Emerging Drone Nations

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Just weeks after Nazi Germany began to use the V-1 missile to attack the United Kingdom in 1944, the United States began work on a pilotless bomber to attack targets deep inside German-held territory. The programme was beset with problems, and converted B-17 and B-24 bombers were only able to fly 13 unsuccessful test missions.[1] Nevertheless, the emergence of long-range missile technology, as well as these early tests in pilotless and remotely piloted aircraft, paved the way for the introduction of modern unmanned aerial vehicles and remotely piloted air systems, collectively and more commonly referred to as drones.[2]

Beginning in the 1950s, the US Air Force began to experiment with drones for high-altitude reconnaissance of Soviet missile, nuclear and military facilities. As the programme matured, the air force tested an SR-71 *Blackbird*-type drone for high-speed flights over China, developed a drone for use in Vietnam and, eventually, created a larger platform that served as a test bed for many of the systems comprising the current *Global Hawk*, *Predator* and *Reaper* drones.[3]

Drones do not, therefore, represent a radically new technology. They are but one strand in the remarkable trajectory of airpower development since the Second World War. The idea of using self-guiding or, more commonly, remotely guided aircraft to minimise the risk to pilots, to collect intelligence

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and to destroy targets has been at the centre of every drone programme for the past six decades.

Drones do not have, and have never had, a monopoly on these roles: manned aircraft, cruise missiles and special forces continue to be used in striking valuable targets in contested areas. Cruise missiles were used to target al-Qaeda in Yemen in 2009, and special forces to kill Osama bin Laden in Pakistan in 2011. Moreover, the great majority of drones around the world are neither armed, nor as large and capable as manned aircraft.[4]

But it is difficult to deny that drones have acquired a special prominence in certain military operations, particularly against non-state actors in low-intensity conflicts. The United States' decades of experience in aerospace, its global network of military bases and its unprecedented capacity for military telecommunications has allowed it to establish a large fleet of armed and unarmed drones, employed at a high tempo of operations, and to place that fleet at the heart of US security policy in North Africa, the Middle East and South Asia.

Nonetheless, the United States has never had a monopoly on drones. In fact, it was the Israeli Air Force's pioneering use of drones over Lebanon in 1982 that piqued American interest and prompted an increase in bureaucratic attention and funding.[5] One estimate is that there are presently at least 56 different types of drone across more than 30 countries.[6] Many of these countries seek to emulate American practice. Their strategic texts and national debates use the American experience in Afghanistan and Pakistan as key points of reference. In many respects, these emerging drone nations face a similar learning curve, make similar mistakes and use drones in similar ways to the United States, albeit on a local scale. There is no reason to suppose that they will be any more or less irresponsible or belligerent. But some of their challenges will be different, and it is these differences that we explore here – drawing on the examples of Turkey and India, and focusing on higher-end medium-altitude long-endurance (MALE) and armed drones.

As with all shifts in military technology, a nation's ability to use drones as effective military instruments depends on the context of their broader technological status, local political conditions and, above all, the strategic and operational context into which the new technology is being introduced.

As Michael Horowitz explains in his book, *The Diffusion of Military Power: Causes and Consequences for International Politics*, past military innovations such as the all-big-gun steel battleship, aircraft carriers, nuclear weapons and the use of suicide terror by non-state actors have spread through the international system in uneven ways, depending on nations' abilities to fund and adapt to these changes.[7]

We argue that there are at least five key challenges that states will have to grapple with as they adapt to building and operating drones: cost, human and material infrastructure, the problem of air superiority, the development of a doctrinal and legal framework, and the impact on proliferation. The United States has not escaped any of these challenges but it does have notable advantages – some of which have come from operational experience, and others of which inhere in its military preponderance.

Cost

Drones are widely touted as cheap and near-disposable alternatives to expensive, scarce manned aircraft.[8] In some respects, the comparison is between apples and oranges. It makes little sense to compare an armed, manned jet to an unarmed drone: they are fundamentally different platforms, with different missions. Moreover, even the more focused comparison between manned strike aircraft and armed drones is fraught with difficulty. There is great variation within both categories and, more importantly, the former are more versatile: they can defend themselves from air and ground threats, fly faster, carry more firepower and therefore perform roles that drones cannot. Nevertheless, there is some overlap in their missions. This should be clear from the way in which they are substituted for one another in the US campaign of targeted killing against al-Qaeda in the Arabian Peninsula in Yemen.

