Please read the following article, <http://www.pbs.org/wnet/need-to-know/five-things/drones/12659/> and complete a 1.5-2 page paper:

Introduction (Paragraph 1)

Give an overview of the article (Paragraph 2)?

Why do you think the United States is using Drones? (Paragraph 3)

How does this Relate to Scientific Visualization? (Paragraph 4 Hint: RS)

Do you agree or disagree with using Drones? (Paragraph 5)

Conclusion (Paragraph 6)

**Drones** By [**Brianna Lee**](http://www.pbs.org/wnet/need-to-know/author/leebr)

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In this Jan. 31, 2010 file photo, an unmanned U.S. Predator drone flies over Kandahar Air Field, southern Afghanistan, on a moon-lit night. (Photo: AP/Kirsty Wigglesworth, File)

Long imagined as a science fiction scenario, robotic warfare is very much today’s reality. As Randall Munroe of the web comic [XKCD put it](http://xkcd.com/652/), “We live in a world where there are actual fleets of robot assassins patrolling the skies. At some point there, we left the present and entered the future.”

Much has been discussed of the U.S. military’s increasing reliance on unmanned aerial vehicles, or UAVs, in modern-day warfare. While the Department of Defense has enthusiastically embraced the technology, arguing that it amounts to safer, cheaper and more effective warfare in the U.S.’s fight against terrorism, other reports have focused on the number of civilian casualties – particularly in Pakistan – that have resulted from drone strikes. Iran’s recent[capture of a downed American UAV](http://www.aljazeera.com/indepth/opinion/2011/12/201112774824829807.html) has also prompted security concerns as the world careens toward a global drone arms race.

Whether we’re comfortable with this trend in warfare, the robotics revolution looks to alter society’s relationship with war in some profound ways. Here are five things to know about the drones of today and tomorrow:

**1. Despite concerns of legality, drone technology is moving ahead at full speed.**

Drones have taken on crucial tasks in the military that have often been deemed too risky for humans: providing surveillance, launching missile attacks on insurgent leaders and dismantling roadside bombs that have been a leading cause of deaths in the recent wars. Frontline [reports](http://www.pbs.org/wgbh/pages/frontline/iraq-war-on-terror/topsecretamerica/inside-the-cias-kill-list/) that since September 11, 2001, the number of drones in the U.S.’s military arsenal has expanded from 60 to more than 6,000, with President Obama making unprecedented use of these robotic warriors. Drone strikes have taken out some of al-Qaeda’s most notorious figures, including American-born cleric Anwar al-Awlaki.

But attitudes toward drones are significantly less upbeat in Pakistan, where the public outcry has grown louder in response to civilian deaths brought about by errant air strikes. The U.S. military’s figures on drone strikes and fatalities there remain strictly classified. However, [analyses by the non-partisan New America Foundation](http://www.newamerica.net/node/41927) estimate that approximately 17 percent of the total deaths caused by drone strikes in Pakistan were civilian fatalities – between 293 and 471 civilians in total. The UK-based Bureau of Investigative Journalism has also [estimated that 175 children have been killed](http://www.thebureauinvestigates.com/category/projects/drones/) by drone strikes since 2004. U.S. officials [disputed these reports](http://www.nytimes.com/2011/08/12/world/asia/12drones.html?pagewanted=all#p[AowAow]), saying that only about 50 non-militants have been killed by drone strikes over the past decade.

But even if the true civilian toll is relatively low – and, by the New America Foundation’s numbers, the civilian fatality rate from drone strikes shrinks every year – is the U.S.’s use of drones for targeted killings in an unofficial war compliant with the norms of international law? Defense Secretary Leon Panetta [declared last year](http://www.politifact.com/truth-o-meter/article/2010/jul/01/do-drone-attacks-comply-international-law/) that, despite the U.S.’s insistence on secrecy in its drone program, “there is no question that we are abiding by international law and the law of war.” Non-partisan research organization Politifact [posed the same question of legality last year](http://www.politifact.com/truth-o-meter/article/2010/jul/01/do-drone-attacks-comply-international-law/) – and promptly declined to answer it. The organization declared: “[W]e are uncomfortable stating with any certainty that a covert program is definitively operating within the law. We simply can’t verify it independently.”

