TOWARD UNMANNED POWER

How a Revolution in Military Affairs is Transforming the Way We Understand Warfare in the Twenty-First Century

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1. The Unmanned Revolution

Beginning this year in 2010, the United States Department of Defense will purchase more unmanned aerial vehicles than manned aircraft.[1] At the same time, the country's air force will continue training more unmanned system operators than conventional pilots. This measurable shift in U.S. military doctrine is clear and tangible evidence of the changing nature of warfare. The world's sole military superpower is now becoming increasingly dependent on unmanned machines to engage in battle on its behalf with the intention of saving friendly lives and enhancing military effectiveness.

Unmanned Aircraft Systems (UAS) have already begun inheriting roles of intelligence, surveillance, reconnaissance, and even targeted assassinations. Their proliferation in U.S. military operations has contributed to the success of numerous missions while reshaping the concept of the American air force. In fact, Congress has mandated that by 2010, one-third of all operational U.S. aircraft designed to strike behind enemy lines shall be unmanned.[2] The military currently has over seven thousand UAS in its inventory—often referred to as Unmanned Aerial Vehicles (UAVs), Remotely Piloted Vehicles (RPVs), Remotely Piloted Aircraft (RPAs), or simply "drones"—and this number will surely continue to escalate as demand for their service rises.[3]

What this means for American air power is a total revolution in the way warfare is conducted, monitored, experienced, and understood. Although absolutely no evidence indicates that human pilots are becoming extinct, it is certain that a growing number of tedious or

[1] P. W. Singer, "Will Foreign Drones One Day Attack the U.S.?" *Newsweek*, March 8, 2010, http://www.newsweek.com/id/234114 (accessed April 16, 2010).
[2] U.S. Congress, *National Defense Authorization, Fiscal Year 2001*, Sec.220, 106th Congress, Public Law, October 30, 2000, http://armedservices.house.gov/comdocs/billsandreports/106thcongress/hr5408law.pdf (accessed April 30, 2010).
[3] "Joint Effort on UAVs," *Air Force Times*, April 9, 2010, http://www.airforcetimes.com/community/opinion/airforce_editorial_uavs_041210w/ (accessed April 16, 2010).

hazardous missions will be carried out by UAS. Nor does evidence suggest that the military wishes to produce weaponized autonomous drones (as opposed to remotely operated systems) any time soon. Thus, the very essence of what it means to fight for one's country is being transformed through a Revolution in Military Affairs (RMA). No longer do pilots of UAS or soldiers operating surface-based unmanned systems have to risk their lives to accomplish a mission or investigate a threat. Instead, we are entering a new epoch of warfare wherein human physiological limits and vulnerabilities are being replaced by expendable machines.

This RMA is comparable to other historical examples in which the advent or exploitation of certain breakthrough technologies turned the tenets of warfare upside-down. Examples include the introduction of gunpowder, machine guns, airplanes, nuclear bombs, and the German strategy of blitzkrieg, as each was employed against entirely unprepared enemies. These advances in military doctrine caused armies worldwide to alter and adapt their weaponry, tactics, training, defenses, and structure after an RMA rendered them obsolete.[4] The current RMA of unmanned warfare has not yet brought about such change, because it is in the pioneering phase when the consequences and necessary changes to military tactics remain impossible to foresee.

Nonetheless, some of the more obvious effects of this technological shift have become apparent in recent years. The U.S. military has been logging valuable flight time with UAS in Afghanistan, Iraq, and Pakistan where elements of asymmetrical warfare have forced it to better safeguard its conventional forces. The duties of UAS range from surveying the battlefield to diligently tracking individual suspects; and since first being rigged with Hellfire missiles in 2001, UAS have been responsible for killing as many as one thousand enemy militants along the

[4] Michael O'Hanlon, *Technological Change and the Future of Warfare*, 1st ed. (Washington, DC: Brookings Institution Press, 2000), p. 20.

Afghanistan-Pakistan border alone.[5] Moreover, the MQ-1 Predator and MQ-9 Reaper—the United States' most notorious attack UAS—have been used to successfully target and kill over *half* of al-Qaeda's top twenty leaders.[6] And this has all been accomplished without sacrificing the life of a single UAS crew member.

These statistics demonstrate the utility and effectiveness of unmanned systems in conflicts characterized by guerilla warfare and counterinsurgency operations. For precisely this reason, UAS have become a vital part of the United States' grand strategy in the War on Terror as well as a response to the security dilemma in post-invasion Iraq. Sending unmanned armed machines into jeopardous hostile environments rather than risking human lives is fundamentally changing the equation for U.S. military affairs. Battles can now be waged in which American blood need not be spilled.

Indeed, the very idea of engaging in battle without having to compromise one's life is a key attribute of this RMA. While technologies such as long-range artillery and missiles have kept troops out of harm's way throughout countless wars, never before have unmanned optical sensors allowed soldiers to monitor and interact with the battlespace from so far away. At the current stage of UAS technology, pilots who are located on stable ground can operate aircraft using computer screens and joysticks. Depending on the UAS, some types must be controlled within the immediate vicinity, while others can be controlled from halfway around the globe. Utilizing satellite uplinks and transatlantic fiber-optic cables, pilots at Creech Air Force Base in Indian Springs, Nevada, and similar locations within the United States wage war in the Middle East every day from nearly eight thousand miles away. While the aircraft can stay aloft twenty-

[5] Peter Bergen and Katherine Tiedemann, "The Year of the Drone," Counterterrorism Strategy Initiative, http://counterterrorism.newamerica.net/drones (accessed April 25, 2010).
[6] Nic Robertson, "How Robot Drones Revolutionized the Face of Warfare," CNN, July 26, 2009, http://www.cnn.com/2009/WORLD/americas/07/23/wus.warfare.remote.uav/index.html (accessed April 25, 2010).

four hours a day, the crews piloting them alternate in shifts to patrol the battlefield, which allows them to return to the comforts of home at day's end.[7] They never see their targets beyond pixilated, often infrared imagery, never physically expose their bodies to the heat of battle, and never undergo G-forces as their aircraft buzz through the sky halfway around the world. But the truth is that these changes may be far more complex than anyone can presently envisage.

One thing can be established, however. Through this RMA, the United States military is transforming not only the way it fights wars, but also who fights them and how the resultant violence is understood. Unlike most RMAs of the past when breakthrough technologies helped transform warfare by dramatically improving the lethality and efficiency of weapons, this revolution is shaking the very foundations of traditional wartime policy. In other words, the use of unmanned systems is an utter deviation from the conventional conduct of war, not merely a change in its degree.