It is clear that the average unit cost of high-end drones is often substantially lower than that of roughly equivalent high-end aircraft. But, for a variety of reasons, including smaller order numbers, this is not always the case. The unit cost of the F-16, a multi-role combat aircraft, ranges from $15 million to $55m, depending on method of calculation and on the specific model.[9] The cost of cheaper strike aircraft is towards the bottom end of that range. The P-3C *Orion*, an American maritime surveillance aircraft, costs $36m.[10]

By contrast, Israel's *Heron*, an unarmed MALE drone, cost Turkey around $18m per unit to procure in 2004, half as expensive as the *Orion*.[11] The *Reaper*, capable of carrying precision-guided munitions, has a unit cost of approximately $30m: cheaper than some F-16s but more costly than many countries' basic strike aircraft.[12] The *Global Hawk*, an extremely long-endurance surveillance drone, costs between $211m and – going by what NATO paid for it in 2012 – $340m per drone, compared to $244m for the E-8C Joint STARS. Both types of aircraft collect battlefield information.[13] The cheapest surveillance and armed drones will always be less costly than the cheapest surveillance and strike aircraft, but the difference narrows for certain platforms.

Even where drones are cheaper per unit, they can be pricier over their lifespan. Drones generally require a larger ground staff, including pilots and those operating their sensors, and are considerably more dependent on that staff once airborne, than manned aircraft. *New York Times* journalists Scott Shane and Thom Shanker estimate that the average drone is supported by 150 personnel on the ground.[14] The *Predator* requires 168 people, the *Reaper* 180 and the *Global Hawk* a staggering 300, compared with just 100 for an F-16.[15]

Many drone pilots do not need to be cycled through a theatre of war in the way that conventional pilots do, allowing for a smaller aggregate pool of pilots and lower training costs.[16] But this advantage does not necessarily make up for the difference: Winslow Wheeler, director of the Straus Military Reform Project of the Center for Defense Information, argues that the *Reaper*'s annual operating costs are four times those of an F-16 or the A-10 ground-attack aircraft.[17] Moreover, for manned aircraft to achieve the same level of persistence in a given target area that drones can achieve through loitering would typically require either substantial air-to-air refuelling or more sorties, each of which would incur greater costs.

This lifecycle cost is raised by an unusually high rate of accidents. The three most important drones in the US inventory – the *Global Hawk*, the *Predator* and the *Reaper* – have a combined accident rate of 9.31 per 100,000 hours of flight, making them three times more crash-prone than the drone fleet as a whole.[18] To put that in context, the accident rate for general aviation was at that level in the 1980s.[19] A 2005 US Department of Defense report showed that 191 (relatively cheap) *Shadow* drones were destroyed or drasti-

cally damaged for every 100,000 flight hours.[20] Other sources, which imply a slightly higher accident rate, suggest that the *Predator* stands at 9.26, the *Reaper* at 7.96 and the *Global Hawk* at 15.16.[21]

It is typical for new platforms to suffer inordinately high accident rates, and for these to decline over time. For example, US naval aircraft suffered losses of nearly 50 per 100,000 flight hours in 1954; the rate is now less than one.[22] American drones are also growing more reliable over time: after over a decade of frequent use, the *Predator*'s accident rate in 2011 (3.89) fell below that of the F-16 at a similar point in its history.[23] The United Kingdom has lost just one *Reaper* aircraft in over 40,000 flight hours.[24] But the rate of improvement is in part down to the extremely high operational tempo set by the extensive military deployments since 2001 and generally high standards of safety, neither of which are easily replicable.

