The Moral and Ethical Implications of Precision-Guided Munitions

SCOTT F. MURRAY, Lieutenant Colonel, USAF
School of Advanced Air and Space Studies

THESIS PRESENTED TO THE FACULTY OF
THE SCHOOL OF ADVANCED AIR AND SPACE STUDIES,
MAXWELL AIR FORCE BASE, ALABAMA, FOR COMPLETION
OF GRADUATION REQUIREMENTS, ACADEMIC YEAR 2002–3.

Air University Press
Maxwell Air Force Base, Alabama 36112-5962

March 2007

Disclaimer

Opinions, conclusions, and recommendations expressed or implied within are solely those of the author and do not necessarily represent the views of Air University, the United States Air Force, the Department of Defense, or any other US government agency. Cleared for public release: distribution unlimited.

Contents

Abstract

This work explores the relationship between one of the most significant military developments to emerge in the past century, namely, aerial precision-guided munitions and their relationship with the just-war tradition. The thesis is straightforward. There are moral, social, and political dilemmas associated with a "perfect" aerial precision bombardment capability that are influenced by the just-war tradition and may not be readily apparent to political decision makers and military strategists. This work examines the historical development of aerial precision since World War I and the emergence of the just-war tradition and international law since 1625. It then identifies specific dilemmas associated with the two sorts of judgments required by the just-war tradition, namely, *jus ad bellum* (justice of war) and *jus in bello* (justice in war), and explores their ramifications. The aim of this study is to encourage moral and ethical reflection by politicians, strategists, and tacticians at all levels. The issues at hand are aerial precision doctrine, the use of the precision-guided munition as the modern aerial weapon of choice, and the influence of the just-war tradition on strategic and tactical decisions.

About the Author

Lt Col Scott F. "Dutch" Murray, a native of Coral Springs, Florida, is a senior operations intelligence officer and weapons instructor with over 16 years of experience at squadron, wing, numbered air force, headquarters, and joint levels. In 2000 he was the recipient of the National Military Intelligence Association's Maj Gen Jack E. Thomas Award as the Outstanding US Air Force Intelligence Professional of the Year. Colonel Murray's past operational assignments include operations officer and intelligence flight commander, 52d Operations Support Squadron, Spangdahlem Air Base (AB), Germany; chief of intelligence, 31st Air Expeditionary Wing, Aviano AB, Italy; chief, intelligence analysis, 607th Air Intelligence Squadron, Osan AB, Republic of Korea, during Operation Allied Force; flight commander and intelligence weapons instructor, USAF Weapons School, Nellis AFB, Nevada; chief, operational intelligence, 366th Wing (Composite), Mountain Home AFB, Idaho; and Soviet strategic systems analyst, First Air Force/Continental United States (CONUS) North American Aerospace Defense Command (NORAD) Region, Langley AFB, Virginia.

Colonel Murray is a 2002 graduate of the US Army Command and General Staff College, a 1994 distinguished graduate of the US Air Force Fighter Weapons School, and a 1993 graduate of Squadron Officer School. His education includes a bachelor's degree in international relations from the US Air Force Academy in 1987 and a master's degree in ethics and policy studies from the University of Nevada, Las Vegas, in 1997. In January 2003, Colonel Murray was selected for promotion to the rank of lieutenant colonel. In July 2003, he assumed the duties of director, commander's action group, Headquarters Pacific Air Forces, Hickam AFB, Hawaii. Colonel Murray is married to the former Jolande Caterine Diderich of Zuidhorn, the Netherlands. They have a daughter, Christiane, 10, and a son, Peter, eight.

Acknowledgments

I wish to thank Dr. Everett Dolman, Prof. Dennis Drew, and the faculty of the School of Advanced Air and Space Studies for their invaluable insights and the time they dedicated to assisting me in my pursuit of this quest. Their contributions were immense. However, any errors contained within are solely my own. Special thanks also to Don Cole, director of the International Center for Peace and Justice, and to the students and faculty at Lipscomb University, Nashville, Tennessee, who endured my presentation of this work during an evening of very lively academic exchange as war raged in and over Iraq. That night helped me refine the moral and ethical dilemmas as identified herein. I also wish to thank William Arkin, Charles Dunlap, Phillip Meilinger, and Tomislav Ruby for their advice and counsel during various stages of my research. Also, I am grateful to my parents, Don and Jane Murray, and the faculty of Saint Thomas Aquinas High School, Fort Lauderdale, Florida, who so many years ago instilled in me a work ethic that remains my driving force.

Finally, immeasurable thanks are due my wife and best friend, Jolande, and our two incredible redheads, Christiane and Peter. Once again, through their loving support, they allowed me to pursue my quest for knowledge completely unabated while always greeting me at the door with an embrace and that key question, "Did you finish your thesis yet?" This work is as much theirs in spirit as it is mine in print.

Chapter 1

Introduction

In all likelihood, the moral inhibitions of commanders will limit future American air offensives.

—Mark Clodfelter

Precision technology has a strategic effect and people haven't yet realized how profound it is.

—Michael Russell Rip

The increased reliance on precision weapons is not a substitute for critical self-scrutiny and moral self-reflection.

—Kenneth Roth, *Human Rights Watch*

This study explores the relationship between one of the most significant military capabilities to emerge in the past century, namely, aerial precision-guided munitions (PGM) and the just-war tradition. This study is straightforward. There are moral, social, and political dilemmas associated with a "perfect" aerial-precision capability and influenced by the just-war tradition that are not readily apparent to political decision makers, military strategists, or tacticians. *Perfect aerial precision* is defined in this study as the ability to strike a target with theoretical certainty, exactness, and intensity to achieve the desired military effect with optimized economy of force and no collateral or unintended damage.[1] This study examines the historical development of aerial precision since World War I and the emergence of the just-war tradition and international law since 1625. It then identifies specific dilemmas associated with the two sorts of judgments required by the just-war tradition as invoked in modern days, namely, *jus ad bellum* (justice of war) and *jus in bello* (justice in war), and explores the ramifications of these dilemmas.

In a world where international relations are increasingly dominated by realism, this study recognizes the importance of moral virtues and ethical reasoning in political and military affairs. Realism, from that espoused by Thucydides in his description of the Athenian siege of Melos to present-day doctrine, does not deny the presence of moral and ethical considerations in international affairs; it focuses instead on a ruthless quest for power and national security. Realism is the acceptance of war and violence as legitimate instruments of policy and is the true nemesis of moral reflection.

Airpower refers to more than a straightforward military capability.[2] More importantly, as historian Tami Davis Biddle suggests, it also refers to an

important idea. The most dramatic manifestation of this idea is precision bombing.[3] Today, aerial precision is a cornerstone of US bombing doctrine, and one could even argue that such has always been the case. For the first 70 years of military-aviation history, however, bombing doctrine and the promise it reflected often outpaced actual technological capabilities. A proven precision-bombing capability remained unattainable technologically. Airpower's efficacy was severely limited by the difficulties in putting free-falling munitions on targets. Only within the last 30 years did technology begin to reach a level of parity with doctrine and the promise of airpower. When laser-guided bombs dropped the Thanh Hoa and Paul Doumer bridges in North Vietnam in May 1972, a true US precision-bombing capability finally emerged. It is my contention that, in the last four years in particular, moral implications of aerial precision capability of the United States have begun to transcend the limits of existing doctrine for the use of such weapons. Aerial precision is now measured in feet, not miles, and is known for its ability to strike individual building windows, not railroad-yard acreage. Therefore, the United States would do well to heed I. B. Holley's warning as published in 1953: "To adopt a new weapon without a new doctrine is to throw away advantage."[4]

Chapter 2 of this study examines the history of aerial-precision weapons with particular emphasis on the relationship between technology, doctrine, and morality. Holley's *Ideas and Weapons* remains the seminal work in the field with regard to the relationship between technology and doctrine. Two of Holley's maxims stand out:

- "The methods used to select and develop new weapons and doctrines concerning their use will have an important bearing upon the success or failure of armies [and air forces]—and of nations."[5]
- "The pace at which weapons develop is determined by the effectiveness of the procedures established to translate ideas into weapons."[6]

The history of the development of US aerial-precision weapons in this study demonstrates clearly the presence of a moral component within Holley's concepts of "ideas" and "methods" as expounded in the above maxims.

Airpower today is one of the foremost means of employing military force. With the horrid memories of trench warfare and stalemate cemented firmly into the psyche of military thinkers following World War I, they soon viewed airpower as a savior in the form of a quicker and more humane way of waging warfare. These kinds of claims have continued through the present day.[7] Much of the justification for such claims has been, and remains, based on the just-war tradition.

Chapter 3 of this study surveys the whole of religious and secular thought regarding just-war tradition throughout history and in the development of international law to arrive at a succinct and useful statement of that tradition. The just-war tradition is not a theory, doctrine, strategy, or even a law. A *tradition* is a dynamic set of ideas and ideals informed by many sources that influence the behavior of persons and nations. The

just-war tradition can provide a moral framework for defining and assessing the use of force. It cannot always be authoritative in law, but it is authoritative in Western ethics. Michael Walzer captures the basic concepts of the just-war tradition in his now-classic book, *Just and Unjust Wars*:

> The moral reality of war is divided into two parts. War is always judged twice, first with reference to the reasons states have for fighting, secondly with reference to the means they adopt. The first kind of judgment is adjectival in character: we say that a particular war is just or unjust. The second is adverbial: we say that war is being fought justly or unjustly. . . *Jus ad bellum* requires us to make judgments about aggression and self-defense; *jus in bello* about the observance or violation of the customary and positive rules of engagement.[8]

Without question, the foundation on which the just-war tradition has been built over the years is distinctly religious. Its formative roots can be traced back to the early Catholic Church and the writings of Saint Augustine and Saint Thomas Aquinas. However, in 1625, with the publication of *The Rights of War and Peace*, Dutch scholar Hugo Grotius refined the just-war tradition in order to remove its religious foundation. According to Grotius, ethical guidelines for war are based on rational and secular reasoning and are no less valid with or without the presence of God or religion. While recognizing that religion continues to play a major role in the evolution of the just-war tradition, this study confines itself to the legal-rational justifications of the tradition. This will lead to the introduction of international law and the laws of war that emerged in the nineteenth and twentieth centuries as part of this study.

Chapter 4 comprises the heart of this study. Three possible moral, social, and political dilemmas created by a perfect aerial-precision capability are identified and discussed at length. These dilemmas are derived directly from both the *jus ad bellum* and *jus in bello* judgments required by the just-war tradition. They demand full consideration by future strategists.

Chapter 5 incorporates a summary and identifies likely dominant characteristics of American airpower in the twenty-first century. If Mark Clodfelter's observation that moral inhibitions will limit future American air offensives is valid, then the conclusion of this study provides a starting point from which to examine those moral inhibitions. Aristotle believed that practical wisdom was demonstrated in the ability to discern the particulars of any situation. The informed thought before any act and not the act itself speaks to the practical wisdom of the decision maker. Dilemmas that could result from a perfect aerial precision capability are most certainly worthy of the level of discernment Aristotle so passionately believed in.

Note that this study is written within the confines of certain political and philosophical boundaries. An important distinction exists between two specific moralities of force—principled realism and amoral realism.[9] The former provides for the use of military force in accordance with the just-war tradition; on the whole, the latter does not. According to Mark Amstutz's typology, there is a third morality of force: pacifism. Pacifists hold that violence is never a morally legitimate means to provide for national security.[10]

Although an important political tradition, pacifism is not useful to the Airman or politician struggling with moral issues within the just-war tradition or planning military action; therefore, this study will not consider it.

