LIVING IN THE DRONE AGE

WHAT IS THE IMPACT OF MILITARY UNMANNED VEHICLES ON THE GLOBAL SOCIOPOLITICAL STRUCTURE?

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CHAPTER ONE

What is a Military UAV?

By even a cursory reading of current events on the topic of global conflict, it can be seen that unmanned vehicles, drones, have taken their place at the forefront of technological interest. UAVs (Unmanned Aerial Vehicles) are shaping the way warfare is carried out, now that nations can carry out attack, reconnaissance, and tactical support from thousands of miles away. While war tears down many aspects of society, it also leads to numerous technological developments in a short amount of time as nations struggle to overcome one another. This chapter will introduce the military UAVs of today from a historical context and show how drones are now being used worldwide. It will examine the role aviation has played in global conflict over the last century, thus providing a basis for the discussion of the use of drones in international military and political struggle today. Technical and developmental information is included on the drones that currently play or have played a role in modern warfare.

The First and Second World Wars proved different from any other global conflicts in a number of ways, not the least of which was the implementation of manned aerial warfare devices. While the term “airplane” could have sufficed, “manned aerial combatants” describes the overarching concept that the vertical dimension was becoming a key part of warfare. Airborne weapons, in concept, date back to the first use of a bow or spear. The key change brought about by the use of military aircraft was that the combatant himself

was now airborne, and had the capability to engage with other airborne combatants. Even with the most sophisticated long-range artillery used at the start of World War I, the belligerents were still operating from ground-level, meeting face-to-face only on dry ground or at sea.

The function of aviation in World War I was closely linked to one of the leading causes of the war: nationalism. Aircraft, at the time new and innovative technology, were taken to be a point of national pride [1]. Just as intense nationalistic mindsets fueled the creation of grandiose and massive armies, aircraft were seen as a mark of accomplishment and military prowess. Two primary forms of aircraft were used in the First World War: airships and airplanes. Airships and dirigibles could be used for reconnaissance, provided a vantage point to observe the actual conflict on the ground [1]. While aerial bombardment via airship was possible, it was not very effective and could only be accomplished by hand-tossing the payload. Germany's zeppelins, know as *wunderwaften* ("wonder weapons"), were the pride of the German public, although they served little strategic purpose other than reconnaissance. Zeppelins were used for bombing raids, but the casualty these raids showed their inefficacy: Germany lost 441 airship crewmen, while England suffered only 556 casualties as a result of these raids; this loss of life proportionally exceeded that of both German airplane and submarine crews [1]. Yet, their use continued throughout the war. While functionality was limited, it was the national accomplishment of developing such technology and using it on the battlefield that fueled the interest and use of airships during the War.

Airplanes also primarily served in reconnaissance roles at the beginning of the war. Early aircraft both posed little threat and were not vulnerable to enemy attacks. Pilots were seen more as sportsman than as soldiers, living a separate and more leisurely lifestyle than their counterparts on land or sea [1]. Forward-firing armament was unachievable until 1915, when Dutch engineer Anthony Fokker used captured French technology to develop a method of synchronizing a machine gun with propeller blades. Suddenly, the skies were no longer safe; allied airplanes became easy targets until British engineers were able to develop comparable forward-firing capabilities. The demand on pilots increased greatly, as more complex maneuvers became requisite to survival and success. An era of air-to-air combat was ushered in, dominated by ace pilots such as Manfred von Richthofen, the Red Baron.

The Second World War ushered in an incredible amount of technological development, particularly in military aviation. At the start of the War, planes were driven by propeller and were detected primarily by line-of-sight. The payload of any above-ground weapon would be carried to its target by its own momentum and weight after being launched by hand, fired from a barrel, or dropped from an aircraft. World War II saw no less technological progress than its predecessor, as scientists and engineers desperately searched for any way to set their nation ahead. By the end of the War, five particular innovations had fundamentally changed the way militaries operated: radar, autopilot, rockets, the helicopter, and the jet engine.

The invention of radar benefited not only the navy by enabling the tracking of submarines, but also the air force by providing a means of detecting air craft at night or from long distances. Britain placed radar into operation in 1939, not only on the ground but also in night fighters to track enemy aircraft in the dark [1]. LORAN (Long Range Navigation) was quickly ushered from the lab into military use immediately following the attacks on Pearl Harbor in 1941. LORAN was a form of hyperbolic navigation, using a series of radio stations and a measurement process similar to echo location. Autopilot was first developed for use on bombers during air raids [1]. The concept of a jet engine had originated before the Second World War in several nations. Germany first developed a successful jet in 1939, followed shortly by Britain. The British, however, were the only ones to successfully implement a jet-powered aircraft before the end of the War.

Long-range rockets, though primarily employed as a scare tactic, proved to be one of the more interesting developments of military "aviation" during WWII. Though above-ground self-propelled weapons were revolutionary in the 1940s, underwater torpedoes had been around for decades. The modern self-propelled torpedo was invented in 1866 by Robert Whitehead. Countless torpedoes were launched during the war from ships, submarines, and even aircraft. In the Battle of the Atlantic, aircraft torpedoes disabled the heavy German battleship Bismark, enabling the British fleet to sink it. While torpedoes needed to be carried within a short distance of an aquatic target and then fired, a rocket had the potential to be fired at another nation from the safety of one's own. Germany was the only nation to utilize rockets during WWII, but only to minimal effect. "Vengeance" weapons, as they were termed, took the form of either an unmanned jet, V1,

or a rocket, V2. These weapons were loaded with explosives and fired at Britain, with minimal effect. They were inaccurate and caused only insignificant damage, but were nevertheless a powerful scare tactic. Germany's vengeance weapons were seen as "psychological warfare" in Britain [1]. The terror caused by these rockets was compounded by the fact that the attackers were many miles away, safely inside their borders.

Immediately following the resolution of the Second World War, tension began to mount between the Soviets and other Allied powers. A combination of disagreement over the division of Berlin and Germany, competing ideologies of communism and capitalism, and the development of nuclear weapons ushered in the Cold War. This era saw its greatest technological progress in the area of electronics. Vacuum tubes, transistors, and later semiconductors were funded by the U.S. government and soon came to play critical roles in the military. One of the first uses of computer technology in defense was SAGE (Semi-automatic Ground Environment). The project served as an air defense system to coordinate defense against enemy bombers. It utilized a cathode-ray tube display, automatic communication, and most notably a Whirlwind computer to process incoming data [1]. Using vacuum tube technology, Whirlwind was the first computer of its kind able to process data in real time. By the time SAGE was fully operational in 1958, however, guided missiles had replaced bombers as the key threat in nuclear attack, making the system mostly obsolete.

The development of the hydrogen bomb enabled the use of nuclear weapons weighing less than 5,000lb, which could be loaded onto a warhead [1]. Intercontinental ballistics missiles (ICBM) soon became the favored delivery package for Russian and American nuclear warheads. ICBMs increased response time and had the advantage of not requiring a pilot or bombing crew, but accuracy was limited against small, hardened military targets, where an almost-direct hit was necessary. In parallel with these nuclear, long-range surface-to-surface missiles, multiple air forces developed conventional short-to-intermediate range air-to-air and surface-to-air missiles. As jet fighters became faster and more maneuverable, relying on computer systems to control flight, electronically-guided weapons such as the USAF Falcon were needed to shoot down interceptor aircraft. These semi-autonomous missiles were a huge step in the direction of remotely operating an entire aircraft system.