The lifecycle cost is raised by an unusually high rate of accidents

Consider the case of India, which has placed great emphasis on integrating both imported drones and those made domestically into its force structure. New Delhi faces major counter-insurgency challenges against Kashmir-based militants and Maoist rebels, and severe problems of border defence, so is eager to develop a capability for cross-border precision strikes. But India's mostly Russian aircraft fleet has an accident rate of 6–7 per 100,000 flight hours, compared to 4–5 for NATO air forces.[25] The Indian Air Force already loses the equivalent of one fighter squadron (about 16–18 fighters) to crashes every two years.[26] At times in the 1990s, India's accident rate leapt as high as 25.[27] Much of this stemmed from inadequate pilot training, which would still affect remotely piloted aircraft. Piloting a drone is demanding and stressful, with some airmen spending up to 11 hours of a 12-hour shift on station.[28] It is no surprise that the majority of drone accidents are still attributed to human error.[29] Other problems, such as poor maintenance and chronic overuse, also afflict both manned and drone fleets equally.[30]

Turkey is another ambitious middle power eager to use drones to augment the current capabilities of its air force. In 2004 the Turkish armed forces demanded that the *Anka*, their domestically made drone, be capable of flying at 30,000 feet for at least 24 hours and carrying sensors for all-weather

surveillance. The drone was first tested in December 2010, and reports indicate that it repeatedly lost contact with its operators and crashed.[31] Despite the aircraft crashing on one of its final flight tests, in January 2013 Turkish Aerospace Industries, its manufacturer, declared that serial production of the aircraft was 'imminent'.[32] Accident-prone platforms will prove to be a strain on military budgets, particularly for air forces such as those of Turkey and India, which are introducing unprecedentedly expensive fifth-generation fighter aircraft.[33]

Support infrastructure

In their use of communications, drones rank amongst the most resource-intensive military platforms ever developed. Because of their remote operation and various sensors, drones require that huge volumes of information, such as real-time images, be transmitted to and from the aircraft.

American drones channel this information via satellite data links, VHF, UHF or microwave radio links. This is enormously demanding. Just one *Global Hawk* requires 500Mbps of bandwidth, five times more than the US military's total requirement in the First Gulf War and about a fifth of the amount used during *Operation Iraqi Freedom*.[34] *Reapers* reportedly require up to 250Mbps.[35] These are not only significant proportions of the military's total available bandwidth, but also costly: leasing the necessary capacity from commercial satellites would cost around $20m, one-tenth of the aircraft's cost. Admittedly, the *Global Hawk* is an exceptionally data-hungry platform. Peter Hadinger, director of emerging programme and technology initiatives at Northrop Grumman, observes that demand averages 50–100 Mbps, and that many sensors would operate at several times this amount if the data links could support it.[36]

Emerging drone states such as Turkey and India do not have a robust network of military satellites dedicated to the transmission of data. India has a relatively large number of satellites but still suffers from a shortage of bandwidth and is yet to launch its first dedicated military satellite.[37] Turkey has one earth-observation satellite but has not launched any communication satellites.[38] Even the Pentagon, which operates a network of 60 satellites, is forced to purchase extra bandwidth from commercial providers.[39]

New drone operators are therefore likely to rely on radio data links for the operation of their indigenous drones. Turkey's *Anka*, for example, uses a VHF/UHF link.[40] This means Turkey's data-transfer burden is less demanding than that of the United States, but it also limits the aircraft's range to line-of-sight and greatly constrains the data-transfer rate.[41] This is easy enough if the drone is operating within national borders, but harder if the mission is further afield. Satellite capabilities are growing over time – Turkey has an ambitious plan to launch 17 satellites in the next eight years alone – but so too are the demands on bandwidth from other parts of militaries, which are increasingly networked and data-hungry. This is likely to be a bottleneck for modernising armed forces, just as it has been for the United States. India is operating over 100 Israeli *Searcher* drones on its borders and a dozen other drones with the Indian Navy, some of which it acquired 15 years ago.[42] These are mostly for surveillance of both state and non-state threats on India's huge land and maritime borders. But India will only be able to cope with the data-transfer requirements of operating many of these concurrently by using line-of-sight communications rather than satellites. This naturally constrains drones' utility for power projection further afield and suggests an important point about doctrine: in most cases, emerging drone nations will use the most capable of these platforms in smaller numbers and in more local contexts than is sometimes assumed by dystopian and alarmist accounts of global drone war.

