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## **ATTACK OF THE DRONES: UNMANNED AERIAL VEHICLES AS AN INSTRUMENT OF WAR**

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### **OVERVIEW**

On December 14<sup>th</sup> and 15<sup>th</sup>, 2009, the Center for Technology and National Security Policy hosted a conference addressing the topic of "Unmanned Aerial Vehicles (UAV) as an Instrument of War."<sup>1,2</sup> A part of the Transforming National Security Seminar series, this conference brought together distinguished panelists and expert speakers from the domestic and international, civilian and military, academic and private sector arenas. Focusing on the explosive rise of remotely-piloted vehicles in the skies above Afghanistan, Iraq, and Pakistan, several panelists addressed the current roles and missions, modern designs, and future capabilities of this unique platform. In addition to these discussions on the "hard" engineering behind these different aircraft, the conference also looked at some of the tougher issues facing UAV manufacturers, unmanned operators in the U.S. Air Force, and the American society in general. For example, what is this robotics revolution we are living through and what does it mean for the U.S. military? How is waging war without warriors affecting our traditional soldier ethos? Is the rise of "joystick jockeys" a sign that war is no longer a risky life-and-death battle but more of a detached form of entertainment? Are these machines even legal or ethical according to international standards?

Based on the conference report, speaker presentations, and independent research, this paper focuses primarily on the aforementioned "soft" challenges associated with operating unmanned systems. After providing a brief general history of American UAVs, this article will highlight the role of unmanned aircraft in the robotic revolution of the 21<sup>st</sup> Century as well as their impact on the U.S. armed forces and the international legal system as a whole.<sup>3</sup>

### **A BRIEF HISTORY OF UAVS**

After the surrender of Japan on August 14, 1945, General Henry "Hap" Arnold, General of the U.S. Air Force (USAF), declared: "We have just won a war with a lot of heroes flying around in planes. The next war may be fought by airplanes with no men in them at all."<sup>4</sup> While the Korean War did not see the use of unmanned aircraft in combat, surveillance versions of such remotely-piloted planes have been a part of the American arsenal since the Vietnam War. Hunter-killer platforms like General Atomics Aeronautical Systems' MQ-1 Predator (which made its unarmed debut in the Balkans in 1995) and MQ-9 Reaper have been omnipresent in the "Global War on Terror" since 2004. Declared to be "the only game in town" by Leon Panetta, Director of the Central Intelligence Agency (CIA), it is clear to all observers that the age of unmanned warfare has arrived.<sup>5</sup> Widely equated to the Ford Model-T or the Wright Flyer, current generations of unmanned systems are

considered bulky and unrefined while their successors are likely to be deadlier, faster, sleeker, and smaller.

Long considered the “bastard step-child” of the U.S. military, drones were originally produced by the Radioplane Company in 1944 for anti-aircraft target practice. In the 1950s, after the U-2/Gary Powers spy plane incident, Norman Sakamoto decided to equip the platforms with cameras and helped create the Ryan Firebee. Soon over 1,000 Firebees were flying surveillance missions above Vietnam.<sup>6</sup> Grounded after the war, unmanned drones were not used extensively again until the 1991 Gulf War and *Operation Desert Storm*. In addition to being the first widespread use of UAVs since Vietnam, the Gulf War also saw the most varied use of unmanned platforms, both in style and in service operation with the U.S. Army, Marine Corps, and Navy all operating Israeli-built RQ-2 Pioneer drones.<sup>7</sup> When fighting broke out in the Balkans in the early 1990s, then-CIA Director James Woolsey was desperate for surveillance footage for his spies. After receiving significant pushback from the U.S. Air Force, Woolsey contacted Abe Karem, an Israeli expatriate and former UAV designer for the Defense Advanced Research Projects Agency (DARPA). Karem’s stripped-down platform, the Gnat 750, had a relatively lackluster performance in the Balkans but evolved into the MQ-1 Predator, an unmanned aircraft American troops on the ground cannot imagine living without.<sup>8</sup> With at least twelve drone variants in operation, there are currently eighteen different missions – not all of them military – that use remotely-piloted aircraft.<sup>9</sup> A mix of upgraded systems, converted manned vehicles, and brand new designs, these platforms are used to assist forest firefighters, stalk and kill terrorists, protect the skies above national/international events like the 2012 Olympics in London, and monitor the U.S.-Mexico border.