The distinction between principled realism and amoral realism is central to this study. Briefly, amoral realism assumes not only that war and violence are legitimate instruments of policy, but also that moral and ethical concerns are not constraints.[11] Its creed is best described as "Win at all costs!" This political philosophy is best exemplified by the Athenian siege of Melos during the Peloponnesian War as described by Thucydides. The crusades of the Middle Ages are also examples of amoral realism. More recently some have argued that the Allies' unconditional-surrender doctrine during World War II exemplified this form of realism. The current war on terrorism and al-Qaeda and the connotations of jihad and holy war also have amoral components. While amoral realism is not the dominant political philosophy of our time, the contrast between it and principled realism demands attention.

Practical or principled realism represents the intermediary position between the extremes of pacifism and amoral realism. This political approach holds that war is always subject to moral and ethical standards.[12] Here is where the just-war tradition is currently applied. Principled realism emerged in earnest following World War II. It reflects the great Western disdain for the images of uncaring, rampant destruction so prevalent throughout the world in 1945. It represents the predominant political philosophy within which airpower strategists and political decision makers make decisions both today and tomorrow. Therefore, principled realism is the major framework for this study.

William Arkin, a military analyst and nationally syndicated columnist, recently asked the following question: "Are we as smart as our weapons?" His answer is insightful: "The question is whether we have the right policies, wisdom, targeting, and understanding of our capabilities to be able to wage war in the right way."[13]

In conclusion the aim of this study is to encourage moral and ethical reflection at all levels. The issues at hand are aerial-precision doctrine, the use of PGMs as the modern aerial weapon of choice, and the influence of the just-war tradition on strategic decisions. It is my hope that this study fosters better, more just, and well-discerned military and political judgments by those who read it.

Notes

(All notes appear in shortened form. For full details, see the appropriate entry in the bibliography.)

1. Jackson, "Global Attack," 108.
2. For additional insights into the use of words and air-mindedness, see Meilinger, "Towards a New Airpower," 39–47.
3. Howard, Andreopoulos, and Shulman, *Laws of War*, 140.

4. Holley, *Ideas and Weapons*, 15.
5. Ibid., 5–6.
6. Ibid., 19.
7. Finn, "Broader Implications," 34–56.
8. Walzer, *Just and Unjust Wars*, 21.
9. Amstutz, *International Ethics*. See the introduction and chap. 5 for an in-depth examination of the relationship between realism and the ethics of force and a full description of Amstutz's moralities of force typology.
10. Ibid., 94–95.
11. Ibid., 96–97.
12. Ibid., 99.
13. Quoted in Kurtz, "Explosive Analyst."

Chapter 2

Aerial-Precision Development

Past, Present, and Future

By exercising the precision, which is the keynote of America, we mean that we carefully select and, to the best of our ability, hit the precise spot which is most vital to the enemy.

—Frederick L. Anderson

In war, the main idea is to get the bombs on the target.

—Curtis E. LeMay

Thank God that we have got precision engagement and they have not.

—Price T. Bingham
play on words of Hilaire Belloc's
famous Maxim Gun verse

The pursuit of aerial precision is almost as old as the airplane itself. Throughout this elusive quest, American Airmen faced two significant challenges with regard to weapons development:

- According to I. B. Holley, "The pace at which weapons develop is determined by the effectiveness of the procedures established to translate ideas into weapons."[1]
- According to Dennis Drew, US Airmen, while renowned for their deep fascination with technology and mental toughness in combat, have never been known for their academic prowess. Rather they have succeeded time and again as "doers" and not as introspective "thinkers."[2]

As a result the evolution of aviation and associated weapons technologies since 1903, particularly the development of an aerial-precision capability using precision-guided munitions, can be characterized as haphazard and disorganized at worst and as an arduous, drawn-out, but ultimately successful process at best.[3] Either way, specific dilemmas surrounding the use of PGMs emerged in the process of development and remain today. Like all other weapons, PGMs have shortcomings.

Through the first half of the twentieth century, the pursuit of a robust aerial-precision capability remained a major unrealized goal of airpower theorists and tacticians the world over. Airpower needed to overcome hurdles such as limitations of basic aerodynamics, distance, geography, night operations, weather, guidance, underground or bunkered facilities, and so

on. It was widely perceived that such technical difficulties could be overcome with dedicated funding and sustained scientific research and development.[4] The payoff would be a more lethal, efficient, and effective weapon, and its cost-utility argument was compelling. Area bombing, while potentially devastating, would never have the political, economic, or military advantages of precision bombing.

The tougher challenge, the major focus of the present study, was to overcome ethical injunctions against engaging noncombatants. Area bombing causes enormous collateral damage and very large numbers of noncombatant casualties, clearly disregarding accepted American moral values, including the dignity and natural rights inherent in every individual. While the movement toward total war began well before the Wright brothers, the traditional moral sanctuary for noncombatants was increasingly violated, largely with the rise of airpower's capacity for aerial bombardment. Things have slowly begun to change, however. When both the Thanh Hoa and Paul Doumer bridges in North Vietnam were dropped by precision aerial bombardment during Linebacker I in 1972, PGMs made their first significant mark in the official history of military aviation.[5] Air warfare would never be the same. All US wars since have sought to maximize the advantages of aerial precision through the use of PGMs. Operations Desert Storm, Allied Force, and, most recently, Enduring Freedom and Iraqi Freedom were fought using increasing numbers of aerial-precision weapons.[6] Even recent limited US military actions, such as El Dorado Canyon and Desert Fox, were characterized by the same reliance on PGMs.

Today scholars display an unprecedented level of confidence in aerial precision when they make bold claims such as "GPS technology and precision-engagement doctrine are now the centerpieces of US aerospace power."[7] There is a strong belief among these scholars that aerial precision has transformed airpower to such an extent that the idea of designating airpower as the supported force and ground and sea power as the supporting forces in future military operations is now plausible.[8]

Precision engagement is a tool of US combat capability. The story of how "technology to war fighting" became a core competency of the US Air Force (USAF) and why the USAF now relies on precision almost exclusively during aerial military actions is as important as the story of the extended pursuit of a perfect aerial-precision capability for military effectiveness.[9] The challenges faced by Airmen, particularly those challenges identified by Holley and Drew, are evident in the history of PGM development. This is especially true when one examines the inevitable trade-offs compelled by moral constraints and military necessity during the history of airpower and the pursuit of aerial precision.

Aerial-Precision Development in Total War

The history of strategic bombardment and the pursuit of aerial precision began in World War I with a new invention known as the airplane. How

were these untested flying machines to be integrated into existing military structures? How were planners to envision and execute aerial bombing of an enemy?[10] Most importantly, would military aviation actually work amid the fog and friction of war?

At the end of the Great War, more questions remained than had been answered. During the interwar years, Airmen at the US Army Air Corps Tactical School (ACTS) began to think rigorously and systematically about the airplane's capabilities and its future potential. World War II validated the claims of many airpower proponents, but consistently effective aerial precision remained elusive. By the 1950s, highlighted by the imposition of nuclear weapons, the ability to hit the desired target unerringly with no more than the desired effects became a moral imperative, a preferred alternative to indiscriminate and destructive area bombing.

World War I

During World War I, the airplane proved its worth in various tactical roles such as reconnaissance, artillery spotting, and air-to-air combat. However, strategic bombing was largely ineffectual in breaking the stalemate of trench warfare. What did emerge from the World War I experience were two important themes in the future development of aerial precision. First, according to John Morrow, the airplane "intensified man's dependence on technology."[11] Once the inherent problems of underpowered engines and aerodynamic failures were overcome, there remained the issue of aerial weapons—machine guns, bombs, and rockets—to make airpower more effective. If the nation's treasury was to fund a military air force, then this significant investment demanded results.

Second, there emerged an unrelenting urge to capture, harness, and unleash the airplane's full strategic potential to achieve successful political outcomes and victory in war. Most nations, including the United States, adopted a very optimistic view of strategic bombing. After a marginal World War I combat performance, strategic bombardment was not really tested. Nevertheless, speculation abounded on the possibilities of airpower to force enemy capitulation by bombing cities, destroying important war industries, and degrading enemy morale. While there was no consensus before 1914 on the role airpower would play in war, one began to emerge by 1919. Many Airmen now believed that strategic bombing could be used to produce the decisive effect in war. Modern industrial nations had exploitable weaknesses arising from complex and interdependent infrastructures. Aerial bombardment was viewed as extremely long-range artillery and a likely instrument to affect these vulnerabilities. Disruption of the industrial base, it was presumed, would rapidly knock the state out of any modern war. Airpower doctrine had begun to emerge, but the technology and weapons to achieve the envisioned effects did not yet exist.[12]

Throughout the World War I experience, moral issues surrounding the use of strategic airpower remained mostly below the surface, but they did

emerge from time to time. Although Kaiser Wilhelm II's moral inhibitions regarding bombing anything other than military targets were well known, there were other opinions, like those of Air Marshal Hugh Trenchard of England, who extolled long-distance bombing for its "maximum moral effect" of "sustained anxiety."[13] Yet, there was a growing sense that "air-delivered frightfulness" was not only undesirable, but also might be immoral.[14] A prominent attitude at the time was that people who wage war do not lose their humanity or moral obligations because of their activities. Gianni Caproni and his chief scribe, Nino Salvaneschi, were well aware of these prevalent moral inhibitions. Part of Caproni's strategy for selling his new bomber to the Americans as they entered the war was to call on the Allies to "abandon all sentiment" and embrace the bomber as an "arm of death."[15] For Caproni, "the extermination of noncombatants" was the lesser of two evils—the other being defeat.[16]

Just before the war ended, US secretary of war, Newton D. Baker, strongly downplayed any future role for strategic bombing in his annual report to Congress. He wrote that the direct damage inflicted by aerial weapons was "relatively small" and had "no appreciable effect."[17] Strategic bombing, the secretary believed, should therefore be outlawed on "the most elemental ethical and humanitarian grounds."[18] It obviously was not, but the larger issue remained. Was strategic bombing immoral in and of itself, or was it immoral because it could not hit targets precisely?

