Drone Warfare: Past, Present, and Future

Presented October 18, 2013, by Chris Bandemer

"Nek Muhammad knew he was being followed. On a hot day in June 2004, the Pashtun tribesman was lounging inside a mud compound in South Waziristan, speaking by satellite phone to one of the many reporters who regularly interviewed him on how he had found and humbled Pakistan's army in the county's western mountains. He asked one of his followers about the strange, metallic bird hovering above him.

Less than 24 hours later, a missile tore through the compound, severing Mr. Muhammad's left leg and killing him and several others, including two boys, ages 10 and 16. A Pakistani military spokesman was quick to claim responsibility for the attack, saying that Pakistani forces had fired at the compound.

That was a lie.

Mr. Muhammad and his followers had been killed by the C.I.A., the first time it had deployed a Predator drone in Pakistan to carry out a "targeted killing". The target was not a top operative of Al Qaeda, but a Pakistani ally of the Taliban who led a tribal rebellion and was marked by Pakistan as an enemy of the state. In a secret deal, the C.I.A. had agreed to kill him in exchange for access to airspace it had long sought so it could use drones to hunt down its own enemies."[1]

Drones are neither a new idea nor technology; however, technological developments within the past 15-20 years have transformed their capabilities, cost, and use. While many

[1] Mazzetti, Mark, "A Secret Deal on Drones, Sealed in Blood", New York Times, April 6, 2013 http://www.nytimes.com/2013/04/07/world/asia/origins-of-cias-not-so-secret-drone-war-in-pakistan.html?pagewanted=all&_r=0

countries have drone programs, the United States is the most notable country to exploit drone technology to carry out surveillance, reconnaissance, and kill those hostile to their cause.

As new technologies are developed, governments, their militaries, and the private sector are finding new and exciting ways to utilize and expand drone programs. Many countries have their own public and private drone programs, each with varying degrees of sophistication. Every day these groups are finding new and exciting ways to utilize drones for military and non-military uses. These areas are so vast and diverse that it is impossible to thoroughly examine them all.

As such, this paper will focus its attention on the development and use of drones for military purposes, specifically the development and use of drones by the government of the United States of America.

History

During the American Civil War, Union and Confederate forces launched balloons loaded with explosive devices. The idea was for the balloons to come down inside a supply or ammunition depot and explode.[2] Charles Perley of New York City went so far as to patent his idea. For obvious reasons this tactic wasn't terribly effective. However, around the turn on the 20th century, Dr. Samuel Pierpoint Langley is credited with designing the first pilotless aircraft.[3] On May 6, 1896, Langley's model "number 5," a steam driven aircraft, was launched by catapult from a houseboat on the Potomac River. The craft stayed aloft for 90 seconds, flying over a half mile at about 25 miles an hour at a height of 80 to 100 feet. In November of that year, model number 6 flew more than 5,000 feet. Langley's successful unmanned flights prompted then Assistant Secretary of the Navy, Theodore Roosevelt, to create a board dedicated to studying

[2] Jim Garamone, "From U.S. Civil War to Afganistan" April 16, 2002, www.defense.gov, American Forces Press Service.
[3] Hugh McDaid & David Oliver, "Smart Weapons" page 10, Welcome Rain, 1997

Langley's aircraft.[4] Unfortunately, Langley's Aerodomes, as they were known, would never achieve real success and the idea was set aside.

The U.S. Military returned to the idea of unmanned aircraft in 1918, when Charles Kettering was recruited to develop a "flying bomb," that become known as the Kettering Bug or "Bug" for short. The Kettering Bug was launched from a dolly-and-track system, flew at a speed of 50 mph, could hit a target 40 miles away, and was produced for $400. Before takeoff, technicians calculated the number of engine revolutions needed, based on distance and wind, for the Bug to travel to its target. When the revolution counter reached the correct number, the engine shut down, the wings fell off, and the Bug fell to the earth and detonated on its target. [5]

Despite some initial successes, the Bug was never used put to use. The design was tested with erratic results: 7 successes on 24 attempts. By the time WWI ended, the U.S. government spent $275,000 for 45 Bugs. Even though the Bug was never in active use, the aircraft and its technology remained a secret until World War II.[6]