Despite the term “unmanned,” maintaining these vehicles is more labor-intensive than manned operations, causing a large cultural shift in the U.S. Air Force as more unmanned

operators were trained in 2010 than traditional pilots. In an effort to increase the ranks of drone operators from 800 today to 1,400 by 2012 and to reduce the stigma of the UAV community within the service, the USAF institutionalized a remotely-piloted aircraft (RPA) undergraduate training course and an associated career field (18XX) last year.<sup>10</sup> Accompanying this internal service change is a larger societal detachment from war and combat. With no war bonds, no victory gardens, no military drafts, and no formal declarations of war, scholars worry that the military option will become the first choice of politicians to resolve international conflicts. And while saving human lives is always an admirable goal, if casualties are completely removed from the equation, negating any kind of risk, some have even speculated that we will enter an age of perpetual conflict. Only time will tell how the rise of the machines will impact U.S. foreign policy but it is clear that the brave new world of the 21<sup>st</sup> Century is a predominantly unmanned one.

## THE ROBOTICS REVOLUTION

Should anyone doubt they are living in the midst of a robotics revolution all they have to do is look at the numbers. For instance, when coalition forces invaded Iraq in 2003, there were only a handful of unmanned drones in the U.S. inventory; today there are over 7,000. Likewise, there were no robotic ground vehicles during the invasion but the popularity of the roadside bomb has led to the creation of over 12,000 unmanned ground systems. Every single service of the U.S. armed forces operates at least one kind of drone variant and over 44 countries possess unmanned aerial platforms, though only the United States, Great Britain, and Israel currently fly hunter-killer UAVs like the MQ-9 Reaper. However, these aircraft are no longer only the property of nation-states. In the 2006 Lebanon War, for example, the political/paramilitary organization Hezbollah flew drones across the Israeli border. This empowerment of the small group against the state is just one of three main trends experts see in the current weapons transformation.



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Unlike other technologies, there is no first-leader advantage in the robotics revolution. The United States will likely spend the maximum amount on development while every other interested party, be it a nation-state, terrorist organization, or private company, will spend the minimum amount on exploitation. Unmanned platforms can cost anywhere from \$1,000 to \$4.5 million to \$35 million allowing anyone with a computer and a credit card to acquire their own personal surveillance aircraft. While this wide accessibility certainly has privacy implications for the larger community, in the military realm, it highlights the second main trend of the revolution – the elimination of the power of the suicide bomber. With Do-It-Yourself drones purchased off the Internet, one can be deadly but not suicidal. A determined insurgent can take out a government building, a military convoy, or an individual Humvee without killing themselves in the process.

The third main trend concerning unmanned technology is one of the most basic challenges any dominant leader would face, criticism. Not everyone is excited by the rise of unmanned capabilities which is leading to new sparks of conflict and tension in already tenuous relationships. This frustration may come from a country that desperately wants to acquire its own drones or an international organization that feels this technology is illegal and unethical. No matter the cause of the apprehension, the reality is these platforms are most likely to be used in the world's hot spots, like Pakistan's Federally Administered Tribal Areas, making their use even more contentious. Couple this fact with the open knowledge that some of these platforms are being flown by a civilian organization whose operating procedures are murky at best and

one sees the dangerous precedent that is being set.<sup>11</sup>

On top of the sheer numbers of platforms and their various owners is the overwhelming amount of information these planes are transmitting home. For instance, in 2008, drones flew for 800,000 hours, a 2,300% increase from the number of hours flown from 2003 to 2007.<sup>12</sup> Full-motion video footage from these flight hours stream back to ground control stations around the U.S. to be analyzed, processed, and if necessary, acted upon. In 2009, the U.S. Air Force alone collected 250,000 hours of video. If an analyst sat down to watch all of that footage it would take him 28 years to get through it.<sup>13</sup> With the coming arrival of new high-tech video Gorgon Stare sensors, these data feeds will increase tenfold, dramatically exacerbating the problem.<sup>14</sup> As many presenters noted at the conference, unless some kind of prioritization scale is created within the mission structure, the Air Force will simply drown in all of this data.

Despite the impressive number of unmanned systems in the field and the data streams coming in from the feeds, the real revolution comes not from the technology itself but the way these capabilities are changing the way we interact with the world around us. While some roboticists eagerly look forward to an age where man and intelligent machine coexist peacefully, other scholars believe that true autonomy is impossible and that automation should simply enhance and leverage existing human assets and skills, not replace them. Whatever one's personal feelings about the future of artificial intelligence, it is clear the current robotics revolution is changing the definitions of what it means to be human and what it means to be a warrior.

