A Drone's Strike Away:

Peace and Security in the Age of Automated Warfare

A Case Study by

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PKSOI

Case Study #1118-08
PKSOI TRENDS GLOBALCASE STUDY SERIES

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To the United States, a drone strike seems to have very little risk and very little pain. At the receiving end, it feels like war. Americans have got to understand that. If we were to use our technological capabilities carelessly—I don't think we do, but there's always the danger that you will—then we should not be upset when someone responds with their equivalent, which is a suicide bomb in Central Park, because that's what they can respond with.

Retired Gen. Stanley McChrystal in an interview with Foreign Affairs[1]

Do the United States and its people really want to tell those of us who live in the rest of the world that our lives are not of the same value as yours?

Archbishop Desmond Tutu, in a letter to the editor of the New York Times[2]

December 12, 2013. A United States aerial drone launched four Hellfire missiles on a convoy of 11 cars and pickup trucks during a counterterrorism operation in rural Yemen. The strike killed at least 12 and wounded 15 others, 6 of them seriously. Only, the strike did not hit a band of insurgents, it hit a wedding convoy with some 60 guests traveling from the groom's home to a neighboring village where the bride lived.[3] After the attack, angry residents took to the streets and "blocked a main road in Rad`a, a provincial capital in central Yemen, while displaying the bodies of those killed. Provincial authorities then unofficially acknowledged civilian casualties by providing money and assault rifles—a traditional gesture of apology—to the families of the dead and wounded."[4] In an effort to introduce more transparency into the military use of drones, on July 1, 2016, the White House released information claiming that "as many as 116 civilians had been killed by drone and other US strikes in Pakistan, Yemen and Africa since President Barack Obama took office in 2009."[5] In the same time span, the administration said, "between 2,372 and 2,581 militants had been taken out by drones."[6]

November 8, 2013. When Typhoon Haiyan, with sustained winds of 195 mph the strongest tropical cyclone ever recorded in human history, made landfall in the Philippines, it left more than 6,000 people dead, destroyed nearly 250,000 homes and displaced almost one million residents.[7] In the aftermath, several relief groups flew drones over the affected areas to survey the damage, identify blocked roads and find displaced people. "But," says Patrick Meier, who was in Manila doing humanitarian work with the UN at the time, "the drone operators didn't share the information they gathered with local authorities or other relief organizations. Many of the drone teams didn't even know about one another, making their work inefficient and even dangerous."[8] Although perhaps best known for their use in military operations, unmanned aerial vehicles, according to Abi Weaver, Director of International Services for the American Red Cross, "have been used to track Indonesia's progress rebuilding after the 2004 tsunami, to monitor sporting events in the Netherlands so that injured athletes can get medical attention more quickly, to track weather in Peru, and to rebuild communication networks in Ireland after floods. In South America, drones are helping to preserve archaeological sites, simplify the land titling process, and document environmental violations."[9]

July 7, 2016. The gunman had just hit his 11th target when the bomb exploded. Following police shootings in Minnesota and Louisiana two days earlier, the lone sniper, an Army Reserve Afghan War veteran, fatally shot five law enforcement officers and wounded another six on this humid summer evening in Dallas, TX. Police Chief David Brown made the final call and "carried out a plan law enforcement experts say they've never seen done by local officials: Use a robot and a pound of C-4 explosive to take the sniper out."[10] Faced with a military-trained and heavily armed suspect who had barricaded himself on the second floor of El Centro Community College building in downtown Dallas, police officers

maneuvered Remotec Androx Mark V A-1 behind a "brick wall" with the suspect on the other side. The robot, purchased by the police department in 2008 for $151,000, sustained only minor damage to the extension arm during the blast and, according to the chief, was still functional.[11]

Three events, three vastly different operational contexts, a similar response: remotely controlled technology employed in response to imminent threats to peace and security. What these three examples show is just a glimpse into the range and complexity of challenges and opportunities inherent in utilizing remote controlled technology in disaster relief, stabilization, and peace operations. This case also illustrates a number of moral, ethical, social, political, legal and strategic dilemmas inherent in the use of automation in warfare, disaster relief, stabilization, and peace operations.

Why Drones?

Drone Evolution

The first use of radio-controlled aerial drones for military purposes can be traced back to WWII, when the German Wehrmacht debuted the "Fritz X," a radio-controlled 2,300 pound bomb with four wings, making it the first remotely controlled weapon used to indiscriminately attack large area targets, such as London, during the late phases of the war.[12] The United States used radio-controlled target drones during World War II to help train aircraft gunners and less than forty years later, Israel used a swarm of unmanned aircraft to outsmart Soviet anti-aircraft technology in the 1982 Lebanon War.

It wasn't until 1995, however, that the public face of drones, the General Atomics MQ-1 Predator UAV, entered service.[13] Post-9/11, this drone was an essential part of US Air Force operations in Iraq and Afghanistan, covering large sections of territory without exposing its own aircrew to fire or capture.[14] "In 2005, tactical and theater level unmanned aircraft (UA) alone, had flown over 100,000 flight hours in support of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF)."[15]

In 2010, drones entered the market place when the Parrot AR, a quadcopter controlled by smartphones, was introduced at the Consumer Electronics Show in Las Vegas.[16] In August 2016, just six years after drones became available to the public, Congress required that the FAA regulate small drones within the national airspace when companies like Amazon and FedEx revealed plans for delivery drones and movie and television producers were granted exemptions to use drones for filming purposes.[17] Within a year, experts estimated some 600,000 commercial drone aircraft to be operating in the US as the result of new safety rules.[18]

The FAA rules specify that drones must weigh less than 55 pounds, can be operated only in daylight, must remain close enough for the person at the controls to see it at all times, can't be flown over people and must not fly higher than 400

feet. But perhaps the FAA's biggest move was "ending the requirement that only licensed aircraft pilots can fly drones that are being used for business purposes."[19] That change lowered the barriers to entry into the commercial drone business, requiring drone-operators-for-hire to be at least 16 years old and pass a $150 aeronautics test every 24 months. "I would say the establishment of the drone rules is one of the largest milestones in regulatory history with the FAA," drone expert Chris Johnson, a University of Wisconsin-Madison engineering professor and pilot said. "It really opens up an opportunity for these machines to be viable business tools." The initial set of rules "help establish what's right and wrong — it's not uncommon today for drones to be in airspace where they don't belong, Johnson said — and open doors for better, more coordinated usage from there."[20]

But drones are big business not only for the consumer and enterprise sectors. Government is also increasingly relying on the remote technology for military and public safety purposes. The US military has been using drones for combat since 2001 and has rapidly expanded its drone fleet to more than 7,000 by 2012. The Department of Defense budget in 2016 allocated $2.9 billion for more than 50 new drones for combat and surveillance, according to the Bard Center for the Study of the Drone.[21] For FY 2018, the Department of Defense has allocated at least $6.97 billion for drones and associated technologies.

