6. Ibid, 32-33.
7. Ibid, 22.
8. Frank Strickland, "An Insider's Perspective on Innovation During Fiscal Austerity: The Early Evolution of the Predator Drone," *Strategies in Intelligence*, 57 no. 1 (March 2013), 6; Richard Whittle, *Predator: The Secret Origins of the Drone Revolution* (New York: Henry Holt & Co, 2014).
9. Arthur Holland Michel, "Drones in Bosnia," *Center for the Study of the Drone at Bard College*, June 7, 2013, <http://dronecenter.bard.edu/drones-in-bosnia/>.
10. Elizabeth Becker, "Crisis In The Balkans: The Drones; They're Unmanned, They Fly Low, and They Get the Picture," *The New York Times*, June 3, 1999, <http://www.nytimes.com/1999/06/03/world/crisis-balkans-drones-they-re-unmanned-they-fly-low-they-get-picture.html>.
11. Michel, "Drones in Bosnia."
12. Ibid.
13. Strickland, "An Insider's Perspective on Innovation During Fiscal Austerity: The Early Evolution of the Predator Drone," 3.
14. Fred Kaplan, "The First Drone Strike," *Slate Magazine*, September 14, 2016, http://www.slate.com/articles/news_and_politics/the_next_20/2016/09/a_history_of_the_armed_drone.html.
15. Micah Zenko, "Obama's Embrace of Drone Strikes Will Be a Lasting Legacy," *The New York Times*, January 12, 2016, <http://www.nytimes.com/roomfordebate/2016/01/12/reflecting-on-obamas-presidency/obamas-embrace-of-drone-strikes-will-be-a-lasting-legacy>.
16. Greg Miller, "Brennan speech is first Obama acknowledgement of use of armed drones," *The Washington Post*, April 30, 2012, https://www.washingtonpost.com/world/national-security/brennan-speech-is-first-obama-acknowledgement-of-use-of-armed-drones/2012/04/30/gIQAq7B4rT_story.html?utm_term=.8b1eba09d594.
17. Barack Obama, "Obama's Speech on Drone Policy," (National Defense University, Washington, May 23, 2013) <http://www.nytimes.com/2013/05/24/us/politics/transcript-of-obamas-speech-on-drone-policy.html>.
18. Jack Serle, "US Policy Standards and Procedures for the Use of Force in Counterterrorism Operations Outside the United States and Areas of Active Hostilities," (The Bureau of Investigative Journalism, May 24, 2013) <https://archive.org/details/703635-drones-policy-standards-and-procedures>.
19. Karen DeYoung, "The foggy numbers of Obama's wars and non-wars," *The Washington Post*, May 22, 2016, https://www.washingtonpost.com/world/national-security/the-foggy-numbers-of-obamas-wars-and-non-wars/2016/05/22/5648b798-1d2f-11e6-b6e0-c53b7e-f63b45_story.html?tid=a_inl&utm_term=.938568cb01a8.
20. Zenko, "Obama's Embrace of Drone Strikes Will Be a Lasting Legacy"; Christine Fair, "The Drone Papers: Intercepting the Nonsense," *Lawfare Institute*, October 27, 2015, <https://www.lawfareblog.com/drone-papers-intercepting-nonsense>; "Drone Warfare," *The Bureau of Investigative Journalism*, 2017, <https://www.thebureauinvestigates.com/projects/drone-war>.
21. Michael Isikoff, "In first public acknowledgement, Holder says 4 Americans died in US drone strikes," *NBC News*, May 22, 2013, http://investigations.nbcnews.com/_news/2013/05/22/18429089-in-first-public-acknowledgement-holder-says-4-americans-died-in-us-drone-strikes.
22. Exec. Order No. 13,732, 81 Fed. Reg. 44485 (July 1, 2016) <https://www.whitehouse.gov/the-press-office/2016/07/01/executive-order-united-states-policy-pre-and-post-strike-measures>.
23. "Summary of Information Regarding U.S. Counterterrorism Strikes Outside Areas of Active Hostilities," Office of the Director of National Intelligence, press release, July 1, 2016, <https://www.dni.gov/files/documents/Newsroom/Press%20Releases/DNI+Release+on+CT+Strikes+Outside+Areas+of+Active+Hostilities.PDF>.
24. Scott Shane, "Debate Aside, Number of Drone Strikes Drops Sharply," *The New York Times*, May 21, 2013, <http://www.nytimes.com/2013/05/22/us/debate-aside-drone-strikes-drop-sharply.html?ref=world>.