## A VIEW FROM THE INSIDE

Despite the fact that all five services of the U.S. armed forces operate some version of unmanned aircraft, the majority of the platforms belong to the U.S. Air Force. Originally outspent in development by both the U.S. Army and the U.S. Navy, the USAF recognized the utility of unmanned aircraft during the Balkan conflict and formed its first UAV squadron at Creech Air Force Base (AFB), Nevada in July 1995.<sup>15</sup> There are now four reconnaissance squadrons and one attack squadron operating in the plains outside of Las Vegas and there are UAV training and maintenance facilities in Arizona, New Mexico, and New York. Since 2007, the U.S. Air Force has been operating in a “surge” mode, deploying 100% of its unmanned aircraft while, by comparison, the U.S. Army has only been flying 30% of its fleet. This discrepancy and the increasing numbers of flight hours UAV pilots put up each year would suggest an embrace of the Air Force’s unmanned mission but the reality is something quite different. While the men who fly the drones recognize the importance of their mission and welcome the new technology, there is a perceptible rift between the old guard of traditional fighter pilots and the Air Force’s senior leadership over the future of force.

Since its creation in 1949, the identity of the Air Force has always been associated with the aerial dogfights of the fighter pilot, but the reality is that less than half of one percent of the force actually fly fighter jets.<sup>16</sup> This out-of-balance perception is one of the main hurdles facing Chief of Staff General Norton Schwartz as he prepares the Air Force for the conflicts of the 21<sup>st</sup> Century. Though numerous challenges face the USAF, from aging planes to poor personnel retention, the largest battle is over the place unmanned aircraft have in the service’s mission repertoire. The first non-fighter pilot to become Air Force Chief of Staff, General Schwartz recognizes the robotic reality of the new millennium and knows the Air Force needs to adapt to remain relevant. While

many fighter aviators dismiss the demands of operating UAVs and mock the skills of the pilots, General Schwartz is determined to change the current ‘leper colony’ mentality to one that sees a viable future in remotely-operated vehicles. To do this, the Air Force created a UAV-specific career field that will operate at the tactical and strategic levels, as well as the operational one. Starting in 2010, the USAF will send 10% of its undergraduate pilots directly to unmanned training. A four-week fundamentals course at Randolph AFB in Texas will be followed by months of hands-on training at Creech. Roughly 100 new pilots will head down this track each year, slowly increasing the ranks of UAV handlers.<sup>17</sup> This process of adjusting current attitudes towards UAVs will be long and arduous and will likely change only when unmanned pilots are in positions of higher authority. However, it will be hard for unmanned operators to advance to these positions as long as fighter pilots still receive valorous awards and all drone “pilots” receive are thank you notes.<sup>18</sup>

In addition to challenging the traditional fighter pilot ethos of the U.S. Air Force, the explosion of military UAVs in theater is creating a role reversal among the top brass and the lower ranks of America’s aerial defenders. With an increasing number of young decision-makers with less in-the-field experience, the U.S. military is seeing the emergence of the ‘Strategic Corporal.’ Likewise, the easy accessibility of UAV video feeds is creating the position of the ‘Tactical General’, the senior micromanager from afar. In numerous articles on the subject, Dr. Peter W. Singer, Director of the 21<sup>st</sup> Century Defense Initiative at the Brookings Institution, references a conversation he had with a four-star general who spent two hours watching Predator footage. As the events on the screen unfolded, he decided this particular area of interest was indeed a legitimate target and even decided which ordnance size he wanted to use.<sup>19</sup> While increasing one’s knowledge of the battlefield is not necessarily a bad thing, for those two hours, the general was doing the work of a captain. While other men and women were capable making the same kinds



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of decisions, there was no one who could step in and do the work of a four-star general. If senior leaders continue to insert themselves into lower-level decision-making and rail against the creation of a UAV career path, the younger generations of U.S. airmen will never acquire the combat experience and confidence they need to rise through the ranks themselves. This discrepancy could leave the Air Force even more unbalanced and unprepared for the next potential conflict.