The Interwar Years and the Air Corps Tactical School

The quest for aerial precision was strengthened by the writings of airpower theorists and the actions of military aviators during the interwar years. Giulio Douhet published *The Command of the Air* in 1921. William L. Mitchell and his Airmen successfully sank the *Ostfriesland* that same year. Certainly one had to be precise in order to sink a battleship with aerial weapons, but the airpower debate remained centered on questions about categories of appropriate targets—not whether bombs could actually hit targets. Additionally, airpower theory immediately following the war was founded primarily on the premise that civilians would be less able than soldiers to withstand aerial attack.[19] This view especially dominated British aerial-bombardment doctrine between the wars.[20] Because this anticipated targeting enemy urban centers, the development of any specific aerial-precision capability in the 1920s and 1930s was inhibited because one did not need a great deal of technology and precision to bomb cities indiscriminately. Notes from the League of Nations General Disarmament Conference of 1932 reflected one of the most prevalent signs of the times. In one document a French diplomat wrote, "The cruelty of war does not vary according to the perfection of the material."[21]

Airmen in Great Britain and the United States were keenly aware of the importance of doctrine development. Holley captures this sentiment when he writes, "To adopt a new weapon without a new doctrine is to throw away

advantage."[22] The divergence of British and American strategic-bombardment doctrine illustrates this clearly. The British focused primarily on the social ramifications of strategic bombing. For them, the moral effect of airpower seemed intuitive. It was the primal fear of vulnerability that airpower could exploit. Oliver Stewart, writing in a British military journal, represents the dominant British view at the time that any attempt to distinguish between force (military) targets and value (civilian) targets in air warfare held little worth. He advocated a doctrine of "central shock" characterized by "direct attacks upon the enemy's centres of government, population, and industry."[23]

For American Airmen, particularly those who thought, wrote, and taught at the ACTS, the focus of their strategic bombing doctrine was on the consequences of damage to specific targets or target systems.[24] No US consensus emerged regarding the meaning or significance of the moral effects of strategic bombing following World War I.[25] American Airmen preferred to concentrate on the material effects of aerial bombardment.[26]

In the spirit of Drew's description of Airmen as doers, ACTS officers possessed an optimistic faith in technology.[27] During the 1930s when faster, larger bombers and the Sperry and Norden bombsights became available, they began to place a high premium on bombing accuracy.[28] The analytical approach taken by the ACTS faculty was statistical and model driven rather than empirical. At the time, their study question looked something like this: "How can airpower most effectively undermine an enemy's ability to wage war by attacking specific targets crucial to the enemy's war economy?" This economical view of bombing came to be known as the industrial web theory.[29] Aerial precision was the key to the success of the ACTS theory. Key nodes of an enemy's economy, viewed as a network of connected and interdependent systems, could be destroyed only by using precision bombing.[30]

The industrial web theory also required an unprecedented quantity and quality of intelligence regarding an enemy's economy. What are the key nodes, and how are they to be destroyed? Then, as today, an aerial-precision capability linked itself inextricably to precision intelligence.

As war loomed in Europe and the Pacific, the Americans, preoccupied with science and technology, set the nation on a course in pursuit of precision bombing at all costs. This differed significantly from the British approach to strategic airpower at the time. It is clear that as early as 1939, American Airmen had come to be convinced that airpower would be decisive in the coming war. Despite this faith the actual capability to achieve true aerial precision did not exist. World War II would prove that the expectations of the ACTS Airmen were not really achievable.

In the history of aerial-precision development, the importance of the interwar years is clear. Technological advances, scientific invention, and an "overarching enthusiasm" for developing precision bombing during the period influenced the American way of war.[31] As historian Biddle rightly concludes, these developments "dovetailed not only with the existing emphasis on careful selection of targets, but also with the requirements of prevailing moral and ethical strictures."[32] While acknowledging the failure of air-

power theorists to gauge correctly what was technically possible in 1939, nonetheless, this strong belief that airpower *could* achieve victory, morally and ethically, became forever lodged in the American psyche. Despite the World War II experience, this airpower creed remains today, and Airmen profess faith in it by their increasing use of aerial-precision weapons.

World War II

During World War II, aerial precision was regarded differently in the European and Pacific theaters of operations. In fact, there was little or no strategic bombing in the Pacific before the end of 1944. Therefore, this study examines each theater separately.

In Europe, the Combined Bomber Offensive (CBO) had two distinct doctrinal components. The Royal Air Force (RAF), generally speaking, conducted night-area bombing at medium-to-low altitude. This was the result of the severe losses RAF Bomber Command suffered in daylight in the first half of 1940. In 1941 the smallest target RAF Bomber Command could find and strike was a large city. By 1943 with improved navigational and electronic aids, Bomber Command could concentrate attacks tactically at night against urban and industrial areas with great effect.[33] Throughout the CBO, however, aerial precision remained a low priority for the British in their pursuit of a "general area bombing policy."[34]

The US Army Air Forces (USAAF) strategic-bombardment doctrine reflected its ACTS roots. Beginning in 1942 and lasting throughout the CBO, the USAAF conducted high-altitude, daylight, precision bombing using Boeing B-17 Flying Fortress and Consolidated B-24 Liberator bombers equipped with the Sperry and Norden bombsights. Their targets were predominantly the industrial web of Germany.[35] Biddle describes the American doctrine succinctly as "a selective bombing policy."[36]

American Airmen in Europe purposely avoided elevating the effects of bombing on civilian morale to a "privileged rhetorical position" as their British counterparts had done. They chose instead to stress, in the most straightforward manner possible, the potential material effects of strategic bombardment.[37] In the words of Lt Gen Ira C. Eaker, a USAAF commander in Great Britain during the CBO, the strategic bomber would not be indiscriminately thrown at "the man in the street."[38] However, American precision bombing, as executed during World War II in Europe, is better described as an attempt to destroy the enemy's morale, not by terror bombing but by the "cumulative effect of having its means of carrying on the conflict destroyed."[39] This reflects the primary goal of the ACTS industrial web theory of strategic bombardment. Taking into account this definition, it is clear that US airpower did actually target the morale of the German population, both civilian and military, and to great decisive effect.[40]

World War I revealed the potential of airpower and exposed its primary weakness—accuracy. Without precision the enemy still had significant physical sanctuaries, and airpower was "more bluster than power."[41] Of-

ten characterized as America's first Top Secret military project, the Norden bombsight is significant in the history of aerial-precision development because it represents the embryonic stage of a special American way of war. Its manufacturer spoke confidently of its ability to drop a "bomb into a pickle barrel." This was a very appealing image to Americans—military and civilian alike. It reflected the American penchant for technological achievement and evoked an ideal of precision that always hit the guilty and never the innocent. Most importantly, it satisfied a deep-seated, uniquely American, and perceived need for achieving and maintaining the moral high ground through "self-imposed restraint."[42] The roots of the modern moral sanctuary, which our enemies exploit today, first germinated here during the CBO.

History has not been kind to the Norden bombsight as a successful aerial-precision mechanism. The results of strategic bombardment by B-17s and B-24s were certainly less than precise. "Its achievements," according to Stephen McFarland, "remain the stuff of mythology."[43] "Precision bombing" proved to be a very artful expression of the times.

At the Casablanca Conference, General Eaker flatly stated, "Day bombing is point bombing."[44] This characterization reflected the American belief that daylight bombing was more precise than British night bombing. However, as previously stated, precision and accuracy were relative terms in 1942.[45] As early as 1941, the US Air War Plans Division (AWPD) had calculated the likelihood of success in an attack against a target 100 by 100 feet in size by Norden-bombsight-equipped B-17s. The likelihood of at least one hit by a combat wing of 54 aircraft dropping a total of 108 bombs was only 75 percent.[46] Throughout the CBO, USAAF bombers never even approached this optimistic prewar AWPD estimate. Indeed, most postwar examinations of bombing precision were framed in reference to the percentage of bombs that landed within 1,000 feet of their aim points and not in terms of the percentage of bombs that actually hit their desired aim point or target.

Various sources make widely differing claims about the level of USAAF precision during the CBO. The accuracy of these claims is beyond the scope of this study. The following descriptions of USAAF CBO bombing results suffice to demonstrate that aerial precision during World War II was anything but precise. Historian Richard Hallion presents the low-end figure. In the fall of 1944, only 7 percent of all bombs dropped by Eighth Air Force B-17s hit within 1,000 feet of their aim point.[47] Jurist W. Hays Parks puts the number during the same time frame at 30 percent.[48] If the scope of the inquiry is narrowed further, the numbers do not improve. According to Parks, between May 1944 and April 1945, USAAF bombing of German synthetic-oil targets resulted in only 13 percent of all bombs impacting within 1,000 feet of their aim points.[49]

By modern standards it is clear that precision bombing was not an accurate description of American efforts during the CBO. It was more precise than aerial bombardment during World War I, however. American attempts at aerial precision during World War II were hindered by a number of fac-

tors. These included the pervasive cloud cover over Europe that inhibiting visual bombing, formidable German antiaircraft flak and fighter air defenses, and the operational limitations of the Norden bombsight despite its promise demonstrated during testing in a prewar, controlled environment.[50] By late 1944, Gen Henry H. "Hap" Arnold, the overall USAAF commander in Washington, D.C., directed the first nonvisual bombing missions in response to the less-than-precise results. These missions were flown using a combat box of 18 to 21 B-17s with the assistance of various instrument-bombing aids.[51] Despite these and other measures, American strategic bombing of Germany never achieved precise results. A 1990 USAF study, "Air Power Lethality and Precision: Then and Now," summarized aerial precision during the CBO as follows: it took 3,024 aircraft carrying 9,070 bombs to achieve a circular error probable (CEP) of 3,300 feet.[52] In retrospect, however, the inability of the USAAF to achieve precise results did not inhibit ultimate victory in Europe or the Pacific.

USAAF operations in Europe contrasted sharply with the American strategic bombing of Japan. Like their counterparts in Europe, Airmen in the Pacific struggled to achieve precise results. As in Europe, however, aerial precision eluded them. For example, in the summer of 1944, 47 Boeing B-29 Superfortress bombers using Norden bombsights dropped 376 bombs on the Yawata steelworks in Japan. Only one plane hit the target with only one of its bombs. This single 500-pound bomb represented only one quarter of 1 percent of the total bombs expended during this particular mission.[53]

Historian Conrad Crane correctly notes that strategic-bombing doctrine in each theater during World War II was shaped by both "military necessity" and the "individual personality of each commander who defined that necessity."[54] In the Pacific, Maj Gen Haywood S. Hansell, Jr., first commander of XXI Bomber Command insisted on deploying his bombers against only precision targets during daylight operations. He maintained that industrial and military installations remained the focus of his operations and opposed forcefully any suggestion that his bombers conduct area attacks on cities and civilians as the swiftest path to victory.[55]

The problems Hansell faced while attempting to execute a precision-bombing doctrine in the Pacific were formidable. They included abnormally high B-29 abort and accident rates, the nature and location of Japanese industrial web targets, and severe (and previously unknown) jet-stream winds aloft. In the end, these problems proved insurmountable for Hansell. Faced with the need for a more expedient and pragmatic bombing policy in the Pacific to appease US political leaders, Arnold relieved Hansell of his command in January 1945, replacing him with Curtis E. LeMay. Once Hansell left the Pacific theater, there was little if any opposition to the abandonment of precision-bombing efforts. LeMay, who had commanded precision-bombing strikes in Europe during the CBO, saw area incendiary bombing of Japanese cities at low altitude as the "best method for ending the war quickly, saving American lives, and demonstrating a true victory through airpower."[56]

Military necessity, growing American war weariness, and LeMay's personality all contributed to the slide toward total war in the bombing of Japan. LeMay decided on the "bombing of Japanese cities as the solution to his operational problems" after Washington proposed the idea.[57] The temptation to abandon an aerial-precision doctrine in favor of the incendiary bombing of Japanese civilians for psychological effect, in addition to the massive disruptions of industrial production, proved too hard to resist for politicians and military commanders alike. The moral decision to use atomic weapons did reflect, ultimately, the honest discernment of the particulars of military necessity in the Pacific by decision makers, most notably by Pres. Harry S. Truman. However, it also represented the purposeful subordination of emerging aerial-precision doctrine—and perhaps the moral high ground as well—in favor of victory.[58]

Despite its spectacularly lethal conclusion in the bombings of Hiroshima and Nagasaki, the World War II experiences of American Airmen influenced aerial-precision development. Despite the clear consensus that area bombing shortened the war and saved lives in the long run, images of uncaring, rampant destruction of the lives of noncombatants in both Europe and Japan were not the ones most Airmen wanted to endure with the American people. As Crane correctly observes, "An impartial observer must conclude that in general most American Airmen did the best they could to win the war with consistent application of a doctrine that favored military and industrial targeting over terror bombing. Their *intent* was to spare noncombatants, and they succeeded better than many historians are willing to concede [emphasis in original]."[59]