Unmanned aerial vehicles (UAV) – colloquially referred to as "drones" – differ from missiles in several key ways. A missile is intended for one-time use to deliver a payload to a target and either explode or deploy other warheads, where a drone could be reused indefinitely. A missile is typically programmed to follow preset guidance algorithms, where a drone is controlled by a human pilot in real time. The USAF, concerned about incidents such as Gary Powers' U-2 spy plane being shot down over Russian territory, began planning for the implementation of unmanned aircraft in 1959-1960 [11]. The continuously high death tolls for any pilots flying over enemy territory fueled interest in early U.S. military UAV programs. Drones were used in the early 1970's as decoys and

for surveillance, but it wasn't until 1991 during the Gulf War that drones were used in combat.

The urgency of a wartime atmosphere urged the invention and production of new technology. While concepts such as the jet engine or radar have been – and will continue to be – at the forefront of the minds of scientists and engineers, the necessities of war drove these innovations into mass production. The development of the drone has followed a similar path. Increasing globalization and the demand for quick response to terrorist attacks makes the UAV appealing as a military forte. The war on terror, unlike either of the World Wars or our arms race with the Soviets, calls for swift attacks against clandestine opponents. Combined with its efficiency and lack of risk for American lives, the military UAV is becoming the weapon of choice for the major belligerents of the twenty-first century.

Despite numerous advances in the field of unmanned aircraft, drones are not fully autonomous and still require a human operator. In design, a drone is similar to a missile in several ways. For one, the safety, weight, and system integration concerns of a living payload are eliminated. A drone can use the space occupied by a pilot and user interface to increase sensor or weapons payload. The safety factor for load design decreases from 1.5 to 1.25 for unmanned vehicles, eliminating both weight and cost. A drone could potentially undergo much greater G-forces than a manned aircraft because the pilot's health is not a concern. However, drones have several demands above those of a missile, which make human operation of some kind necessary. A drone must be capable of

responding instantly to changes in its mission objective. A guided missile is launched with a single purpose: to hit a designated target. It relies on sophisticated feedback controls to make course corrections to stay on its target, but in most cases is not capable of changing targets, or aborting the mission and returning home. A drone, on the other hand must be capable making on-demand changes to the mission and responding to changes in its surroundings. A drone is also frequently called upon to integrate smoothly with manned aircraft. This issue is most obvious with carrier-based drones. The US Navy ran a set of tests to integrate an X-47B drone with carrier-based Hornets to determine if the drone could keep up with the rigorous pace of launch and recovery. Initial tests failed but determined that it was potentially possible, with continued improvement of the technology [2].

The training and function of a drone pilot is a topic seldom discussed, but one of which many people have a preconceived notion of. For example: "A single pilot sits at a computer terminal operating something similar to a flight simulator;" "he or she is flying a drone equipped with significant firepower, and whose mission is either to unload said payload or threaten to do so;" "while some formal training is required, drone operation requires much less experience than 'real airplanes.'" I have personally heard drone pilots likened to "a kid with a joystick" or "a guy by himself in a dark room." However, the reality is quite different. A drone operating platform consists of multiple supporting crews in addition to the pilot; a single combat air mission can require up to two hundred personnel to monitor and control all aspects of the aircraft from launch to recovery [3]. The primary mission of the majority of unmanned military aircraft, rather than combat, is

ISR (Intelligence, Surveillance, and Reconnaissance). ISR missions include battlefield surveillance, communications relay, and early-warning radar detection. While relatively few drones carry a weapons payload, all carry some sort of radar, television, or infrared sensor package. The training required for remote pilots involves a one-year intensive program, typically in addition to an undergraduate degree in manned aircraft training. Pilots with ISR capabilities continue to be in top demand [3].

A number of drone models are currently in use today, each with a unique, specialized function. The first to be examined in detail is Northrop Grumman's RQ-4 Global Hawk, a HALE (High Altitude Long-Endurance) surveillance craft (see figure 1). The "eye-in-the-sky" of the United States Air Force, the RQ-4 is not equipped with any weapons, but instead contains and intensive sensor platform. The Global Hawk is a highly capable aircraft, well-equipped to handle high-altitude missions similar to those of the Lockheed U-2. Its range of 12,000 nautical miles and 35 hour endurance enables it is able to go much further and remain aloft much longer than most unmanned aircraft [4]. Operating at 15,240-19,810 meters, it is sufficiently distanced from surface-to-air weapons while still collecting sensory data on targets. Sensor packages include both radar and visual systems. The Hughes Integrated Surveillance and Reconnaissance (HISAR) package, a derivative of the sensor used on the U-2, is a low-cost platform [5]. NATO has purchased Global Hawk platforms for AGS, Allied Ground Surveillance; these drones will be collectively used and operated by multiple nations.

Figure 1: Northrop Grumman Global Hawk
(https://upload.wikimedia.org/wikipedia/commons/9/9d/Global_Hawk_1.jpg)

While the majority of drone missions focus on ISR, most (if not all) of the controversy over drone usage revolve around attack drones. Any drone meeting the payload (cargo weight) requirements can be outfitted with weapon platforms. However, two specific models currently dominate the niche for combat drones: the Predator and Reaper, both manufactured by GA-ASI (General Atomics Aeronautical Systems Inc.). First developed in 1994, the MQ-1 Predator "A" was classified as a "Tier II" MALE (Medium Altitude Long-Endurance) vehicle. The drone was relatively small, measuring only 8.23m long, with a 16.76m wingspan. Although speed and range were limited, the Predator A was able to sustain a 40 hour flight time, longer than any of its successors. Its 1060kg payload enabled the aircraft to support both synthetic aperture radar and a weapons array

consisting of Hellfire missiles and an under-nose ball turret. By 2001, it had become the primary aircraft for offensive operations by the USAF [6]. The Predator B, classified as the MQ-9 Reaper, began development in 1998 (see figure 2). A notable change from the Predator was the down-facing V-tip to improve stability. A jet-powered model, the Predator C is currently under development. Today, major European powers are purchasing Reaper platforms from the U.S. for use in their own military. While only the United Kingdom is furnished with armed drones, nations such as France, Spain and Italy are purchasing these drones for tactical support and ISR; France is planning to augment its Reapers with elint (electromagnetic intelligence) capabilities [7].