### WAGING WAR WITHOUT WARRIORS

In his recent book, Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century, Dr. Singer writes: "Avoidance of war has been a traditional tenet of [American] foreign policy. Yet we have been at war for most of our nation's history and many of our greatest heroes are warriors." He goes on to suggest that our fascination with war exists because it brings out "the most powerful emotions that define what it is to be human. Bravery, honor, love, leadership, pity, selflessness, comradeship, commitment, charity, sacrifice, hate, fear, and loss all find their definitive expressions in the fires of war."<sup>20</sup> Of all of these emotions, the one most strongly associated with war is fear. Very few people take to war naturally and are inclined, when faced with potentially mortal danger, to run in the opposite direction. What makes servicemen and women different is that they show courage under fire. When everyone else is running away, they charge forward defending their country, protecting innocent lives, and restoring order. It is that spirit of selflessness that makes them heroes. But what happens if you take fear out of the equation? What would occur if a UAV operator was simply monitoring the progress of ground robots, not human soldiers? Could war lose its meaning? Would the lack of political risk

make it the first option for politicians? Is it possible that war could become an ever-present, societal mainstay? How dearly do we hold our "unalienable rights" – life, liberty, and the pursuit of happiness – if we aren't willing to die defending them?

The idea of "no-fear" warfare is a difficult subject that scholars are just beginning to address. There certainly are benefits to robotic warfare – no concern for self-preservation, no feelings towards the enemy, no motivation besides a set of programmed instructions – but the number of concerns are just as many. What kind of people would be attracted to a world of "no-fear" warfare? What skills, training, and leadership would be needed to make this military successful?<sup>21</sup> What would decide victory in this kind of environment? More importantly, what would happen to our warrior class and their brave heroics on behalf of the country?

As one of the speakers at the UAV conference suggested, what makes us human is the fact that we tell stories and then act upon the lessons from those stories. We recognize a warrior culture and ethos that comes from maintaining one's integrity and character in difficult, often life-threatening, situations. In a "fear less" environment where there is no more self-sacrifice there is also no more courage under fire. With robots we may lose fewer lives but we also lose the morality story of the returning hero. Since survival is programmed into our psyches, we look to these heroes for a reason. Relying on memories to honor those who have gone before and their personal sacrifices, we often define our own sense of humanity and responsibility through their individual actions. However, while these stories instruct our sense of self, they also shape the opinions of others, including the enemy. To them, our

reliance on technology, particularly UAVs, is a sign of both our arrogance and cowardice.<sup>22</sup> With current and, most likely, future fighting occurring in a part of the world that prizes bravery, courage, honor, and masculinity above all else, relying on technological advantages will result in extended, stalemated conflicts. Trapped in a “virtueless” war of our own making that requires neither courage nor heroism, we would lose the very emotions and stories that define who we are as humans.<sup>23</sup> Although some roboticists look forward to a future of androids walking the planet, their enthusiasm begs the question: just because you can make it, should you really bring it to life? And if you bring it to life, how do you control it?

## THE LEGALITY AND ETHICS OF UAVS

Almost every single aspect of operating unmanned aircraft is fraught with intense debate but one of the most contentious areas of concern revolves around the legality and ethics of deploying such aircraft into combat and non-combat zones. Drones were issued into the airspace above the battlefield so quickly that only now is their military context being questioned according to international regulations. While USAF RPAs are considered an extension of the general military, “subject to the laws of armed conflict within a military chain of command subservient to civilian oversight,” many analysts agree that these frameworks – the Geneva Conventions and the Law of Armed Conflict – were not designed with this autonomous capability in mind.<sup>24</sup> As one scholar noted, “the current protocols are so old that if they were people, they would qualify for Medicare.”<sup>25</sup> As legal experts struggle to place these autonomous machines into a formal protocol, the place they turn most often for guidance is science fiction, particularly *I, Robot* and the “Three Laws of Robotics” by Isaac Asimov.

First introduced to the world in Asimov’s short story, “Runaround,” published in 1942, the “Three Laws of Robotics” are as follows:

- 1) A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- 2) A robot must obey any orders given to it by human beings, except where such orders conflict with the first law.
- 3) A robot must protect its own existence as long as such protection does not conflict with the first or second laws.<sup>26</sup>

Though these three laws may seem like a decent guide for restricting robotic behavior, the truth is they are fiction. They were created as plot devices for Asimov’s stories, most of which focus on a breakdown in the rules and the resulting chaos. As such, there is no current technology that can translate these laws into binary code and program them into a computer chip or robot. Lastly, the U.S. military specifically wants robots that can kill humans, can act independently from human handlers, and don’t care about their own lives.<sup>27</sup> When the robots we are concerned about are designed to violate these very protocols, what good are the laws as guidance?