This difficulty with data is symptomatic of a broader set of challenges, which require the accumulation of tacit knowledge gleaned through operational and, particularly, battlefield experience. It will take many years and the mastery of many different technologies before most air forces can use drones as smoothly and reliably as experienced operators.

The intelligence burden of precision targeting

The most prominent drone missions in recent years have come out of the CIA's controversial programme of targeted killing in Pakistan's Federally Administered Tribal Areas, Yemen and Somalia. That programme has given rise to the serious misconception that drones are a necessary or sufficient instrument for such a campaign. In fact, they are neither.

In theory, drones have three advantages. Firstly, they reduce the risk to pilots or special operators. Secondly, in carrying both the sensor and the weapon on the same platform, they compress the time between target acquisition and the strike itself. Finally, they tend to have longer loiter times than manned aircraft – 24 hours for a modern *Predator*, compared to five hours for an F-15 – which, in concert with the previous factor, should allow for more time for decision-making and therefore greater discrimination in targeting.

All of these advantages are, however, either diluted in practice – for example, by the use of less durable manned aircraft as part of a strike package – or replicated by other platforms, such as cruise missiles.[43] Drones are not therefore strictly necessary. And, more importantly, they are not sufficient. Drones are a *platform* but they have in recent years become synonymous with a *capability*: targeting individuals. Yet that capability is akin to an iceberg: the drone itself is the visible part, and its efficacy pivots on a sprawling human and physical infrastructure. The intelligence requirements of operating such platforms are even more severe than their demands on manpower.

Drones are just the tip of the spear

The CIA's programme of drone strikes in Pakistan rests on the world's pre-eminent signals-intelligence and electronic-intelligence capability; a network of forward bases in Afghanistan near the Pakistani border; extensive and long-standing cooperation with local intelligence services, including those of the targeted country; and human-intelligence networks inside specific target areas. Drones are just the tip of the spear, largely the means of destroying the target, even if they do have some advantages over other similar instruments. A country that has drones but lacks this supporting infrastructure is simply unable to replicate the US campaigns of recent years – and that is before one considers the unusually permissive threat environment in which the US employs drones in Pakistan, Yemen, Libya, Somalia and elsewhere.

The logistical footprint of human intelligence is not trivial. In December 2009, an attack on Camp Chapman, a CIA outpost in Afghanistan's Khost province, killed multiple intelligence officers. The base played an active role in recruiting agents for target acquisition.[44] That incident demonstrated the

vulnerability of personnel contributing to drone missions and underscored that their presence requires a fully fledged military base. American intelligence officials have confirmed that the CIA uses GPS tracking devices to target militants in Pakistan.[45] The use of such devices and other intelligence collection is greatly eased by the permission of host states for a US presence.

But this dependence is a problem, even for Washington. Pakistan has already restricted the deployment of US drones and intelligence officers on its soil.[46] The diplomatic relationship between Afghanistan and the United States will determine whether Afghan soil can be used similarly after 2014.[47] The importance of counter-terrorism missions to the United States means that intelligence collection will continue with or without local support, but few countries can match the resources and technical prowess that the US intelligence community brings to bear. This is admittedly mitigated by the fact that many emerging drone nations will have more localised interests, often in neighbouring countries with which they have greater cultural and linguistic affinity, and will therefore bear a lighter intelligence burden. In some cases, weaker states outsource aspects of their security to drone-operating neighbours: recent examples of this include Egypt's alleged acquiescence to Israeli drone strikes in the Sinai Peninsula, and Jordan allowing unarmed Israeli drones to surveil Syria from its airspace.[48] But it is implausible, for example, that the Kurdistan Regional Government in north Iraq would extend similar support to Turkey in its pursuit of Kurdistan Workers' Party (PKK) insurgents, or Pakistan to India with regard to Punjab-based jihadists.