So, if this RMA is causing nations and armies to reconsider their comprehension of what it means to fight, perhaps it is time to open a discussion on its repercussions. It may be obvious *why* the United States and at least forty other countries are pursuing UAS technology,[8] but it has yet to be determined when or how this strategic shift will alter military culture and the sociopolitical dynamics of international relations. This work seeks to shed light on such lingering questions as well as address new concerns about the nature of unmanned warfare. For instance, how will the physical disconnect affect soldiers' appreciation for the violence and valor of war? Will it become easier for leaders to justify military intervention abroad when only machines are at stake? And at what point will international consensus be needed to establish the rules of

[7] Lara Logan, "Drones: America's New Air Force," CBS News, August 14, 2009, http://www.cbsnews.com/stories/2009/05/08/60minutes/main5001439.shtml (accessed April 25, 2010).
[8] Max Boot, *War Made New: Technology, Warfare, and the Course of History; 1500 to Today* (New York: Gotham, 2006), p. 440.

unmanned war? To approach these questions, this analysis has been divided into the following sections:

- Part one discusses the basis for unmanned weapons by addressing the question of why militaries want to pursue the technology in the first place.
- Part two provides a brief history of unmanned military systems in order to achieve an in-depth understanding of their progression toward the current RMA.
- Part three investigates how the United States Air Force perceives its shift toward unmanned aerial vehicles, based on the opinions of interviewed pilots and officers.
- Part four examines scholarly views on how past technological changes have transformed mankind's conception of war.
- Part five applies this scholarship to the hypothesis that unmanned systems are revolutionizing the way we fight, experience, and understand war in the twenty-first century.

The end result is a comprehensive and evocative look into one of the most pressing and relevant issues affecting military affairs and global relations today. Realizing that mankind is on the threshold of a revolution in military affairs must be brought to the forefront of discussion in both the political and public spheres. This is especially pertinent to the United States since, although American forces presently hold supremacy in the field of remote-controlled technology, other nations and organizations will soon follow suit by integrating their own unmanned systems into defense structures. Hence, the United States, as a society, must establish exactly what this revolution entails before potentially opening a Pandora's box the likes of which has not been seen since the Manhattan Project. This study aims to provide a framework and catalyst for popular discussion on this matter.

2. Why Unmanned?

The answer is simple: to prevent the unnecessary loss of human lives. By removing the human presence from a machine, the apparatus inherently becomes lighter, feasibly smaller, unrestricted by physiological limitations, and entirely replaceable. For these reasons, warring parties throughout history have incessantly pursued the advantages of remotely triggered weapons. The earliest of such developments may have included throwing an object—perhaps a stone or a spear—at an intended target. Though it may seem like a very minor technological step, the act of inflicting damage *from a distance* already exceeds the capabilities of most species on Earth. In fact, very few life-forms have learned to employ tools or projectiles for defense and survival purposes.

With that said, human beings have become very good at the art of war. Despite its perils and devastation, our greed and unwillingness to compromise have inspired inventors from every culture to devise new weapons in order to attain advantage over one's enemy. Following a never-ending cycle of reciprocal development, our creations have become more complex, more destructive, and most importantly, more efficient. On the other hand, each new improvement has concurrently challenged the survivability of soldiers, thus equally inspiring the creation of stronger defense mechanisms. Yet, no matter how thick a castle's wall or how impenetrable a tank's armor, no soldier has ever been truly invincible on the battlefield. That is, until now.

From anywhere on the planet, the operators of an unmanned unit can subdue an enemy from the comfort—and distance—of a ground control station. Although the unmanned vehicle itself can be defeated or destroyed, it would require nearly inconceivable measures to kill the person behind it. The true advantage of this feature is best described by the United States Air Force's recent slogan for UAS, which emphasizes their ability to "project power without

projecting vulnerability."[9] While some may argue that a similar catchphrase could have been used upon the advent of any long-range weapon, never before has technology permitted the amount of control and observable feedback made possible with modern UAS.

On that note, it is necessary to differentiate the nature of unmanned combat systems from weapons such as guided missiles or other technically "uninhabited" weapons. For starters, UAS are capable of long-term surveillance during which they can designate, track, and engage targets under the control of an operating crew. Unmanned systems are also recoverable, reusable, and usually capable of accomplishing multiple missions in a single deployment. These critical dissimilarities separate UAS from mere projectiles or missiles no matter how maneuverable they may be. A cruise missile is therefore *not* an unmanned aerial vehicle.

One final and crucial distinction is that modern UAS are not "drones" despite the mass media's frequent use of the term. By definition, a drone is a pre-programmed automaton that lacks human guidance once it has been activated.[10] Modern UAS instead provide a controllable and sustainable platform for aviators to enter combat as if they were inside the aircraft themselves. Unmanned systems are therefore an extension of human strength, not an independent substitute. The uninterrupted presence of a remotely located controller is an essential component to today's unmanned systems. And most important of all, UAS provide the benefit of whatever distance necessary to keep their operators fully out of danger.

This vantage of unmanned power is proving to be especially valuable in modern conflicts characterized by guerilla or terrorist strategy. UAS can be used to fly miles overhead to monitor the clandestine activities of enemy operatives, and when the aircraft are armed with precision

[9] U.S. Air Force, "Predator CAPs Double in One Year," http://www.af.mil/news/story.asp?id=123097490 (accessed April 15, 2010).
[10] Director for Operational Plans and Joint Force Development, *Department of Defense Dictionary of Military and Associated Terms* (Washington, DC: Department of Defense, 2009), p. 171.

missiles, operators can extinguish threats themselves. In many ways, UAS are a response to the unpredictability of guerilla warfare as they make it much more difficult for enemies to exploit the frustration of conventional forces. After all, guerilla warfare "relies on harassment and attrition to achieve its goals,"[11] but to do so, it must directly affect the well-being of enemies. The use of unmanned systems impairs the effectiveness of guerilla strategy by minimizing the presence, fatigue, and vulnerability of those who operate them. While, again, it may be possible to defeat the machine itself, attrition-oriented tactics will do little to discourage the soldiers behind it. Thus, the stamina of militaries that employ unmanned power has much less to do with psychological fortitude than it does with economics. As long as the resources for producing unmanned combat machines continue to exist, a guerilla war against these machines cannot be won.

In sum, the use of unmanned systems is advantageous in conventional and asymmetrical warfare. Their expendability and durability allow users to maintain force for unprecedented spans of time while consuming minimal resources. As Gordon Johnson of the United States Joint Forces Command blatantly put it, "[Unmanned systems] don't get hungry. They're not afraid. They don't forget their orders. They don't care if the guy next to them has just been shot."[12] In a world where human capital is a scarce and valuable commodity, it is only logical that militaries would wish to pursue the technology for unmanned power.

[11] Martin van Creveld, *Technology and War: From 2000 B.C. to the Present* (New York: Free Press, 1989), p. 304.
[12] P. W. Singer, *Wired for War: The Robotics Revolution and Conflict in the 21st Century* (New York: Penguin, 2009), p. 63.

3. From Radio-Controlled to Counterterrorism: A Century of Progress

Throughout history armies have strived to possess such safe power as made possible with remotely controlled weapons. But the technologies necessary to realize this vision have been developed only within the last century. Radio-controlled planes were first adapted for military use as far back as World War I.[13] However, these primitive designs were often nothing more than navigable airborne explosives used for kamikaze attacks.