Following World War II, the "US ability to bomb civilians swelled, but the practice of doing so diminished."[60] The American way of war remained grounded in the concepts of aerial precision and the pursuit of precision bombing. The moral and ethical strictures in today's doctrinal literature reflect an emphasis on aerial precision that evolved directly from "the effort and intent of experience in World War II."[61] At the dawn of the nuclear age, the question then became "How might air power serve American objectives while strictly limiting American sacrifices and not entailing horrific destruction of human life?"[62]

The Korean War

In the five years between the end of World War II and the beginning of the Korean War, little money and even less attention were applied to the development of aerial-precision weapons. This is not at all remarkable given the massive demobilization that occurred after World War II and the US nuclear monopoly at the time. The new USAF was still trying to find its bearings and grapple with the emergence of many technologies, including the transition from reciprocating engines to jets and rapidly developing missile technologies.[63]

At the Eglin Proving Ground in northern Florida, work did continue on the precision-guidance systems first conceived during World War II. There were two main efforts, both concentrating on visually guided, radio-directed guidance systems for aerial bombs—AZON (azimuth only) and RAZON (range and azimuth only). The bombardier controlled these weapons individually after their release.[64] These bombs represented the first practical attempts at aerial-precision capability. However, these efforts fell woefully short of expectations. AZON, RAZON, and TARZON (Tall-Boy azimuth and range only; "Tall-Boy" refers to a British-developed 12,000-pound bomb) guided bombs were considered operational-test-and-evaluation weapons rather than standard in-the-inventory ready-to-go aerial-precision options.[65]

Many strategic and political factors during the Korean War restricted the area of operations and limited the use of air assets throughout the conflict. Fear of a larger war with the Soviet Union and China represented the greatest restraint on airpower. Without any proven aerial-precision technologies beyond AZON, RAZON, and TARZON, Airmen were forced to revisit the question of military necessity and the utility of urban strategic bombing just as they had during World War II.

Rules of engagement (ROE) restricted the application of American airpower in Korea to certain specific geographic areas in that limited war, but the ROEs did not restrict the targets within those areas. Accordingly, airpower was applied in a variety of ways in different scenarios to achieve multiple objectives. With the war going well, and perhaps because of accusations of indiscriminate bombing, the US Far Eastern Air Forces (FEAF) Bomber Command B-29s stood down from operations in Korea just four months into the war because of a lack of suitable targets south of the Yalu River, which separates China and North Korea.[66] After Chinese intervention in the conflict, the ROEs were eased, and strategic bombers concentrated on the interdiction of enemy lines of communications using somewhat unreliable AZON and RAZON bombs to cause real mayhem in the enemy rear areas.[67] In May 1953, successful strategic-bombing attacks took place on North Korean hydroelectric plants and irrigation dams.[68] FEAF bombers were also able to conduct successful night attacks on North Korean airfields using short-range aid to navigation (SHORAN), which used radio-frequency transmission to direct B-29s to targets that could not be seen due to darkness.[69] A 1952 FEAF directive for Operation Pressure Pump, a concentrated attack on 30 military objectives in and around the North Korean capital of Pyongyang, is representative of the strategic bombing doctrine as practiced during the Korean War: "Whenever possible, attacks will be scheduled against targets of military significance so situated that their destruction will have a deleterious effect upon the morale of the civil population actively engaged in the support of enemy forces."[70]

In the end, the Korean War highlighted the inability of the USAF to conduct decisive strategic bombing operations in a limited war. Little was done to stimulate the kind of dramatic technological changes needed to develop a true aerial-precision capability. Korea was, however, a more pre-

cise air war than was World War II. Airpower, according to a 1990 USAF study, did achieve a CEP of 1,000 feet using 550 aircraft carrying a total of 1,100 bombs.[71] Several important innovations were demonstrated during the war, namely, in-theater tactical airlift utilizing the C-119 Flying Boxcar and parachute-bomb deliveries for improved accuracy.

While meager, there was moral sanctuary during the Korean War. Even when given the approval by Gen Douglas MacArthur to use incendiary bombs to attack North Korean civilian morale, FEAF commanders chose not to do so.[72] Moral and ethical considerations remained strongly influential. Most significantly strategic bombing operations in Korea did focus attention on the "increasing military, public, and diplomatic demands for accuracy in bombing operations in urban areas."[73] The war in Vietnam, like Korea, would also be limited by severe political constraints in the form of ROEs and characterized by an increasing demand for aerial precision. Only the president could change the former. For the first time PGMs would enable the latter demand to be met successfully.

The Vietnam War

The Vietnam War remains a very controversial episode in American military history. Benjamin Lambeth states succinctly the conclusions of many historians and political scientists: "There is no denying that the American defeat in Southeast Asia was, first and foremost, a product of flawed strategy." At the same time there were "significant deficiencies in the character of the American air weapon."[74] That said, during this war, the first true American aerial-precision capability emerged finally in the form of electro-optical (EO), infrared (IR), and laser-guided PGMs. These weapons, according to a commander of Seventh Air Force in Vietnam during the war, "truly brought a new dimension to the employment of airpower."[75]

When American airpower was first unleashed in Vietnam in 1964 with Operations Barrel Roll and Flaming Dart, and in 1965 with Rolling Thunder, its PGM inventory was extremely limited. In the early 1960s, the US Navy (USN) had developed the Bullpup guided aerial bomb in response to the losses naval aircraft suffered during air-to-ground attacks in Korea. It was a rocket-powered weapon based on RAZON-guidance technology. The USN also developed the Walleye EO-guided 1,000-pound bomb that was little more than a television camera mounted on the bomb's nose. As the munition descended, the camera relayed the bomb's view to a weapons officer who could either remotely steer the bomb by electronically controlling its tail fins or engage an autonomous launch-and-leave mode after target lock-on.[76] The Bullpup and Walleye munitions represented the only aerial-precision weapons in the USAF and USN inventory at the beginning of the Vietnam War.[77] Both proved effective under the right conditions but were very difficult to employ, susceptible to the weather sanctuary, and expensive to produce and procure.[78]

Rolling Thunder was significant in the evolution of aerial precision because, according to Conrad Crane, it "drew directly on precision-bombing doctrine to target North Vietnam's vital economic and military centers and to destroy its capacity to wage war."[79] A combination of the political constraints of limited war, a gradualist approach to airpower application, the nature of the enemy's will to fight, and North Vietnam's agrarian economy and insurgency tactics all contributed to the failure of Rolling Thunder.[80] Yet, when pressed for an initial air strategy in Vietnam, Airmen defaulted to the industrial web theory and precision-bombing doctrine first espoused at the ACTS in the 1930s.

Not until 1972, during Operation Linebacker I, would PGMs enable precision-delivered airpower to become an effective and efficient instrument of American military power. Many technological and organizational developments took place between 1964 and 1972 that enabled the eventual emergence of PGMs and changed the nature of American air warfare. It was a long developmental process because the USAF, unlike the USN, entered the Vietnam War without having made any significant changes in its doctrine, technology, or organization. While jet aircraft had advanced significantly since the introduction of the North American F-86 Sabre during the Korean War, the air-to-ground armament for these jets had not kept pace and lacked an equivalent level of sophistication.[81]

The need to destroy precision targets such as bridges had driven development of rudimentary guided bombs in World War II. Korea accelerated this interest. By 1972 the failure of Rolling Thunder and an increased concern to limit collateral damage and noncombatant casualties ushered in the first aerial-precision era. Linebacker I was highlighted by the first-ever sustained use of laser-guided bombs (LGB). This newfound precision capability also led to a reduced level of risk for US forces. It was during Linebacker I that American Airmen could begin to contemplate using precision airpower for strategic effect, finally breaking reliance on the far less restrained bombing of World War II and Korea. Now precision bombardment could be integrated into the strategic plan and not used solely as a contextually opportunistic option.

As early as 1964, USAF, Texas Instruments, and Martin Marietta engineers began to investigate using laser energy to guide bombs more accurately. In July 1966, operational testing began using the first prototype LGBs. Under optimum weather conditions the CEP for these new LGBs was shown to be only 30 feet. By 1968 LGBs were being tested in Laos and South Vietnam. However, not until the moratorium on bombing North Vietnam was lifted in 1972 did the aerial-precision revolution actually begin in earnest.[82]

LGBs consist of a guidance kit attached to a regular gravity-bomb body. The attacking aircraft fires a laser designator to paint the target.[83] The bomb then homes in on the beam of monochromatic, single-frequency light. LGB employment varies according to the type of target requiring destruction. If self-lasing, a single aircraft can both release the weapon and

guide it using a designator that swivels under the aircraft. Buddy lasing requires two aircraft, one to drop the bomb and one to lase the target. While susceptible to clouds and high atmospheric moisture levels that refracted the laser designation off the desired target, LGBs consistently displayed a CEP of 30 feet in Vietnam.

In April 1972, Pres. Richard M. Nixon authorized Linebacker I to achieve his "peace with honor" objective by wrecking North Vietnam's war-making capacity.[84] These so-called smart bombs became the airpower weapon of choice to accomplish the president's objective. PGMs provided an unprecedented level of aerial precision. What had previously required hundreds of sorties and bombs (for often ineffectual results) now took considerably fewer and often achieved significant effects. Between April 1972 and January 1973, US aircraft destroyed or damaged 400 North Vietnamese bridges using only 4,000 LGBs.[85] Linebacker air operations also supported friendly ground forces by exploiting the newfound accuracy of LGBs against enemy armor. More than 70 percent of the enemy tanks destroyed or damaged during the North Vietnamese Easter offensive in April and May 1972 were the result of aerial-precision attacks.[86]

The efficiency of PGMs did not escape the attention of airpower planners. PGMs allowed for markedly reduced strike packages consisting of two or three four-ship flights. They also allowed for safer release altitudes above the effective ranges of most enemy antiaircraft artillery systems that were the primary threat to American aircraft during Vietnam.[87] The 95 percent reduction in the number of sorties required to destroy a given target was notable because of concomitant, dramatically lower aircraft and aircrew loss rates.[88]

From April through October 1972, 155,548 tons of bombs fell on North Vietnam. This represented only one-fourth of the total tonnage dropped during Rolling Thunder. Yet, the resulting damage and destruction of the seven-month air campaign exceeded that of the three-year Rolling Thunder campaign by a factor of three.[89] These results represented as "revolutionary a development in military air power as the jet engine," largely due to the increasing use of LGBs.[90]

By the end of the war in 1975, the United States had dropped more than 28,000 Paveway LGBs in Southeast Asia. This represented less than 1 percent of the 3.3 million bombs dropped during the entire war.[91] However, the most significant impact of the introduction of PGMs in Vietnam is readily apparent in the 1990 USAF case study. In Vietnam 44 aircraft dropping only 176 bombs now achieved a CEP of 400 feet. The PGM revolution had begun. In the 30 years since World War II, bombing CEPs had been reduced eightfold while the number of aircraft and bombs required to achieve a CEP of 400 feet had decreased by factors of seven and 10 respectively.[92]

The American public, after Watergate and Vietnam, took little notice of the potential benefits of an aerial-precision capability like LGBs. However, the success of PGMs made a substantial impression throughout the US

military, particularly among Airmen. Programs were soon initiated to improve laser, EO, and IR aerial-precision technologies.[93]

Above the surface, the Vietnam War suggested many possible lessons for the future of airpower. Among them, bombing accuracy was much improved. Consequently, indiscriminate attacks on civilian targets could be drastically reduced without sacrificing strategic effects. More sophisticated enemy air defenses increased the need for additional support aircraft to protect the bomb droppers during their missions. Limited resources, therefore, diminished the number of bombers available to deliver ordnance. PGMs increased bomber effectiveness to compensate for the number of required support aircraft to ensure greater chances of mission success. Finally, PGMs were adversely affected by poor weather and restricted visibility, especially at night without additional visual aids such as low-light-level television.[94]

Below the surface, some additional lessons remained ambiguous. PGMs had social, political, and moral ramifications that would begin to emerge over time. According to Gen William W. Momyer, he first experienced the political pressure to avoid collateral damage during the Vietnam War.[95] These kinds of pressures would increase in the years to follow. Air warfare in Vietnam did not validate aerial-precision doctrine or ease the selection of urban targets, but it foretold many future dilemmas. Arguments for the decisive potential of airpower percolated among professional military circles. But, at what cost?