Military Drones

Drones for military use are typically classified in three broad categories: UAVs (Unmanned Aerial Vehicles), UGVs (Unmanned Ground Vehicles) and USVs (Unmanned Surface Vehicles).[22] UAVs are either remote controlled aircraft (e.g. flown by a pilot at a ground control station) or can fly autonomously following pre-programmed flight plans or more complex dynamic automation systems. The US military uses UAVs for missions ranging from reconnaissance to combat. Most generally, UAVs are capable of "controlled, sustained level flight and powered by a jet or reciprocating engine."[23] While a cruise missile can also be considered to be a UAV, it is treated separately on the basis that it is considered a weapon. To reflect on the complex nature of modern autonomous systems that include ground stations and other elements besides the actual air vehicles, the US military now uses the term "Unmanned Aircraft Systems" (UAS).

With rapid advances in technology, enabling more and more capability to be placed on smaller airframes, the role of UASs in military application is advancing at unprecedented levels. UAS range in cost from a few thousand to tens of millions of dollars and in size from a Micro Air Vehicle (MAV) weighing less than one pound to large aircraft weighing over 40,000 pounds.[24]

UAS no longer only perform target and decoy operations or intelligence, surveillance, and reconnaissance (ISR) missions, although this still remains their predominant application.[25] Their roles have expanded to include electronic attacks (EA) that jam enemy systems,[26] precision strike missions[27] and combat search and rescue (CSAR).[28] In July 2016, the US Air Force awarded a $40 million contract to a private "national security solutions provider" for the development of a Low-Cost Attritable Strike Unmanned Aerial System Demonstrator (LCASD) designed to take drone warfare to the next level: air-to-air warfare, where LCASDs will be capable of shooting down other aircraft, manned or unmanned. A novel feature of the LCASD is that it is "runway independent," meaning it can be launched from rails mounted on trucks or ships at sea.[29] This, an industry reporter notes,

> *opens up the possibility of small, lightweight robotic fighter bombers that don't need airfields in order to operate. Entire squadrons of LCASDs could be dispersed on the ground, in a camouflaged ready storage position, and launched on short notice to augment manned fighters. There would be no telltale landing strips dug into the ground to mark their location, making them much harder for an enemy to spot.[30]*

Drone Application

Disaster Drones

After the widespread devastation hurricanes Harvey and Irma caused in Florida and Texas in September 2017, the FAA quickly issued more than 130 airspace authorizations to drone operators performing search and rescue missions and assessing damage to roads, bridges and other critical infrastructure. For example, the FAA reports, "the Air National Guard used drones normally tasked for combat operations to perform aerial surveys. The drones allow the Guard to assess disaster-stricken areas quickly and decide which are the most in need of assistance. Similarly, US Customs and Border Protection sent drones from Corpus Christi to Florida to help map areas in Key West, Miami and Jacksonville, using radar to survey geographic points on infrastructure such as power plants for The Federal Emergency Management Agency."[31] In addition, the authorizations also enabled commercial drone services to help insurance companies act more quickly on claims from homeowners.[32] FAA Administrator Michael Huerta explains the importance of drone operations in disaster response:

> *Essentially, every drone that flew meant that a traditional aircraft was not putting an additional strain on an already fragile system. I don't think it's an exaggeration to say that the hurricane response will be looked back upon as a landmark in the evolution of drone usage in this country.[33]*

Yet, when hurricane Irma hit Puerto Rico at the end of September 2017, drones were surprisingly absent from early relief efforts. "We are dying here," exclaimed San Juan Mayor Carmen Yulín Crus, shocked by the extent of the devastation to the island and the tardiness of the federal government's response. "And I cannot fathom the thought that the greatest nation in the world cannot figure out the logistics for a small island of 100 miles by 35 miles."[34] The hurricane savaged local ports, airports, railroads, and roads. Getting food, water, and medicine to and throughout Puerto Rico was a "logistical nightmare," former FEMA boss Michael Brown told CNBC.[35]

"Where are the drones that could pick up the slack?" asked Wired reporter Eric Adams. In the spring of 2017, the US Marine Corps Warfighting Laboratory showed off a disposable one-way drone. The glider – estimated to cost as little as $1,500 to $3,000 per copy – "launches out of a cargo plane, carries up to 700 pounds of cargo, has a range of 80 miles, and can land within 150 feet of its target."[36] Explains technology reporter Evan Ackerman:

> The wings fold up, and you can fit a bunch of these gliders inside of a wide variety of military aircraft. The Marines are even toying with the idea of one big drone that acts as a mothership, carrying several of these cargo gliders on its back. Once you get somewhere near the area where your supplies need to go, just drop the glider out of the aircraft and it'll unfold its wings and pilot itself into a gentle gliding crash within a few tens of meters of its GPS target.[37]

Lt. Morgan Grossman from the Marine Corps Warfighting Laboratory adds:

> *While the intended use will have military applications, low cost gliders like this could be used anywhere that quick delivery of supplies is needed and more traditional means of delivery are not available. Applications such as disaster relief, remote mountain search and rescue, forest fire fighting, and remote site support could all utilize resupply by means such as this.[38]*

It's not just about a fancy camera and about the data, but it's also about how the technology can be used as force multipliers," adds Brett Velicovich, a former military intelligence soldier who consults on drone adoption. "If the roads are down and there aren't enough helicopters out there, we should be using drones to do the work. This is not sci-fi technology. It exists now."[39] For instance, Nautilus, a Richmond, CA-based startup, is "developing an amphibious drone the size of a Boeing 777 that can haul as much as 200,000 pounds of cargo, taking off from an airport and pulling into a port. The company is now testing a 30-foot prototype that can carry 700 pounds, which itself would be a perfectly useful load in a crisis. Even the smallest of loads can be accommodated: A company called Zipline has launched a drone service in Rwanda, Tanzania, and Switzerland, delivering blood supplies and medicine."[40]