25. Jack Serle and Jessica Purkiss, *Drone Wars: The Full Data*, The Bureau of Investigative Journalism, 2017, <https://www.thebureauinvestigates.com/stories/2017-01-01/drone-wars-the-full-data>.
26. Paul D. Shinkman, "Report: Trump Gives CIA Authority for Drone Strikes," *US News & World Report*, March 14, 2017, <https://www.usnews.com/news/politics/articles/2017-03-14/report-trump-gives-cia-authority-for-drone-strikes>.

27. Michael R. Gordon, "Trump Shifting Authority Over Military Operations Back to Pentagon," *The New York Times*, March 19, 2017, <https://www.nytimes.com/2017/03/19/us/trump-shifting-authority-over-military-operations-back-to-pentagon.html>.
28. Micah Zenko, "The (not-so) peaceful transition of power: Trump's drone strikes outpace Obama," *Council on Foreign Relations*, March 2, 2017, <http://blogs.cfr.org/zenko/2017/03/02/the-not-so-peaceful-transition-of-power/>.
29. Matt Fuhrmann and Michael C. Horowitz, "Droning On: Explaining the Proliferation of Unmanned Aerial Vehicles," *International Organization*, 71 no. 2 (Spring 2017), 397-418.
30. The United States, United Kingdom, Israel, China, Nigeria, Iran, Iraq, Jordan, Egypt, United Arab Emirates, Saudi Arabia, Kazakhstan, Turkmenistan, Pakistan, Myanmar, Turkey. Fuhrmann and Horowitz, "Droning On: Explaining the Proliferation of Unmanned Aerial Vehicles."
31. Ben Watson, "The Drones of ISIS," *DefenseOne*, January 12, 2017, <http://www.defenseone.com/technology/2017/01/drones-isis/134542/>; Michael C. Horowitz, Sarah E Kreps, and Matthew Fuhrmann, "Separating Fact from Fiction in the Debate over Drone Proliferation," *International Security*, 41 no. 2 (Fall 2016), 7-42.
32. George Arnett, "The numbers behind the worldwide trade in drones," *The Guardian*, March 16, 2015, <https://www.theguardian.com/news/datablog/2015/mar/16/numbers-behind-worldwide-trade-in-drones-uk-israel>.
33. Ibid.
34. Kyle Mizokami, "For the First Time, Chinese UAVs Are Flying and Fighting in the Middle East," *Popular Mechanics*, December 22, 2015, <http://www.popularmechanics.com/military/weapons/news/a18677/chinese-drones-are-flying-and-fighting-in-the-middle-east/>.
35. Kelley Saylor, "A World of Proliferated Drones: A Technology Primer" (Center for a New American Security, June 2015), <http://drones.cnas.org/reports/what-are-drones/>.
36. Andrea Gilli and Mauro Gilli, "The Diffusion of Drone Warfare? Industrial, Organizational, and Infrastructural Constraints," *Security Studies*, 25 no. 1 (February 2016).
37. "Frequently asked questions," Mtrc.info, <http://mtrc.info/frequently-asked-questions-faqs/>.
38. Seth Robson, "US approves sale of Global Hawks to South Korea," *Stars and Stripes*, December 17, 2014, <https://www.stripes.com/news/us-approves-sale-of-global-hawks-to-south-korea-1.319755>; Lara Seligman, "US Approves \$1.2B Global Hawk Sale to Japan," *DefenseNews.com*, November 23, 2015, <http://www.defensenews.com/story/defense-news/2015/11/23/us-approves-12b-global-hawk-sale-japan/76256262/>; Kris Osborn, "Japan, S. Korea Buy Global Hawk Drone From US," *Warrior.com*, March 23, 2016, <http://www.scout.com/military/warrior/story/1654523-japan-s-korea-buy-global-hawk-drone-from-us>; Andrew McLaughlin, "Australia to buy MQ-4C Triton," *FlightGlobal.com*, March 13, 2014, <https://www.flightglobal.com/news/articles/australia-to-buy-mq-4c-triton-396964/>; "MQ-4C Triton Unmanned Aircraft System," Royal Australian Air Force, <https://www.airforce.gov.au/Technology/Aircraft/MQ-4C-Triton-Unmanned-Aircraft-System/?RAAF-BYjCaU6eHptQ3E2Ei-Hw9jKOLJvauES8Y>.