Lambeth is correct when he states that PGMs in Vietnam "offered a telling preview of future possibilities."[96] The legacy of American airpower in Vietnam was a statement of its potential. Ideas would soon become new weapons with the potential for defeating an enemy—not through the classic imposition of brute force, but through an unprecedented reliance on aerial precision. One significant dilemma loomed in the background for American Airmen. As Clodfelter describes the post-Vietnam world, the moral inhibitions of commanders would limit future American air offensives.[97]

Aerial-Precision Development and Limited War

From 1946 until at least 1982, the USAF maintained a clear, if delicately balanced, subordination structure with regard to its strategic and tactical air forces.[98] The former, as directed by the commander in chief, were charged primarily with the nuclear delivery mission, generally thought to be the more crucial mission. Fear of complete and assured nuclear destruction, in part delivered through strategic bombers, was believed the only guarantee of US national survival in the face of the Soviet nuclear threat. The latter stressed both air-to-air and air-to-ground missions unique to the circumstances of their employment—useful, to be sure, but not as large a part of the calculation of vital national interests. Thus, tactical air forces almost always played a secondary role to strategic bombers.

At the height of the Cold War, the two superpowers reached nuclear parity. Then, as the Cold War drew to a close, their nuclear inventories were drastically reduced, and their relative influence shifted. With the specter of nuclear war reducing the likelihood that it would ever be fought, in a real sense the world became safer for limited war—the realm of tactical air. Mike Worden concluded that "the insularity and narrow doctrinal focus of Strategic Air Command" especially during limited wars contributed directly to the rise of fighter generals as USAF leaders in the post-Vietnam era.[99] Tactical air operations and limited war were inextricably linked. Indeed, tactical air operations had the clearest need for PGMs. As the old saying goes, close only counts in horseshoes and nuclear war. When one tries to limit collateral damage and prevent escalations that could lead to an all-out nuclear exchange, aerial-precision engagements become essential to political aims. Therefore, the concept of limited war was most important to the development of a true aerial-precision capability.

All wars in the modern era have been limited by political constraints, though the two world wars of the twentieth century and their attendant ferocity, unlimited stakes, and requirement of complete victory (clearly in evidence with the strategic-bombing campaigns) approached, in reality, the levels of violence that the term *total war* invokes. Thankfully, total nuclear war has always been contained within the realm of theory. According to Clausewitz, war in practice is really "an extension of politics by violent means" and always requires political limitations short of total war, even in the world wars.[100] Thus, PGMs were developed primarily to fulfill limited-war mission aims efficiently. As historian David Mets observed, "The coming of the United Nations and atomic bombs did not portend eternal peace and brotherhood."[101] Subsequent US military actions in Korea, Vietnam, Libya, Panama, and Iraq saw the gradual development of EO, IR, and laser-guided weapons that by 1991 gave the United States its first true aerial-precision capability.

The devotion of American Airmen to a precision-bombing doctrine during World War II established an important precedent for future limited-war air operations during and since the Cold War. The moral ambiguities of World War II strategic bombing further influenced the development of precision doctrine. By the time of the Persian Gulf War in 1991, technological capability appeared to match theoretical precision preferences for the first time. It was now possible to be assured that a PGM would hit a given target with a desired effect—operations dubbed surgical strikes. Another airpower sanctuary was overcome, but in other meaningful ways the moral sanctuary was increased. It would soon be apparent that the more aerial precision the United States was capable of, the more morally repugnant any associated collateral damage became.

Desert Storm

Between 1975 and 1991, the USAF was extremely slow to address the doctrinal implications of the new capabilities in aerial precision and accuracy. Holley's warning about the difficulty of translating ideas to weapons and Drew's characterization of Airmen as doers and not thinkers both ring true. While the USAF did upgrade its PGM technology with further improvements in the Paveway LGB system, it failed to equip the major portion of its combat aircraft with LGB delivery capability. At the beginning of the Gulf War, only the General Dynamics F-111F, the Lockheed F-117 stealth fighter, and the McDonnell Douglas F-15E Strike Eagle had the capability to drop and guide LGBs.[102]

The General Dynamics F-16 and Fairchild Republic A-10 fighter aircraft did have the capability to launch the AGM-65 Maverick air-to-ground missile against enemy armored vehicles and tanks. Maverick missiles came in three guidance variants: EO, IR, and laser guided. While considered tactical PGMs, these munitions reflected the Cold War–era procurement policies of the 1980s driven by fear of a Soviet invasion of Central Europe.

When the Gulf War began in January 1991, the primary PGMs in the USAF inventory were Maverick missiles and Paveway II and III LGBs. The LGBs, known as guided bomb units (GBU), featured improved laser guidance, maneuverability, and low-level launch capabilities compared to the Vietnam-era Paveway I series.[103] Despite these improvements, aerial precision in Desert Storm would remain subject to the weather sanctuary.

Desert Storm was characterized by conventional bombing of pinpoint targets. There were few limitations on the targeting of military and economic objectives. Military commanders and political leaders quickly countered unsubstantiated claims of indiscriminate bombing, such as the al-Firdos bunker incident in Baghdad.[104] As Crane describes it, "Theory, practice, and ethics seemed to merge in a clean and decisive air campaign" that stressed the avoidance of both noncombatant and friendly casualties.[105]

In the Gulf War, more than 15,000 LGBs and Maverick missiles were expended. Of particular note, 333 Tomahawk land attack missiles (TLAM) and conventional air-launched cruise missiles (CALCM) were also used during Desert Storm.[106] These cruise missiles represented the latest in aerial-precision technology. Costing over $1 million each, TLAMs and CALCMs used terrain-mapping technology in conjunction with an inertial navigation system (INS) to find and strike their targets precisely, making the mission-planning process exceedingly complex and inflexible.

LGBs, Mavericks, and cruise missiles comprised less than 10 percent of the total bombs expended, yet they accounted for more than 75 percent of the significant damage achieved during the war.[107] By way of comparison, approximately 210,000 unguided bombs were dropped during Desert Storm.[108] Aerial precision did come at a high price in the Gulf War, however. Approximately $2.2 billion of munitions of all types were dropped on

Iraq and Kuwait during Desert Storm. PGMs made up over $1.3 billion of that total, or 60 percent.[109]

The impact of the aerial-precision capability in the Gulf War was considerable—some even said revolutionary.[110] Four major impacts of lasting significance are highlighted here. First, PGMs in Desert Storm radically changed the USAF approach to both strike-package planning and targeting methodologies. USAF planners used force packaging as they had during Vietnam. However, a true aerial-precision capability allowed smaller packages of bombers to strike multiple aim points as opposed to a single, large package bombing just one aim point.[111] For senior USAF leaders, this method of force packaging using air-shaft accuracy gave new meaning to the term *mass*. Fewer weapons now delivered so much for so little. Two F-117s with four bombs did in Desert Storm what 600 B-17s with 3,000 bombs could not do during World War II. Airpower using PGMs was seen as "a war-winning strategy for the future."[112] The aerial-precision capability of American airpower drastically reduced the number of sorties needed to destroy a target, thus opening up a new option of simultaneous versus sequential attack. The concept of "massing firepower in time" was highly appealing to many Airmen as an antithesis to the gradual application of airpower during Vietnam.[113]

Second, PGMs, with their improved accuracy and penetration capability, challenged the underground sanctuary for the first time.[114] Iraq's extensive system of underground bunkers and hardened aircraft shelters was vulnerable only to PGMs with a penetrating warhead. These targets were vital to the overall military strategy of the coalition, and the LGBs proved a successful means for destroying them.[115]

Third, the Gulf War demonstrated the need to carefully consider collateral damage, total casualties (combatant and noncombatant), and the impact of instant television coverage of military operations. Iraqi military casualties totaled an estimated 25,000 to 65,000, and about 84,000 Iraqi soldiers surrendered during the conflict. Coalition military losses in combat were less than 200.[116] Most significantly, human rights organizations estimated the number of Iraqi noncombatant deaths at 2,300.[117] Yet, the illusion of perfect aerial precision caused many to conclude the latter figure was too high. PGMs made the physical task of destroying targets without collateral damage less difficult than at any time in US military history. However, the penalties for *any* collateral damage or noncombatant loss of life grew steadily as the century waned.[118] Aerial precision in the Gulf War did not overcome the growing influence of the moral sanctuary in the world community.

Fourth, despite their improved capabilities, PGMs remained vulnerable to the weather sanctuary. Laser designation was hindered by overcast skies, fog, and smoke; accuracy suffered as a result.[119] Airmen would soon begin to translate ideas into weapons in order to overcome the weather sanctuary.

Desert Storm was a war where a poorly led Third World force was broken by a technologically superior air force.[120] Some even said Iraq was defeated

by airpower.[121] Regardless of these kinds of grandiose statements, American Airmen demonstrated their strong belief in the potential of aerial-precision doctrine first envisioned 60 years earlier at the ACTS. Aerial-precision technology in the Gulf War represented a further evolution of modern airpower and contributed decisively to the coalition victory.

As Thomas Keaney and Eliot Cohen point out, some caution was indicated. A sterner test against a more capable adversary may be the only scenario from which conclusive judgments about airpower and aerial precision in Desert Storm could be drawn.[122] In the end, this war demonstrated the emergence of a new kind of moral sanctuary open to exploitation by the enemy. In an age of instant television coverage, American Airmen clearly displayed a strong concern to keep American casualties to an absolute minimum and those of noncombatants as low as possible. Indeed, the degree of concern about enemy losses by Americans, in general, though certainly less strong, was nonetheless pronounced. The great attraction of aerial precision after Desert Storm was its promise of low casualties. What remained to be seen was the degree to which this attraction would become "a distinctive feature of the new American way of war."[123]

Aerial Precision Today

Desert Storm was a distinct transition point in aerial-precision development from a variety of aspects. In 1995 Operation Deliberate Force was far more than an affirmation of the Gulf War experience. Technologically, culturally, and morally, aerial precision now represented a new American way of war. American airpower did remain linked to the theories first espoused at the ACTS; however, actual results of precision bombing on the ground and moral and ethical dilemmas that emerged after Desert Storm were worlds apart from the CBO and the incendiary bombing of Japanese cities. Operations Deliberate Force, Allied Force, and the ongoing operations known as Enduring Freedom and Iraqi Freedom all represent important chapters in the evolution of modern aerial precision.[124]

Operation Deliberate Force

While described as revolutionary during Desert Storm, the use of PGMs and modern aerial-precision doctrine emerged in full during Deliberate Force—the North Atlantic Treaty Organization (NATO) air campaign conducted between 30 August and 20 September 1995 to advance the cause of peace in the Balkans region. It was the first air campaign in history to employ more PGMs than unguided bombs.[125]