Moreover, former Obama administration officials have indicated that intercepted communications and aerial imagery are crucial to targeting.[49] The United States also enjoys intimate intelligence-sharing with Britain, itself in possession of very substantial global signals-intelligence capabilities, and other allies.[50] Even states as powerful as China do not possess the same combination of broad-based political and intelligence coalitions, technical proficiency and wide intelligence coverage. To be clear, these demands are not created by drones per se, but by a policy which uses drones as the primary instrument in a campaign of targeted killings. Pursuing similar policies with cruise missiles would require much the same apparatus of human and technical intelligence. Indeed, any campaign of precision strikes

will require an extensive intelligence infrastructure; drones do not negate this basic principle of warfare. But perception matters, and the perception, which military trends follow in many states, is that drones are uniquely optimised for such policies.

Even non-combat drone operations, such as surveillance missions, place a severe burden on intelligence manpower owing to the need for the processing and analysis of data. In 2009 US drones produced 24 years of video footage.[51] In 2012 the US Air Force alone required approximately 70,000 people to engage in data processing and analysis.[52] Today, drones transmit 1,600 hours of video every day.[53] For states in which educated manpower is cheap and plentiful, such as India, this is unproblematic, but for others, this will place a greater strain on military budgets. Much drone data is produced and used at the tactical level, and does not go through this chain. But for some of the data, the military bureaucracy will have to establish procedures to collect it, synthesise it for those higher up the chain of command and turn it into actionable intelligence. These bureaucracies, therefore, will have to be agile enough to respond to the greater intelligence flow that results from wider drone use. And, as they adapt, bureaucratic and institutional infighting is likely to occur – as it has in the United States – when intelligence services and different branches of the armed forces compete for control and oversight of the new platforms.[54]

The threat environment

Despite major advances in technology, drones' combat capability is in its infancy. They cannot defend themselves. Today, drones are able to fulfil their most prominent missions largely because they operate in uncontested or weakly contested airspace.[55] Facing few or no threats, they enjoy air superiority by default. As Lieutenant-General David A. Deptula, a former senior US Air Force officer, has noted, 'we have become accustomed to operating in battle space that we control … some of the systems that we have today, you put in a high-threat environment, and they'll start falling from the sky like rain.'[56] The higher intensity of data transmissions around a drone could give away their location to modern air defences, making them even more vulnerable than ordinary aircraft. And the rise of the cruise-missile threat

means that national air defences are frequently configured to identify low- and slow-flying aircraft such as drones.

That permissive threat environment is rooted in a variety of factors, including adversaries' lack of air forces or adequate anti-aircraft weapons, and the United States' ability to coerce the targeted state into leaving the drones untouched. The Taliban does not have fighter aircraft. Pakistan does, but it does not deem it prudent to shoot US aircraft out of the sky.[57]

In some respects, emerging drone nations could replicate these conditions. Turkey enjoys air superiority over Kurdish fighters, India over its part of Kashmir, China over Xinjiang, and so on. Israel freely uses aircraft, including drones, over Lebanon and Gaza. Indeed, the threat to its ability to do so explains the urgency with which Israel treated possible transfers of sophisticated anti-aircraft weapons out of Syria in 2012–13. But other advantages enjoyed by the United States would be harder to emulate. In particular, drones would be more difficult to use in inter-state regional rivalries where air operations are acknowledged to be so difficult that, on occasion, as during the India–Pakistan Kargil War in 1999, each side either eschews or tightly restricts the use of aircraft to limit hostilities.

Even where the adversaries are unevenly matched, the gap is likely to be smaller than that between the United States and the countries in which it currently operates drones. For instance, India would struggle to coerce or co-opt even its weakest neighbours into allowing it expansive and long-term access to airspace of the sort that the United States enjoys in Yemen. Turkey is widely believed to have violated Iraqi airspace with its fleet of *Heron* drones to monitor PKK bases in Qandil, a Kurdish area of north Iraq. Baghdad allows unarmed US drones to operate in Iraq, but it is unclear whether it extends the same privilege to Turkey.[58] However, if Iraqi territory were repeatedly targeted with drone-fired missiles, Turkey's relations with Erbil would sour. China considered using a drone to kill a Myanmar drug lord suspected of murdering 13 Chinese sailors in 2011 but opted to capture him instead.[59] It is not known what inhibited Beijing, but one factor might have been concern over securing Myanmar's future cooperation. The Chinese military may have also been hesitant to use an untested platform for such a sensitive mission.