39. Andrea Shalal, "U.S. government approves Italy's request to arm its drones," *Reuters*, November 4, 2015, <http://www.reuters.com/article/us-italy-usa-drones-idUSKCN0ST1VI20151104>; Tom Kington, "Italy Wins US State Dept. OK To Arm Its Reapers," *DefenseNews.com*, November 5, 2015, <http://www.defensenews.com/story/defense/air-space/strike/2015/11/05/italy-wins-us-state-dept-ok-arm-its-reapers/75242852/>; "Reaper MQ9A RPAS," Royal Air Force, <http://www.raf.mod.uk/equipment/reaper.cfm>.
40. Kington, "Italy Wins U.S. State Dept. OK to Arm Reapers."
41. Justin Berger, "Obama Administration denied Predator Drone Request for Jordan, rep urges reversal," *Fox News*, February 6, 2015, <http://www.foxnews.com/politics/2015/02/06/obama-administration-denied-request-for-jordan-to-get-predator-drones-rep-urges.html>; Bill Carey, "General Atomics Plans Predator XP Deliveries to UAE," *AIN Online*, November 9, 2015, <http://www.ainonline.com/aviation-news/defense/2015-11-09/general-atomics-plans-predator-xp-deliveries-uae>.
42. Jeremy M. Sharp, "Jordan: Background and U.S. Relations," Congressional Research Service, January 25, 2017, <https://fas.org/sgp/crs/mideast/RL33546.pdf>.
43. Dan Gettinger, "Drone Bases Updates: Zarqa, Jordan," *Center for the Study of the Drone at Bard College*, December 1, 2016, <http://dronecenter.bard.edu/drone-bases-updates/>.
44. Fuhrmann and Horowitz, "Droning On: Explaining the Proliferation of Unmanned Aerial Vehicles."
45. Information from the Stockholm International Peace Research Institute (SIPRI) Arms Transfers Database, <https://www.sipri.org/databases/armstransfers>.
46. "U.S. State Department: U.S. Export Policy for Military Unmanned Aerial Systems," Council on Foreign Relations, February 17, 2015.
47. Ankit Panda, "U.S. Senators Urge Progress on US-India F-15, Guardian Drone Deals," *The Diplomat*, April 3, 2017, <http://thediplomat.com/2017/04/us-senators-urge-progress-on-us-india-f-16-guardian-drone-deals/>.

48. Jeremy Herb, "Lawmakers Press Trump to Approve Drone Sales to Jordan, UAE," *CNN*, April 17, 2017, <http://www.cnn.com/2017/04/17/politics/congress-sales-drones-jordan-uae-trump/>.
49. Erik Lin-Greenberg, "New Declaration on UAV Exports Unlikely to Reduce Drone Proliferation," *Lawfare*, November 20, 2016, <https://www.lawfareblog.com/new-declaration-uav-exports-unlikely-reduce-drone-proliferation>.
50. "State is following the blueprint used for the International Code of Conduct against Ballistic Missile Proliferation, commonly called the Hague Code of Conduct (HCOG), Nilsson explained. In that treaty, a small number of countries initially agreed on principals, then hammered out the details over a series of meetings before coming to final conclusions. That small group has now expanded widely as more countries came on board." Aaron Mehta, "White House Rolls Out Armed Drone Declaration," *DefenseNews*, October 5, 2016, http://www.defensenews.com/articles/white-house-rolls-out-armed-drone-declaration?utm_source=Sailthru&utm_medium=email&utm_campaign=Breaking%20News%2010.5.16&utm_term=Editorial%20-%20Breaking%20News.
51. Horowitz, Kreps, and Fuhrmann, "Separating Fact from Fiction in the Debate over Drone Proliferation," 7-42.
52. Gili Cohen, "Israeli Fighter Jet Shoots Down Hamas Drone Over Gaza," *Haaretz*, September 20, 2016, <http://www.haaretz.com/israel-news/1.743169http://drones.cnas.org/reports/drone-proliferation-use-force/>.
53. Missy Ryan, "U.S. drone believed shot down in Syria ventured into new area, official says," *The Washington Post*, March 19, 2015, https://www.washingtonpost.com/world/national-security/us-drone-believed-shot-down-in-syria-ventured-into-new-area-official-says/2015/03/19/891a3d08-ce5d-11e4-a2a7-9517a3a70506_story.html?utm_term=.1f559e8b8c03.
54. Orhan Coskun, "Turkey shoots down drone near Syria, U.S. suspects Russian origin," *Reuters*, October 16, 2015, <http://www.reuters.com/article/us-mideast-crisis-turkey-warplane-idUSKCN0SA15K20151016>.
55. Munir Ahmed, "Pakistan shoots down Indian drone 'trespassing' into Kashmir," *Associated Press*, November 19, 2016, <http://bigstory.ap.org/article/b67d689fb1f7410e9d0be01daaded3a7/pakistani-and-indian-troops-trade-fire-kashmir>.