The overall numbers are noteworthy. Sixty-nine percent of all bombs expended during Deliberate Force were PGMs. The proportion of PGMs employed during this 22-day air campaign was more than eight times greater than the percentage of PGMs used during Desert Storm.[126] The PGM-to-non–PGM ratio in Deliberate Force was 2.3 to one, compared to a

ratio of only one to 11.5 during the Gulf War four years earlier.[127] Based on USAF Historical Support Office statistics, the average number of PGMs per aim point destroyed was 2.8. The average number of attack sorties per aim point destroyed was just 1.5.[128]

The types of PGMs available for use during Deliberate Force had not changed significantly since Desert Storm. LGBs remained the aerial-precision weapon of choice. What had changed dramatically was the number and types of aircraft now capable of employing PGMs. New block variants of the Grumman F-14, the F-16, and the McDonnell Douglas F/A-18 could now employ PGMs. Weapons delivery systems had improved, but development of the precision munitions slowed for the time being.[129]

If Deliberate Force represents the emergence of modern aerial-precision doctrine, then the most significant aspect of this new doctrine centers on casualty avoidance. This aspect of the doctrine remains with us today. Aerial precision had advanced to the point where friendly aircrew and aircraft survivability became paramount. A dependable aerial-precision capability strengthened the obsession of American Airmen to negate collateral damage and noncombatant casualties. It also allowed air commanders to express an unprecedented level of concern for the safety and survivability of their Airmen. This is the legacy of Deliberate Force. Gen Michael Ryan, the combined force air component commander during Deliberate Force and later USAF chief of staff, believed strongly that no target was worth the loss of life of one of his Airmen.[130]

Deliberate Force, according to the editor of the only definitive study of the operation, was a "restrained peace operation strategically, but tactically it was an energetic operation characterized by the employment of technologically cutting-edge air forces."[131] True enough, the obsession displayed by American Airmen to avoid enemy and friendly casualties and limit collateral damage foretold accurately the ramifications of air warfare that relied predominantly on PGMs and aerial precision still very much vulnerable to the weather and moral sanctuaries.

Operation Allied Force

Behind the scenes, work on an all-weather-capable PGM began soon after Desert Storm. Gen Merrill A. McPeak also stressed the importance of low cost in the development of all-weather PGMs, recognizing the limited financial resources available for the USAF budget in a post–Cold War world. By 1996 what emerged was the "Ford Mustang of smart bombs," the Joint Direct Attack Munition (JDAM).[132] As revolutionary as the LGB was in Vietnam and Desert Storm, the JDAM would exceed this revolutionary threshold during Operation Allied Force. The USAF purchased its first JDAM from the Boeing Corporation in 1998 at a cost of $27,000 per munition.[133]

JDAM guidance depends in large part on the Navstar global positioning system (GPS) constellation of 29 satellites operating at semisynchronous altitude above Earth. GPS signals are available continuously worldwide at

any altitude in any weather.[134] In order to hit a target, the JDAM is simply programmed with the target location coordinates and released within its operational aerodynamic limits from medium-to-high altitude. The JDAM also possesses backup INS guidance. The accuracy of the 2,000-pound bomb is said to be less than 15 feet CEP.[135]

Approximately 650 JDAMs were dropped on Serbia during the 79-day air campaign in 1999.[136] The new Lockheed B-2 stealth bomber, capable of dropping 18 JDAMs per mission, was the primary carrier of this latest PGM. This capacity represented a major development in the history of aerial-precision development. Whereas in the past the question had always been "How many aircraft will it take to destroy a single target?" the key question now became "How many targets can one aircraft destroy on a single mission?"[137]

Noted airpower scholar Phillip Meilinger has observed, correctly in this writer's view, that airpower is targeting, and targeting is intelligence.[138] Nowhere is this more apt than in the employment of PGMs—particularly JDAMs. Allied Force demonstrated the criticality of this axiom. PGMs have a voracious appetite for timely, accurate, all-source, and fused intelligence. The primary weakness of modern aerial precision is the lack of timely and accurate target intelligence. Witness the B-2 bombers that dropped five JDAMs on the Chinese Embassy in Belgrade during Allied Force. US intelligence analysts believed they were targeting a Serbian arms-export agency, but their information was woefully wrong. The JDAMs hit the target they were sent after. The other side of the intelligence coin is known as the "empty building syndrome."[139] PGMs that destroy a target without achieving the desired effect are of limited utility in this age of modern precision.

Allied Force and the surgical nature of GPS-guided bombs continued the trend of intolerance for collateral damage and casualties on all sides by American Airmen. Many, like author Michael Ignatieff, have pointed to the unsubstantiated restrictions on the minimum allowable operating altitude of coalition aircraft during Allied Force as evidence of this obsession.[140] Again, the numbers heighten this tension. Human-rights groups place the number of noncombatant deaths during Allied Force at approximately 500.[141] There were no coalition deaths during the entire air campaign.

As of this writing, the legacy of Allied Force, dubbed "strategic bombing lite" by respected journalist William Arkin, appears to be twofold.[142] First, Allied Force empowered what he calls "perfect war expectations."[143] Just 35 percent of the 23,000 bombs dropped during Allied Force were PGMs.[144] Yet, a very strong perception emerged following the campaign that airpower, due to the unprecedented level of demonstrated aerial precision, was the "most discriminate, prudent, and risk-free weapon in our arsenal." Therefore, it should always be "our weapon of first resort."[145]

Gen Wesley Clark, supreme allied commander Europe during Allied Force, is on to something significant when he describes the "key characteristic of modern war" as the potential for seemingly insignificant tactical events during war to pack a huge political wallop.[146] This is the second

legacy of Allied Force. High-speed global communications and PGMs have changed the old separations between political leaders and the echelons of military command. PGM-capable aircraft are more controllable than tanks, artillery, or infantry. Therefore, politicians can now take a more active role in directing the pace and conduct of military operations.[147] As demonstrated during Allied Force, the development of aerial precision has had important ramifications on what historian John Keegan calls "the changing face of war."[148] As US military operations continue in Afghanistan, Iraq, and elsewhere during the global war on terrorism, the larger effects of aerial precision will continue to build.

Future Aerial-Precision Development

An intense drive toward a perfect aerial-precision capability characterizes improvements in modern US weapons and military doctrine. Several new aerial-precision weapons are in development. Smaller versions of the current JDAM are just around the corner. Five-hundred-pound and 1,000-pound small-diameter JDAMs will better limit collateral damage. There is even a 500-pound version filled with concrete instead of explosives to dramatically limit the physical effects of the munition. The Joint Air-to-Surface Standoff Missile is a GPS-guided cruise missile with triple the range of the current JDAM and an endgame IR seeker programmed to recognize specific features of an individual target. This sensor-fuzed weapon consists of 40 miniprojectiles that are released at high altitude. Each microprojectile is either IR or laser guided. The IR guidance seeker is particularly precise because it actively looks for preprogrammed battlefield IR signatures. These weapons are within one to three years of becoming fully operational.[149]

Long term, the Low-Cost Autonomous Attack System (LOCAAS) is a precise system that possesses the capability to loiter over the battlefield while looking to acquire a target. Target identification involves what are known as automatic-target-recognition algorithms computed by an onboard miniature computer. While still in the developmental stage, LOCAAS represents a major leap to autonomous targeting, theoretically eliminating humans from the decision-making loop. What we now call smart bombs could soon be dubbed brilliant bombs.[150]

Many other weapons have perfect aerial-precision applications in theory. These include high-powered microwave weapons and other directed-energy technologies—the so-called robust nuclear earth penetrator and the air-delivered "sleeping" unattended ground-sensor weapons, for example. The potential for a perfect aerial-precision capability to achieve desired effects is nothing short of unlimited.

Conclusion

Less than 100 years after the first airplane took to the sky, aerial precision has become the dominant theme of airpower, and perfect aerial precision remains the vision of the future for Airmen. Born in the minds of American Airmen and visible in their intent to consistently achieve the most precise and effective bombardment possible, the ideal of perfect aerial precision is a goal yet to be reached. Precision has enabled Airmen to overcome many sanctuaries, predominantly night and weather operations, and underground facilities to a more limited degree. According to author Benjamin Lambeth "American airpower has been transformed over the past two decades to a point where it has finally become truly strategic in its potential effects."[151] Yet, moral sanctuary remains.

Notes

1. Holley, *Ideas and Weapons*, 19.
2. Drew, "U. S. Airpower Theory," 831.
3. PGMs are generally characterized as weapons-possessing, terminal-guidance systems. The term *PGM* is often applied to a wide variety of weapons, ranging from air-to-air missiles to terminally guided artillery shells to wire-guided torpedoes. In this study, the term represents aerial-delivered munitions including air-to-ground missiles and so-called smart bombs, be they electro-optical, infrared, laser, or GPS guided.
4. Mets, *Long Search*.
5. Prior to April 1972, the Thanh Hoa Bridge had been dubbed "the bridge that would never go down" by US military planners. See Davis, "Strategic Bombardment," 529.
6. Sources vary widely on the exact percentages of PGMs used during each conflict. For the purposes of this study, it is sufficient to recognize the growth of PGM usage since 1991 as follows: Desert Storm, 5–10 percent; Deliberate Force, 69 percent; Allied Force, 35 percent; and Enduring Freedom, 60–70 percent. Estimates of the percentage of PGMs to be used in the war with Iraq to oust Saddam Hussein and cause a regime change rise as high as 90 percent. See Keeter, "Pentagon Estimates."
7. Rip and Hasik, *Precision Revolution*, 5.
8. Mets, *Long Search*, xii. Also see Lambeth, *Transformation of American Air Power*.
9. Roche, "The Secretary's Vector."
10. Biddle, *Rhetoric and Reality*, 3.
11. Morrow, *Great War in the Air*, 366.
12. Ibid., 377–78; and Biddle, *Rhetoric and Reality*, 67–68.
13. Trenchard quoted in Quester, *Deterrence before Hiroshima*, 48. Numerous anecdotes about the Kaiser's supposed moral inhibitions can be found throughout both chaps. 2 and 3 of Quester's book.
14. Ibid., 48.
15. Ibid., 41.
16. Ibid.
17. Holley, *Ideas and Weapons*, 170–71.
18. Ibid. Biddle adds that Secretary Baker thought strategic bombing was "immoral." Biddle, "British and American Approaches," 109.
19. Morrow, *Great War in the Air*, 378.
20. This is a major theme throughout Biddle's essay, "British and American Approaches."
21. Quoted in Quester, *Deterrence before Hiroshima*, 59. See League of Nations Publications, 258–59.

22. Holley, *Ideas and Weapons*, 15.

23. Stewart, "Doctrine of Strategic Bombardment," 98; quoted in Quester, *Deterrence before Hiroshima*, 91–92.

24. Biddle, *Rhetoric and Reality*, 128–30.

25. Holley, *Ideas and Weapons*, 157. Holley attributes this to the relatively small body of experience US Airmen had to draw upon following World War I and the inability of those who did see combat to articulate effectively about their experiences.

26. Biddle, *Rhetoric and Reality*, 130.

27. Officers at the US Air Corps Tactical School, located at Maxwell AFB, Alabama, during this time included Kenneth Walker, Donald Wilson, Laurence Kuter, Haywood Hansell, and Claire Chennault.

28. Buckley, *Air Power*, 79.

29. Wilson, "Origins of a Theory," 19. Donald Wilson, an eccentric ACTS faculty member, later claimed full credit for devising the industrial web theory. In his autobiography he stated, "War plans for the air offensive in Europe were based on my theory." See Wilson, *Wooing Peponi*, 239.