Outside of these few initial explorations, pilotless aircraft development was stalled until the mid-twenties when the British and U.S. began to develop pilotless aircraft for target practice by anti-aircraft gunners. British are best known for their developed the "DH.82B Queen Bee." The wooden "Queen Bee" biplane was produced with either wheels, for conventional operation from an airfield, or floats, for use at sea when it was fired from a ship's steam catapult. The Queen Bee could reach a height of 17,000 feet, travel a range of 300 miles, and fly at a speed of

Comment [EM1]: I would just use one footnote here at the end of the paragraph because you got all of the info in this paragraph from the same source the Langley Aerodrome Wiki page. Or, you could be more studious and use the original sources that the Wiki page used since Wikipedia isn't the most reliable source.

Comment [EM2]: I'm going to stop marking this – but if all info from paragraph is from the same source, only put one footnote at the end of the paragraph. If there is more than one source, you only need to place footnotes when you change the source (i.e. at the end of the next paragraph)

[4] http://en.wikipedia.org/wiki/Langley_Aerodrome
[5] http://en.wikipedia.org/wiki/Kettering_Bug
[6] http://en.wikipedia.org/wiki/Kettering_Bug

over 100mph.[7] Through some convoluted path, the name "Queen Bee" is said to have led to the use of the term "drone" for unmanned aircraft.[8]

The first large-scale production of drones was the product of Reginald Denny. During WWI, Denny served with the British Royal Flying Corp, but later immigrated to the United States to seek his fortune as an actor.[9] Denny, best known for his roles in *Rebecca* (1940), *Mr. Baldings Builds His Dream House* (1948), *Cat Ballou* (1965), and as various characters on the 1960s *Batman* television series, over his career he appeared in over 184 titles. [10]

In addition to a successful acting career, Denny was interested in aviation and in the 1930s opened a model airplane shop on Hollywood Boulevard.[11] Denny formed a company named Radioplane, and with a group of radio hams and engineers began work on creating large remote-controlled model airplanes. In 1941, they developed the OQ-2A Target, which was used to train anti-aircraft gunners. Radioplane was the predecessor to Northrop, now Northrop Grumman.[12]

Despite Denny's notoriety, the most famous person associated with Radioplane was Norma Jean Dougherty, better known as Marilyn Monroe. Upon arrival in California, she took a job as an assembler at Radioplane. On June 26, 1945, a photographer was sent to Radioplane by his commanding officer, Captain Ronald Reagan, to photograph women war workers. The

[7] Hugh McDaid & David Oliver, "Smart Weapons" page 11, Welcome Rain, 1997
[8] http://en.wikipedia.org/wiki/History_of_unmanned_aerial_vehicles
[9] Hugh McDaid & David Oliver, "Smart Weapons" page 16, Welcome Rain, 1997
[10] http://www.imdb.com/name/nm0219666/?ref_=sr_1
[11] Hugh McDaid & David Oliver, "Smart Weapons" page 16, Welcome Rain, 1997
[12] Hugh McDaid & David Oliver, "Smart Weapons" page 16, Welcome Rain, 1997

photographer loved Norma Jean and persuaded her to model for more photos, which he circulated around Hollywood.[13] The rest is history.

For the next fifty years, the U.S., and other countries, developed, tested, redesigned, and scuttled hundreds of drone projects. By the mid-1970s the Pentagon had almost given up on robotic planes. At the time, the most promising Unmanned Aerial Vehicle (UAV), produced by the United States was the Aquila.[14] This drone was a small propeller driven UAV, that gathered information over the battlefield and beamed it back to an operations base. The problem with Aquila was the technology was not fully developed. As a result, the Aquila crashed once every twenty (20) hours of operation and was a billion dollar project by the time a few prototypes were developed.[15]