Despite these concerns and the current debate over cutting the Pentagon’s budget, developments in drone technology are moving ahead at full speed. UAVs are being developed with improved flexibility, precision and endurance. The Washington Post reported earlier this year on military tests that are [paving the way for completely automated drones](http://www.washingtonpost.com/national/national-security/a-future-for-drones-automated-killing/2011/09/15/gIQAVy9mgK_story.html) that operate free of human control – although these types of UAVs are not likely to be realities for quite a while. Drones are also [getting smaller](http://www.nytimes.com/2011/06/20/world/20drones.html), built down to the size of birds and insects. These micro air vehicles, or MAVs, are a booming sector in drone development, and in some cases the Pentagon has been looking to [add on bug-like features](http://www.popsci.com/technology/article/2011-10/big-robotic-drones-become-more-bug-bulging-eyes-and-tiny-sensing-hairs) like compound eyes and tiny cilia to assist with flight.

**2. Rise of the “cubicle warriors”**

Unmanned they may be, but the drone wars of today certainly are not lacking for a human element. Drone pilots are being [recruited and trained at a faster rate](http://www.npr.org/2011/11/29/142858358/drone-pilots-the-future-of-aerial-warfare) than traditional military jet pilots, and face a host of different emotional challenges for the type of work they do.

Drone pilots remain cushioned from the risks to life and safety that fighter pilots face, but for them, being in combat is an experience that weaves in and out of their civilian lives on a daily basis. The concept of war as a video game has many observers wondering if pilots might be desensitized to the real effects of war, but according to P.W. Singer, Brookings Institute fellow and author of the 2009 book “Wired for War,” [drone pilots face higher levels of combat stress](http://www.spiegel.de/international/world/0%2C1518%2C682852%2C00.html) than do some soldiers physically deployed in Afghanistan. One theory holds that drone pilots experience “[whiplash transition](http://www.msnbc.msn.com/id/26078087/)” – the drone pilot’s experience of spending their work day in the virtual war zone, at times killing enemy combatants, and then returning home to their families in the evening. Moreover, even though pilots may not be physically close to the battlefield, they often view the war zone through [up-close, high-definition imagery](http://www.msnbc.msn.com/id/26078087/).

In a Frontline interview, Noah Shacthman of Wired magazine [also discounts the idea](http://www.pbs.org/wgbh/pages/frontline/digitalnation/interviews/shachtman.html) that drones turn war into a video game:

No part of war is like a video game. Not even the part of war that involves a lot of glowing plasma screens is in any way like a video game. War can be slow; war can be deliberate; war can be boring; and war can have very serious consequences. None of that is true about a video game.

Even the parts of war that would seem the most video game-esque — controlling a drone, remotely operating a heavy weapon, doing some surveillance — even those things are so plodding and so deliberate, and the consequences are so great, that they’re really nothing like a video game whatsoever.

**3. Desensitizing war for everyone else?**

The surveillance capabilities of drones have enabled more and more video footage of on-the-ground operations to become available to the American public. Much like televising footage of the Vietnam War dramatically affected public perception of the military abroad, it’s anticipated that the proliferation of videos of operations in the Middle East will reshape the public’s relationship with war. Singer says that this trend carries with it the potential to desensitize viewers from the reality of being in the war zone. “The drone war is documented, downloaded, accessible for everyone,” Singer said [in an interview with Der Spiegel last year](http://www.spiegel.de/international/world/0%2C1518%2C682852%2C00.html). “You can see the videos on YouTube. It’s turning war for some into a form of entertainment. The soldiers call that ‘war porn.’ We can see more but experience less.”

Another concern is that the desensitization of war, along with the cost effectiveness of drones, will lead to more war in the future. At the Washington Post, Susan Brooks Thistlethwaite [writes](http://www.washingtonpost.com/blogs/guest-voices/post/drone-wars-the-temptation-of-automated-conflict/2011/12/05/gIQA1rilWO_blog.html?wprss=guest-voices):

Drones will not reduce conflict. Their very ease of use will tempt nations, our own very much included, to engage in automated conflict.

The problem with automated conflict, however, is that it doesn’t stay automated. People die in drone wars, just like they died from the automation of arrows when the crossbow was invented. War machinery has a terrible capacity to tempt us to think it’s something else.

However, others have dismissed the idea that weaponry by itself will subtract humanity from warfare. Human psychology and human emotions are still a primary driving force behind wars, and technological advances have not substantially curbed that element of warfare in the past, [writes Adam Elkus](http://www.democracyarsenal.org/2011/12/weapons-dont-make-war.html?utm_source=twitterfeed&utm_medium=twitter) at Democracy Arsenal:

Despite the nearly century-long prevalence of airpower, we have not become numb to war. Witness, for example, the powerful desire for retribution after the 9/11 attacks and its impact on domestic and international policy. Airpower — drones included — has not erased emotion from war because [war is a complex mixture](http://www.clausewitz.com/readings/Bassford/Trinity/TRININTR.htm) of irrational forces (emotion, hatred, and enmity), chance (friction and the fog of war) and rational policy. And as long as humans are involved in conflict, these forces will continue to exert themselves on the theory and practice of war.