30. Wilson, "Origins of a Theory," 80; and Biddle, *Rhetoric and Reality*, 131.

31. Buckley, *Air Power*, 139; and Biddle, *Rhetoric and Reality*, 161–64. Michael Sherry goes further when he describes US strategic bombing doctrine as driven primarily by "technological fanaticism." In my view, Biddle provides a more accurate description of the prevailing mood entering World War II. See Sherry, *Rise of American Air Power*.

32. Biddle, *Rhetoric and Reality*, 161.

33. Jacobs, "British Strategic Air Offensive," 166–67.

34. Biddle, "British and American Approaches," 91.

35. McFarland and Newton, "American Strategic Air Offensive," 184.

36. Biddle, "British and American Approaches," 91.

37. Biddle, *Rhetoric and Reality*, 159.

38. Quoted in McFarland and Newton, "American Strategic Air Offensive," 184.

39. McFarland, *America's Pursuit*, 3–4.

40. "Allied air power was decisive in the war in Western Europe." *United States Strategic Bombing Survey*, 37.

41. McFarland, *America's Pursuit*, 3.

42. Ibid., 5–6; and Meilinger, "Matter of Precision."

43. McFarland, *America's Pursuit*, 6.

44. Parks, " 'Precision' and 'Area' Bombing," 147.

45. Even today the British have a saying that during World War II the RAF area-bombed area targets while the USAAF area-bombed precision targets. Drew, "U. S. Airpower Theory," 809.

46. Ibid.

47. Hallion, *Precision-Guided Munitions*.

48. Parks, " 'Precision' and 'Area' Bombing," 167.

49. Ibid., 166.

50. Biddle, *Rhetoric and Reality*, 223–24.

51. Ibid., 228–29.

52. Hallion, *Precision-Guided Munitions*. The 1990 Headquarters USAF/XOX study used the following case-study parameters: a 90 percent hit probability on a target measuring 60 x 100 feet using 2,000-pound bombs dropped from medium altitude. This same scenario was used throughout the chapter. CEP is defined as the radial distance from a target inscribing an imaginary circle with an area large enough so that 50 percent of the bombs dropped fall within it.

53. Ibid.

54. Crane, *Bombs, Cities, and Civilians*, 7.

55. Griffith, *Quest*, 17–19.

56. Crane, *Bombs, Cities, and Civilians*, 161.

57. Ibid., 11.
58. It can be argued that there is no higher morality than saving hundreds of thousands of American and Japanese lives by using atomic bombs against Japan in 1945. The difficulty lies in judging decision makers based on what they knew at the time. In this regard this remains an open question.
59. Crane, *Bombs, Cities, and Civilians*, 10.
60. Sherry, *Rise of American Air Power*, 87.
61. Crane, *Bombs, Cities, and Civilians*, 11.
62. Sherry, *Rise of American Air Power*, 303–6.
63. Mets, *Long Search*, 13–14.
64. Mets, "Stretching the Rubber Band," 124–26.
65. Hallion, *Precision-Guided Munitions*. See also note 18.
66. Crane, *Bombs, Cities, and Civilians*, 148.
67. Mets, "Stretching the Rubber Band," 129.
68. Crane, *Bombs, Cities, and Civilians*, 150.
69. Hone, "Strategic Bombing Constrained," 482.
70. Quoted in Crane, *Bombs, Cities, and Civilians*, 148.
71. Hallion, *Precision-Guided Munitions*.
72. Hone, "Strategic Bombing Constrained," 490.
73. Crane, *Bombs, Cities, and Civilians*, 150.
74. Lambeth, *Transformation of American Air Power*, 13.
75. Momyer, *Air Power in Three Wars*, 213.
76. Hallion, *Precision-Guided Munitions*.
77. Mets, *Long Search*, 21–22.
78. Ibid., 28; and Mets, "Stretching the Rubber Band," 131.
79. The original "94-target" air campaign aimed at destroying North Vietnam's capacity to wage war was not Rolling Thunder, an air campaign designed in Washington, D.C. Crane, *Bombs, Cities, and Civilians*, 152.
80. Ibid., 152–53; and Mets, *Long Search*, 25.
81. Mets, *Long Search*, 23.
82. Loeb, "Bursts of Brilliance."
83. The following description of Paveway LGB operations is drawn from Hone, "Strategic Bombing Constrained," 509–10; Hallion, *Precision-Guided Munitions*; and Mets, "Stretching the Rubber Band," 130.
84. Clodfelter, *Limits of Airpower*, 177.
85. Sherwood, "U. S. Air Operations in the Vietnam War," 769; and Keaney and Cohen, *Revolution in Warfare?*, 191.
86. Lambeth, *Transformation of American Air Power*, 27.
87. Ibid., 26–27.
88. Finn, "Broader Implications," 36.
89. Clodfelter, *Limits of Airpower*, 166–67.
90. Hallion quoted in Loeb, "Bursts of Brilliance."
91. Ibid.
92. Hallion, *Precision-Guided Munitions*.
93. Mets, *Surgical Strike*, 29; and Loeb, "Bursts of Brilliance."
94. Mets, *Surgical Strike*, 26–27.
95. Momyer, *Air Power in Three Wars*, 227.
96. Lambeth, *Transformation of American Air Power*, 53.
97. Clodfelter, *Limits of Airpower*, 206.
98. Mike Worden's *Rise of the Fighter Generals* is a very detailed analysis of the evolution of the primacy of fighter generals in the USAF due to the growth of limited wars like Vietnam.
99. Worden, *Rise of the Fighter Generals*, 236.
100. Clausewitz, *On War*, 87.
101. Mets, *Long Search*, 15.

102. Davis, "Strategic Bombardment in the Gulf War," 529–30.

103. Ibid., 529.

104. Two F-117 stealth fighters attacked this facility with two laser-guided GBU-27 bunker-busting bombs on 13 February 1991. Intelligence assessments held that the al-Firdos bunker was a command and control facility for the Iraqi Intelligence Service. Post-war assessment did confirm that the bunker was also being used as a hideout for senior Iraqi government officials and their families. At least 408 Iraqis were killed. See Gordon and Trainor, *Generals' War*, 324–29. Over 10 years later, one journalist characterized the strike on the al-Firdos bunker as "the single most lethal incident for civilians in modern air warfare." See Peterson, "Smarter Bombs Still Hit Civilians."

105. Crane, *Bombs, Cities, and Civilians*, 154–55.

106. Keaney and Cohen, *Revolution in Warfare*, 191.

107. Lambeth, *Transformation of American Air Power*, 160.

108. Ibid.

109. Keaney and Cohen, *Revolution in Warfare*, 280–81, "Appendix 2, Table 32: Desert Shield/Storm: Total USAF, USN, and US Marine Corps Weapons Cost and Utilization (FY 90/91)" is used to calculate these figures.

110. Mets, "Stretching the Rubber Band," 131.

111. Davis, "Strategic Bombardment in the Gulf War," 531.

112. Glosson, "Impact of Precision Weapons," 5–9.

113. Mets, *Long Sear*ch, 38. See also Warden, "Enemy as a System," 40–55.

114. The overall accuracy of PGMs during Desert Storm is difficult to compute. A commonly cited figure indicated that 50 percent of LGBs achieved direct hits on their intended aim points. See Mets, "Stretching the Rubber Band," 131.

115. Keaney and Cohen, *Revolution in Warfare*, 192.

116. Cordesman, "Persian Gulf War," 589–90.

117. Meilinger, "Precision Aerospace Power," 24.

118. Mets, *Long Sea*rch, 39.

119. Keaney and Cohen, *Revolution in Warfare*, 193.

120. Crane, *Bombs, Cities, and Civilians*, 157.

121. After the war, USAF chief of staff Merrill A. McPeak remarked, "My private conviction is that this is the first time in history that a field army has been defeated by air power." Quoted in Crane, *Bombs, Cities, and Civilians*, 155–56.

122. Keaney and Cohen, *Revolution in Warfare*, 209.

123. Ibid., 213–16.

124. Operations Enduring Freedom and Iraqi Freedom are ongoing as of this writing. Therefore, this study will not examine them in great detail except to say that the Joint Direct Attack Munition (JDAM) remains the PGM of choice in both of these operations. Estimates of the overall use of PGMs, to include JDAMs, in each operation range as high as 90 percent. At present Enduring Freedom has been called "the most precise war in history" by US Army general Tommy Franks, the overall commander of the operation. See Weinberger, "Franks."

125. Sargent, "Weapons Used in Deliberate Force," 257.

126. Ibid.

127. Ibid., 270.

128. Quoted in Hallion, *Precision-Guided Munitions*.

129. Sargent, "Weapons Used in Deliberate Force," 271.

130. Ibid., 273.

131. Ibid., xx.

132. Loeb, "Bursts of Brilliance."

133. Thompson, "Tools of War." JDAM sales could reach over $6 billion with the United States buying over 250,000. See Fulghum, "JDAM Sales."

134. Rip and Hasik, *Precision Revolution*, 10.

135. Loeb, "Bursts of Brilliance."

136. Hendren, “Afghanistan Yields Lessons.”
137. Meilinger, “Airpower: Observations from the Past Decade,” 61.
138. Meilinger, *10 Propositions*, 20.
139. Rip and Hasik, *Precision Revolution*, 421.
140. Ignatieff, *Virtual War*, 97. Also see 161–64 for a detailed analysis of the moral implications of such employment-altitude restrictions, if ever actually imposed.
141. Meilinger, “Matter of Precision,” 78.
142. Ignatieff, *Virtual War*, 96.
143. Arkin, “War of Subtle Strategy.”
144. Finn, “Broader Implications,” 40. This percentage decline from Deliberate Force is due largely to the increased participation of PGM-incapable coalition aircraft during the air campaign.
145. Meilinger, “Precision Aerospace Power,” 25.
146. Clark, *Waging Modern War*, 11.
147. Ibid., 8–11.
148. Keegan, “Changing Face of War.”
149. Loeb, “Bursts of Brilliance.”
150. Ibid.
151. Lambeth, *Transformation of American Air Power*, 298.

Chapter 3

Airpower and the Just-War Tradition

War is an instrument of rational, civilized men with a function, the preservation of society. It is the condition of those contending by force.

—Hugo Grotius

It's more immoral to use less force than necessary, than it is to use more. If you use less force, you kill off more of humanity in the long run because you are merely protracting the struggle.

—Curtis E. LeMay

War is always judged twice, first with reference to the reasons states have for fighting, secondly with reference to the means they adopt.