Further complicating the above conclusion is the fact that there are currently two different operational unmanned programs in the United States, one run by the U.S. military and one handled by the CIA. As noted above, legal experts agree that the unmanned operations conducted by the U.S. military are done in the traditional context of conflict and are therefore subject to the Law of Armed Conflict, ultimately legalizing the program. While some may question the ethicality of using drones in combat, they are considered lawful weapons. They may just be used in unlawful or illegitimate ways.

The second drone program is operated by the Central Intelligence Agency which flies unmanned vehicles from bases in Afghanistan and Pakistan and operates them from their headquarters in Langley, Virginia. Most legal analysts agree that this program, conducted under a cloak of secrecy by a civilian agency that often outsources its missions to contractors in a country with which we are not





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at war, is illegal and results in targeted killings/assassinations – acts banned in the intelligence community by Executive Orders 11905, 12036, and 12333.

Targeted killings are defined as the use of lethal force against a state with the intent to kill individually-selected persons not in the custody of the state targeting them. While the Obama Administration claims U.S targeting practices comply with all applicable laws – foreign and domestic – the dramatic increase in air strikes authorized by the 44<sup>th</sup> U.S. President has some international organizations crying foul.<sup>28</sup> For example, in 2010, the CIA alone carried out 118 strikes (at \$1 million a piece) while there were 33 total strikes authorized in 2008 – an increase of nearly 360%.<sup>29</sup> While some analysts speculate the increase in air strikes reflects the administration's frustration with the Inter-Services Intelligence (ISI) Directorate's suspect relationship with militants like the Haqqani network, the truth is President Obama initially allowed the Pakistani government to select some of its own targets, a decision many analysts fear led to deadly political reprisals and personal vendettas.<sup>30</sup>

While those familiar with the CIA's program admit there is a well-established protocol for selecting targets, no one is entirely sure what oversight actually occurs. Who operates the UAVs – civilian employees, private contractors, or military personnel – determines some of the legality of the program. As some legal experts have said, who pushes the button doesn't necessarily matter but the rules they follow do. What those rules are at the CIA is anybody's guess since the agency often declines "to comment on a program [it] refuses to acknowledge publicly."<sup>31</sup> How the targets are selected also determines if the strikes are following appropriate protocols.

While the military creates a list of "high value targets" based on two verifiable human sources and other substantial evidence, there is no such public guide for how targets end up in the CIA's crosshairs. For instance, out of the 581 militants killed in CIA drone strikes last year, only two were on the most-wanted list.<sup>32</sup> Even the military's list is starting to expand from known terrorists to drug traffickers, albeit bad guys but not ones directly involved with the "War on Terror." This blurring of the lines between legitimate combatant target and politically-motivated removal could have serious implications for the U.S. intelligence community. If U.S. drone strikes begin to attack a wider variety of targets, it is quite possible that civilian UAV operators working in the United States will be considered unlawful combatants – civilians that take up arms – by our enemies and the CIA's Langley headquarters would become a legitimate target. Since the U.S. has been flying unmanned aircraft in uncontested airspace, policymakers have chosen not to worry about some of these thornier issues but the reality is we no longer have a monopoly on this technology. We may have the most aircraft in sheer numbers and in platform variety but drone-on-drone combat is very possible in the next battle of the 21<sup>st</sup> Century. We need to prepare for that eventuality, and all of the problems associated with it, now rather than later.

## **POLICY CHALLENGES**

Counter-terrorism operations have employed surveillance UAVs since 2001 and armed RPAs since 2004. Since 2009, the Obama Administration has almost quadrupled the number of air strikes – lethal operations – raising critical questions for policymakers:

Who approves the target list and the actual target selected for neutralization?

Are the “pilots” of the UAVs unlawful or lawful combatants?

Do precision UAV strikes reduce civilian casualties?

Are they effective in decapitating and otherwise destroying, disrupting, and dismantling Al Qaeda and the Taliban?

What is the impact on relations with Pakistan (sovereignty)?

How does killing from a stand-off distance affect the moral and legal questions of

surrender of the enemy?

What is the intelligence cost of killing an insurgent instead of capturing and detaining him instead?

Is the U.S. Constitutional system of checks and balances adequately preserved by the Presidential findings and Executive Orders that form the basis for these strikes?