**4. The global drone arms race**

Much of the discussion about drones and warfare has focused primarily on how America’s use of the technology would shape U.S. foreign policy and Americans’ relationship with war. But the U.S. is not alone in drone development: Countries like Israel and the UK also use drone strikes, and several other countries have UAVs for surveillance purposes. Earlier this year, [China debuted a small drone](http://online.wsj.com/article/SB10001424053111904070604576514782800973542.html) equipped with a high-definition camera at a robotics trade show. Though the model was only about the size of a pizza pan, and less sophisticated than the U.S.’s combat drones, many observerssaw the display as a glimpse of a future for an expanding global UAV market.

The premise of a “space race” in drone technology leading up to a world filled with drone warfare on all sides, analysts say, is troubling primarily because of the political and legal implications of such a world. The U.S.’s use of drones is tightly wound in the legacy of its counterterrorism campaign in the Middle East – undeclared, secretive and rife with targeted killings by unmanned vehicles. At the New York Times, Scott Shane [describes the conundrum](http://www.nytimes.com/2011/10/09/sunday-review/coming-soon-the-drone-arms-race.html?pagewanted=all) brought about the U.S.’s precedent of drone use:

If China, for instance, sends killer drones into Kazakhstan to hunt minority Uighur Muslims it accuses of plotting terrorism, what will the United States say? What if India uses remotely controlled craft to hit terrorism suspects in Kashmir, or Russia sends drones after militants in the Caucasus? American officials who protest will likely find their own example thrown back at them.

**5. Drones at home**

UAVs have proven their popularity on a global scale, but drones are also looking to go local. UAVs Predator drones currently serve [as surveillance units](http://www.globalpost.com/dispatch/news/regions/americas/united-states/111205/drones-us-border-mexico-drug-war-immigration) for drug trafficking operations along the U.S.-Mexico border, and U.S. police officials have [expressed great interest in utilizing drone technology](http://www.pbs.org/wnet/need-to-know/the-daily-need/are-we-becoming-a-police-state-five-things-that-have-civil-liberties-advocates-nervous/12563/) for law enforcement purposes on the domestic front. In February, the Federal Aviation Administration granted approval to Mesa County, Colo., to [utilize the Draganflyer X6](http://www.draganfly.com/news/2011/02/15/mesa-county-sheriff-colorado-receives-faa-approval-to-operate-the-draganflyer-x6-helicopter-county-wide-2/), a small drone model that comes equipped with wireless cameras and a variety of sensors, for law enforcement purposes. The Draganflyer X6 has already been [used by police officers in Canada](http://gizmodo.com/5167853/the-draganflyer-x6-uav-police-edition) to gather evidence and survey crime scenes. Another model, the Qube, developed by military drone supplier AeroVironment Inc., was developed [specifically for law enforcement assistance](http://www.npr.org/templates/transcript/transcript.php?storyId=143144146).

Last week, a Predator B drone deployed from a North Dakota Air Force base provided surveillance that [eventually helped local police arrest](http://www.latimes.com/news/nationworld/nation/la-na-drone-arrest-20111211%2C0%2C72624%2Cfull.story) three men charged with stealing six cows from a local family farm. The Los Angeles Times [called it](http://www.latimes.com/news/nationworld/nation/la-na-drone-arrest-20111211%2C0%2C72624%2Cfull.story) the “first known arrests of U.S. citizens with help from a Predator.”

While the idea of drones proliferating on the home front may seem like an unsettling future for some, the scenario isn’t quite imminent yet. The FAA holds [tight regulations over UAVs](http://www.faa.gov/news/fact_sheets/news_story.cfm?newsid=6287) in the national airspace, primarily because it deems current UAV models lacking in “adequate ‘detect, sense and avoid’ technology” that would prevent collision with other aircraft.  The [manufacturer of the Draganflyer X6 noted](http://www.draganfly.com/news/2011/02/15/mesa-county-sheriff-colorado-receives-faa-approval-to-operate-the-draganflyer-x6-helicopter-county-wide-2/) that its approval in Mesa County came “after a year or more of in-depth aircraft flight experience, safety practices, program development, use by the agency and the proven solid commitment by the Sheriff’s office to adhere to the FAA practices and policies.”  However, as the idea of using drones domestically begins to appeal to more and more local authorities, the FAA is looking to [change its current regulations](http://www.latimes.com/business/la-fi-drones-for-profit-20111127%2C0%2C6584711.story) to accommodate the technology in U.S. airspace.

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