During World War II, contending armies experimented further with radio-controlled unmanned vehicles. Yet, although the U.S, and Nazi militaries made significant leaps in remotely operated technologies, their creations were far too cumbersome and expensive for widespread use. In addition to serving as essentially flying torpedoes like those of World War I, the unmanned aircraft of the 1940s were occasionally equipped with automatic cameras and eventually with television cameras for reconnaissance and intelligence. This proved highly valuable when drones could be pre-programmed to fly in circles or flown directly over a photographable target. But in the end, the oversize rolls of film, unreasonable costs, and immense manpower required for these surveillance machines were altogether too inconvenient for leaders to seriously consider them a large-scale replacement for human pilots. It would take another two decades of technological progress to facilitate more complicated and efficient unmanned missions.

The first extensive use of semi-sophisticated UAS was during the Vietnam War. The United States military tried adamantly throughout the conflict to develop unmanned aerial vehicles for reconnaissance purposes, and ultimately sent UAS to fly some 3,435 sorties

[13] National Air and Space Museum, "Military Unmanned Aerial Vehicles (UAV)," National Air and Space Museum, Smithsonian Institution, www.nasm.si.edu/exhibitions/gal104/uav.cfm (accessed April 1, 2010).

throughout the 1960s and 1970s.[14] Most of these flights were carried out by products of the Ryan Aeronautical Company, most famous for its 147A Fire Fly and 147B Lightning Bug jet-propelled drones (see appendix 1). In all their simplicity, these UAS were a minor step up from the company's orange-painted target drones that had been in use for years to train U.S. Air Force and Navy pilots in air-to-air combat. The design of the target drones was then slightly altered to accommodate surveillance equipment, and in some instances, they were made capable of staying aloft for up to two hours. While their capabilities may seem trivial by today's standards, the technological progress was evident and UAS were gaining far more attention than ever before.

In fact, the Vietnam War convinced many U.S. officials to endorse the benefits of unmanned power—especially after it was realized that 90 percent of all American prisoners of war in Southeast Asia were downed pilots or airmen, and five thousand American deaths had resulted from aircraft-related incidents.[15] The majority of these losses were not the direct result of encounters with the enemy North Vietnamese Air Force, but were consequences of surface-to-air resistance, human error, or equipment malfunctions while American lives were onboard.

During the Cold War other instances similarly encouraged the United States to develop its unmanned aircraft program. For starters, the 1960 debacle that ensued after a U-2 spy plane was shot down over the Soviet Union provided sufficient motive for the American intelligence community to evolve its surveillance techniques. Upon capture, the airplane's pilot, Captain Francis Gary Powers, became the focus of international controversy and the subject of heated debate between the rival superpowers. According to Russian courts, Powers's participation in the flight was enough for him to be convicted of espionage and sentenced to several years of hard

[14] James Hasik, *Arms and Innovation: Entrepreneurship and Alliances in the Twenty-First Century Defense Industry* (Chicago: University of Chicago Press, 2008), p. 33.
[15] Paul Dickson, *The Electronic Battlefield* (Bloomington, IN: Indiana University Press, 1976), p. 185.

labor in a Soviet prison. In the end, it was an embarrassment for U.S. intelligence and an unnecessary point of friction in the Cold War.

In stark contrast, only four years later, on November 15, 1964, the People's Republic of China claimed to have shot down an American Ryan 147 drone. Within a year, the Chinese government would attest to having captured as many as *eight* such drones from its skies.[16] The fact that these stories from China never received the same level of attention as the prior Soviet episode indicates the vast difference in how human and machine casualties are perceived. Perhaps the Soviet Union's frustration warranted greater international coverage, but nonetheless, the United States was never forced to defend, in a public forum, its presence in China via unmanned aircraft. At least, it did not have to negotiate in the way it had when Captain Powers's life was in jeopardy. This lesson gave ample reason for the U.S. military to shift toward UAS to carry out more of its spy-plane missions. After all, when a machine crashes, it cannot be prosecuted or tortured.

It was, however, the Israelis who arguably achieved the first great demonstration of offensive unmanned air power in its campaigns against Egypt in 1972 and Syria in 1982. Israel had been developing unmanned systems for years before using them to fly into neighboring countries at the forefront of attacks. Reports show that when launching an air strike on the Bekaa Valley of Syria in 1982, the Israeli military flew swarms of Tadiran Mastiff and IAI Scout unmanned aerial vehicles (see appendix 2) into hostile airspace before sending its manned air force. The initial wave of UAS triggered Syrian anti-aircraft defenses to fire upon the unmanned planes, and by the time the Syrians were able to reload their surface-to-air missiles, conventional Israeli jets swept in and bombed their positions.[17] This innovative strategy of using UAS like

[16] Ibid., p. 187.
[17] Singer, *Wired for War*, p. 56.

pawns on a chessboard is something the future is bound to see more of. The expendability and infinite courageousness of UAS make them the perfect choice for not only extended surveillance, but also for spearheading "shock and awe" or blitzkrieg assaults.

In the 1990s United States President Bill Clinton recognized the intrinsic advantages of UAS when his administration was faced with the decision to send troops to the Balkans. In order to quell the worsening situation in Bosnia and Herzegovina, Clinton knew that U.S. intervention was necessary but would most certainly lose public support at home upon the first American casualties.[18] This notion provided the impetus for the Pentagon's Defense Advanced Research Projects Agency (DARPA) to immediately expand development programs for various UAS.

Such projects included General Atomics RQ-1A Predator (see appendix 3) which, by 1995, was deployed to the Balkans where as many as nineteen served as sustainable reconnaissance platforms to monitor troop and refugee movement.[19] By 1999, Predators were flying regular orbits over the region, especially over Kosovo where NATO forces had begun conducting air strikes. Although UAS were not yet weaponized themselves, several were equipped with laser designators to help guide other aircrafts' precision weapons to their targets. Having UAS, rather than pilots, track and illuminate enemy targets proved to be an invaluable advantage throughout NATO's air campaign.

Meanwhile, the United States had recently perfected the technological capacity to control UAS from greater distances than ever before using its Global Positioning System (GPS). This network of orbiting satellites allows American military units to relay positional information at near-instantaneous speeds from anywhere on the planet with pinpoint accuracy. Thus, by the late 1990s UAS could be flown from locations safe within the United States while observing territory

[18] Hasik, *Arms and Innovation*, p. 34.
[19] Ibid., p. 38.

half a world away. The United States continues to maintain a monopoly on its GPS although competing navigation systems including China's *Beidou*, Europe's *Galilleo*, and Russia's *GLONASS* are scheduled to be online within the next few years. Until then, the United States will continue to be the only nation in the world with a military infrastructure truly capable of wielding global unmanned power.