Combat Drones

Revolution in (automated) Military Affairs

When the US launched Operation Iraq Freedom in 2003, there were only a handful of aerial drones in the invasion force. By 2010 the Pentagon had nearly 7,500 drones in its arsenal and in 2018, almost one in three US military aircraft flies without a pilot.[41] Indeed, drones are the latest manifestation of the so-called "revolution in military affairs (RMA)" that started more than two decades ago. The RMA signaled the rapidly increasing substitution of technological advances in warfare in place of boots-on-the-ground. American combat effectiveness during the first Gulf War already foreshadowed a future where the US military "could strike anywhere with force, precision, and relative safety, its enemies electronically confused into submission with little of warfare's normal collateral destruction."[42] In his infamous speech to Pentagon staff the day before the 9/11 attacks, then Secretary of Defense Donald Rumsfeld explained,

> *In this period of limited funds, we need every nickel, every good idea, every innovation, every effort to help modernize and transform the US military. We must change for a simple reason — the world has — and we have not yet changed sufficiently. The clearest and most important transformation is from a bipolar Cold War world where threats were visible and predictable, to one in which they arise from multiple sources, most of which are difficult to anticipate, and many of which are impossible even to know today.*[43]

To meet the challenges of the contemporary strategic environment, Joint Vision 2020 advocated achieving "full spectrum dominance," i.e., the ability "to defeat any adversary and control any situation across the full range of military operations," which also included "those ambiguous situations residing between peace and war, such as peacekeeping and peace enforcement operations, as well as noncombat humanitarian relief operations and support to domestic authorities."[44]

The Predator and the Reaper

Combat drones are designed to be surgically precise tools "that make the world a safer place by enabling targeted killings of so-called terrorists without collateral damage."[45] The two most widely used attack drones are the MQ-1 Predator (which the US military ceased purchasing in February 2011) and the upgraded MQ-9 Reaper, both developed by military contractor General Atomics Aeronautical Systems. As Michael Perry, Vice President for Mission Systems at GA-ASI, explains, "[y]ou would have a capability for close-air support, aircraft defense, counter-air, and even some types of non-lethal actions. You would really be expanding the mission space... The focus at this point is principally defensive missions."[46]

The Predator and Reaper are famous for their ability to hover thousands of feet above a target for hours and relay high-resolution live surveillance.[47] The Reaper is powered by a 900 hp turboprop engine with a maximum speed of 276 miles per hour. It has a wingspan of 66 feet, is 36 feet long, 12.5 feet high, carries a maximum payload of 3,850 pounds, and can be armed with a variety of weapons, including up to 14 missiles or a combination of four missiles and two laser-guided bombs. With a range of 3,682 miles, an operational altitude of 50,000 ft. and a maximum flight time of 27 hours,[48] the Reaper carries approximately 15 times the amount of ordnance payload of the Predator, and cruises at nearly three times the speed.[49]

The military's expansion of its drone program is based partly on cost-effectiveness.[50] According to the Department of Defense, "drones are generally cheaper to acquire and operate than conventional fighter jets."[51] However, critics question whether or not they present an operational advantage: "whether the strategic advantage and human protection afforded by the use of drones in overseas operations outweighs the potential security threat posed by high crash rates and growing backlash in target environments."[52]

According to The Washington Post, between 2001 and 2014, more than 400 military drones were involved in accidents and 49% of them were considered Class A accidents in which the aircraft was destroyed or the damage incurred cost at least $2 million.[53] The crash rate in 2015 doubled that of 2014. When fully equipped, the estimated cost to replace one of these drones in 2017 is about $14 million.[54]

Objective metrics in the evaluation of strategic advantages are hard to come by. While drones are capable of loitering unmanned for hours collecting intelligence, they collect more intelligence than could possibly be analyzed by humans. Drone contractor Sean Varah of MotionDSP admits that, while drones are excellent at getting "eyes on" denied or restricted places at no risks to humans and can collect data over a long period of time, they are better at gathering data than they are at producing answers.

> Drones help identify who, what, when and where for humans to calculate the why and make informed decisions on how to take action...You might be amazed at how much human effort this process still takes and how labor-intensive it is, even in today's technologically advanced world. The military deploys thousands of man-hours to do the processing and analysis work. Of course, they have the manpower, and the work is sensitive. If you are providing oversight for an infantry platoon entering a hostile area, and you need to identify threats, make sure the soldiers don't meet any surprises, and alert them of unforeseen factors; you're not going to rely on a computer algorithm alone to do that."[55]

Adds Joe Eyerman, Senior Director of the Research Triangle Institute's (RTI) Center for Security, Defense, and Safety and Co-Director of Black Channel, a company conducting R&D to validate drones for regulatory agencies in the US and the European Union: "Drones are essentially high powered and flexible data collection tools. They are having an immediate impact on surveillance, but the truly disruptive impact will come from the massive amount of data that will be generated by drone deliveries and autonomous vehicles."[56]

Drone Strikes
Immediately after the attacks on 9/11, Predators were deployed to Afghanistan to support the "boots on the ground."[57] When conventional military strategies began to fail in Afghanistan and later on in Iraq, the US military and intelligence agencies expanded their use of drones to carry out targeted and selected attacks on key leaders of terrorist organizations and their followers. Famously, in September 2011, a fleet of Predator and Reaper drones killed Anwar al-Awlaki, al-Qaeda's chief propagandist and strategist, who was the mastermind behind a number of high-profile plots, including the 2009 "underwear bomber," a 23-year old Nigerian national who attempted to detonate plastic explosives hidden in his underwear on a flight from Amsterdam to Detroit on Christmas Day[58] and a 2010 attempt to bring down cargo aircraft with exploding toner cartridges.[59]

In 2016 alone, the Bureau of Investigative Journalism (BIJ) reports, US military forces conducted 1071 drone and other air strikes in Afghanistan that killed between 1400-1600 people, up to 105 of them civilians.[60] In eight years in office, drone usage increased tenfold during the Obama Administration. Overall, President Obama ordered a total of 563 strikes, largely by drones, compared to only 57 strikes during the Bush Administration. Justifying increasing drone strikes, President Obama explained:

> *What I think is absolutely true is it's not sufficient for citizens to just take my word for it that we're doing the right thing. … We respect and have a whole bunch of safeguards in terms of how we conduct counterterrorism operations outside of the United States. The rules outside of the United States are going to be different than the rules inside the United States.[61]*