Comment [EM3]: odd choice of words

Comment [EM4]: You haven't defined yet what this acronym is for

The failure of the U.S. government to develop and produce a high quality drone inspired an Israeli immigrant named Abe Karem to transform the drone landscape. In 1980, he founded Leading Systems, and set out to produce a high quality drone using low tech equipment, but with very high design standards. From 1980-1983, Karem and his team of three, developed and created the Albatross. Prior drones followed the design paradigm which mirrored that of conventional aircraft. Karem and his team flipped drone design on its head. They placed the motor in the rear, drastically increased the wingspan of the drone, and used the lowest technology available. The result was an UAV made out of plywood, fiberglass, and was powered by a modified two-stroke engine (commonly used on go-karts) which burned 1/10 of a gallon of fuel per hour.[16] After a flight test in which the Albatross remained aloft for 56 hours,

[13] Hugh McDaid & David Oliver, "Smart Weapons" page 17, Welcome Rain, 1997
[14] The Economist "The Dronefather", December 1, 2012, http://www.economist.com/news/technology-quarterly/21567205-abe-karem-created-robotic-plane-transformed-way-modern-warfare
[15] Rise of the Drones
[16] The Economist "The Dronefather", December 1, 2012, http://www.economist.com/news/technology-quarterly/21567205-abe-karem-created-robotic-plane-transformed-way-modern-warfare

the Defense Advanced Research Projects Agency (DARPA) stepped in to fund Mr. Karem's project.[17]

The Albatross prototype was developed into the larger scale Amber. Unlike the Aquila, the Amber rarely crashed, suffering just one accident in 650 hours of testing. Under Mr. Karem's direction the cost of each drone was only $350,000, which was less than the cost of running the Aquila for a single hour. Despite his initial success, the Amber fell victim to political infighting and Mr. Karem sold Leading Systems. By the mid-nineties, Karem was producing a cut-down version of the Amber, called the Gnat 750. In 1993, the U.S. needed high-endurance drones to keep tabs on the conflict that was raging in the former Yugoslavia. Jim Woolsey, then director of the CIA, was told by this UAV program officer it would take 5 years and $100 million dollars to develop a high endurance reconnaissance drone. Karem told Woolsey it would cost $5 million dollars and take three months. As promised within 3 months the Gnat was flying over Bosnia, relaying live video feeds to the Pentagon. By the 1994, the Gnat was redesigned and given a new name: Predator.[18]

II. Drones

While the U.S. may be on the forefront of drone technology, it is estimated that 76 countries have UAVs of some kind and that 11 countries possess armed drones.[19] Presently, the Pentagon employees approximately 10,000 drones.[20] The most widely used drone is the Raven

[17] The Economist "The Dronefather", December 1, 2012, http://www.economist.com/news/technology-quarterly/21567205-abe-karem-created-robotic-plane-transformed-way-modern-warfare
[18] The Economist "The Dronefather", December 1, 2012, http://www.economist.com/news/technology-quarterly/21567205-abe-karem-created-robotic-plane-transformed-way-modern-warfare
[19] Asawain Suebsaeng, "Drones: Everything You Ever Wanted to Know But Were Afraid to Ask", www.motherjones.com , March 4, 2013. http://www.motherjones.com/politics/2013/03/drones-explained
[20] NOVA "Rise of the Drones"

and the Predator done is probably the most widely recognized. It would impossible to list and describe all the drones in use today, therefore, this paper will highlight a few of drones in use and development.

A. Raven

The Raven is a small hand-launched drone that has a wingspan of three (3) feet, weights four (4) pounds, operates with an electrical motor, and rechargeable battery. It that can fly about 6 miles, at 500 feet, at flying speeds of 28-60 miles per hour. The Raven can be operated manually or programmed for autonomous operation. The Raven is not designed to be lethal, rather it transmits live imagery directly back to the operator without the need of a satellite link. Its camera has the ability to automatically follow a moving object, merely by touching that moving object on the ground control system's screen. The Raven is used by US Military, Air Force, Marine Corps and at least six other counties. As of 2012, approximately 19,000 Ravens had been shipped to customers around the world.[21] Each Raven costs about $35,000 and $250,000 for the entire system.[22]

B. MQ-1 Predator

The Predator is probably the most widely recognized drone. The Predator is an armed, multi-mission, medium-altitude, long endurance remotely piloted aircraft.[23] The "M" stands for multi role, the "Q" means remotely controlled, and the "1" refers to the aircraft being the first in a series.[24] It is 27 feet long, has a wingspan of 48.7 feet, and is about 7 feet tall.[25] The Predator is