Perhaps the most critical step, however, in the U.S. military's ability to "project power without projecting vulnerability"[20] came in 2001 when, for the first time ever, its Air Force successfully fired live munitions from an airborne unmanned vehicle. The initial test was carried out on February 21 of that year when a Predator UAV armed with a laser-guided AGM-114C Hellfire missile (see appendix 4) targeted and destroyed a stationary tank on the Nevada desert floor.[21] Never before had a reusable UAS fired a weapon, let alone launch a 100-pound missile, and it did so with stunning accuracy and flawless technique. The United States suddenly had a way to engage and eliminate threats using the same unmanned platform capable of meticulously monitoring battlefields from thousands of miles away. Therefore, the delay of waiting for an air strike or cruise missile was no longer a necessary inconvenience. When armed with their own multipurpose anti-tank missiles, UAS operators could now finish the job themselves.

In fact, one of the driving forces behind America's decision to equip UAS with missiles had occurred earlier in 2000 when an unarmed CIA surveillance Predator reportedly spotted Osama bin Laden in Afghanistan but could do nothing about it.[22] As the UAS crew simply watched bin Laden walk about Tarnak Farm, they realized it would take several hours before an air strike could arrive. And by the time a bomb could be dropped on the farm, bin Laden would

[20] U.S. Air Force, "Predator CAPs Double in One Year."
[21] Sue Baker, "Predator Missile Launch Test Totally Successful," Air Force News Service, February 27, 2001, www.dau.mil/pubscats/PubsCats/PM/articles01/afns1m-a.pdf (accessed March 26, 2010).
[22] David Ensor, "Drone May Have Spotted Bin Laden in 2000," CNN, March 17, 2004, http://www.cnn.com/2004/WORLD/asiapcf/03/17/predator.video/ (accessed March 23, 2010).

have surely changed location anyway. Though this is the only confirmed sighting of bin Laden since then, some believe Predator spy planes had indeed tracked him several times between 2000 and 2001 as he traveled back and forth between training camps, usually by convoy.[23] Nonetheless, it took only the one confirmed sighting before CIA officials demanded that UAS be able to kill when high-value targets enter their crosshairs.

Within a year after the initial 2001 Predator-Hellfire tests in Nevada, the Central Intelligence Agency began deploying its own weaponized UAS to the Middle East. Soon President George W. Bush began authorizing the CIA himself to conduct "drone strikes" for the assassinations of various al-Qaeda and Taliban leaders. The first of such strikes took place in Yemen on November 3, 2002, when a CIA Predator UAS delivered a lethal blow to six al-Qaeda members riding in a vehicle alongside Abu Ali al-Harithi.[24] According to intelligence, al-Harithi had been the mastermind behind the October 2000 bombing of the USS *Cole*, which had resulted in the death of seventeen American sailors as it was anchored in the Gulf of Aden, off shore of Yemen. Bush would later approve a total of forty-five UAS strikes throughout his presidency, most of which took place during his last year in office.[25]

In the meantime, during the Bush Administration, the Pentagon continued to roll out new models of UAS with increasingly powerful capabilities. The first to debut was an upgraded version of the battle-proven Predator, the MQ-9 Reaper (see appendix 5). At about one-third larger than its predecessor, the Reaper can travel three times the speed, fly higher, stay aloft longer, and carry more than *fifteen* times the ordnance.[26] Hence, it quickly earned the title of the

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[23] Singer, *Wired for War*, p. 34.
[24] Dana Priest, "U.S. Military Teams, Intelligence Deeply Involved in Aiding Yemen on Strikes," *Washington Post*, January 26, 2010, http://www.washingtonpost.com/wpdyn/content/article/2010/01/26/AR2010012604239.html (accessed April 23, 2010).
[25] Bergen and Tiedemann, "The Year of the Drone."
[26] U.S. Air Force, "'Reaper' Moniker Given to MQ-9 Unmanned Aerial Vehicle," http://www.af.mil/news/story.asp?storyID=123027012&.com (accessed March 31, 2010).

first true "hunter/killer" UAV. Together, the Predator and the Reaper currently form the core of the U.S. military's attack-UAS program. In fact, the majority of all pilots trained by the Air Force in recent years have been trained to operate one of these two unmanned systems.

Another UAS added to the Air Force's inventory in the twenty-first century was the Northrup Grumman's RQ-4 Global Hawk (see appendix 6). Essentially built to replace the outdated U-2 spy plane of the Cold War, the Global Hawk has the capability of reaching any point on the planet within a matter of hours. The aircraft, however, is not designed to carry weapons. Instead, it is primarily used to survey ground activity within a three hundred-mile radius while flying twelve miles above the battlefield.[27] Its appeal has attracted customers worldwide including NATO, Germany, and even NASA, which has recently been using its own Global Hawks for high-altitude atmospheric sampling.[28] For military purposes, this means having an "eye in the sky" with greater range and sustainability than ever before. Not to mention, if a Global Hawk were ever to be shot down while spying over enemy airspace, its operators would never be in danger, let alone have to serve time in a Soviet prison as Captain Gary Powers did in 1960.

Today, the U.S. Air Force flies Predators, Reapers, and Global Hawks over Afghanistan and Iraq twenty-four hours a day to keep a constant eye on the battlefield below. The aircrafts' multi-spectral sensors allow operating crews to gather intelligence and watch out for enemy insurgents planting roadside bombs or mounting guerilla attacks on friendly forces. To do so, the Air Force currently flies long-range UAS in at least thirty-five simultaneous orbits, with hopes of

[27] Discovery Channel, "Future Weapons: Global Hawk," March 14, 2007, http://dsc.discovery.com/videos/futureweapons-global-hawk.html (accessed April 25, 2010).
[28] Mike Carlowicz, "NASA's Global Hawk Completes First Science Flight Over the Pacific," National Aeronautics and Space Administration, Smithsonian Institution, http://www.nasa.gov/topics/earth/features/global-hawk.html (accessed April 22, 2010).

increasing this number to fifty by the year 2011.[29] Many, if not most, of the Predator and Reaper UAS flying these orbits are equipped with Hellfire missiles or even more powerful 500-pound GBU-38 bombs. Within seconds after receiving permission to engage, UAS pilots can use these weapons to obliterate enemies in their sights. Moreover, American ground troops can indicate exactly where they need an air strike using handheld ROVER computer screens (see appendix 7) that offer real-time images from the UAS above. With a text message, the UAS operating crew can fulfill troops' requests from eight thousand miles away by dropping a bomb wherever needed. All the pilots ever see is a bright flash on their screen followed by a billowing black cloud of smoke.

It is also worth noting that every branch of the U.S. military has adopted some sort of unmanned unit. Although the Air Force's fleet of Predator and Reaper UAS currently dominates the realm of *weaponized* unmanned systems, other military branches have acquired their own reconnaissance types. Next in line would most certainly be the Army, which in addition to having an assortment of portable and mid-sized UAS, has increasingly expanded its inventory of Unmanned Ground Vehicles (UGVs). However, the development of UGVs has been relatively slow compared to that of UAS due to the difficulty of overcoming rough terrains. For this reason, most modern UGVs are limited to simple tasks and must be operated within the immediate vicinity. So far, their duties have included bomb defusing, urban scouting, and enemy cave spelunking. Some, however, like the Foster-Miller SWORDS (see appendix 8) have been designed to carry weapons ranging from assault rifles to rocket launchers in order to perform missions too risky for troops. But again, even these must be controlled from a nearby location, since UGVs can very easily get stuck or be captured. For instance, enemies can render UGVs

[29] Walter Pincus, "Air Force Training More Pilots for Drones than for Manned Planes," *Washington Post*, August 11, 2009, http://www.washingtonpost.com/wp-dyn/content/article/2009/08/10/AR2009081002712.html (accessed April 13, 2010).

useless by simply throwing a blinding tarp over its sensors or leading it into a trap hole. Future technological developments will surely fix these problems, but until then, unmanned ground vehicles are much too vulnerable and lack the maneuverability needed for long-range deployment. Thus, unmanned aircraft have become the weapon of choice for many current U.S. operations.