But US drone strikes not only increased in number, they also changed in their strategic intent – from targeting suspected terrorists to ground troop support. Jack Serle of the BIJ knows: "More than 200 strikes, the majority by drones, have been conducted to defend ground forces battling a rising insurgency, despite the fact that combat missions came to an end in 2014. These strikes represent more than 60% of all US airstrikes in the country."[62] The target also changed, as the BIJ investigation revealed: "President Barack Obama brought in new rules on June 10 [2016] giving his troops greater freedom to target the Taliban with air strikes and to accompany Afghan troops in the field. Until then, the US military in Afghanistan was only allowed to go on the offensive against al Qaeda and the Afghan offshoot of Islamic State. They could strike the Taliban solely for self-defence purposes or if failing to do so would result in a serious setback for the Afghan military."[63]

Apart from Afghanistan, the BIJ reports in September 2016 that there had been between 136-156 confirmed US drone strikes in Yemen since 2002,[64] 424 in Pakistan since 2004 and between 32-36 in Somalia since 2007.[65] In Pakistan, drone strikes are aimed at Al Qaeda and other terrorist groups that continue to attack US and NATO targets inside Afghanistan.[66] In Somalia, drone strikes exclusively target al-Shabaab,[67] a terrorist group set on turning Somalia into a fundamentalist Islamic state with a history of attacks on international aid workers, peacekeepers from the African Union, journalists and civilian leaders.[68]

Drone supporters herald the expansion of targeted strikes as the key reason for the successful assassination of high value targets such as Said Ali al-Shihri, deputy Al-Qaeda leader in the Arabian Peninsula and Anwar al-Awlaki, the aforementioned Yemeni imam and its lead recruiter.[69] Despite these successes, critics of this broadened use of power note the increasing number of civilians, especially children, who are killed in the process as collateral damage. In August 2012, a volley of remotely operated American missiles shot and killed three Al Qaeda members along with a respected cleric who had publicly denounced the terror organization just a few days earlier in far eastern Yemen. "The killing of Mr. Jaber, just the kind of leader most crucial to American efforts to eradicate Al Qaeda," the New York Times explained, "was a reminder of the inherent hazards of the quasi-secret campaign of targeted killings that the United States is waging against suspected militants."[70]

Although the Department of Defense claims that American drone strikes are extremely accurate and that the vast majority of people killed in such strikes are members of armed groups such as the Taliban and al-Qaeda, critics "claim that drone strikes are much less discriminating, have resulted in hundreds of civilian deaths … and foster animosity that increases recruitment into the very groups the USA seeks to eliminate."[71] Amnesty International reported that, according to NGO and Pakistan government sources, the US launched more than 330 drone strikes in Pakistan between 2004 and 2013, killing between 400 and 900 civilians and seriously injuring at least another 600.[72] Although firm conclusions are difficult to reach, "because the US government refuses to provide even basic information on particular strikes, including the reasons for carrying them out," Amnesty International expressed serious concern "that these and other strikes have resulted in unlawful killings that may constitute extrajudicial executions or war crimes."[73]

But how are drone strikes different from aerial bombings? RTI's Joe Eyerman points out, "there is nothing about the drones that makes it more susceptible to collateral damage than cannon or manned aircraft. The kinetic strike is essentially the same."[74] Eyerman's view is consistent with a 2010 report by the Special Rapporteur on extrajudicial, summary or arbitrary executions to the United Nations Human Rights Council Philip Alston, who explained:

> However, a missile fired from a drone is no different from any other commonly used weapon, including a gun fired by a soldier or a helicopter or gunship that fires missiles. The critical legal question is the same for each weapon: whether its specific use complies with [international humanitarian law] IHL.[75]

Statistically speaking, drones may even reduce civilian casualties. Slate reporter William Saletan argues: "In World War II, civilian deaths, as a percentage of total war fatalities, were estimated at 40 to 67 percent. In Korea, they were reckoned at 70 percent...In Vietnam, aerial bombing killed more than 50,000 North Vietnamese civilians by 1969. Each year of that war, the least discriminate weapons—bombs, shells, mines, mortars—caused more civilian injuries than guns and grenades."[76]

Between 2006 and 2012, the Long War Journal, reports 150 civilian casualties from drone strikes compared to some 2,500 Al-Qaeda and Taliban members, which puts the civilian casualty rate at 6 percent.[77] Using the less charitable estimates from the BIJ for the same time period (473 to 893 civilian deaths versus some 2,600 to 3,500 total killings) puts the civilian death rate at 35 percent for the high-end estimates and at 22 percent for the low-end estimates. "From 2010 to 2012, BIJ's count of 172 civilian deaths, against a background of 1,616 total fatalities, yields a civilian death rate of 12 percent."[78] The takeaway for Saletan is obvious:

> Drones kill a lower ratio of civilians to combatants than we've seen in any recent war...One reason to prefer drones is that when you send troops, fighting breaks out, and the longer the fighting goes on, the more innocent people die. Drones are like laparoscopic surgery: They minimize the entry wound and the risk of infection.[79]

"The appeal of drone attacks for policy makers is clear," counterterrorism experts David Kilcullen explains. "For one thing, their effects are measurable. Military commanders and intelligence officials point out that drone attacks have disrupted terrorist networks in Pakistan, killing key leaders and hampering operations. Drone attacks create a sense of insecurity among militants and constrain their interactions with suspected informers. And, because they kill remotely, drone strikes avoid American casualties."[80] But on balance, Kilcullen knows, the costs far outweigh the benefits since "public anger over the American show of force" not only solidifies the power of extremists, it may also undermine public trust in the government, thereby further destabilizing the region. Completely missing, said Kilcullen, is "a concerted information campaign directed at the Pakistani public or a real effort to understand the tribal dynamics of the local population, efforts that might make such attacks more effective."[81]

Automating War

According to Peter Finn of the *Washington Post*, "The killing of terrorism suspects and insurgents by armed drones, controlled by pilots sitting in bases thousands of miles away in the western United States, has prompted criticism that the technology makes war too antiseptic. Questions also have been raised about the legality of the use of air space and its subsequent drone strikes when employed in places such as Pakistan, Yemen and Somalia, which are not at war with the United States. This debate will only intensify as technological advances enable what experts call lethal autonomy."[82]

Stony Brook University professor and defense blogger Noah Smith wonders if weaponized drones will eventually replace soldiers altogether. "Note that what we call drones right now are actually just remote-control weapons, operated by humans. But that may change. The United States Army is considering replacing thousands of soldiers with true

autonomous robots much like the Remotec Androx Mark V A-1 that killed the Dallas, TX gunman in July 2016. The proposal is for the robots to be used in supply roles only, but that could obviously change in the long term. Sometime in the next couple of decades, drones will be given the tools to take on human opponents all by themselves."[83] Aside from minimizing American battlefield casualties, defense experts predict that continuing progress in automation paralleled by plummeting production costs may soon make autonomous drone militaries cheaper than traditional infantries, let alone bombers, destroyers, tanks or artilleries.[84]