Figure 2: General Atomics MQ-9 Reaper
www.af.mil

Land-based drones pose a vast array of issues, but launching unmanned vehicles from an aircraft carrier adds even greater challenges. Northrop Grumman's X-47B serves as an experimental UCAV (Unmanned Combat Aerial Vehicle) for the US Navy (see figure 3). While not a particularly large aircraft, with a wingspan of 19m, it is capable of a

significant (2041 kg) payload of both sensors and weapons. Developed in the early 2000's, the X-47B was contracted by the US Navy in 2007. A carrier-launched drone can be useful in many situations, working in tandem with other aircraft on overseas strategic missions. Several additional factors must be considered with any aircraft launched over water. Because active carriers will frequently run nonstop launch-and-recover sequences to keep as many aircraft aloft as possible, planes must prepare for flight and take off very quickly, in close quarters with other aircraft. Teams of carrier crews work with the pilot to prep, stage, launch, and monitor aircraft as efficiently as possible. When the pilot is replaced by an automated launch sequence or an operator across the globe, it becomes difficult to maintain the necessary pace of the launch sequence. Integrating unmanned vehicles with piloted ones is near to impossible. Testing was done in 2014 to determine if the X-47B could be integrated into carrier operations alongside F-18 hornets [2]. While several aviation firsts were achieved, the test themselves proved unsuccessful. The Navy was instructed to further improve the design and continue tests in the hopes of a full integration in the future.

One concern facing carrier-launched drones is aerial refueling. Because of the short runway distance of a carrier, a typical fighter will expend a large proportion of its fuel achieving enough lift for takeoff; it will then refuel aerially via a tanker launched earlier from the carrier and remaining above. During a test in 2015, the X-47B successfully refueled autonomously during flight from a Boeing Omega tanker [8]. Aerial refueling capabilities for UAVs would do more than just enable carrier launches. By increasing

overall range and payload, aerial refueling would augment the key advantages drones hold over piloted aircraft.

Figure 3: Northrop Grumman X-47B
www.northropgrumman.com

Not all unmanned aerial platforms operate as fixed-wing aircraft. There is an ever-present need for persistent (operating non-stop for weeks or months) high-altitude sensor platforms to monitor airspace for incoming warheads or other unwanted items. Satellite surveillance is not only distanced from the target and can be subject to weather conditions, but is also very costly. While pilots in spy planes such as a U-2 or SR-71 can achieve an excellent perspective on their targets, it is impractical to attempt persistent surveillance using pilots, whose flights are limited to only a few hours. Furthermore, it is ideal for a persistent sensor platform to maintain a geostationary position. While

satellites can be placed in geosynchronous orbit, atmospheric craft require a constant source of lift, generated by movement. Although a helicopter could maintain a stationary position with sufficient automation, an airship (blimp) could accomplish the same task without expending fuel to generate lift. In March 2009, the United States Air Force created a program tasked with finding an airship-based solution to persistent surveillance. ISIS (Integrated Sensor is Structure), directed by the USAF Research Laborator, proposed a 450ft unmanned airship, capable of maintaining an altitude of 65,000ft for up to 10 years (see figure 4) [9]. The project was later funded and turned over to DARPA for development. Lockeed's HALE-D, High Altitude Long-Endurance Demonstrator, was launched in 2011 by the U.S. Army as the first-of-its-kind high altitude unmanned airship platform [10]. Capable of an operational altitude of 60,000ft, its 36kg payload can be reconfigured to support surveillance, telecommunications relay, or even weather monitoring. The airship's weight is minimized through the use of high-strength fabrics in the hull. A geostationary position can be maintained for up to a year using a solar-regenerative propulsion system.

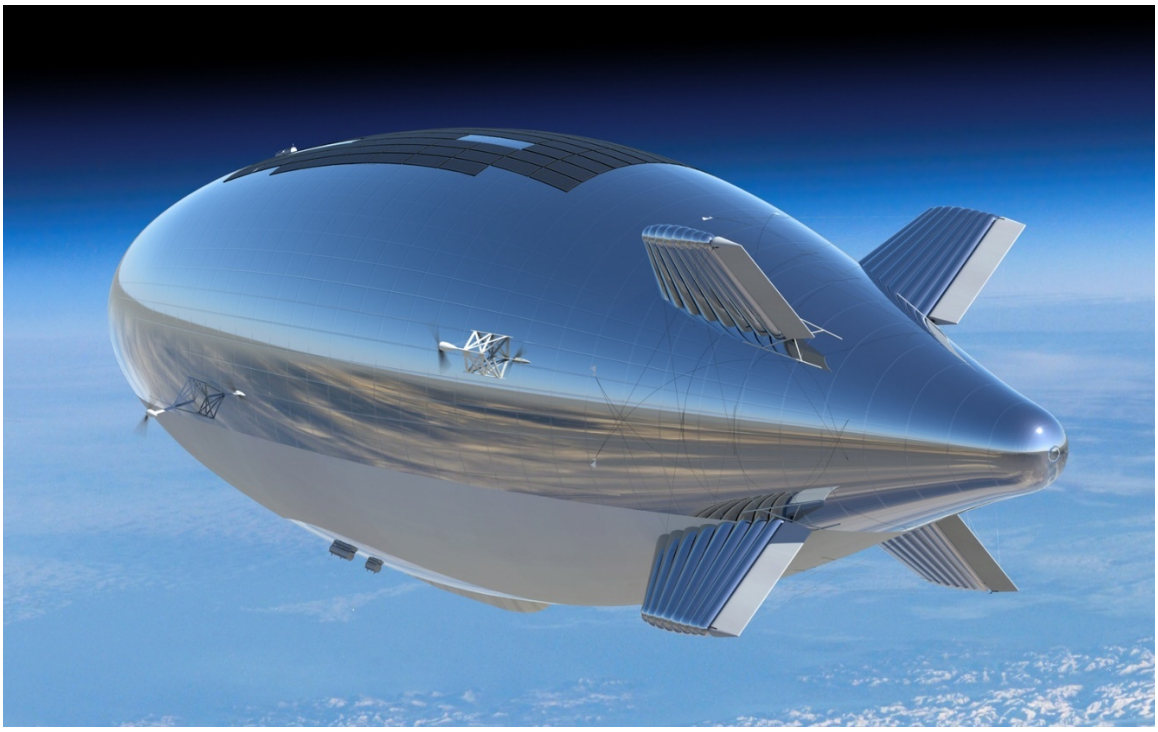

Figure 4: ISIS
www.Aviationweek.com

The development of today's unmanned warfare has followed a simple path of development in response to conflict. Since the Wright brothers created their first manned flying vehicle, each global conflict has spurred the creating of better and more effective aircraft. As technology developed to the point of autonomous flight, drones took their place the forefront of military development. Although they are becoming ever more pervasive, our understanding of their proper role in this world remains unclear.

CHAPTER TWO

International Business and Hardware Relations

The introduction of unmanned aircraft into modern technological development did not end with the United States military. Other nations were eager to benefit their own national interests by purchasing military-grade drone platforms for use in their military and security. Meanwhile, smaller drones were quickly commercialized, providing both recreational enjoyment as well as an aerial presence for photographers. Suddenly, although the most advanced combat drones were kept under careful guard, non-lethal platforms suddenly became ubiquitous. This chapter will examine the legal issues associated with unmanned aircraft, including international regulations, domestic and civilian concerns, and elimination of potential threats from terrorists and oppressive governments.