Drones' vulnerabilities go beyond the conventional anti-aircraft threat from interceptor aircraft and missiles. In December 2011, Iran claimed to have brought down and captured a US *Sentinel* drone near the country's border with Afghanistan by spoofing the aircraft's GPS navigation signal.[60] American officials, though conceding that they had lost a drone, denied the method of capture, pointing out that the drone had an inertial navigation system and used GPS only for minor corrections to this.[61] GPS jamming and spoofing are only a problem when this is the sole means of navigation and communications are unencrypted, factors that usually apply to smaller and lighter drones.[62] Nonetheless, the problem of electronic warfare goes beyond disruption: in 2009 it was reported that Iraqi insurgents had intercepted hours of footage from US surveillance drones.[63]

Doctrinal and legal framework

The use of drones as part of a targeted-killing programme presents a number of legal, ethical and broader procedural problems. These problems are well-documented in the case of the United States. They range from the legality of killing American citizens fighting abroad, to the differences between military and intelligence oversight of killings, to the role of the legislature and its committees in scrutinising the policy of the executive branch, to the appropriate threshold and criteria for using force against uncertain targets.

In response to these problems, the Obama administration has undertaken what it calls an 'institutionalisation' of its lethal drone operations.[64] This so-called 'nominations' process involves a Pentagon-run weekly meeting of over 100 national-security bureaucrats, who propose targets for the personal consideration of President Barack Obama. Although 'signature strikes', based on observed patterns of behaviour rather than prior intelligence, can take place in some areas without direct presidential assent, reportedly the president typically approves one-third of all drone strikes, including all attacks in Yemen and Somalia, and the more complex Pakistani cases.[65]

The United States has also developed and partially articulated its legal reasoning, based on an 'inherent' right to self-defence and expansive and elastic authority to use military force granted immediately after 9/11. In killing American citizen Anwar al-Awlaki, a member of al-Qaeda in the

Arabian Peninsula, the administration considered a wide range of domestic and international legal impediments in a 63-page memorandum.[66] The United States continues to be intensively and widely criticised for its secrecy, method of casualty calculation (specifically, the reported assumption that all military-age males in the vicinity of a strike are combatants), use of force in areas outside formally defined war zones and targeting of groups distinct from al-Qaeda that have local agendas.[67] In his seminal remarks at the National Defense University in May 2013, President Obama insisted that 'America does not take strikes when we have the ability to capture individual terrorists'; that drone strikes required 'near-certainty that no civilians will be killed or injured'; and that the Congress is 'briefed on every strike that America takes'.[68] Many remain concerned over the credibility of Obama's assurances and the continued opacity of the targeting process. Nevertheless, the United States has reportedly done more than nearly any other nation engaged in targeted killing – an admittedly low bar – to develop a rudimentary procedural, legal and doctrinal framework for the lethal use of drones.[69] As Caitlin Hayden, spokeswoman for the US National Security Council, put it in March 2013, 'we are establishing standards other nations may follow.'[70] But even that framework is opaque and fragmentary.

There is no inherent reason why other countries cannot develop far more sophisticated parameters for using drones. But are they doing so? The Turkish example is worth considering. In lieu of selling armed drones to Turkey, something complicated by export-control laws and congressional resistance, the Obama administration sought to appease Ankara by stationing four unarmed *Predator*s at Incirlik Air Base.[71] The drones are flown from the United States by an American contractor. The video feed is beamed via satellite to a shared joint-operations centre near Ankara. Turkish Air Force officers are in the room with their American counterparts and reportedly have the authority to direct the drones' movements.[72]