Indeed, the US Army's thinking is moving in the direction of increased automation. "We should be thinking about having a robotic vanguard, particularly for maneuver formations," explains Dr. Bob Sadowski, the Army's chief roboticist. "There's no reason why the first contact with an enemy force should be with a man-platform, because it means that platform is at the greatest risk."[85]

However, some in the military push back on this idea, suggesting that robots and machines have limitations that might actually harm the military cause. For instance, former military weapons systems specialist Pierre Sprey explained, "The soldier is able to cover most of the horizon very quickly, within fractions of a second, sweeping visually to check any kind of threat that he might have. And you're doing the same thing sitting in front of a laptop, you know, with a sensor that's as relatively poor, relative to the human eye, as a video camera, you know, first of all, you're going to miss most of the really important cues. And the ones you pick up, it's going to take you a lot longer to react, because they're going to be more indefinite."[86]

Artificial Intelligence and the Evolution of Killing Machines

In early 2018, the Department of Defense requested solicitations seeking to "develop a system that can be integrated and deployed in a class 1 or class 2 Unmanned Aerial System (UAS) to automatically Detect, Recognize, Classify, Identify (DRCI) and target personnel and ground platforms or other targets of interest."[87] For some observers, this was a big step forward.[88] While current military drones are still controlled by people, this artificial intelligence (AI)-based technology, according to Peter Lee, Director of Security and Risk and a Reader in Politics and Ethics at the University of Portsmouth, will be able to

> decide who to kill with almost no human involvement. Once complete, these drones will represent the ultimate militarisation of AI and trigger vast legal and ethical implications for wider society. There is a chance that warfare will move from fighting to extermination, losing any semblance of humanity in the process. At the same time, it could widen the sphere of warfare so that the companies, engineers and scientists building AI become valid military targets.[89]

The idea of autonomous weapons systems has received intense criticism, especially for the elevated risk of civilian deaths and liability. Human Rights Watch observer Steve Goose suggests that programmers, manufacturers and operators not only open themselves up to liability but may also open up a Pandora's box, the consequences of which are unknown. "Once those weapons exist, there will be no stopping them," he said.[90] Automated technology relies on self-learning algorithms – i.e., programs that independently learn from whatever data they collect – and, as a result, becomes better at the assigned task. University of Portsmouth expert Peter Lee warns that "someone will need to decide on an acceptable stage of development ... In militarised machine learning, that means political, military and industry leaders will have to specify how many civilian deaths will count as acceptable as the technology is refined."[91]

Autonomous weapons systems have been heavily criticized by science experts and tech leaders from Stephen Hawking to Tesla Motor CEO Elon Musk and Apple co-founder Steve Wozniak for dehumanizing warfare and eroding ethical constraints on it. AI, which drives much of the new technology, in their mind, "will never be capable of meeting the requirements of the laws of war (a.k.a. international humanitarian law) to distinguish between combatants and noncombatants

and to avoid excessive collateral damage. As a moral matter, many of them do not believe that decisions to intentionally kill should be delegated to machines, and as a practical matter they believe that these systems may operate in unpredictable ways or be used in irresponsible—or even in the most ruthless—ways."[92]

During the AeroAstro Centennial Symposium at the Massachusetts Institute of Technology (MIT) in October 2014, Elon Musk declared AI to be "the most serious threat to the survival of the human race."[93] Worried about a "Terminator scenario arising from research into artificial intelligence,"[94] Musk warned that with AI "we are summoning the demon. In all those stories where there's the guy with the pentagram and the holy water, it's like – yeah, he's sure he can control the demon. Doesn't work out."[95] Echoing Musk's sentiment, James Hendler, a professor of Computer, Web and Cognitive Sciences at the Rensselaer Polytechnic Institute (RPI), a former member of the US Air Force Science Advisory Board and a former Chief Scientist of the Information Systems Office at the US Defense Advanced Research Projects Agency (DARPA), warns, "Applied as tools of war, robotics raises the threat of ruthless dictators with unfeeling killing machines to use against civilian populace. Laws governing the development and proper use of these machines are needed now, before it is too late."[96]

Take out the Human, Take out Humanity

In October 2013, a number of human rights NGOs and more than 270 computing experts from 37 countries called for a global ban of automated weapons. "Governments need to listen to the experts' warnings and work with us to tackle this challenge together before it is too late," said Professor Noel Sharkey, Chair of the International Committee for Robot Arms Control (ICRAC). "It is urgent that international talks get started now to prevent the further development of autonomous robot weapons before it is too late."[97]

With some delay, 89 signatory nations to the United Nations Convention on Conventional Weapons (CCW) voted to convene groups of governmental experts in 2017 to discuss the implications of autonomous weapons choosing targets with little or no human oversight. A treaty ban, however, is unlikely to work, according to American University Law Professor Kenneth Anderson and Columbia Law School professor Matthew Waxman, "especially in constraining states or actors most inclined to abuse these weapons—and gives them an advantage of possessing such weapons if other states are banned even from R&D into the weapon technologies that enable such systems, as well as autonomous defenses to counter them. Because automation of weapons will increase gradually, step-by-step toward full autonomy, it is also not as easy to design or enforce such a ban as proponents assume."[98] More even, Waxman and Anderson explain that a global ban may be counterproductive:

> *Besides the self-protective advantages to military forces that might use them, it is quite possible that autonomous machine decision-making may, at least in some contexts, reduce risks to civilians by making targeting decisions more precise and firing decisions more controlled. True, believers in artificial intelligence have at times overpromised before, but we also know for certain that humans are limited in their capacity to make sound and ethical decisions on the battlefield, as a result of sensory error, fear, anger, fatigue, and so on.*[99]

By contrast, former US drone program analyst Heather Linebaugh cautions: "What the public needs to understand is that the video provided by a drone is not usually clear enough to detect someone carrying a weapon, even on a crystal-clear day with limited cloud and perfect light. This makes it incredibly difficult for the best analysts to identify if someone has weapons for sure. One example comes to mind: 'The feed is so pixelated, what if it's a shovel, and not a weapon?' I felt this confusion constantly, as did my fellow UAV analysts. We always wonder if we killed the right people, if we endangered the wrong people, if we destroyed an innocent civilian's life all because of a bad image or angle."[100]