Remote control aircraft have been popular among hobbyists for decades. Those with the required patience and technical skills could purchase and operate model aircraft of various sizes. In recent years, however, two major technological developments have brought RC (remote-control) aircraft into mainstream commercialism: smart phones and gyro stabilizing technology. Early RC helicopters were almost impossible to fly and were ultimately at the mercy of the technical abilities of their operators. Advancing technology, such as counter-rotating propellers and flexible blades, have resulted in small RC helicopters that require minimal skills to operate and that can survive high-speed impacts caused by inexperienced pilots. Today's smart phones provide operators with a

controller that is much more sophisticated and user friendly than traditional remotes, with no additional expense. The prevalence of social media exponentially increases the market value of any aircraft with a camera; from the millennial term “selfie,” “dronie” spawned as civilians used the technology to photograph themselves. Among civilian hobby aircraft, there is little technical difference between what is considered a “remote-controlled aircraft” and a “drone,” although drones are typically in a quadricopter (four-propeller) configuration. In practice, a drone features more stabilization, more automation, and a camera, where other RC aircraft are tailored after real aircraft in appearance and performance. Drones such as the Parrot AR 300 provide civilians with sophisticated guidance and control from most smartphones, live high-definition video recording, and a range of more than 150 ft, all for under $300 from online retailers (see figure 5) [12]. More expensive drones sport larger airframes, longer range, and self-stabilizing cameras.

Figure 5: Parrot AR 300
www.amazon.com

Ease-of-access to this equipment created serious concerns of potential terror threats, not to mention countless domestic disturbances. Although intensive training and registration are required for pilots of legitimate aircraft, anyone with a computer, $50, and access to a shopping mall could establish himself in the skies. Spying, aesthetic disturbance, property damage and injury are among the minor issues posed by civilian drones. In 2015, a Kentucky man, William Meredith, used a shotgun to disable a neighbor's drone flying above his property [13]. Meredith believed the drone, which had appeared three times in the course of day, was being used to spy on his 16 year-old daughter. A county judge ruled that flying the drone over Meredith's property constituted a violation of privacy, thus giving him the right to blast it. Drones are reported to have interfered with aircraft takeoffs by flying too close to runways. Amateur photographers disrupted

helicopter-based forest fire fighting by flying drones underneath helicopters to get pictures of the fires [13]. Until recently, Federal Aeronautics Administration (FAA) regulations remained limited to a recommended 400 foot flight ceiling.

Fear of terrorist drone usage has prompted much greater governmental involvement with civilian drones in the United States. In 2011, a lone wolf terrorist was arrested for plotting to attack the Pentagon and White House with a small unmanned aerial system (UAS). Fearing further malicious use, the FAA and DHS worked together to curb non-recreational use of drones. In May 2016, Congress introduced the Homeland Security Drone Assessment Act. The act, while not directly prescribing specific regulations, required the Secretary of Homeland Security to research and report on how small unmanned aircraft could be used in a terrorist attack and what countermeasures were available. FAA regulations have since been increased to require licensing to use drones for non-recreational purposes, such as professional photography.

While small drones keep the internal United States government occupied, large aircraft corporations struggle to maintain a competitive edge in an unstable international market. In the mid-twentieth century, numerous aircraft manufacturers competed in a thriving market for both government and commercial contracts. Over the past few decades, American fixed-wing aircraft manufacturers have consolidated numerous companies into a few large corporations, including Boeing, Textron, Lockheed Martin, and Northrop Grumman [14]. Following the Second World War, the technology was still primitive enough to allow smaller companies to be viable in the market. Now, as these

corporations have gradually bought out or merged with competitors, combining technology at each step, the technology has become extremely esoteric and highly protected by the government. Newer, smaller companies must either engage in small commercial endeavors or become entrepreneurs in completely new technology, such as small civilian drones or, in the case of SpaceX, look towards uncharted territory.

Because of the lack of competition, policy makers have become concerned that the industry will become unsustainable and eventually erode away [14]. The most advanced aircraft technology has become highly proprietary, leaving little overlap between competitors. Though all major aircraft corporations engage in research of unmanned aircraft technology, Northrop Grumman continues to be the primary manufacturer of unmanned aerial systems (UAS). Lockheed Martin has won the contracts for both the F-22 and the F-35, while Boeing continues to produce the majority of large passenger jets. In "Keeping a Competitive US Military Industry Aloft," John Birkler lays out a number of steps necessary for America's aircraft industry to survive [14]. If these major companies, "primes," are to maintain viability in the coming years, it will be necessary for them to take on major government contracts.

Even within the unmanned vehicle sub-industry, current cost efficiency interests must be weighed against long-term loss of competition. For example, the completion of the United States Navy's Unmanned Combat Air System Demonstrator (UCAS-D) program brought the Northup Grumman X-47B into full service as Unmanned Carrier-Launched Airborne Surveillance and Strike (Uclass) aircraft. The X-47B is a highly effective

drone, posing no immediate need for replacement. However, continuing to operate the aircraft without contracting a replacement could cause economic damage to competitors [15]. In this case, the Navy may find it necessary to prematurely begin development of a replacement for the sole purpose of sustaining the industry.

Few nations indigenously produce large-scale military drones. The United States, followed by Israel and China, dominates international drone production. Though set back technologically after the fall of the Soviet Union, Russia has been covertly developing drone systems. Other nations such as Australia, France, and the United Kingdom utilized drone platforms purchased from other nations, while they continuously move closer to indigenous production. Just as with any other medium of international trade, unmanned military aircraft sales usher in a plethora of issues and subsequent regulations.

Although much remains unknown about their capabilities, China is one of the few nations to fully produce an indigenous drone fleet. China uses military drone primarily for airborne early warning (AEW), relaying radar information in battlefield settings. In general, China's military relies more on over-the-horizon anti-ship and land attack weapons, but their developing drone fleet fills the void in ISR-related roles [16]. One of their primary high-altitude long-endurance drones, the Chengdu Soar Dragon, features a joined-wing design (continuous wings, eliminating wingtips), which gives the plane a high aspect ratio (short, wide wings with a large area) and reduces drag on the aircraft (see figure 6). It also allows for a higher payload, which the Chinese use for both increased sensor capabilities and missiles.

Figure 6: Chengdu Soar Dragon
http://errymath.blogspot.com/2014/07/china-develops-mature-broad-based-uav.html#.WEYesvkrLIU

Major European nations lack the technology to produce large unmanned aircraft, but their desire for such devices is still present. The General Atomics MQ-9 Reaper has found favor in the eyes of nations such as Italy, France, and Spain, who are purchasing platforms from United States manufacturers. Trade regulations restrict the sale of armed aircraft to these nations, but numerous uses still remain for the Reaper such as border security and ISR. France is reportedly augments their drones with electromagnetic intelligence (elint) capabilities, a form of covert intelligence gathering using electronics [17]. Drone platforms require significantly greater operating manpower than conventional aircraft, which leads to a shortage of appropriately-trained personnel in nations purchasing foreign aircraft. Grumman aims to implement automatic takeoff and landing for the Reaper by 2017; the plane will utilize "waypoints," or markers, to guide it during the takeoff and landing processes [18]. The primary objective is to lessen the

demand on pilots, but the automation will also serve to reduce pilot errors and thus increase safety. Subsequently, the increased automation will make the platform more appealing to foreign consumers like France.