As proof, President Barack Obama, within his first year of being in office, has authorized more CIA counterterrorism "drone strikes" than George W. Bush had throughout his entire eight-year presidency. This is according to a recent study by the New America Foundation, which since last being updated on April 16, 2010, calculated that Obama has authorized eighty-four UAS strikes in Pakistan alone.[30] Compared to the forty-five that Bush approved, the number of unmanned CIA attacks has nearly doubled between presidents. What is more, these statistics fail to include the countless number of UAS bombings that have taken place in Afghanistan and Iraq. This is because presidents must approve only CIA strikes, not those conducted by the Air Force, Army, or other branches of the military in theaters of war. In fact, there are no longer any accurate public records on the total number of times UAS have launched their weapons.

What this means is that the use of lethal unmanned power has become a norm for the United States military. It seems like every day there is a new story about American UAS scoring a major kill or causing collateral damage in the Middle East. The U.S. military and President Obama are relying increasingly on unmanned machines to complete missions that would otherwise be too difficult or dangerous for conventional forces. Thus, after almost exactly one hundred years since the first bomb was dropped from an airplane in 1911,[31] the United States has

[30] Bergen and Tiedemann, "The Year of the Drone."
[31] R. G. Grant, *Flight: 100 Years of Aviation*, 1st U.S. ed. (New York: Dorling-Kindersley, 2004), p. 59.

revolutionized the meaning of air power by removing the pilot from the cockpit and sending high-tech instruments in their place.

4. An Air Force Perspective

To understand the true meaning of the metamorphosis taking place within the United States Air Force, it is necessary to gain a first-hand perspective from its pilots. After all, no one else could possibly be so passionate about and genuinely appreciative of the organization's legacy, capabilities, and future. To therefore complement the depth and diversity of this study, several cadets of the Air Force Reserve Officer Training Corps (ROTC) at American University in Washington, DC, agreed to participate in interviews about America's shift toward unmanned power. With much gratitude for their willingness to meet and discuss personal experiences with UAS, the following offers a glimpse into the mindsets of warriors currently at the vanguard of this revolution in military affairs. For reasons of anonymity, the interviewees have requested that their names be excluded.

After first establishing each participant's official rank and title, they were asked to describe what had initially interested them in joining the Air Force. While some indicated that their love for planes and flying had manifested since childhood, others saw the Air Force as a launch pad for future career goals. Enlisting meant having an exceptional opportunity to gain first-hand experience with cutting-edge communication and intelligence technologies, and if chosen, ultimately being able to fly some of the most advanced aircraft in the world. To these cadets, becoming a pilot or officer also comes with the honor of following in the footsteps of many of their heroes. A Cadet First Lieutenant mentioned his particular admiration for Chuck Yeager, the first man to travel faster than the speed of sound, whose courage and demeanor

helped shape modern concepts of the fighter pilot. Aspiring to his level of veneration gives recruits like these a preconceived idea of what it means to be an Air Force pilot and the honor it entails.

However, the cadets explained that before ever achieving the status of a pilot, they must apply to be considered in a rigorous selection process. Only after comparing the achievements of all applicants does the Air Force determine who will fly, who will not fly, and who may be best suited for the UAS program. Those with the most outstanding scores will be offered the opportunity to fly in the cockpit of a conventional fighter, bomber, or tactical aircraft. On the other hand, the standards for prospective pilots of unmanned systems are much more ambiguous. As one cadet noted, "Often the first thing that comes to mind when thinking about the qualifications needed to be a fighter pilot is having perfect vision. But to become a UAV operator, the standards are very different. You can wear glasses and don't necessarily have to be in top physical shape."[32] Thus, the classic notion that soldiers must be in their optimal physical condition to be prepared for battle may no longer hold relevance in remote-controlled warfare.

Another difference is that UAS recruits can potentially start in just about any division of the Air Force. It is relatively easy for an aircraft mechanic or air-traffic controller to be trained for unmanned systems. It is much more difficult to spontaneously switch paths toward becoming a traditional pilot. An interviewee even pointed out that the cost of training a UAV pilot is presently about $135,000 compared to $2.1 million to train an F-16 pilot.[33] And as research and development costs of unmanned systems continue to drop, the Air Force will send more teenage recruits straight into Predator and Reaper UAS programs.

[32] Anonymous air force cadet, interview by author, American University, Washington, DC, April 15, 2010.
[33] Ibid.

This is a drastic change from the very beginning of the twenty-first century when UAS had only recently been armed with missiles. At that time, it was mandated that pilots of weaponized unmanned platforms be experienced aviators of traditional warplanes, not young rookies who had never flown in combat before. Conventional pilots were preferred because they already had "a tactical sense of the airspace, the conscious awareness that they are in battle, and know what kind of indicators to look for in enemies" [34] explained a Cadet Third Class. Yet, now that UAS training programs have expanded greatly and UAVs have become more abundant and affordable, the Air Force is recruiting just about anyone who performs well in computer simulations. After all, modern UAS interfaces are not too terribly different from the computer games the recruits grew up playing. Many young cadets are already good at operating the unmanned systems before being trained.

The next set of questions pertained to the impact of the current RMA on the Air Force's culture, future, and wartime effectiveness. First, the ROTC cadets were asked if they had noticed any obvious changes occurring within the dynamics of Air Force unity. More specifically, had conventional pilots developed any negative attitudes toward the proliferation of unmanned systems? The majority of answers were, in fact, contrary to expectation. While one participant admitted, "Some pilots are annoyed by the lack of direct intervention and not actually being able to get in and exert influence themselves,"[35] most responses indicated that UAS are generally perceived as beneficial. As long as pilots are still allowed to do their jobs and fly planes, there is an overall appreciation for the advantages of unmanned power. Besides, modern UAVs are remarkably low-tech compared to the Air Force's inventory of jets. Until technology permits

[34] Ibid.
[35] Ibid.

faster, more maneuverable, and stealthier UAS, some jobs are still best left to conventional pilots.