[21] Greg McNeal, "Raven Drone Spotted in Act of Valor", www.forbes.com, 2.29.12, http://www.forbes.com/sites/gregorymcneal/2012/02/29/raven-drone-spotted-in-act-of-valor/
[22] www.Army-technology.com, "RQ-11 Raven Unmanned Aerial Vehicle, United States of America"
[23] MQ-1 Predator, "Fact Sheet", www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104469/mq-1b-predator.aspx
[24] MQ-1 Predator, "Fact Sheet", www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104469/mq-1b-predator.aspx

powered by a 101 horsepower engine, the same engine type commonly used on snowmobiles.[26] It typically operates at about 25,000 feet, can fly for over 24 hours, at speeds of 81-103mph, and is typically equipped with 2 Hellfire missiles.[27]

According to the Defense Department, the Predator is a system, not just an aircraft.[28] A fully operational system consists of four (4) drones, a ground control station, and a satellite link communication suite.[29] The Predator is operated by a pilot and systems operator. In addition, the Predator needs about 82 personnel to handle and maintain it.[30] In 2009, the Predator system had a price tag of $20 million dollars.[31]

The Predator was initially employed in the mid-1990s during the conflict in the former Yugoslavia. Initially, the Predator was not armed and was only used for surveillance and reconnaissance. If a hostile situation arose which required lethal force, a separate attack vehicle, such as a warplane, was called in. This obvious shortcoming all changed in October of 2001 when the U.S. armed the Predator and launched its first missile strikes.[32] This was a game changer which ushered in modern drone warfare.

C. X-47B

The 1.4 billion dollar project known as the X-47B Unmanned Combat Air System Carrier Demonstration program is the future of drone technology, specifically autonomous drone technology.[33] The hardest thing for any fighter pilot is to land on an aircraft carrier. Not only is

---

[25] MQ-1 Predator, www.wikipedia.org
[26] http://science.howstuffworks.com/predator1.htm
[27] MQ-1 Predator, www.wikipedia.org
[28] http://science.howstuffworks.com/predator6.htm
[29] http://science.howstuffworks.com/predator6.htm
[30] http://science.howstuffworks.com/predator6.htm
[31] MQ-1 Predator, "Fact Sheet", www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104469/mq-1b-predator.aspx
[32] NOVA "Rise of the Drones"
[33] Hennigan, W.J., "New Drone Has No Pilot Anywhere, So Who's Accountable?" L.A. Times, January 26, 2012, http://articles.latimes.com/2012/jan/26/business/la-fi-auto-drone-20120126

the carrier moving, but so is the height of the landing deck, additionally, there is only about 500 ft of runway space. The X-47B was produced for the sole purpose of proving that an autonomous drone could take off and land on an aircraft carrier. On July 10, 2013, the Navy successfully launched and landed the X-47B on an aircraft carrier. While the X-47B will never be put into operational use, it will help officials develop future carrier based drones.[34] The program cost $1.4 billion dollars, but the Navy won't spend anymore because the Navy is retiring its two X-47's.[35]

III. Drone Operations

Drone operators work out of control centers that resemble shipping containers. Each drone is operated by two individuals, the pilot and the systems operator. The pilot flies the drone and the systems operator is in charge of maneuvering the camera to spot high value targets ("HVT"). The control center is connected to the drone through a satellite link. It is this satellite link which enables the drone to operate. Drone pilots are growing in number as drone technology becomes more sophisticated and more commonly used. Currently, the Air Force is training more drone pilots than fighter and bomber pilots combined.[36] It typically takes at least two (2) years to train a fighter pilot. Conversely, it takes less than 12 months to train a drone pilot. Even more surprising, an FAA study found that trained pilots are worse or harder to train than UAV pilots with no prior flight training.[37]

While the pilot flies the drone, the systems operator identifies high value targets (HVT) and when necessary eliminates them. The process of acquiring a target is known as "painting the