But this, of course, is inherent in the nature of warfare. Yes, computers are not 100% reliable, but neither are human beings. According to researchers at Stanford University, "Computers are complex and not deterministic. However, people

are not deterministic either, as evidenced by the large number of war crimes committed and military brutality statistics. Even soldiers have trouble telling who is a civilian and who is not. Computers can perform gait analysis and eventually more sophisticated algorithms involving emotion recognition etc., as computer vision advances and will one day surpass humans in this area of judgment."[101]

In the heat of battle, the Stanford University experts argue, "fear, anger, and vengefulness can cause even the most trained soldiers to commit war crimes that violate ethical standards laid down by Geneva and other international conventions." Looking to the future of automated warfare, they even see ethical benefits of machine over man: "There is a possibility that machines may one day reach a point where they make more ethical decisions on the battlefield than humans can in the short time they are given."[102] However, in interviews, every one of more than 100 Reaper operators agreed that "ultimately, it should be a human who pulls the final trigger. Take out the human and you also take out the humanity of the decision to kill."[103]

Drone Warriors

"Like any other weapons system, drones have caused civilian casualties. But they also have the potential to dramatically reduce civilian casualties in armed conflicts, and particularly in counterinsurgencies." A drone's ability to follow targets for days or weeks contributes to saving innocent lives. Michael Lewis, a former Navy fighter pilot and now a professor at Ohio Northern University School of Law, explains: "First, it confirms that the target is engaged in the behavior that put them on the target list, reducing the likelihood of striking someone based on faulty intelligence. Second, by establishing a "pattern of life" for the intended target, it allows operators to predict when the target will be sufficiently isolated to allow a strike that is unlikely to harm civilians."[104] Moreover, the fact that drones are controlled remotely allows for real time review by lawyers or intelligence analysts without the imposition of a battlefield timeline. More importantly, drone operators do not need to be concerned about personal safety, thereby eliminating anxiety and tension when making the decision to fire the weapon.[105]

It's Like "Call of Duty"
But legal experts and some critics also point to the distance between drone operators and the targets. John Yoo, law professor and former legal advisor to President George W. Bush, describes the operator's sensation maneuvering a drone or weaponized robot as akin to playing a video game and questions the lack of angst from the American public.

> *I would think if you are a civil libertarian, you ought to be much more upset about the drone than Guantánamo and interrogations. Because I think the ultimate deprivation of liberty would be the government taking away someone's life. But with drone killings, you do not see anything, not as a member of the public. You read reports perhaps of people who are killed by drones, but it happens 3,000 miles away and there are no pictures, there are no remains, there is no debris that anyone in the United States ever sees. It's kind of antiseptic. So, it is like a video game; it's like Call of Duty."[106]*

Actual drone operators tell a different story. They describe the blood and carnage as something seen in real time. Mark Bowden of The Atlantic shares the story of one such drone operator:

> *He sees the carnage close-up, in real time—the blood and severed body parts, the arrival of emergency responders, the anguish of friends and family. Often, he's been watching the people he kills for a long time before pulling the trigger. Drone pilots become familiar with their victims. They see them in the ordinary rhythms of their lives—with their wives and friends, with their children. War by remote control turns out to be intimate and disturbing. Pilots are sometimes shaken... He witnesses it in a far more immediate way than in the past, and he disdains the notion that he and his fellow drone pilots are like video gamers, detached from the reality of their actions. If anything, they are far more attached."[107]*

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Although drone operators might not conform to the traditional image of the battle-weary warrior, they can suffer higher levels of post-traumatic stress disorder than conventional bomber crew members, a recent study found. Explains aviation expert and former Royal Air Force navigator Peter Gray, "they [drone operators] follow the pattern of life in a target environment, and they get so used to that, living day in, day out with these people, that when an attack has to be made, they feel it every bit as much as a pilot of a fast jet who just drops the bomb."[108]

An Operator's Story
In 2013, Airman First Class Brandon Bryant spoke out about being diagnosed with post-traumatic stress disorder due to the pressures of his job. Recounting an attack from his base in the Nevada desert on two suspects in Kunar Province, Afghanistan, Bryant recalls what he watched on his screen:

> *The smoke clears, and there's pieces of the two guys around the crater. And there's this guy over here, and he's missing his right leg above his knee. He's holding it, and he's rolling around, and the blood is squirting out of his leg, and it's hitting the ground, and it's hot. His blood is hot. But when it hits the ground, it starts to cool off; the pool cools fast. It took him a long time to die. I just watched him. I watched him become the same color as the ground he was lying on.[109]*

That was Bryant's first shot in early 2007, just a few weeks after his 21st birthday. For most of his six years in the US Air Force, Byant worked as a sensor in tandem with the drone pilot, who sat in the chair next to him. "While the pilot controlled the drone's flight maneuvers, Bryant acted as the Predator's eyes, focusing its array of cameras and aiming its targeting laser. When a Hellfire was launched, it was a joint operation: the pilot pulled a trigger, and Bryant was responsible for the missile's 'terminal guidance,' directing the high-explosive warhead by laser to its desired objective. Both men wore regulation green flight suits, an unironic Air Force nod to the continuity of military decorum in the age of drone warfare."[110] Most days, Bryant worked twelve-hour shifts, often overnight, six days a week. Because both the Afghanistan and Iraq wars were not going well at the time, "the Air Force leaned heavily on its new drone fleet. A loaded Predator drone can stay aloft for eighteen hours, and the pilots and sensors were pushed to be as tireless as the technology they controlled."[111]

> *Sitting in the darkness of the control station, Bryant watched people on the other side of the world go about their daily lives, completely unaware of his all-seeing presence wheeling in the sky above. If his mission was to monitor a high-value target, he might linger above a single house for weeks. It was a voyeuristic intimacy. He watched the targets drink tea with friends, play with their children, have sex with their wives on rooftops, writhing under blankets. There were soccer matches, and weddings too. He once watched a man walk out into a field and take a crap, which glowed white in infrared.[112]*

At first, Bryant believed in the mission and that it was vital, that drones were capable of limiting the suffering of war and of saving lives. But, "when this notion conflicted with the things he witnessed in high resolution from two miles above, he tried to put it out of his mind. Over time he found that the job made him numb: a 'zombie mode' he slipped into as easily as his flight suit."[113] By 2011, Bryant had logged nearly 6,000 hours of flight time, flown hundreds of missions, killing-in-action 1,626 enemies altogether. Looking at a large bulletin board with the faces of wanted targets, including bin Laden and al-Awlaki, he often asked himself when starting his shift: "What motherfucker's gonna die today?" He conceded, "it seemed like someone else's voice was speaking, some dark alter ego. 'I knew I had to get out.'"[114]