As for the future of the U.S. Air Force, all interviewees conceded that the most logical and likely path will be for it to go increasingly, if not entirely, unmanned. Everything from strike-force aircraft to cargo planes will eventually be remotely controlled. The latter will be especially useful for picking up and dropping off supplies in hostile landing zones without having to risk the lives of crews. By unanimous agreement among the interviewed ROTC personnel, unmanned power will be the rational choice for the United States in the future. However, some cadets warned of what they refer to as "over-intel."[36] Short for "over-intelligence," this term describes the situation in which an unmanned machine acts with too much autonomy, and in the worst case scenario, harms the wrong person. A Cadet Third Class asserted, "At the end of the day, you need that human reason and logic in the system" and that hopefully, armed unmanned systems will always remain "one pilot, one system." [37] Anything else might turn out to be hugely irresponsible.

The next question again yielded completely unexpected answers. Assuming that the Air Force would be somewhat territorial over its realm of the airspace, the participants were asked how they felt about other branches of the military integrating UAS into their own orders of battle. Rather than insisting that the air should be protected as the Air Force's dominion, the cadets instead welcomed the increased use of UAS across the board. Any kind of system, they said, that acts as a force-multiplier for friendly troops is beneficial to the military at large. Thus, the Army, Navy, Marines, etc. should all be empowered to freely utilize the airspace to their

[36] Ibid.
[37] Ibid.

advantage. The less the Air Force needs to risk its assets, the better. Or as General Nathan F. Twining put it in 1956, "If our air forces are never used, they have achieved their finest goal."[38]

Nonetheless, the Air Force is still being used and indeed playing a vital role in current U.S. conflicts. The officers-in-training were then asked how they feel about this and particularly, how they perceive the role of UAS in the global War on Terror. Many acknowledged the effectiveness and practicality of UAS in situations of guerilla warfare, but some also pointed out the growing dependence ground troops have on these "eyes in the sky." UAS not only provide a perfect platform for coordinating attacks, but can now stay aloft longer than ever before to diligently monitor the battlefield. According to one cadet, this gives ground forces the reassurance that they are constantly being protected from above. They no longer need to worry about being abandoned, if even for a moment, when other planes need to land and refuel.[39] Moreover, UAS are capable of functioning much more like snipers than traditional bomber aircraft. They can find, follow, and engage their targets for longer periods of time rather than having to conduct hit-and-run missions that frequently result in collateral damage or missed opportunities.

Going along with this, the interviewees were asked to describe how piloting a UAV affects one's situational awareness and ability to focus on the right target at the right time. The most interesting response was that "cockpit pilots are often looking down at their instruments anyway. They only really have to look up when they need to get a sense of their bearings."[40] But the real difference is that UAS operators lack the 360-degree audiovisual experience that fighter pilots get from flying in a bubble canopy. "You can only take in what the system will allow you

[38] Combat Air Force, *Securing the High Ground: Dominant Combat Air Force for America*; *2008 Combat Air Force Strategic Plan*, http://www.acc.af.mil/shared/media/document/AFD-090227-123.pdf.
[39] Anonymous air force personnel, interview.
[40] Ibid.

to," said one of the participants.[41] This means that although UAS operators may work in calm environments inside ground control stations, their situational awareness is limited by the capacity of the UAV's electronic sensors. Not to mention, their command of the aircraft is at the mercy of any glitch in the system. As one ROTC recruit hoping to become a conventional pilot expressed, "Being relegated to just a screen would make me nervous being in charge of a multi-million dollar aircraft."[42] In other words, it is not so easy to fly an airplane looking through the single lens of a camera. So, while UAS may offer many solutions to the uncertainties of war, the "naturalness" of piloting them still remains far from perfect.

The final question asked at the conclusion of every interview was designed to incite the personal emotions of those willing to answer. Participants were asked how they felt about widespread accusations coming from Afghanis, Iraqis, Pakistanis, and other critics of UAS that American forces are "cowards" for sending machines to fight instead of men.[43] "The first distinction that must be made," replied one cadet, "is that these machines *are* being operated by someone. They aren't just being thrown out there like *the Terminator* and told to do a job."[44] Indeed, the cadet is correct that modern UAS are controlled by crews at all times despite reactions from enemies who might be oblivious to this fact. Another cadet referred to America's decision to use unmanned weapons as "smart warfare," since it allows soldiers to concentrate solely on accomplishing the mission and avoid many of the distractions entailed with human risk.[45] So, in theory, the soldier's physical absence from the battlefield allows for more time to make rational, reasoned combat decisions. Whoever is on the losing end of these decisions is

[41] Ibid.
[42] Ibid.
[43] Singer, *Wired for War*, p. 308.
[44] Ibid.
[45] Ibid.

therefore not waging war as "smartly." After all, it has always been the natural progression of warfare to challenge enemies in new, more advantageous ways.

From an Air Force perspective, the U.S. military's expanding use of UAS is all part of a highly calculated strategy to protect the lives of its soldiers, and in doing so, its missions can be carried out more efficiently and accurately than ever before. After sitting speaking with the Air Force cadets, some of the complexities of unmanned warfare have become clearer, certain assumptions stand corrected, and an overall better appreciation for the experience of UAS pilots has been achieved. It was also found that tremendous differences exist in the way UAS operators are selected, trained, and even understood in comparison to their "cockpit pilot" counterparts. Eventually, it will be these very men and women that determine the next phase of this RMA, and now, their views and opinions will forever be recorded in this snapshot of Air Force culture as it was in the early twenty-first century.

5. Revolutions in Military Affairs and the Transformation of War

To fathom the extent to which unmanned combat systems are revolutionizing warfare, it is necessary to consider their effect in comparison to RMAs of the past. Unsurprisingly, studies of this reoccurring phenomenon have a long history, since every time a game-changing technology has been introduced to war, somebody somewhere, usually on the victorious side, becomes deeply fascinated by the spectacular devastation it brought about. However, the advent alone of new technology does not constitute a military revolution. New inventions instead provide the tools for achieving an RMA and its systematic changes in the political, social, and cultural arenas.[46] Therefore, rather than thinking of RMAs as part of the evolving symbiosis between technology and war, they should be considered products of combining the two in entirely new

[46] Williamson Murray, "Thinking about Revolutions in Military Affairs," *Joint Force Quarterly* (1997): p. 71

ways. The following provides insight into this notion by summarizing the origin of the term "revolution in military affairs" as well as comparing how various authors have used it to describe historical events.

Many consider the concept of an RMA to have originated in the mid-twentieth century. It arguably derives from the phrase "military revolution" first coined by the British historian Michael Roberts in his 1955 lecture at the Queen's University Belfast.[47] In his speech Roberts proposed that between 1560 and 1660 the country of Sweden, under the leadership of Gustavus Adolphus, had revolutionized contemporary warfare with new military tactics and a newly reformed doctrine. Although chronologically this was not the first RMA to have ever taken place, Roberts's account of the event served as the first official application of the word "revolution" to describe a drastic transformation in the conduct of war.