In 2011 Turkish officers in the operations centre directed an American drone to surveil a known smuggling route near the Kurdish-majority town of Uludere. After a group of men were spotted crossing the border illegally, the Turks reportedly ordered the *Predator* to fly away. A Turkish *Heron* drone then picked up the surveillance and the Turkish Air Force bombed the

smugglers. It was later revealed that the group of men were not members of the PKK but 34 Kurdish citizens attempting to eke out a living by smuggling subsidised Iraqi gasoline to Turkey for resale. The subsequent uproar prompted the Turkish government to task parliament with investigating the incident. The commission's report, however, failed to assign blame for the incident and attributed it to operational mistakes. Turkish citizens, therefore, still do not know how their armed forces use drones for military strikes or who is responsible for authorising the use of lethal force. This episode also highlights a grey area: what are the implications of such multinational operations where drones from one state play a partial or major role in a foreign operation of a partner government? This ambiguity surely exists for other weapons platforms too, but the perceived character of drones – unobtrusive and low risk – exacerbates the problem.

Nations such as Turkey and India practise considerable military secrecy, deeper and more pervasive than that of the United States. They do not have a long record of publishing doctrinal statements or parliamentary reports on operational matters. For example, the Turkish military is largely free from parliamentary oversight, and India's intelligence services have no legal status.[73] Historically, they have also taken a fairly permissive approach to targeted killing, partly because they have prosecuted the bulk of these campaigns within national boundaries. Unlike the United States, they have frequently killed their own citizens or foreign nationals on their own soil, and often do so with relative legal impunity.

As many have pointed out, and as the Turkish example demonstrates, these problems are hardly drone-specific – after all, it was Turkey's manned aircraft which dropped the bombs in the final instance. Moreover, targeted killings outside declared theatres of war have often required presidential or prime ministerial authority and special procedures. But the combination of lower *perceived* risk and cost means that drones are likely to raise these issues with greater frequency and salience than other platforms. Cruise missiles, for instance, have never been used as intensively as drones, even though they could perform much the same role.[74] Although very few nations will face the breadth of counter-terrorism commitments taken on by the United States, we should not underestimate the narrative appeal of drones and

their assumed capabilities. Executive branches, armed forces, legislatures, judiciaries and other decision-makers or overseers will each have to adapt to this shift in the manner that the United States has over the past few years.

Proliferation

Finally, drones present a particular proliferation challenge. Most arms-importing nations do not see this issue as very important. Understandably, their priority is to equip their forces rather than worry about whether and when other countries will follow suit. But drones are something of a special case: they share a great deal of technology with cruise missiles. As Dennis M. Gormley, senior lecturer at the University of Pittsburgh, has noted, 'the virtue of most UAV's is that they have long wings and you can strap anything to them.'[75] They therefore impinge on issues related to the proliferation of nuclear, chemical and biological weapons – issues in which regional powers have bigger and more significant stakes.

The principal international arrangement governing the spread of missile and drone technology is the Missile Technology Control Regime (MTCR). This informal group of 34 states has agreed to adopt national export-control policies that incorporate a common export-control list. Controlled items are divided into two categories. Countries are expected to apply the greatest restraint to the export of Category I items, which include rockets, missiles and drones capable of flying more than 300 kilometres while carrying a payload of 500 kilogrammes.[76] Smaller drones, such as Turkey's *Anka*, are Category II items: capable of flying at least 300km, but only with lighter payloads.

New drone states party to the MTCR, therefore, do not face any major hurdle in exporting drones that fall below the Category I threshold. Ankara, for example, has reportedly agreed to export ten *Anka* drones to Egypt, even though the country has not signed the Chemical Weapons Convention.[77] But such drones' flight stability makes them ideal for delivering a chemical or biological agent via a sprayer and spray tank.[78] Iraq tried to convert surplus MiG-21 and L-29 manned aircraft into unmanned vehicles for one-way missions to deliver nuclear, chemical and biological weapons. Its efforts were unsuccessful, but ominous. Drones potentially increase the lethal area of effect for biological agents by a factor of ten, when compared with deliv-

ery by ballistic missiles.[79] Moreover, drone technology could be adapted to the development of controlled items. A potential proliferator could use drones' flight-control systems to help overcome obstacles associated with converting anti-ship cruise missiles into land-attack cruise missiles, and the conversion of manned aircraft to drones.[80]