Australia is another significant customer in the drone market. Australia's intense involvement in Middle Eastern conflicts has placed pressure on the Australian Defense Force (ADF) to increase military capabilities. Australian leaders favor drones, and are undergoing preparations to purchase armed drone platforms, such as the General Atomics MQ-9 Reaper. Royal Australian Air Force Air Marshall Geoff Brown states "… the combination of a good [intelligence, surveillance, and reconnaissance] platform that's weaponized is a pretty legitimate weapon system for Australia" [19]. As a part of its planned two percent increase in military spending, the ADF will upgrade its current drone platforms from propeller-powered to more advanced jet-powered drones.

In 2015, NATO (North Atlantic Treaty Organization) announced its intentions to purchase several Northrop Grumman Global Hawk platforms for AGS (Alliance Ground Surveillance) [20]. AGS aims to provide commanders with a detailed picture of a situation, collecting persistent and comprehensive coverage of both land and sea [21]. Intended for full deployment by 2018, it will contribute to a variety of missions, including border and maritime security, humanitarian assistance, and the war on terror. The Main Operating Base will be located in Europe, an area NATO is hoping to have more involved in the purchase and acquisition of military drones. AGS will require high-altitude long-endurance (HALE) drones that can operate in any condition, a requirement

met perfectly by the unarmed Global Hawk. NATO will initially purchase five of these drones to be used collectively by the fifteen nations acquiring the AGS program on behalf of all twenty-eight allies.

Numerous trade regulations affect the export of military drones, most of which are still being formulated as the technology continues to develop. In recent years, the United States has attempted to loosen restrictions on drone sales in order to allow American drone manufacturers to remain competitive as the technology becomes ubiquitous across the world [22]. The Arms Export Control Act (AECA) establishes the general principles and objectives that govern sharing of American defense materials with foreign nations. The International Traffic in Arms Regulations (ITAR) sets forth specific export guidelines consistent with AECA and gives the Department of State authority over any United States citizen selling arms to foreign buyers. These regulations are serious and firmly enforced; in 2009, former University of Tennessee professor John Roth was sentenced to 48 months in prison for violating AECA by selling technical data for plasma actuators for drones to China. The Missile Technology Control Regime (MTCR), established in 1987 as a voluntary international partnership of 34 countries, is a directive to establish international guidelines for the sale of any missile or unmanned aircraft having a range of at least 186.4 miles (300 km) and a payload of at least 1102 lbs (500 kg). The most desirable drones – Predator, Reaper, and Global Hawk – all fall under Category 1 of MTCR.

The United States Department of State has laid out an end-user agreement that evaluates exports on a case-by-case basis and requires sellers to comply with all national and international regulations [22]. The recipient of any drone export must be in accordance with any applicable humanitarian laws and must not be utilizing the aircraft for unlawful surveillance or force against their domestic population. The manufacturer must provide any necessary training and documentation to allow for safe operation of all drone platforms. Finally, drones that are armed or capable of being armed must only be used where the use of force is called for under international law. In summary, these restrictions apply primarily to the buyer and their use of the drones, rather than the specifications of the aircraft itself.

Initially, it seems that the regulations mentioned here are more than enough to properly control military-grade drone usage. However, there is a major flaw: these restrictions apply exclusively to consumers, not to nations that indigenously manufacture drones. This leaves nations such as the United States, Israel, and China autonomous in their use of these aircraft. The situation is further compounded by the fact that the United States carries out the majority of lethal attacks. Without any international treaties or internal legislation to control drone usage, it is very easy to use the technology to the detriment of smaller nations and very difficult for the small nations to enact protective laws or develop appropriate countermeasures. In order to complete the discussion of the effect of military drones, the legality and ethics of the American drone campaign must be evaluated in great detail.

CHAPTER THREE

International Policy and the American Constitution

The introduction of drones into the modern arena of war has coincided directly with a change in the way wars are carried out. Over the course of the Cold War, warfare moved from large-scale direct conflict between major nations to a nuclear stalemate between a handful of superpowers, with smaller countries and independent groups struggling in the shadows to achieve their goals. Since the late 1990's, several large terrorist organizations have gained significant footholds in smaller nations, then spreading across the world to further their violent agendas. Technologies such as satellites, long-range missiles, and drones have diminished the significance of international borders by decreasing the effective distance between territories, allowing larger nations to encroach upon the boundaries smaller ones without obstruction. While the interests of smaller governments and individual citizens must be considered as a part of a discussion of the ethics of drone strikes, this chapter will examine the legal issues associated with both the United States government and overarching authorities such as the United Nations. These policies require careful definition, followed by a discussion of their current application in the global War on Terror.

A typical drone strike falls under the category of "targeted killings." As defined within a United Nations special report, "Targeted killings are a lethal act of premeditated force

employed by states in times of peace or during armed conflict to eliminate specific individuals outside their custody" [23]. The concept came into popular usage in 2000 when Israel began openly targeted alleged terrorists in Palestine; it has since been used to describe any military action aimed at eliminating specific individuals determined to constitute a threat. While peacetime assassinations have been banned in the United States since 1976, recent United States presidential administrations have sought justification for targeted killings, such as the Navy SEAL strike that eliminated Osama bin Laden. The 2001 Authorization for the Use of Military Force (AUMF) gave the president – at that time George W. Bush – the ability to "use all necessary and appropriate force" to combat affiliates of the Taliban and al Qaeda [23]. Although this provided domestic justification for these target killings, including drone strikes against potential terrorism threats, two main issues faced President Bush and later President Barack Obama: Constitutional due process and international law. The key to understanding the international policies which affect the use of drones in targeted killings are the recent events in the troubled regions of Pakistan and Afghanistan.

In recent years, Pakistan and Afghanistan have been zones of war, anarchy, and oppression. Their governments have degenerated to the point of allowing open repression of civilians and commission of heinous acts by radicals [24]. The cause of this is most likely the cyclic occupation of both world superpowers and terrorist groups. During the Cold War, these nations were major war fronts between the United States and the Soviet Union. The United States provided approximately 3 billion dollars of war supplies in an effort to drive out the Soviet occupation of Afghanistan [25]. Once the

Soviets were driven out, however, United States forces quickly withdrew, closing their embassy in Kabul in 1989. This left large gaps in structure and government, giving opportunity for the Taliban to take control. The Al Qaeda, a formal terrorist group of radical Sunni, initially fought against the Soviet invasion in the 1980s, and later established a presence in Afghanistan from which it attacked both military and civilian targets. Following the September 11th terrorist attacks, the United States launched Operation Enduring Freedom, a large military operation aimed to overthrow the Taliban government and capture or eliminate al-Qaeda leaders [25]. Afghanistan returned to a weak, United States-instituted government that ultimately amounted to anarchy [24].