What targets in the U.S. become fair game for an adversary’s counter-attacks?<sup>33</sup>

These and other perplexing questions will haunt this and future administrations as we wrestle to find the means necessary to prosecute a war on terror consistent with our national values. However, it is equally important to remember that, to some degree, it is the military’s job to make war unfair and to our advantage.<sup>34</sup> Unmanned systems live on the edge of this double-edged sword – what may be legally fair is perceived as ethically unfair. As technological innovation races ahead and provides us with additional capabilities to prosecute this war while keeping our soldiers safe, it is incumbent that the policy debate keeps pace.

## CONCLUSION

Unmanned aerial vehicles are exciting, new instruments of war that have proven their worth throughout the wars in Afghanistan and Iraq. They are a low-cost, big impact weapon that creates results disproportionate to the sacrifice, saving the lives of American servicemen and women.<sup>35</sup> But using them against our enemies is a tactic, not a strategy. And history has shown us that having a comprehensive strategy is much more important than a good tactic. For example, at the end of World War I, Britain and France had more armored tanks than Germany but still believed in the power of the cavalry and posted tanks to the rear of their divisions. It was a defeated Germany that retooled its strategy, created the blitzkrieg, and overran much of Europe in just a matter of months.<sup>36</sup> American policymakers need to work with academics, ethicists, roboticists, strategists, and UAV operators to create a robust national robotics strategy. Utilizing this vast field of knowledge would not only allow these leaders to create a legal framework for the use, research, and development of autonomous systems but would also address the widening science, technology, mathematics, and education (STEM) gap between the United States and the rest of the world. There is no first-leader advantage in a robotics revolution but that should not prevent the U.S. from negotiating a path and a place for these new weapons in international treaties and national arsenals.

However, though the future looks increasingly unmanned, policymakers should not be too quick to favor the machine over the individual. Viewing technology as a panacea to end all evil in the world devalues not only our selves but our unique set of skills. One cannot negotiate with a UAV, a drone cannot feel empathy and a remotely-piloted platform cannot be a brave and conquering hero. With younger generations that are increasingly less literate, with weaker powers of concentration, and an inability to conduct deep analysis, we risk further detaching ourselves from the





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meaning of "war" at a time when the battle is increasingly an existential one.<sup>37</sup>

War is a terrible human constant; robots save lives and are "fucking cool."<sup>38</sup> It seems like a non-issue. But if the definition of a warrior is courage is the face of fear, what happens when conflict loses that fear? How often will troops be committed when leaders know they won't have to suffer a single casualty? When insurgents on the ground get a hold of this technology and use it against us, what then? War is already destructive but technology has become more lethal as we look for new ways to end wars cleaner and faster. However, the drone is an advanced piece of technology that is tied to a fallible human operator who makes mistakes. Even if the aircraft was fully autonomous, there could be a glitch in the programming. Mistakes will happen and we need to be prepared to respond accordingly. While unmanned aerial vehicles will continue to raise tough cultural, ethical, legal, and societal questions, we need to start answering

them now, not after some catastrophe shows us how inhuman we have truly become.

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<sup>1</sup> This conference was a part of an unclassified, "not for attribution" series sponsored by the Office of the Under Secretary of Defense for Policy. The event was held at Fort Lesley J. McNair and was attended by 145 participants, with more than 290 total registrants.

<sup>2</sup> Unmanned aerial vehicles (UAV), unmanned systems, remotely-piloted aircraft (RPA), and remotely-operated platforms, as well as various subsets of these phrases, are all terms used in the current lexicon to refer to these semi-autonomous weapons systems and as such, the authors of this paper have tried to use each reference equally throughout the paper.

<sup>3</sup> Electronic copies of the "Unmanned Aerial Vehicles as an Instrument of War" conference report and speaker presentations are available online at: <http://www.ndu.edu/CTNSP/index.cfm?secID=21&pageID=2&type=section>.

<sup>4</sup> Quote read to the author by Colonel Pete "Gunz" Gersten, Commander of the 432<sup>nd</sup> Air and Air Expeditionary Wing at Creech Air Force Base, Nevada. Mockenhaupt, Brian. "We've Seen the Future, and It's Unmanned." *Esquire*. November 2009. Available

online at: <http://www.esquire.com/features/unmanned-aircraft-1109>.

<sup>5</sup> Mayer, Jane. "The Predator War." *The New Yorker* October 26, 2009: 36-45. Available online at: [http://www.newyorker.com/reporting/2009/10/26/091026fa\\_fact\\_mayer](http://www.newyorker.com/reporting/2009/10/26/091026fa_fact_mayer).