The next significant interpretation of the concept was developed by members of the General Staff of the Soviet Armed Forces who, throughout the 1960s and 1970s, theorized about a "military technical revolution" (MTR). At the time, their MTR theory was based largely on the incredible influence nuclear weapons and ballistic missile delivery systems had on the politics of conventional warfare. Nikolai Ogarkov, chief of staff of the Soviet Armed Forces from 1977 to 1984, is considered to be the most prominent voice of this movement. His writings primarily focused on what he saw as the Unites States' superiority in the field of information technology. Realizing the potential for America's computer industry, Ogarkov knew that an MTR favoring the United States military was about to render the Soviets' awe-inspiring war machine obsolete. Or as one scholar put it, the USSR could not possibly keep up in an arms race when their country

[47] MacGregor Knox and Williamson Murray, *The Dynamics of Military Revolution, 1300–2050* (New York: Cambridge University Press, 2001), p .1.

was "incapable of [even] manufacturing a satisfactory personal computer."[48] America's advances in digital communications and microprocessors, on the other hand, were exponentially increasing the capabilities and effectiveness of its armed forces.

It was not until after the Gulf War in the early 1990s that officials in the United States began to register the significance of the former Soviets' writings on an emerging MTR. America's demonstration of satellite communications, precision-guided munitions, and stealth technology used against Iraqi forces was clear and tangible evidence that a radical change in the nature of warfare was underway. Soon, the Pentagon's think tank, the Office of Net Assessment (ONA), run by Andrew W. Marshall, began to acknowledge the possibility of an MTR. However, in order to signify that the changes occurring were more conceptual and doctrinal than simply technological, the ONA coined the term "revolution in military affairs."[49] It did not take long before the notion of an RMA caught on throughout the U.S. defense community causing many to believe that America should adamantly pursue it.[50] The development of unmanned systems would eventually become a vital part of this effort.

Meanwhile, the newly popularized theory of an RMA spawned a whole new body of scholarly literature that attempted to put the idea into context. By the mid-1990s several scholars began producing works that applied the term "RMA" to historical examples of comparable revolutions. But because the term is so vaguely defined, it has sometimes been used to describe virtually any strategic innovation that has altered the magnitude or appearance of war. Thus, while some historians have applied the term to a long list of specific wartime technologies,

[48] Eliot Cohen, "A Revolution in Warfare," *Foreign Affairs* 75, no. 2 (1996): p. 37.
[49] Andrew W. Marshall, "Revolutions in Military Affairs," Statement for the Subcommittee on Acquisition and Technology, Senate Armed Services Committee, May 5, 1995.
[50] O'Hanlon, *Technological Change and the Future of Warfare*, p. 2.

others have chosen to use the RMA concept much more sparingly to describe key eras that witnessed a complete upheaval in the experience of war.

The first notable attempt by an author to enumerate a list of past RMAs was Andrew F. Krepinevich. In his 1994 publication *Calvary to Computer: The Pattern of Military Revolutions* he asserts that in order to qualify as an RMA, a revolution must comprise of four elements: "technological change, systems development, operational innovation, and organizational adaptation."[51] Under these criteria, he identifies ten revolutions that have taken place over the last seven hundred years:

1. The Infantry Revolution of the fourteenth century, as exemplified by Swiss pikemen and English longbow archers, wherein armor-piercing weapons gave soldiers the upper hand against cavalry.
2. The Revolution of Sail and Shot introduced sailing ships that rendered former oar-driven galley boats obsolete.
3. In the fifteenth century, the Artillery Revolution unfolded with advances in metallurgy and gunpowder production.
4. The Fortress Revolution improved architecture using lower, thicker walls for strongholds.
5. The Gunpowder Revolution of the sixteenth and seventeenth centuries made personal firearms a standard for troops.
6. In the eighteenth century, Napoleon achieved the first great conscript army with mass-produced gunpowder weapons.

[51] Andrew Krepinevich, "Calvary to Computer: The Pattern of Military Revolution," *The National Interest* (1994), http://web.clas.ufl.edu/users/zselden/Course%20Readings/Krepinevitch.pdf (accessed April 21, 2010), p. 31.

7. The Land Warfare Revolution transpired around the time of the American Civil War with the inventions of the telegraph, railroad, rifled musket, and machinegun.
8. The Naval Revolution brought about metal-hulled ships equipped with long-range cannons and powered by turbine engines.
9. The multifaceted RMA known as the Interwar Revolutions of Mechanization, Aviation, and Information redefined the nature of combat in the two World Wars by implementing new developments like aircraft, radio, radar, blitzkrieg, and carrier warfare.
10. The Nuclear Revolution, beginning in the 1940s, forever altered the politics of international relations.

In contrast, MacGregor Knox and Williamson Murray have suggested a narrower list of what they believe were the RMAs of the past. In their 2001 book *The Dynamics of Military Revolution: 1300–2050*, they distinguish only five revolutions in Western history that have "fundamentally changed the framework of war":[52]

1. The establishment of the modern nation-state in the seventeenth century, when European powers completely reorganized their fiscal and military institutions.
2. The second revolution, as Krepinevich also noted, originated in eighteenth-century France, under the reign of Napoleon. After amassing an army of patriotic conscripts, Napoleon employed the military strategy of "battlefield annihilation of enemy forces," which allowed him to conquer nearly the entire European continent.[53]
3. The Industrial Revolution transformed warfare with inventions such as the telegraph, automatic weapon, and steam engine.

[52] Knox and Murray, *The Dynamics of Military Revolution*, p. 6.
[53] Ibid., p. 13.

4. The fourth RMA was the synthesis of the previous three revolutions, which culminated in World War I and set the standards for armed conflict throughout the twentieth century and into the early twenty-first century.
5. Finally, again in agreement with Krepinevich, the fifth revolution came about with the inception of nuclear warheads and ballistic missiles, which ultimately "kept the Cold War *cold*."[54]

Perhaps the most comprehensive review of RMAs to date, however, was written by Max Boot in 2006. His book, *War Made New: Technology, Warfare, and the Course of History, 1500 to Today*, offers nearly five hundred pages of in-depth analyses of past RMAs and their manifestations in specific battles throughout history. Boot divides his study into four overarching revolutions emphasizing that "we must not pretend that change was more sudden or sweeping than it actually was":[55]

1. The first RMA, dubbed the Gunpowder Revolution, lasted from approximately 1500 to 1700, thus beginning a century before Krepinevich's Gunpowder Revolution.
2. Boot refers to the second RMA as the First Industrial Revolution, which spanned from 1750 to 1900 and included the proliferation of steel and steam throughout the military-industrial complexes of nations.
3. The Second Industrial Revolution, according to Boot, occurred during the first forty years of the twentieth century and hosted the inaugural battles of tanks, radios, and airplanes.

[54] Ibid., p. 6.
[55] Boot, *War Made New*, p. 7.

4. Lastly, the Information Revolution, beginning in 1970 and continuing into the early twenty-first century, has resulted in advancements such as stealth aircraft, satellite communication systems, computerization, and other cutting-edge technologies.