The turmoil in Afghanistan ultimately flowed across the border into Pakistan (see figure 7). The 1973 Constitution of the Islamic Republic of Pakistan, approved by the Pakistani Parliament, placed much of the nation in semi-autonomy, accounting for much of the oppressive environment [24]. The country soon became a major battleground for the United States-led "War on Terror." Whereas Afghanistan had been occupied by occupied by multiple powers for years, the United States' entry into Pakistan was a sudden, outside intrusion. In recent years, American foreign policy has consisted of several similar intrusions into affairs outside its own domain of influence. Supporters of this type of policy see the United States as a necessary peacekeeper which must intervene in international – and even national – affairs; in the case of Pakistan, whose pending collapse was a matter of international concern, it is thought to be even more necessary for the United States military to intrude. Opponents say the United States wrongly acts in a "paternal" manner to preserve peace, often breaking the conventions that it forces onto

other nations [24]. The government of Pakistan accepted military aid from the United States, but much of the Pakistani population felt that foreign interference was unwelcome, resulting in further internal insurgencies. Drone strikes, however, were condemned by both the Pakistani populous as well as Prime Minister Yousuf Raza Gilani. The precision strikes attempted by the newly developing American drone fleet, intended to kill al Qaeda leaders in mountain hideouts, resulted in numerous accidental civilian deaths.

Figure 7: Afghanistan-Pakistan border
http://devpolicy.org/the-world-bank-vice-president-for-south-asia-on-afghanistan-and-pakistan20111007/afghanistan-pakistan-map-php/

The United Nations has placed guidelines in place outlining the legality and definitions of armed conflict. Article 51 of the United Nations charter protects nations who use force

reactively in response to an international threat. This article absolves the United States of any guilt from strikes carried out in Afghanistan following the September 11th attacks, because force was used only in direct response to an attack [24]. Article 51, however, does not allow nations to use force *proactively* to prevent a threat. Critics of the United States' targeted attacks inside Pakistan borders would cite this Article to say that the United States is undertaking preemptive self-defense, thus committing international crime. The key issue with this argument, however, is that the United States is not attacking the *nation* of Pakistan, but is seeking out terrorist groups taking refuge within Pakistan. The factor distinguishing Pakistan from these terrorist groups is state sovereignty.

State sovereignty, exclusive authority over a given piece of territory, is the basis for all international law [24]. The difference between Pakistan and each of the various terrorist organizations is that Pakistan is recognized as a "state," where a terrorist group is defined as a "non-state actor" (NSA). An NSA is "an individual or organization that has significant political influence but is not allied to any particular country or state" [26]. A non-state terrorist group cannot legally undertake any sort of armed conflict without state sponsorship. Furthermore, state consent is required to establish the legitimacy of any foreign intervention. So, do United States strikes against NSAs on Pakistan soil constitute armed attacks against the state of Pakistan? Attacks carried out in self-defense against an NSA that had already carried out aggressive action are justified, but any sort of preventative strike must be considered an attack against the state of Pakistan. If these terrorists had not already committed a direct act of aggression against the United States,

they would be solely under the jurisdiction of their housing country. By not committing an act of aggression against the United States, the group has incurred no legal judgment from the United States and enjoys the rights of Pakistani citizens, as long as Pakistan chooses to protect him. So, an attack against individuals taking refuge inside any nation is considered an attack on that nation, according to the theory of state sovereignty and the definition of non-state actors.

Even if the drone strike is legal according to international law, targeted killings against terrorist present a major issue of Constitutionality: due process. The Fifth Amendment of the United States Constitution protects suspects from being punished before being convicted as guilty by proper legal means. In the case of drone strikes, however, targets on the kill list will typically be eliminated without any kind of trial or verdict. Opponents of such strikes point out that there are remaining peaceful means of resolution that the United States should attempt to carry out before ordering a lethal strike. Senator Rand Paul (R-Ky.), while approving of many aspects of drone usage under the Obama administration, spoke against the White House for using "flashcards" and "PowerPoints" as decision-making procedures for condemning individuals [28]. He nicknamed the White House's weekly national security meetings "terror Tuesdays" because of their continuous discussion and alteration of the secret "kill list." Drone strike opponents would further point out that the force used in countering individual terrorist suspects is disproportional to the treat incurred, exacerbating the situation rather than amending it [24]. Author and analyst Norman Polmar believes that drone strikes are counterproductive, stating that although they eliminate threats, their repercussions result

in much greater setbacks to United States interests [28]. It is clear that failure to follow satisfactory due process methods when eliminating individuals through drone strikes is among the more grave issues with international UAV usage.

The use of unmanned aircraft rather than conventional means in target killings makes questionable forms of combating terrorism much foggier and seemingly less unethical. Undertaking small, precision attacks with an unmanned aircraft eliminates both human involvement and any appearance of full-scale war. President Barack Obama has been an avid user of drone strikes, in his first two years ordering nearly four times the number that President George W. Bush had while in office (see figure 8) [23]. His administration made key changes in management of drone operations, shifting control of lethal drone strike from the Central Intelligence Agency (CIA) to the Department of Defense (DOD), making it significantly easier for the United States president to order drone strikes. With severe defense budget setbacks, drone strikes provided a relatively cheap way to dispense with the most deadly of potential threats; the general public found that a targeted killing, with no risk of American lives and less risk (theoretically) of civilian lives overseas, was easily reconciled as an acceptable means of combating terrorism. In addition, unilateral drone strikes do not require the United States to cooperate with other countries, such as Pakistan. Pakistani security forces have offered to assist the United States military with counter-terrorism operations, even offering to carry out the targeted killings themselves, but the United States remains reticent to cooperate [24]. In sum, the use of lethal drone strikes was pushed forward by the White House under George W. Bush and Barack Obama because of their overall ease and short-term effectiveness.

Figure 8: Satire representing the Obama administration's excessive use of drone strikes http://sayyidali.com/wp-content/uploads/2015/09/ObamaDroneAttacks061513.jpeg

As a part of this increase in drone implementation, several obstacles had to be overcome – or simply circumvented. Since the attacks on September 11th, 2001, the CIA has moved from their role of "traditional" intelligence gathering to management of paramilitary operations to collect information on a larger scale. When the Obama administration transferred control of targeted drone killings to the DOD, CIA operatives were forced to return to traditional methods, which involve long hours of tedious official work, a cultural shift likely garnering resistance from lawmakers [28]. As officials under the Obama administration made great efforts to promote the drone campaign, from its precision to its cost-effectiveness, the idea they emphasized most was the "lawfulness" of drone strikes. This comes in contrast to the United States' history of condemning most forms of targeted killings. The use of drone strikes did not find support under conventional federal rulings, but rather was legitimized under a form of executive ruling known as "secret law" [27]. These secret laws, passed by executive branch officials, are

shielded from the public and often from both the Legislative and Judicial branches. Although potential arguments exist for why drone strikes are different than assassinations, none have been legally substantiated, and the White House continues to rely on its own secret law. This provides a glimpse into an unsettling aspect of American drone strikes: rather than taking the proper steps to define and legalize procedures for attacking terrorist threats with unmanned aircraft, world leaders are taking things into their own hands while convincing the general populous that their actions are legal.