<sup>6</sup> Barry, John and Evan Thomas. "Up in the Sky, An Unblinking Eye." *Newsweek*. June 9, 2008. Available online at: <http://www.newsweek.com/id/139432>.

<sup>7</sup> Zaloga, Stephen. *Unmanned Aerial Vehicles: Robotic Air Warfare 1917-2007*. Oxford: Osprey Publishing, 2008.

<sup>8</sup> Barry, John and Evan Thomas. "Up in the Sky, An Unblinking Eye." *Newsweek*. June 9, 2008. Available online at: <http://www.newsweek.com/id/139432>.

<sup>9</sup> Nicoll, Alexander ed. "The drones of war." *IISS Strategic Comments*. May 2009 Volume 15, Issue 04. The International Institute of Strategic Studies.

<sup>10</sup> Martin, Matt and Charles Sasser. *Predator: The Remote-Control Air War Over Iraq and Afghanistan – A Pilot's Story*. Minneapolis: Zenith Press, 2010.

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<sup>11</sup> Since 2001, the Central Intelligence Agency has flown unmanned vehicles over Pakistan but the program is classified as covert, prohibiting the agency from releasing information about where it operates, how it selects targets, who is in charge, and exactly how many people have been killed to the public. Mayer, Jane. "The Predator War." *The New Yorker* October 26, 2009: 36-45. Available online at: [http://www.newyorker.com/reporting/2009/10/26/091026fa\\_fact\\_mayer](http://www.newyorker.com/reporting/2009/10/26/091026fa_fact_mayer).

<sup>12</sup> Joshi, Shashank. "Droning on: the American bolt from the blue." Analysis and Commentary. Royal United Services Institute. Available online at: <http://www.rusi.org/analysis/commentary/ref:C4B702A C47A4BF/>.

<sup>13</sup> Peters, Katherine McIntire. "Up in the Air." *Government Executive*. February 1, 2010. Available online at: <http://www.govexec.com/features/0210-01/0210-01s2.htm>.

<sup>14</sup> While the current Gorgon State sensors are designed to beam 10 different video feeds to 10 different ground users, future capability projections exist for 30 video streams by the end of this year and as many as 65 video streams by 2014. Baldor, Lolita. "US to expand eyes in the sky over Afghanistan." *ABC News*, December 17, 2009. Available online at: <http://abcnews.go.com/Business/wireStory?id=9359061>.

<sup>15</sup> Yenne, Bill. *Attack of the Drones: A History of Unmanned Aerial Conflict*. St. Paul: Zenith Press, 2004.

<sup>16</sup> This figure is a rough approximation by the authors. Despite numerous Google searches and calls to the Air Force Personnel Center, it was not possible to find a specific figure for the number of fighter pilots within the active U.S. Air Force. According to the AFPC's Program on Air Force Demographics, out of 330,159 active Air Force personnel, 13,725 members are pilots (4% of the total force). Evenly split among all eleven pilot categories, there would be approximately 1,248 fighter pilots (0.3% of the total force). However, the fact that all fighter pilots are officers, of which there are 65,515, means this percentage of the total force is probably much smaller.

<sup>17</sup> Mulrine, Anna. "UAV Pilots." *Air Force Magazine*. January 2009 : 34-37.

<sup>18</sup> In an article for *The Washington Post*, writer Greg Jaffe cites the example of the 2006 air strike that killed al Qaeda in Iraq leader Abu Musab al-Zarqawi. Predator crews located in the United States spent more than 630 hours searching for Zarqawi before they tracked him and several of his associates to a small farm northeast of Baghdad. Minutes after confirming Zarqawi's location, an F-16 fighter jet raced through the sky and released a 500-pound bomb that killed the insurgent leader. The F-16 pilot, who was never in any danger from insurgents on the ground and spent mere minutes on the operation, was awarded the Distinguished Flying Cross. The Predator pilots who spent day after day

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tracking Zarqawi through Iraq received a thank-you note from a three-star general based in the Middle East. Jaffe, Greg. "Combat Generation: Drone operators climb on winds of change in the Air Force." *The Washington Post*. February 28, 2010: A01.

<sup>19</sup> For example – "Tactical Generals: Leaders, Technology, and the Perils of Battlefield Micromanagement." *Air and Space Power Journal*. Summer 2009. Available online at:

<http://www.airpower.maxwell.af.mil/airchronicles/apj/apj09/sum09/singer.html>; "The Rise of the Tactical General." *Air Force Journal*, June 2009; and "Robots and the Rise of the 'Tactical General.'" *Defense News*, March 9, 2009. Available online at: <http://www.defensenews.com/story.php?i=3979783>.