In a 2011 mental-health survey of 600 combat drone operators, Air Force psychologists found that 42 percent reported "moderate to high stress and 20 percent reported emotional exhaustion or burnout. The study's authors attributed their dire results, in part, to 'existential conflict.' A later study found that drone operators suffered from the same levels of depression, anxiety, PTSD, alcohol abuse, and suicidal ideation as traditional combat aircrews."[115]

The Laws of War

The laws of war that govern soldiers carrying guns on the battlefield also govern drones and other unmanned military technology. The principles of customary international law (CIL) in this context refers to the UN Charter Article 51, which acknowledges a country's right to self-defense when under an armed attack.[116] Law of Armed Conflict (LOAC) principles, codified in the Hague and Geneva Conventions, requires armed forces to follow two general rules: proportionality and distinction. The National Security Law defines both principles as follows: "Proportionality prevents a state from using force that will result in too much collateral damage, and distinction requires states to use force only when civilians and combatants can be separated."[117]

On March 25, 2011, Harold Koh, then Legal Advisor to the US Department of State, crafted a legal defense of US targeted-warfare and use of unmanned military technology based on these two principles. For legal purposes, drones are considered conventional weapons and must abide by CIL and LOAC.[118] The CIA's targeted killing program in Pakistan, Yemen, and Somalia has raised concerns among lawyers and human rights advocates who claim that US drone strikes outside of declared war zones violate the laws of war. At issue is whether these strikes conform to the principles of discrimination and proportionality. The principle of discrimination asserts that war should only be directed at enemy combatants and not towards civilians caught in a set of circumstances they did not create. Proportionality assumes that the harm to civilians ought not exceed the direct military advantage gained by an attack on a legitimate military target.[119]

Viewed this way, using drones is no different from using any other means of military force during war. In his analysis of the lawfulness of using drones under international law, Durham Law Professor Michael Schmitt argued:

> *Drones are, however, not a panacea. While reliable data is difficult to obtain, civilians have at times been wrongly identified as targetable insurgents or terrorists. It is equally incontestable that many civilians have been killed incidentally during drone strikes. Tragic as such losses are, they do not necessarily render the attacks unlawful. In the confusion of battle, mistakes are inevitable; but they are only unlawful when the attacker has acted unreasonably.[120]*

Schmitt concludes, "the sole relevance of drones operations is that they may not be mounted if less forceful measures would suffice ... and must be conducted if likely to suffice in lieu of more forceful and invasive measures."[121]

Meanwhile, in the United States, a parallel legal debate took place over the President's authority under the 2001 Congressional Authorization for Use of Military Force (AUMF) to engage in targeted killings across the globe.[122] The debate centered primarily on President Obama's framing of the fight against the Islamic State. Generally, the president's constitutional right to order airstrikes extends only so far as it involves the protection of US citizens against a credible threat. Since Obama's original order for airstrikes, the narrative has turned into one of being on "the offensive," a terminology some in Congress consider to be within the congressional purview of declaring war. However, others in Congress see the president's unilateral approach to war as a way to avoid the political repercussions of seeking a declaration of war.[123] Said for instance Sen. Angus King (I-ME),

> *It just makes me uncomfortable that the president, whoever it is, is the prosecutor, the judge, the jury and the executioner, all rolled into one. So I'm not suggesting something that would slow down response. But where there is time to submit it to a third party, a court, in confidence, and get a judgment that, yes, there's sufficient evidence, that feels to me like that's, its not full compliance with the Fifth Amendment ... but some independent check on our executive is healthy for the system.[124]*

Sen. Rand Paul (R-KY) agreed, "The president, a politician, Republican or Democrat, should never get to decide some-one's death by flipping through some flash cards and saying, 'You want to kill him? Yeah, let's go ahead and kill him.'"[125]

Georgetown law professor Rosa Brooks went even a step further and suggested establishing a special court to review drone strikes:

> *If Congress were to create a statutory cause of action for damages for those who had been killed in abusive or mistaken drone strikes, you would have a court that would review such strikes after the fact. [That would] create a pretty good mechanism that would frankly keep the executive branch as honest as we hope it is already and as we hope it will continue to be into administrations to come.*[126]

Human Rights

There has been mounting criticism from human rights and civil-liberties groups claiming violations of "due process" in targeted assassinations. Jamil Jaffer, deputy legal director of the ACLU speaking in reference to a 2012 lawsuit over the drone killing of three American citizens in Yemen, said, "This suit is an effort to enforce the Constitution's most funda-mental guarantee, the guarantee of due process. Ten years ago extrajudicial killing by the United States was exceptional. Now it's routine."[127]

While the American public, for the most part, seems content that the secret war to protect them from their enemies is going pretty well, concerns over the unintended consequences of drone warfare are mounting. A May 2015 Pew Re-search Center survey found that 58% of Americans "approve of the US conducting missile strikes from drones to target extremists in such countries as Pakistan, Yemen and Somalia. About a third (35%) disapproved of US drone attacks."[128] Despite support for drone strikes – particularly if those lower the risk of losing American lives – nearly half of those surveyed (48%) "say they are very concerned that US drone strikes endanger the lives of innocent civilians, while anoth-er 32% say they are somewhat concerned about this." However, the public "expresses less concern over other potential consequences of US drone attacks. About three-in-ten or fewer say they are very concerned US strikes could lead to re-taliation from extremist groups (31%), that they are being conducted legally (29%) or that they could damage America's reputation around the world (24%)."[129]

Humanitarian Law

According to the International Committee of the Red Cross (ICRC),

> *Under international humanitarian law – the rules of war, i.e. the set of laws governing armed conflicts – drones are not expressly prohibited, nor are they considered to be inherently indiscriminate or perfidious. In this respect, they are no different from weapons launched from manned aircraft such as helicopters or other combat aircraft. It is important to emphasize, however, that while drones are not unlawful in themselves, their use is subject to international law.*[130]

According to Steven Groves, research fellow at the conservative, London-based Margaret Thatcher Center for Freedom, "Critics of US drone strikes generally maintain that transnational terrorism should be treated as a law enforcement matter and that individual terrorists should be arrested and tried as common criminals. Such critics often claim that the United States is not engaged in an armed conflict with al-Qaeda that is recognized by international law and therefore is not justified in using lethal force except under highly restrictive, arguably prohibitive, circumstances."[131] However, ICRC President Peter Maurer points out that,

> *When using drones, parties to a conflict must always distinguish between combatants and civilians and between military objectives and civilian objects. They must take all feasible precautions in order to spare the*

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civilian population and infrastructure, and they must suspend or cancel an attack if the expected incidental harm or damage to civilians or civilian objects would be excessive in relation to the concrete and direct military advantage anticipated.[132]

Two prominent human rights organizations, Amnesty International and Human Rights Watch, both released reports in 2013 concluding that some US airstrikes actually violated these rules of war, citing for instance an attack in a Yemeni village that killed 12 people, including three children and a pregnant woman and a 2009 attack in Yemen when 41 Bedouin civilians were killed by American cluster bombs.[133] The basic questions is what laws apply? Is the US operating in theater under international humanitarian law (a war context) or human rights law (a peacetime context)? And what about the military use of drones in non-combat operational environments.