[34] The Guardian, "US Navy to attempt drone landing on aircraft carrier for first time" July 10, 2013, http://www.theguardian.com/world/2013/jul/10/us-navy-drone-landing-aircraft-carrier
[35] Vergakis, Brock, "X47B Unmanned Navy Drone Successfully Lands on Aircraft Carrier for First Time", Huffington Post, July 10, 2013, http://www.huffingtonpost.com/2013/07/10/x47b-unmanned-navy-drone_n_3575504.html
[36] NOVA "Rise of the Drones"
[37] NOVA "Rise of the Drones"

target". [38]Through the computer, the systems operator fires a laser or infrared beam from the Multi Spectral Targeting System (MTS) ball located near the nose of the drone. The beam lands on the target and sends out pulses that attract the laser seekers located within the Hellfire missiles. The drone's on-board computer uses the beam to make calculations about wind speed, direction, trajectory, distance, and other battlefield variables. Once a target is "painted" the drone pilot can unleash the missiles to destroy the target.[39]

Because drone pilots view the landscape through a television screen, they have a limited range of sight. Many drone pilots describe flying a drone as flying an airplane while looking through a straw.[40] This is a big difference from piloting a traditional aircraft where there pilot can look around to see what is going on. In order to compensate for the a pilot's limited view the U.S. military, developed ARGUS-IS, a 1.8 gigapixel camera that can detect and track moving objects as small as six (6) inches from 20,000 feet in the air.[41] This camera is the highest resolution camera in the world.[42]

Although the technology is classified, ARGUS' engineer, Yiannis Antoniades, explained the basic technology as taking the imaging chip out of your cell phone, add an additional 368 imaging chips together and you have ARGUS. Also known as "wide area persistent stare", ARGUS is the equivalent of having up to 100 Predator drones look at a medium size city all at once.[43] This technology allows ARGUS to stream live and store everything, a million terabytes

[38] http://science.howstuffworks.com/predator4.htm
[39] http://science.howstuffworks.com/predator4.htm
[40] "How the Predator UAV Works" www.science.howstuffworks.com/predator6.htm
[41] Joshua Kopstein, "DARPA's 1.8 gigapixel drone camera is a high-res Fourth Amendment lawsuit waiting to happen" February 1, 2013, www.theverge.com
[42] NOVA, "Rise of the Drones"
[43] NOVA, "Rise of the Drones"

of video per day, which is the equivalent of 5,000 hours of HD video.[44] To put that in perspective, in 20 years of operation, the Hubble telescope only collected 45 terabytes of data[45]

What makes ARGUS even more interesting is that it is linked to a computer screen can show a wide angle view of a 15 square mile area from 17,500 feet. Those monitoring the screen can then zoom in on a specific area while keeping the overall view intact. While watching a zoomed in area, ARGUS will identify each moving object on the screen. Not only can one (1) area be zoomed in on, but up to sixty-five (65) different screens can be opened up and viewed simultaneously without losing the overall view. Because ARGUS stores everything, it allows the operator the ability review video as if it were being streamed live.[46]The government will not confirm that ARGUS is operational..

IV. FUTURE OF DRONES

While the ARGUS system is amazing, the holy grail of drone technology is drone autonomy. Besides the X-47B, the U.S. military is developing and autonomous robotic mule named Alpha Dog. This drone was designed to carry 400lbs of gear for troops in the field. The Alpha Dog can trot around on its own and is smart enough to take voice commands from its handlers. One version of the Alpha Dog can even outrun the world's fastest human.[47] Another project in development is an unmanned submarine that can shoot out of the water and turn into an unmanned aerial vehicle.[48]

[44] NOVA, "Rise of the Drones"
[45]"Hubble Space Telescope" http://www.nasa.gov/mission_pages/hubble/story/index.html
[46] NOVA, "Rise of the Drones"
[47] Estes, Adam Clark, "The Future of Drone Warfare is Scary", The Atlantic, February 6, 2013 http://www.theatlanticwire.com/technology/2013/02/future-drone-warfare-is-frightening/61884/
[48] Estes, Adam Clark, "The Future of Drone Warfare is Scary", The Atlantic, February 6, 2013 http://www.theatlanticwire.com/technology/2013/02/future-drone-warfare-is-frightening/61884/

Autonomous drone technology is important because ensures the integrity of the drone and its mission. Presently, drones are reliant on satellite links to connect the operators to the drone. The links routinely fail for reasons such as poor weather or that the pilot turned the UAV too quickly. When these systems fail, the operators cannot communicate with the drone, and the drones may crash. More importantly, there are fears that an unwanted third party could hack into the drone's computer systems or satellite links and take over control. If this occurred a third party would gain control of the drone, its technology, and weapons system.