<sup>20</sup> Singer, P.W. *Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century*. New York: Penguin Press, 2009.

<sup>21</sup> Herman, Mark and Art Fritzon. "War machines." *CAISR Journal*. June 1, 2008. Available online at: <http://www.c4isrjournal.com/story.php?F=3434587>.

<sup>22</sup> Ghosh, Bobby and Mark Thompson. "The CIA's Silent War in Pakistan." *Time*. June 1, 2009. Available online at:

<http://www.time.com/time/magazine/article/0,9171,1900248,00.html>.

<sup>23</sup> Mayer, Jane. "The Predator War." *The New Yorker* October 26, 2009: 36-45. Available online at: [http://www.newyorker.com/reporting/2009/10/26/091026fa\\_fact\\_mayer](http://www.newyorker.com/reporting/2009/10/26/091026fa_fact_mayer).

<sup>24</sup> Martin, Matt and Charles Sasser. *Predator: The Remote-Control Air War Over Iraq and Afghanistan – A Pilot's Story*. Minneapolis: Zenith Press, 2010.

<sup>25</sup> Speaker. Conference on "Unmanned Aerial Vehicles as an Instrument of War." National Defense University, Washington, D.C. December 14, 2009.

<sup>26</sup> Asimov, Isaac. "Chapter 2: Runaround." *I, Robot*. New York: Spectra, 2004.

<sup>27</sup> Singer, P.W. *Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century*. New York: Penguin Press, 2009.

<sup>28</sup> Koh, Harold. "The Obama Administration and International Law." Annual Meeting of the American Society of International Law. March 25, 2010. Available online at:

<http://www.state.gov/s/l/releases/remarks/139119.htm>.

<sup>29</sup> Miller, Greg. "Increased U.S. drone strikes in Pakistan killing few high-value militants." *The Washington Post*. February 21, 2011. Available online at: [http://www.washingtonpost.com/wp-dyn/content/article/2011/02/20/AR2011022002975\\_pf.html](http://www.washingtonpost.com/wp-dyn/content/article/2011/02/20/AR2011022002975_pf.html).

<sup>30</sup> Mayer, Jane. "The Predator War." *The New Yorker*. October 26, 2009: 36-45. Available online at: [http://www.newyorker.com/reporting/2009/10/26/091026fa\\_fact\\_mayer](http://www.newyorker.com/reporting/2009/10/26/091026fa_fact_mayer).

<sup>31</sup> Miller, Greg. "Increased U.S. drone strikes in Pakistan killing few high-value militants." *The Washington Post*. February 21, 2011. Available online at: [http://www.washingtonpost.com/wp-](http://www.washingtonpost.com/wp-dyn/content/article/2011/02/20/AR2011022002975_pf.html)



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[dyn/content/article/2011/02/20/AR2011022002975\\_pf.html](http://www.nationaljournal.com/njmagazine/cs_20100109_8396.php).

<sup>32</sup> Kitfield, James. “Predators: Part 1 – Wanted: Dead.” *National Journal Magazine*. January 9, 2010.

Available online at:

[http://www.nationaljournal.com/njmagazine/cs\\_20100109\\_8396.php](http://www.nationaljournal.com/njmagazine/cs_20100109_8396.php).

The most that has been written about the CIA’s drone program is that “it is multi-layered and methodical,” but there is still no clarification about what informs that methodology. McKelvey, Tara. “Inside the Killing Machine.” *Newsweek*. February 21, 2011: 34-37

<sup>33</sup> McKelvey, Tara. “Inside the Killing Machine.” *Newsweek*. February 21, 2011: 34-37.

<sup>34</sup> Martin, Matt and Charles Sasser. Predator: The Remote-Control Air War Over Iraq and Afghanistan – A Pilot’s Story. Minneapolis: Zenith Press, 2010.

<sup>35</sup> Mockenhaupt, Brian. “We’ve Seen the Future, and It’s Unmanned.” *Esquire*. November 2009. Available online at: <http://www.esquire.com/features/unmanned-aircraft-1109>.

<sup>36</sup> Singer, P.W. Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century. New York: Penguin Press, 2009.

<sup>37</sup> Speaker. Conference on “Unmanned Aerial Vehicles as an Instrument of War.” National Defense University, Washington, D.C. December 14, 2009.

<sup>38</sup> Singer, P.W. Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century. New York: Penguin Press, 2009.