After comparing the views of these authors, it is clear that even those who have carried out the most extensive research on RMAs, both past and present, are not in agreement of what exactly constitutes a revolution in the first place. For instance, although Krepinevich, Knox and Murray, and Boot concede that technology plays a vital role in the transformation of warfare, they dispute whether RMAs are defined by individual inventions or entire eras of progress. Furthermore, they do not agree about what constituted the first RMA. Krepinevich argues that the first revolution was the Infantry Revolution of the fourteenth century, Knox and Murray believe the first came with the advent of the nation-state in the seventeenth century, and Boot, whose analysis begins with the year 1500, names the Gunpowder Revolution. Thus, it would seem that a coherent understanding of the term "revolution in military affairs" does not exist. What is lacking, however, is a universal interpretation of what qualifies a change in warfare as *revolutionary*.

That said, it is most important to consider the similarities, and not the differences, found in the comparisons above. For instance, each author identifies gunpowder, metallurgy, advancements in communication, and nuclear weapons as technologies that when properly employed, sparked RMAs of their own. None of these revolutions took place overnight, but were gradually integrated into military, political, and societal structures to forever alter the course history and the conduct of war. Each also required prolonged periods of experimentation in order to produce the necessary effects to bring about an actual revolution. This developmental phase can be compared to the current stage of unmanned technologies as it remains impossible to

predict how unmanned systems will be used in future wars, or let alone, what the consequences of using them might be. RMAs can therefore only be fully understood in retrospect to the wars they shape and the responses they invoke.

6. The Early Twenty-First Century RMA: Implications and Concerns

Like revolutions in military affairs of the past, the United States' shift toward unmanned power is transforming the outlook of modern battle. But unlike any RMA that has occurred before, this revolution offers soldiers something new: perfect invulnerability on the battlefield. What is more, the defense mechanism making this possible is virtually impenetrable. Distances of up to eight thousand miles from the enemy provide modern American UAS operators with an advantage that warriors have only dreamed of throughout time. Operators can accomplish a mission, engage a target, or monitor the activities of enemies twenty-four hours a day without ever worrying whether they will make it home to see their families. To quote a popular saying floating around the hallways of the Pentagon nowadays: "When a robot dies, you don't have to write a letter to its mother."[56] Instead, the only thing that needs to be done is call a mechanic.

Not worrying about losing lives or limbs means greater concentration and accuracy, and improved stamina in the heat of battle. Pilots attest that these differences serve as a force-multiplier for American troops by not only lifting the proverbial "fog of war," but also by providing uninterrupted protection from the sky. Within seconds of calling in an air strike, UAS can deliver support to troops on the ground by delivering a lethal blow wherever needed. Meanwhile, the operators safely located at ground control simply watch computer screens as their missiles home in on targets on the other side of the planet.

[56] Singer, *Wired for War*, p. 21.

This physical disconnect is changing the soldier's very experience of war. Unique to this RMA, the use of technology is not merely increasing the lethality of individual combatants, but replacing the agent of war altogether. As one military analyst stated, "First you had human beings without machines. Then you had human beings with machines. And finally you have machines without human beings."[57] Although he is not entirely correct that humans are absent from modern unmanned systems, his point is well suited to describe the nature of this particular RMA.

Just as it affects the fundamental equation for the participants of battle, the unmanned RMA is impacting the politics behind it. As the United States Air Force describes it, the use of long-range UAS allows countries to "project power without projecting vulnerability."[58] This subtraction of human risk from the decision to wage war gives leaders the ability to use military intervention without the repercussions of putting lives in jeopardy. Hence, the use of unmanned systems has made the decision to use force relatively easier to justify. Nowhere has this been more apparent than in the United States during the presidencies of George W. Bush and Barack Obama who have increasingly used UAS in counterterrorism operations, even in countries with which America is not at war. Indeed, the use of UAS has proven to be a tremendously successful strategy if measured solely by kill counts and resource retention.

For these reasons of practicality and convenience, the United States military is turning to unmanned machines largely to perform work that is "dull, dirty, or dangerous."[59] Furthermore, as the United States and other countries around the world pursue this RMA, the capabilities of unmanned systems will become greater, continuing to surpass the physiological limitations of

[57] Fred Reed, "Robotic Warfare Drawing Nearer," *Washington Times,* February 10, 2005, http://www.globalsecurity.org/org/news/2005/050210-robotic-warfare.htm (accessed March 17, 2010).
[58] U.S. Air Force, "Predator CAPs Double in One Year."
[59] Boot, *War Made New*, p.7.

human beings. Through this RMA, planes will become more maneuverable, weapons will become infinitely more precise, and surveillance will become more perfect and inescapable. At what point these technological advances will become unbearable has yet to be determined.

Some even question the psychological ramifications for pilots of UAS since engaging in battle halfway around the globe could potentially result in new types of post-traumatic stress disorder.[60] After all, operators of UAS face the challenge of having to cope with the stress and violence of war during regular workday shifts while essentially sitting in a cubicle. Although the targets they kill are real, their projected images do not reflect the gruesome realities of warfare or the consequences of the operators' UAS command. The cognitive dissonance that ensues may be far more harmful than the military would currently like to admit or even realize.

Thus, many now wonder whether unmanned systems will indeed necessitate international convention, regulation, or legal standards. Like landmines, cluster bombs, and chemical weapons, it is possible that weaponized UAS and other unmanned vehicles will someday be deemed "too cruel for wartime use."[61] Already, such accusations have been made by critics and protestors of U.S. "drone strikes". For instance in March 2010, the American Civil Liberties Union filed a lawsuit against the United States government pertaining to the legality of the UAS program, especially concerning the hundreds of president-authorized UAS assassinations.[62] While this lawsuit may not have received the publicity the plaintiffs would have liked, it can be certain that it will be the first of many cases pitting unmanned systems against human rights as this RMA continues to unfold.

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[60] Associated Press, "Remote-Control Warriors Suffer War Stress," MSNBC, August 7, 2008, http://www.msnbc.msn.com/id/26078087/ (accessed February 9, 2010).
[61] Priya Satia, "Attack of the Drones," *The Nation*, www.thenation.com/doc/20091109/satia, October 21, 2009 (accessed March 2, 2010).
[62] American Civil Liberties Union, "American Civil Liberties Union Seeks Information on Predator Drone Program," March 16, 2010, http://www.aclu.org/national-security/aclu-seeks-information-predator-drone-program (accessed April 26, 2010).

It is therefore imperative that a dialogue be promptly commenced on the implications and concerns of unmanned military weapons. The course of the current RMA must ultimately be determined, at least in part, by public input and international dialogue. Failing to allow for this could be a colossal error on behalf of mankind. Although the United States presently leads the world in remote-controlled technologies, the inherent appeal of unmanned power guarantees its proliferation. And upon falling into the wrong hands, enemies too may soon become invincible.

Appendix

1. Vietnam-era Ryan Aeronautical Company 147 Fire Fly and Lightning Bug drones

2. Israeli Aircraft Industries (IAI) Scout reconnaissance UAS

3. General Atomics MQ-1 Predator UAS

4. AGM-144C Hellfire missile

5. MQ-9 Reaper UAS

6. Northrup Grumman RQ-4 Global Hawk long-range UAS

7. ROVER (Remotely Operated Video Enhanced Receiver)

8. Foster-Miller TALON, SWORDS weaponized unmanned ground vehicle

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