56. Michael C. Horowitz, Paul Scharre, and Ben FitzGerald, "Drone Proliferation and the Use of Force: An Experimental Approach," (Center for a New American Security, March 2017), <http://drones.cnas.org/reports/drone-proliferation-use-force/>.
57. Michael S. Schmidt and Eric Schmitt, "Pentagon Confronts a New Threat From ISIS: Exploding Drones," *The New York Times*, October 11, 2016, <https://www.nytimes.com/2016/10/12/world/middleeast/iraq-drones-isis.html>; Joby Warrick, "Use of weaponized drones by ISIS spurs terrorism fears," *The Washington Post*, February 21, 2017, https://www.washingtonpost.com/world/national-security/use-of-weaponized-drones-by-isis-spurs-terrorism-fears/2017/02/21/9d83d51e-f382-11e6-8d72-263470bf0401_story.html?utm_term=.afc481e98f78; Ben Watson, "The Drones of ISIS," *DefenseOne*, January 12, 2017, <http://www.defenseone.com/technology/2017/01/drones-isis/134542/>.
58. Kyle Mizokami, "Terrorist Group Hezbollah Is Reportedly Using Drone Bombers," *Popular Mechanics*, August 16, 2016, <http://www.popularmechanics.com/military/weapons/a22366/hezbollah-drone-bombers/>.
59. Caroline Alexander and Gwen Ackerman, "Hamis Bragging Rights Grow With Drones Use Against Israel," *Bloomberg*, July 16, 2014, <https://www.bloomberg.com/news/articles/2014-07-16/hamas-bragging-rights-grow-with-drones-use-against-israel>; "Israel shoots down Hamas drone from Gaza Strip: military," *Reuters*, February 23, 2017, <http://www.reuters.com/article/us-israel-palestinians-uav-idUSKBN1621TL>.
60. Taimur Khan, "Iran smuggling 'kamikaze' drones to Yemen's Houthi rebels," *The National*, March 22, 2017, <http://www.thenational.ae/world/middle-east/iran-smuggling-kamikaze-drones-to-yemens-houthi-rebels>.
61. Joby Warrick, "Use of weaponized drones by ISIS spurs terrorism fears."
62. James Drew, "USAF to automate MQ-9 takeoffs and landings," *FlightGlobal.com*, May 4, 2016, <https://www.flightglobal.com/news/articles/usaf-to-automate-mq-9-takeoffs-and-landings-424975/>.
63. "Centaur," Aurora Flight Sciences, accessed April 5, 2017, <http://www.aurora.aero/centaur/>.
64. Horowitz, Scharre, and FitzGerald, "Drone Proliferation and the Use of Force: An Experimental Approach."
65. Peter Bergen et al., "The Future of Drone Warfare: Striking at Home," (New America), <https://www.newamerica.org/in-depth/world-of-drones/6-future-drone-warfare-striking-home/>.
66. Sydney Freedberg Jr, "Russian Drone Threat: Army Seeks Ukraine Lessons," *Breaking Defense*, October 14, 2015, <http://breakingdefense.com/2015/10/russian-drone-threat-army-seeks-ukraine-lessons/>.
67. Robert M. Gates, "Statement on Department Budget and Efficiencies" (The Pentagon, Washington, D.C., January 6, 2011) <http://archive.defense.gov/Speeches/Speech.aspx?SpeechID=1527>; Dave Majumdar, "USAF leader confirms manned decision for new bomber," *FlightGlobal.com*, April 23, 2013, <https://www.flightglobal.com/news/articles/usaf-leader-confirms-manned-decision-for-new-bomber-385037/>.

68. "RPA Vector: Vision and Enabling Concepts United States Air Force," GlobalSecurity.org, February 17, 2014, http://www.globalsecurity.org/military/library/policy/usaf/usaf-rpa-vector_vision-enabling-concepts_2013-2038.pdf, 54.
69. Hope Hodge Seck, "Air Force Wants to Keep 'Man in the Loop' with B-21 Raider" *Defense Tech*, September 19, 2016, <https://www.defensetech.org/2016/09/19/air-force-wants-to-keep-man-in-the-loop-with-b-21-raider/>.
70. Ria Novosti, "Russia Could Deploy Unmanned Bomber After 2040 - Air Force," GlobalSecurity.org, February 8, 2012, <http://www.globalsecurity.org/wmd/library/news/russia/2012/russia-120802-rianovosti01.htm>.

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