Drones for Peace

Inspired by the successes of UAV surveillance in western countries, the UN Department of Peacekeeping Operations began deploying drones for surveillance in the Kivu provinces of eastern Democratic Republic of Congo (DRC) in early 2013 as part of the United Nations Organization Stabilization Mission in the DRC (MONUSCO) to "improve awareness and promote deterrence to those who move around with bad intentions in that area."[134] Initially, the UN was hesitant to announce a deployment date, because of the continued and much criticized use of drones in Afghanistan, Pakistan and Somalia and stark opposition from countries in the Great Lakes region, especially Rwanda, arguing that "Africa should not become a laboratory for intelligence devices from overseas. China, Guatemala, Pakistan and Russia also raised concerns regarding the deployment of UAVs. Later, however, [Rwandan] President Paul Kagame indicated that if the UN thinks the drones will help achieve peace, then let them [deploy them]."[135]

And indeed, drones have been credited with ending violence. In March 2013, the UN Security Council authorized MONUSCO to contract drone capability and revised its mandate to now also "take all necessary measures" to "neutralize" and "disarm" groups that pose a threat to "state authority and civilian security."[136] At the end of the October 2013, DRC government forces, with the support of UN peacekeepers, launched a military offensive against the M23 rebel group, declaring "total victory" over the rebels after only two weeks of military action. "It is reported that Rwanda and Uganda, the suspected supporters of the M23 rebels, refrained from intervening due to concern that they would be discovered by UAVs deployed by the victorious forces."[137]

The UN had used drones for aerial surveillance already in 2006 to monitor trans-border activities of armed groups along the Sudanese borders with Chad and the Central African Republic.[138] Indeed, drones have helped crime and conflict monitoring. As Scandinavian researchers John Karlsrud and Frederik Rosen explain:

Having drones in the air over particularly volatile areas would allow peacekeepers to register suspicious behavior, even at night, and monitor movements of groups and individuals, checking for weapons and other items that would indicate hostile intentions. Drones could also be used for detecting arms smuggling and breaches of embargos. There is thus reason to believe that the presence of drones could have a deterrent effect on adversaries.[139]

But deploying them during ongoing conflict was a watershed moment for peacekeeping. The fact that drone technology can deliver high-quality, close-up images in real time considerably improves the situational awareness of UN peacekeepers, as the following scenario illustrates:

An attack on a village a few kilometers from the compound is being reported, yet currently the only way to assess the situation is by moving troops into the area, which could take hours. With drones, it would take only minutes from the arrival of a report before high-quality images could be reviewed.[140]

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However, improved situational awareness also increases decision pressures on commanders in the field. Typical peace-keeping environments are characterized by the need to respond to frequent, smaller violent incidents. "More detailed situational awareness will demand more comprehensive decision-making processes, affecting the responsibilities of officers. Peacekeepers will have less leeway for failing to respond to atrocities if knowledge is available in real time; this will significantly lower the acceptance threshold for civilian casualties."[141]

Moreover, there are a number of other legal and practical concerns. First, the Laws of War specify that parties to an armed conflict must distinguish between the civilian population and combatants and between civilian and military targets. UAVs in the DRC are operated by civilian contractors who are not UN peacekeepers. Are those operators now combatants, because they participate directly in combat operations and are open to enemy attack? In addition, drones are considered dual-use technologies[142] and can be used equally for legitimate or malicious purposes, making compliance with and enforcement of international law difficult. Finally, surveillance UAVs generate a lot of data, but who owns that data and what should be done with the information gathered by UAVs? Who could and should have access to live video streams? Who could and should have access to recorded streams?

To protect the integrity of UN peacekeeping, experts have called for effective regulation to ensure that any information collected with UAVs remains the property of the UN alone. Karlsrud and Rosen argue that

> *drones can dramatically increase the general capability of a UN peacekeeping operation – improving access to vulnerable populations, providing better information on potential threats to civilians, and increasing access to information in cases where the UN must use force to protect civilians. Drones represent a new way of 'seeing and knowing' in peacekeeping and can dramatically improve peacekeepers' access to information.[143]*

As the acquisition and operation of drones becomes less expensive, non-governmental organizations such as human rights or aid groups may use drones themselves or may demand that they be included in any peacekeeping mission to monitor humanitarian relief and human rights violations. Chicago Policy Review's Songkhun Nillasithanukroh explains, "[g]overnments can be reluctant to send troops on peacekeeping missions for fear of political backlash from the potential loss of human life. In contrast, politicians will likely not face intense political backlash if a drone is shot down. This may encourage more governments to contribute to peacekeeping missions." And he concludes:

> *Surveillance drones would prevent human rights violations by acting as outside observers in situations where it is dangerous or costly for human monitors to be present. First, the presence of drones can deter risk-averse violators from committing malicious acts due to a fear of being caught. And, indeed, previous research suggests that crimes often occur when perpetrators think they will not be held accountable for their wrongdoings. Second, even if the presence of drones fails to deter human right abuses, the information gathered by drones can make it easier to identify and prosecute perpe*trators.[144]

On the flipside, however, as the technology becomes more widely available, it also becomes more widely available to insurgents and criminals. Warns RTI's Joe Eyerman, "Counter-drone technologies are becoming increasingly important as criminals develop applications for smuggling and terrorism. Counter-drone work needs to consider more than just the technical solutions, it needs to include the strategic element and recognize that the criminals are adjusting their strategies to counter our technologies."[145]

Eventually, Karlsrud and Rosen argue, "the UN will need to recognize that opting not to use drones could indeed someday be considered a breach of IHL [International Humanitarian Law]."[146]

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