In December of 2011, the U.S. controlled Sentinel drone crashed in Iran. The Iranian government showed what appeared to be a fully intact drone on Iranian television. The Iranian government claimed that it hacked into and disabled the drone.[49] While the U.S. military has not officially admitted it, many insiders believe Iran was able to hack into the Sentinel's communication link. Now there are reports that China may have reverse engineered and replicated the Sentinel drone.[50]

OPERATIONS WITHIN THE U.S.

UAV operation within the United States is primarily limited to government use. Currently the government authorizes drones for police investigations, scientific research, and boarder control.[51] However, a 2012 law, called the FAA Modernization and Reform Act, requires the FAA to fully integrate UAVs into the National Airspace System by September 2015.

As of April 2013, 327 drones were licensed by the FAA to fly over U.S. soil. By 2020, the FAA expects that number to reach 30,000.[52] Current FAA regulations allow an individual

[49] http://www.washingtonpost.com/world/national-security/iran-says-it-downed-us-stealth-drone-pentagon-acknowledges-aircraft-downing/2011/12/04/gIQAyxa8TO_story.html?wprss=rss_national-security
[50] http://www.wantchinatimes.com/news-subclass-cnt.aspx?id=20130605000107&cid=1101
[51] http://www.mcclatchydc.com/2013/04/29/v-print/189894/uncertainties-remain-as-faa-integrates.html
[52] http://www.mcclatchydc.com/2013/04/29/v-print/189894/uncertainties-remain-as-faa-integrates.html

without FAA approval to fly a UAV, for non-commercial purposes, when the aircraft is kept below 400 feet and is flown a sufficient distance from populated areas and full scale aircraft.[53] In July of 2013, the FAA, approved the Insitu's Scan Eagle X200 and AeroVironment's PUMA for domestic commercial use.[54]

Many within the drone community are excited by the relaxation of rules related to drones. By one estimate the domestic drone market is a $90 billion industry.[55] The Association for Unmanned Vehicles International, an Arlington, VA based trade group, estimates that within the first three years of drone introduction into the domestic marketplace will result in $13.6 billion in economic activity and 34,000 new manufacturing jobs.[56] The domestic drone market will allow drones for a variety of uses from first responders in search and rescue missions after natural or manmade disasters, scientific research, crop dusting, disease detection, and oil rig inspection to such basic uses as pizza delivery.

Meanwhile privacy advocates worry about the unexpected consequences and/or overzealous use of drones. In the 1980s, the Supreme Court ruled that the Fourth Amendment does not categorically prohibit the government from carrying out warrantless aerial surveillance of private property.[57] At the time, aerial surveillance entailed the use of manned aircraft, which was dramatically more expense and less technologically sophisticated than today's drones. The fear is that federal, state, and local law enforcement will overzealously utilize today's drones. Given the capabilities of ARGUS, infrared cameras, and the stamina of drones, these fears are not totally unwarranted. In response, this year Idaho became the second state to restrict police

[53] http://www.faa.gov/about/initiatives/uas/uas_faq/index.cfm?print=go
[54] http://www.theverge.com/2013/7/30/4572618/faa-approves-first-commercial-uav
[55] http://www.mcclatchydc.com/2013/04/29/v-print/189894/uncertainties-remain-as-faa-integrates.html
[56] http://www.dailycamera.com/news/boulder/ci_23787473/boulder-businessmen-targeting-agriculture-drones
[57] https://www.aclu.org/files/assets/protectingprivacyfromaerialsurveillance.pdf

and public agencies use of drones. The Idaho law requires, in most cases, that law enforcement obtain warrants to collect evidence using drones.[58]

V. Drone Use Abroad

On September 18, 2001, President Bush signed the Authorization for Use of Military Force (AMUF). The bill authorizes the president to use all necessary and appropriate force against those nations, organizations, or persons he determines planned, authorized, committed, or aided the terrorist attacks that occurred on September 11, 2001, or harbored such organizations or persons, in order to prevent any future acts of international terrorism against the United States by such nations, organizations or persons.