In summary, drones warfare has taken the international political stage by surprise and left numerous grey areas as to the usage, which world leaders have quickly taken advantage of. Drone technology as a whole can be classified as a "disruptive technology." A disruptive technology is any invention that becomes pervasive significantly faster than society can accustom itself to it. Nuclear weapons, which changed the course of world history in only a few years, were a disruptive technology upon their creation in the 1940's, causing an almost immediate end to World War II and ushering in an international arms race that lasted for decades. Treaties for the control and proper use of the technology did not develop until after the Cold War, when multiple smaller, more unstable nations like Iran began to achieve nuclear capabilities. Likewise, unmanned aircraft have sprung into high levels of usage and development among nations with high technological capabilities. If history follows the same course that it did with nuclear weapons, UAV technology will eventually be properly legislated and controlled, but only after years of conflict and international tension. However, drones are currently following a much different path than nuclear weapons. Drones are quickly becoming key players

the modern theater of war, claiming lives almost daily through their usage. Where the horror of nuclear war made the necessity of treaties much easier to perceive and agree upon, reaching an international agreement on unmanned aircraft is likely to prove more difficult.

While the unrest and confusion regarding drone politics will remain for years, several simple steps can be taken. First, clear and open policies regarding drone strike procedures must be implemented by the United States government. The FAA has been taking active steps in recent years to classify and regulate drone usage, which have provided some legal framework for American Citizens using drones for recreation and business. However, the use of larger drones, both combat and surveillance models, remains greatly lacking in definition. Perhaps the current drone warfare policies will remain in effect, but they must be subject to review not only by non-Executive branches of United States government, but also international critique. Secondly, legal standards of warfare must be updated to accommodate for unmanned combatants. In the coming years, remote control technology will become increasingly more sophisticated, expanding from aircraft to naval equipment, domestic security, and possibly even robotic foot soldiers. Each passing day makes the need for proper legislation more critical to ensure proper use of such deadly technology. Finally, international treaties must be set in place which both regulate the use of armed drones by large nations – the United States – and protect the interests of smaller nations – Pakistan. This can only come about if drone-operating nations are willing to be transparent regarding their use of drones and to submit

to international treaties. If each of these steps is followed, drone warfare can be used in great ways to preserve peace in this world as the fight against global terrorism continues.

CHAPTER FOUR

The Ethics of Drones and Conclusion

The question of whether the contemporary usage of unmanned vehicles is ethical is a complex one. While any course of action that reduces friendly combatants' loss of life could be considered ethical, it could also have a negative effect on individuals living in a combat zone. The introduction of remotely-controlled combatants is intended to decrease pilot risk, but does it increase or reduce unintentional deaths of bystanders? Separating the pilot from the battlefield by several thousand miles only causes further issues. The models of drones currently used for lethal strikes are quite dissimilar to the manned aircraft carrying out the same sort of missions; do the change in armaments and absence of a pilot improve or degrade the precision and proportionality of a strike? The ethics of engagement itself, regardless of whether UAVs are involved, are important to the discussion. This chapter will outline several ethical arguments and theories, and will end by presenting the overall conclusions of this thesis.

Just War theory is a tradition of how and why wars are fought. Outside of any specific set of legal conventions, Just War is the historical and philosophical basis for determining the ethics or warfare [29]. These bases originated in religious schools of thought, primarily the Bible and Greek mythology, citing divine intervention both as justification for war and as guidance for conduct in warfare. Philosophers – religious seculars – have since contributed to these discussions through their own writings and theoretical

discourse. Most recently, these discussions were brought to the forefront of international debate following the 9/11 terrorist attacks as academics sought definition for the conventions of warfare in a changing world [29]. Just war tradition (*justum bellum*) is comprised of three complimentary sets of principles: *jus ad bellum* (just cause for war), *jus in bello* (just conduct in war), and responsible and *jus post bellum* (fair resolution between belligerents following a war). Jus ad bellum and jus in bello principles are most applicable to the discussion of armed UAVs, as the topic involves both the conditions that merit usage of remote warfare and the just usage of such weapons.

As a side note, it is critical to remember that the introduction of unmanned systems marks a significant shift in the direction of ethical war discussions. While many technological developments have changed the way war was carried out, drones now change the nature of who is carrying out war [30]. They are a massive step in the direction of fully autonomous belligerents, theorized for decades by science fiction writers. Although the introduction of long-range weapons of mass destruction sparked a great amount of controversy, these weapons have only twice been used (intentionally) against human targets, while drone strikes are carried out daily, taking lives at the impulse of governing authorities.

Jus ad bellum tradition, justice in declaring war, sets for criteria for a legitimate initiation of conflict: there must be a just reason for the war, war must be a last resort to resolution of a conflict, the war must be declared properly by governing authorities, there must be a reasonable chance of success, and the end must be proportional to the means used [30].

These principles can be easily applied to conventional means of war involving territorial belligerents with large groups of armed forces, but the introduction of both unmanned vehicles and non-territorial terrorist groups immediately complicates the traditional theories. For example, who are the "proper authorities" to declare war within a terrorist organization? How must preemptive strikes against those associated with known terrorist groups be justified? Are drone strikes considered an act of war by themselves or a way of preventing war?

While it may appear that a highly-advanced, heavily-armed UAV is not a proportional use of force to isolated terrorist threats, they are in fact a much more appropriate means than conventional aircraft or ground assault [30]. A single drone can cross international borders quickly, locate and eliminate a target, and return without risking the pilot's life. Sending a piloted aircraft on a targeted kill mission incurs not only additional safety and defense measures, but the possible necessity of a rescue attempt should the plane be shot down. Deployment of ground troops further requires crossing of physical borders, a long-term presence in hostile territory, and a significant amount of support equipment. A drone strike can be executed with minimized risk of civilian casualties and no human liabilities inside enemy territory. As chronicled n the 2001 film *Black Hawk Down*, a United States military operation was carried out in 1993 to capture a dangerous faction leader in Somalia. A straightforward attack was turned into a hellish nightmare when a helicopter was shot down, resulting in several unsuccessful rescue attempts and numerous deaths. While drones are incapable of capture missions, they can carry out precision

strike operations without any necessity of a rescue attempt should the plane be shot down.

The danger of such a clean and efficient manner of killing, however, is that it will actually forestall an open declaration of war past the proper time. As long as a government such as the United States can continue to use carry out low-profile strike missions effectively, it can postpone a declaration of war against the target entity, thus violating jus ad bellum. The issue becomes particularly complicated when the strikes are carried out against unstable nations being controlled or partially run by terrorist organizations; if the nation housing the target group does not either give consent to the strikes or openly oppose them, the aggressive posture of the strikes (whether or not they are an act of war) is open to interpretation, thus causing further destabilization of the territory [30].