This matters because many regional powers, such as Turkey, place great emphasis on non-proliferation. After all, they would be the most affected by the acquisition of disruptive technology related to nuclear, chemical and biological weapons by other regional powers, such as Iran. This is one reason why both Egypt and Turkey continually raise the issue of a Middle East free of 'weapons of mass destruction', and why India is eager to join the MTCR and other export-control regimes.[81] Yet these countries face pressure to balance their economic and military interests in importing and exporting drones with the effect this will have on the spread of controversial technology.[82]

In some regions, such as South Asia and the Middle East, cruise missiles (which are also unmanned aerial vehicles) are being touted as essential not just for modern warfare but also as nuclear delivery systems; examples of the former are Turkey's Stand-Off Missile, and Saudi Arabia and the UAE's imported *Storm Shadow*, while the latter category includes India's *BrahMos*, Pakistan's *Babur* and Israel's *Popeye*.[83] Because of the technological overlap between drones and cruise missiles, this has an impact beyond that of manned aircraft. The proliferation of drones will accelerate the proliferation of cruise missiles in a way that, say, the F-16 does not. That will make it harder to craft regional arms-control policies on issues related to nuclear, chemical and biological weapons. States will be hesitant to give up a dual-use platform for the sake of uncertain treaties and agreements if doing so will weaken their conventional military capabilities and deprive them of a technology seen as key to modern warfare.[84]

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Over the past few years, the debate over drone use has grown increasingly alarmist. Critics argue that drones, as Google chairman Eric Schmidt puts it, 'democratise the ability to fight war'; that the United States' deployment

of drones for targeted killing represents assassination without due process and encourages other nations to emulate American practice;[85] that the status quo is paving the way for what Michael J. Boyle calls 'a new arms race for drones'; and that new drone operators might use this capability recklessly and prolifically.[86]

Our claims are more modest and more prosaic: emerging drone nations will face new and familiar challenges as they acquire and deploy this technology for a variety of purposes, and some of those challenges will be more onerous than they were for the United States. In a period of plenty, the United States was able to throw ample resources at building, maintaining and operating drones. It then exploited an unparalleled human and material infrastructure, involving a global intelligence presence and a sprawling network of alliances and bases, to turn those platforms into a formidable surveillance and strike capability, almost exclusively used against adversaries lacking any ability to resist. Over a number of years, it has sought – with uncertain results – to place that capability within a still-evolving legal and procedural framework.

Emerging drone states cannot replicate this. They cannot deploy drones, or any other aircraft, on a global scale. They will increase their use of drones, but only in local settings. Neither Turkey nor India, for example, is likely to receive overflight rights similar to those that the United States has in Pakistan, Somalia and Yemen. This underscores the challenge for national legal and decision-making frameworks in adapting to the increasing use of potentially armed systems over a state's own territory, for instance as part of counter-insurgency campaigns in Pakistan's Federally Administered Tribal Areas, India-administered Kashmir, Turkey's southeast Kurdish majority regions and Iraqi Kurdistan.

Nor can these countries simply pad out their air forces with drones at a negligible cost. Many such nations continue to face conventional air threats that require large complements of relatively advanced, manned aircraft capable of engaging in air-to-air combat.[87] At a time when fifth-generation fighters are becoming prohibitively expensive, militaries will face difficult choices about how to balance their fleets between different types of platforms. Most drones remain unsuited to high-threat environments,

and therefore cannot resolve that dilemma. Moreover, the proliferation of drones and cruise missiles could saturate national missile defences and persuade states to expand their missile arsenals in response, to preserve their second-strike capabilities.

Even as they take advantage of the platform's very real advantages, then, emerging drone states will have to work through the difficulties of establishing the necessary human and material infrastructure for out-of-area drone use; debate the cost of drone development; develop an operational and legal framework for their use; and balance their desire to export such technology with their non-proliferation interests. The path to drone development does not simply stop once an emerging state develops a workable system, but instead rests on the concurrent development of several interrelated norms, practices and support systems to govern and facilitate their use. The United States, despite its decades of experience, continues to grapple with many of these issues and will do so for years to come. For emerging drone nations, the road is rockier still.

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