Despite President Barack Obama's recent call to reduce the United States' reliance on drones, they will likely remain the administrations weapon of choice. Whereas President George W. Bush oversaw fewer than 50 drone strikes, President Obama has signed off on over 400.[59] The drone strategy is seen by many as the centerpiece of U.S. counterterrorism strategy. The Obama administration opts for drones use because drone strikes allow for maximum strike capabilities at low financial and human cost.

In February of 2013, a confidential Department of Justice White Paper entitled, "Lawfulness of a Lethal Operation Directed Against a U.S. Citizen Who is a Senior Operational Leader of Al'Qaida as An Associated Force" was leaked to the press. The white paper's stated goal is to, "set forth a legal framework for considering the circumstances in which the U.S. government could use lethal force in a foreign county outside the area of active hostilities against a U.S. Citizen who is a senior operational leader of al-Qa'ida or an associated force of al-Qa'ida

[58] http://www.reuters.com/article/2013/04/12/us-usa-drones-idaho-idUSBRE93B03S20130412
[59] http://www.brookings.edu/research/articles/2013/06/17-drones-obama-weapon-choice-us-counterterrorism-byman

– that is, an al-Qa'ida leader actively engaged in planning operations to kill Americans."[60] According to this document, once the following circumstances are met a U.S. operation may use lethal force against a U.S. citizen in a foreign country without violating notions of due process, federal law barring unlawful killings, or the assassination ban in Executive Order 12333: 1) an informed, high-level official of the U.S. government has determined that the targeted individual poses an imminent threat of violent attack against the United States, 2) capture is infeasible, and the United States continues to monitor whether capture becomes feasible; and 3) the operation would be conducted in a manner consistent with applicable law or war principals.

The language set forth in the White Paper is a bit murky. For example, "imminent" threat of violent attack against the United States does not require the United States to have clear evidence that a specific attack on U.S. persons or interests will take place in the immediate future.[61] The paper goes on to state, that "delaying action against individuals continually planning to kill Americans until some theoretical end stage of the planning for a particular plot would create an unacceptably high risk that the action would fail and that American casualties would result".[62] Critics, such as Georgetown University law professor Rosa Brooks, question whether AUMF still justifies drones strikes because many of the groups now being identified as threats don't fall clearly under AUMF's umbrella – and many do not pose a significant danger to the United States.[63]

Critics of U.S. drone policy argue that the policy is not transparent and is exclusively consolidated within the executive branch. One commentator made the point that

[60] Department of Justice White Paper, "Lawfulness of a Lethal Operation Directed Against a U.S. Citizen Who is a Senior Operational Leader of Al'Qaida as An Associated Force", page 1
[61] Department of Justice White Paper, "Lawfulness of a Lethal Operation Directed Against a U.S. Citizen Who is a Senior Operational Leader of Al'Qaida as An Associated Force", page 7
[62] Department of Justice White Paper, "Lawfulness of a Lethal Operation Directed Against a U.S. Citizen Who is a Senior Operational Leader of Al'Qaida as An Associated Force", page 7
[63] Byman, Daniel, "Why Drones Work", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 40

unacknowledged detentions or killings of U.S. citizens is similar to techniques employed by Argentina's military junta during the "dirty war" of the 1970's.[64] Others claim that the drone policy has taken on a life of its own, to the point where tactics are driving strategy rather than the other way around.[65]

Critics contend that a drone program that seeks to destroy al Qaeda by killing off its leadership is not effective (a process known as decapitation). Terrorist groups that were destroyed through decapitation looked nothing like al Qaeda: they were hierarchically structured, characterized by a cult of personality, areless than ten years old, and they lacked a clear succession plan. In contrast, al Qaeda was never singularly dependent on Osama bin Laden, the group is 25 years old, and is adept at replacing dead operatives.[66]