The central theme of "jus in bello," tradition – just conduct in war – is to minimize noncombatant (civilian) casualties through the principles of discrimination and proportionality [29]. Discrimination is to employ tactics that direct attacks towards belligerents and away from civilians; proportionality is to determine the ethically-appropriate amount of force to use in response to a threat. A surface-level examination shows that drone strikes satisfy both conditions of jus in bello theory. An unmanned aircraft can infiltrate enemy territory to eliminate a specific target without involving (or even alerting) the majority of the civilian population; if ground troops must establish a presence in enemy territory and subsequently navigate their way out, the odds of civilian

involvement increases substantially. Because a drone does not need excessive defensive measures to protect a pilot, it can enter the battlefield carrying only the weapons payload necessary to destroy the given target. If only the aircraft is at stake and not the pilot, the operation as a whole will be better able to account for the protection of civilian lives. In short, typical drone strike practices are ethical in that they satisfy both discriminatory and proportionality conditions of jus in bello.

One concern, however, is whether or not drone pilots are actually better able to discriminate between civilians and combatants than those deployed on-site. There exists a simple tradeoff between accuracy and safety: the closer a combatant is to the target, the greater the risk of harm, but the better he or she will be able to make informed decisions, discriminating between civilian and belligerent [30]. A foot soldier within an enemy establishment will be better able to assess a given situation than a tank operator a mile away, who in turn is at a better vantage point than a pilot flying at high speed and high altitude. Drones complicate the situation because the operator is able to both view and analyze a target in detail, but remain in complete safety several thousand miles away. On one hand, the pilot does not have the immediate compulsion of self-preservation and can immediately receive advisement from superior officers, thus enabling greater discriminatory abilities than even a conventional pilot within eyesight of the target. However, drone strikes rely heavily on intelligence gained from on-site operatives or ground troops. The beginning of *Black Hawk Down* portrayed a local using his vehicle as an aerial marker for the attack point and communicating verbally with the American military base [33]. Because they are in the combat environment, responding instantly to

threats and experience things first-hand, conventional pilots are able to personally assess situations more holistically and respond to various environmental factors in real-time.

What is the result of these contrasting advantages of conventional and unmanned aircraft? A statistical study of combatant vs. non-combatant deaths by the New America Foundation shows the effect of drone strikes on discrimination, contrasting the rate of civilian deaths from early drone implementation (2004) to the drone campaign of the Obama administration:

> The 233 reported drone strikes in northwest Pakistan, including 20 in 2011, from 2004 to the present have killed approximately between 1,435 and 2,283 individuals, of whom around 1,145 to 1,822 were described as militants in reliable press accounts. Thus, the true non-militant fatality rate since 2004 according to our analysis is approximately 21 percent. In 2010, it was more like 6 percent. [31]

So, although civilian casualties remain, they were greatly reduced over only a few years. These years marked numerous developments in drone warfare, both in technology and operation; while these statistics do not compare directly with those of manned aircraft strikes, they do show that the United States drone program has the capability of rapid reduction of civilian casualties. It is this high potential for improvement, as technology continues to develop, that shows that drones do indeed provide an appropriately discriminatory means of carrying out attacks.

Although the focus of drone ethics discussions is the execution and impact of targeted strikes, the operators of the aircraft are beset with their own set of psychological effects and dilemmas. The common public perception of drone operations is that of an

individual behind a video game consol, one which could not be more inaccurate according to an article published by the secretary of USAF (United States Public Affairs) public affairs [32]. Many overseas drone operations are carried out at facilities in the central United States, where the operators are able to return to their families and some form of civilian life after hours. This presents several ethical dilemmas, the first of which is "cognitive dissonance." As defined by Dr. Byron Newberry of Baylor University, cognitive dissonance is the separation of the pilot from the war environment. Primarily, the risk of death in combat is completely removed. While this of itself is a major reason for implementing UAVs, it alters the mentality of the pilot. A conventional pilot stationed on a carrier or overseas base shares living arrangements and daily life with his or her comrades, who are engaged in similar life-and-death situations. This 24-hour hostile environment can grant the pilot an increased sense of focus and awareness. However, a drone pilot in Nevada viewing a live feed of the combat zone has the benefit of immediate consultation with his or her superiors; the commanding officer has the ability to see everything the pilot sees, give advisement, and even make final calls on strikes [30]. A pilot in a conventional aircraft must often relay information back to command and await instructions, all the while dealing with real-time combat issues. A drone pilot is unhindered by combat stress, which could allow for clearer decision-making. So, is cognitive dissonance a cause for drone warfare to be considered unethical? No, because there is no concrete reason to believe that cognitive dissonance violates jus in bello by unnecessarily increasing risk to non-combatants. It must, however, be taken into account in military operations, as the mode of response of a remote pilot is unlike anything encountered before.

In conclusion, I will outline my opinions of the effect of drones on the global sociopolitical situation. First, I believe that drones will continue to raise ethical and legal concerns until they are properly defined. Unmanned vehicles, more than most disruptive technologies, blur the lines between man and machine, warrior and weapon. Based on the research previously presented, it is clear that a drone functions as a combatant rather than a weapon in almost all aspects, while maintaining distinct advantages by not having an onboard pilot. Although deriving this conclusion (or its counter) is simple, it has yet to be resolved at an international level. Political thinkers, government officials, and military leaders must engage in open discussions of this topic at a theoretical level. This must be followed by treaties and policies that will not only regulate drone usage, but also classify in a way that all can understand. Before legislation can be drafted to govern the usage of military drones, the world must know and accept the reality of this technology.

Secondly, I believe that drones will not follow the historical route of nuclear weapons. A completely plausible view of drone technology today is that it parallels long-range weapons of mass destruction in the height of the Cold War. Drones are only possessed by a few nations, they are being rapidly enhanced and deployed, and that confusion over the disruptive technology is throwing the world into chaos. From this, it would follow that nations operating drones would eventually reach and impasse and that some form of disarmament would take place. However, nuclear weapons represented a potential threat to all of humanity, where drones present an active threat to those targeted by their operators. Armed drones, already used on a daily basis, have provided numerous benefits

to international security, barring some accidents and ethical dilemmas. Unlike weapons of mass destruction, they are easily countered with out causing a world crisis. I predict that military drones will continue to become more and more prevalent in our world, fundamentally changing the way combat is carrying out, most likely for the better.

Finally, I find that drones are an ethical and appropriate response to a changing world of warfare. The misuse of drones will continue, as with any other weapon, until those that utilize them are held to firm standards, but this misuse does not mean drones themselves are wrongful. Since the early twentieth century, war has shifted from an open struggle between nations to a highly complex game between peace-keepers and peace-disruptors; smaller groups struggle to achieve their own goals against the establishment set by a handful of world superpowers. This new game of warfare has increased civilian involvement in war while decreasing the profile of the "enemy." Drones provide a proportional response that allows the peace keeper to fight an evasive enemy while minimizing civilian casualties. The most obvious benefit of unmanned aircraft, however, is the reduction of risk of the pilot's life. Removing the pilot from the cockpit has involved countless roadblocks, ethical and technological, but the net effect is that the pilot remains out of harms way while carrying out a mission of justice with comparable effectiveness to that of an on-site pilot. In sum, future generations will have much to benefit from the proper usage of unmanned military aircraft.

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