While drone strikes are safe and cost effective, critics believe the strikes undermine Washington's goal of destroying al Qaeda. The targeted killings have not thwarted the group's ability to replace leaders, nor has it undermined its propaganda efforts. Since Washington uses lethal force against individuals whose identities and activities are not completely known, al Qaeda is able to use footage of drone strikes to portray Americans as immoral bullies who care less about ordinary people than al Qaeda. While it is easy to kill an individual terrorist with drone strikes, it is nearly impossible to control al Qaeda's powerful internet presence.[67]

Another reason the drone strikes may not be the most effective weapon against al Qaeda is that decapitation generally works best when group members can be easily separated from the general population. This is not the case with al Qaeda, thus critics argue that decapitation has morphed into a remote controlled campaign of repression. Historically, campaigns of repression

[64] Cole, David, "What's Wrong with Obama's Drone Policy", The Nation, February 13, 2013, http://www.thenation.com/article/172898/whats-wrong-obamas-drone-policy#axzz2fXOZZLjx
[65] Cronin, Audrey Kurth, "Why Drone Fail", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 44.
[66] Cronin, Audrey Kurth, "Why Drone Fail", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 45.
[67] Cronin, Audrey Kurth, "Why Drone Fail", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 46

are costly, difficult to sustain, and often results in violence spreading to neighboring countries or regions which we are seeing as al Qaeda expands its footprint in the Middle East, North Africa, and the Caucasus.[68]

Proponents of drone strikes counter that the drone policy does not violate due process. Since 2001, the courts and Congress have reaffirmed the validity of AUMF.[69] The Obama administration contends that discussion held within the executive branch and the extensive vetting process constitute a form of due process.[70] Lastly, the Department of Justice argues that it should not intercede because it is well established that "matters intimately related to foreign policy and national security are rarely proper subjects for judicial intervention.[71]

There is very little argument that drones allow for targeted killing of terrorists leaders. The drones can track, observe, follow, and deliver lethal force with minimal amounts of collateral damage. Proponents of drone attacks against terrorist leaders argue that targeting individuals with leadership roles is effective because these leaders are hard to replace and with top level management out of the way, lower level individuals are prematurely promoted to undeserved leadership roles. These new leaders are not properly vetted, and prone to errors and miscalculations which erodes the groups' effectiveness.[72]

In addition to destroying leadership, drones severally hamper communications. A tip sheet found among jihadists in Mali advised militants to "maintain complete silence of all

[68] Cronin, Audrey Kurth, "Why Drone Fail", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 47
[69] Byman, Daniel, "Why Drones Work", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 40
[70] Byman, Daniel, "Why Drones Work", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 40
[71] Department of Justice White Paper, "Lawfulness of a Lethal Operation Directed Against a U.S. Citizen Who is a Senior Operational Leader of Al'Qaida as An Associated Force", page 10
[72] Byman, Daniel, "Why Drones Work", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 33

wireless contacts" and "avoid gathering in open areas".[73] Proponents argue, that if terrorists can't communicate or gather together, their ability to operate is contained.

Proponents also argue that drone strikes are supported by locals. In support of this position, they cited Middle East scholars C. Christine Fair and Christopher Swift, whose research suggests that it is hard to detect any blowback against the United States' use of drone attacks. They insist that many locals grudgingly support drones and recognize their utility.[74] In addition, the United States has operated drones with the support of host countries such as Pakistan and Yemen. Sometimes going so far, as in the case of Pakistan, to conduct goodwill kills against Pakistani militants, like Nek Muhammad, who threatened Pakistan far more than the United States.[75]

IV. CONCLUSION

Each year individuals are finding new, exciting, and sometime scary ways to utilize drones. While drone technology and development has come a long way, this field is still in its infancy. The future of drone technology and warfare is autonomous operation. What form that ultimately takes is impossible to predict. Nonetheless, drones will become more commonly utilized by the military and private sector. There uses will be everything from help us kill our enemies to deliver pizzas. The technology is so cheap and readily available that drone use has the strange dynamic of making us safer, yet, at the same time more vulnerable. Hopefully, it is the former and not the latter.

[73] Byman, Daniel, "Why Drones Work", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 33
[74] Cronin, Audrey Kurth, "Why Drone Fail", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 51
[75] Byman, Daniel, "Why Drones Work", Foreign Affairs, July/August 2013, Volume 92, Number 4, page 38