—Michael Walzer

The just-war tradition is not a single or unified theory, doctrine, strategy, or even codified law. It is a dynamic set of ideas and ideals, informed by many religious, legal, and historical sources, that influences the behavior of persons and nations. At its most fundamental level, the just-war tradition provides a moral framework for state-level decision makers to determine whether conditions and means for the application of force are morally and ethically permissible.[1] It is the basis of Western moral strictures against killing human beings during war. James Childress asserts that because "it is a prima-facie wrong" to injure or kill others, war demands an even higher level of justification.[2] According to J. Bryan Hehir, a contemporary just-war scholar and, presently, director of Catholic Charities USA, the just-war tradition "begins with a *presumption* against the use of force and then admits the possibility of *justifiable exceptions* to the presumption" (emphasis in original).[3] The force of moral reasoning identifies the exceptions that override the presumption. Most importantly, the tradition "attempts to hold together two claims for those with national responsibility; to protect the lives of citizens through national security and the responsibility to use national security forces morally."[4]

The just-war tradition requires two different kinds of moral judgments, namely, the decisions for *jus ad bellum* and *jus in bello*. Political philosopher Michael Walzer describes these mandatory moral judgments succinctly: "War is always judged twice, first with reference to the reasons states have for fighting [*jus ad bellum*], second with reference to the means they adopt [*jus in bello*]."[5] The notion of the just-war tradition is inevitable in Western society. "You can't send soldiers into battle or order them to

kill," contends Walzer, "without being able to justify those actions in moral terms—to yourself, to fellow citizens, and to the world."[6] The great difficulty, according to Hehir, is that "the realm of war is not hospitable to moral limits."[7] The just-war tradition, then, serves as a moral compass for decision makers. It is used before one acts, then reviewed continuously during war and assessed retrospectively after a war. The great strength of the just-war tradition is that "it changes as the context of warfare changes."[8]

According to James Turner "J. T." Johnson, in broadest form, the *jus ad bellum* thematic branch of the just-war tradition deals with the justification of war and the resort to military force. Historically, this branch has developed into a set of seven criteria: just cause, right authority, right intention, proportionality of ends, last resort, reasonable hope for success, and the aim of peace.[9] The branch for *jus in bello* deals with the methods of force application and their justification. The criteria for *jus in bello* are defined by two primary concerns. The first is "discrimination or avoiding direct, intentional harm to noncombatants"; the second is "proportionality of means or avoiding needless destruction to achieve justified ends."[10]

Modern legal expression of the criteria for *jus ad bellum* just-war tradition is found, for example, in the United Nations' charter. The principles of discrimination and proportionality of the *jus in bello* just-war tradition can likewise be found within international law that establishes noncombatant immunity as a right and noncombatant protection as the responsibility of all belligerent parties engaged in the use of military force. An understanding of the historical development of these two thematic branches that is detailed and "beyond the rhetoric" is a prerequisite for decision makers and airpower strategists to assess, decide, and act in this age of modern warfare and aerial precision.

This chapter considers the history of the just-war tradition and the emergence of related international law in the nineteenth and twentieth centuries to provide a succinct summary of the moral and legal considerations that can influence the decisions to use force, with an emphasis on the application of airpower. The just-war tradition will be examined in terms of the major stages of its development as exemplified by the work of certain specific individuals. It is not intended to present an exhaustive chronology of development.

Walzer writes that the central principle of the law of war is "soldiers [likewise Airmen] have an equal right to kill."[11] This chapter is an effort to think through the requirements of two interconnected questions for Airmen. When and whom is it morally permissible to kill? A well-informed understanding of the just-war tradition and related international law for an examination of the moral, social, and political issues that come with nearly perfect aerial-precision attack capability will be described in subsequent chapters of this study.

Augustine and Thomas Aquinas

Foundations of the Just-War Tradition

Ethical judgments about war date back at least to the classical Greeks and Romans. In those eras, the ethics of war were widely seen as relevant when people aimed to accomplish three things: (1) to go to war, (2) to prosecute it successfully, and (3) to remain a civilized, moral people in the process. For example, Roman senator and scribe Cicero argued that there was no acceptable reason for war outside of just vengeance, self-defense, or the defense of honor.[12] He based his arguments on the assumption that human nature and reason predisposed society against war and there was a fundamental code of behavior for all peoples and nations engaged in war. Cicero was the first to link universally applicable rules of natural law to just causes for going to war, a principle to be taken up by Dutch jurist Hugo Grotius some 1,600 years later.[13]

Saint Augustine of Hippo first enunciated a complete doctrine of just and unjust war in the fourth century. Following Emperor Constantine's official declaration of Christian tolerance and his deathbed conversion, Augustine emerged as "the great coordinator of Christian doctrine upon peace and war."[14] His distinction between just and unjust wars was not new; however, his conclusion that general ethical standards and not simply the ambitions of the prince or ruler were the true guiding forces on the decision to go to war, and the conduct of the war itself was innovative. The just-war tradition first began to emerge in earnest as a political and philosophical force with Augustine's efforts.[15]

Augustine's essential contribution to the just-war tradition is found in his "Letter to Count Boniface," where he writes: "We do not seek peace in order to be at war, but we go to war that we may have peace."[16] For Augustine the only just reason to go to war was the desire for peace. This became and remains the foundation of the criteria for the just-war tradition *jus ad bellum*. The bulk of Augustine's work was derived from this conclusion about the fundamental purpose of war and dealt primarily with what constitutes a just war in pursuit of peace.

Augustine's just-war tenets remained essentially unchanged until later elaborated upon by medieval Catholic theologians, most notably by thirteenth-century scholar Saint Thomas Aquinas. According to J. T. Johnson, Aquinas' primary contribution to the just-war tradition was "to embody, rationalize, and extend the developing consensus on the moral use of armed force."[17] He did this by making the emerging just-war tradition clearer and more structured for laymen.

In his *Summa Theologiae*, Aquinas wrote that for a war to be just, "three things are necessary: 'In the first place, the authority of the sovereign, by whose command the war is to be waged; . . . Second, a just cause is required, namely that those who are attacked, should be attacked because they deserve it; . . . Third, it is necessary that the belligerents have a right-

ful intention; that is to say, that they propose to themselves a good to be effected or an evil to be avoided. . . .' Those who wage wars justly have peace as the object of their intentions."[18]

Catholic doctrine played a major role in the evolution of the just-war tradition as evidenced by these brief summaries of Augustine and Aquinas' work. These religious foundations remain in place today. Four of the seven modern criteria for *jus ad bellum* defining the right to resort to force are taken directly from this period, namely, just cause, right authority, right intention, and the aim of peace. Military scholar Wray Johnson expertly summarizes the development of the just-war tradition up through the Middle Ages: "Theoretically, at least, the tradition placed war under the dominion of conscience and in doing so established the precept that 'right' was more important than 'might.' War now required a moral sanction. Moreover, war required the *imprimatur* of state authority and was to be carried out by professionals [emphasis in original]."[19]

A form of practical realism was now tempering Thucydides' classic realism as Western civilization moved beyond the Middle Ages. In 1625 Dutch scholar and jurist Huig de Groot, better known by his Latinized name, Hugo Grotius, influenced significantly the further development of practical realism.

Grotius, Pufendorf, and Natural Law

Secularizing the Just-War Tradition

The writings of Augustine and Aquinas remained the core of the just-war tradition until the emergence of the nation-state in the sixteenth and seventeenth centuries. In 1625, with the publication of his *De Jure Belli ac Pacis* or *On the Law of War and Peace*, Grotius purposely refined the just-war tradition in order to remove its religious foundations, replacing them with his theory of natural law. For many who followed Grotius, the ethical guidelines for war were better grounded on rational and secular reasoning and were no less valid with or without the presence of God. Natural law did not depend on religion. A series of legal, rational justifications of the just-war tradition emerged from this period with far-reaching effects. The secularization of the just-war tradition allowed for the introduction of fledgling international law and the law of armed conflict (LOAC) in the nineteenth and twentieth centuries, when the preeminent position of the nation-state was secured permanently on the world political stage.

Grotius was to jurisprudence and the just-war tradition as Francis Bacon and Rene Descartes were to philosophy and Galileo Galilei and Sir Isaac Newton were to applied science. Grotius' interpretation of the just-war tradition as it stood in the seventeenth century was guided by his belief that restraint and decency in war could be based justifiably on secular natural law as opposed to religious dogma. His purpose was to divorce natural law

from religion by grounding it solely in the nature of society and in human reason. For his work and contributions to many fields of study, Grotius is commonly credited as "the father of modern secularized natural law" and as "the father of modern international law."[20]

In *On the Law of War and Peace*, Grotius stated that natural law "is a dictate of right reason, which points out that an act, according as it is or is not in conformity with rational nature, has in it a quality of moral baseness or moral necessity."[21] With this seminal conclusion, Grotius humanized and secularized the concept of natural law for future generations of scholars and philosophers. His interpretations of the just-war tradition reflected a fundamental shift from religion to secular law as the basis for going to war and the conduct of the war itself. According to the Grotius scholar, G. I. A. D. Draper, Grotius' purpose in refining the just-war tradition was to limit and restrain war in two very important ways: "First, by the just-war doctrine, with its severe limitations on the causes of resort to it; and second, in seeking some humane limitations upon the means by which wars were waged, that is, his plea for the *temperamenta belli* [i.e. moderation in the conduct of war]."[22]

Grotius was disturbed at the prevalence of what he considered to be unjust wars in his time and in times past.[23] This unease and his strong belief in the supremacy of secular natural law greatly influenced his thinking and writing on just war. His significant contributions to the just-war tradition are highlighted by Frederick Copleston, Society of Jesus (S. J.), in his classic, multivolume opus, *The History of Philosophy*, and are summarized as follows.[24] In the tradition of *jus ad bellum*, Grotius believed it was permissible for a state to wage a just war against another state that has attacked it, or in order to recover what has been stolen from it, or to "punish" another state if that state is obviously infringing the natural law.[25] A preventive war could not be waged unless there was "moral certainty" that the other state intends attack.[26] A just war could not be waged simply for the sake of advantage or out of a desire to rule others under the pretext that it was for their own good.[27] War, according to Grotius, should not be undertaken rashly.[28] It should only be undertaken in cases of "necessity."[29] Peace, for Grotius like Augustine and Aquinas before him, should always be the goal of war.[30]

In the tradition of *jus in bello*, Grotius believed that the measure of what is permissible in the actual conduct of war is either absolutely in relation to the law of nature or in relation to the law of nations.[31] Grotius believed that the law of nature binds all men as men because "those who are enemies do not in fact cease to be men."[32] The law of nations, as defined by Grotius, is "the law which has received its obligatory force from the will of all nations, or of many nations."[33] In summary, Grotius considered war something that should be avoided at all costs. Nevertheless, just as individuals enjoy the right of self-defense, so do states. Grotius believed there could be a just war but not without restrictions on legitimate means during war. The laws of nature and of nations had to be followed.

This Grotian tradition is still with us. The international law and the LOAC that emerged in the nineteenth and twentieth centuries are taken mostly from his groundbreaking work. It can be said that the final three modern criteria for *jus ad bellum* defining the right to resort to force, namely, proportionality of ends, last resort, and reasonable hope of success, emerged directly from Grotius' work.

Grotius is also credited with first writing about both noncombatant immunity and what Paul Ramsey would later reinvigorate as the "principle of double effect."[34] These concepts are the bedrock for the modern criteria for *jus in bello* that restrict the employment of force known as discrimination and proportionality of means. Grotius contended that, according to Wray Johnson, "what matters most is intent." If the intent is just, then the end outweighs the means even if innocent lives are lost in the process. While these deaths are regrettable, they can be necessary and, therefore, justified.[35]

For our purposes, Grotius' greatest contribution to the just-war tradition can be seen in his contention that a just war, waged within just limits, serves positive human ends. Ultimately, just wars promote rather than disrupt order among nation-states. According to Charles Edwards, Grotius fully recognized that humans "are volitional creatures who make moral choices."[36] In spite of his stated intent to remove the theological foundations from the just-war tradition and replace them with secular natural law and the law of nations, Grotius believed in "a higher, more positive moral outlook for human behavior."[37] As a result, in the exceptional cases when war did occur, Grotius held that its character could be regulated rightly and sufficiently to moderate its cruel nature and effects.[38]

Samuel von Pufendorf, a contemporary and great admirer of Grotius, also made a subtle but very important contribution to the emerging secular just-war tradition. In his most important work, *De Jure Naturae et Gentium* or *The Law of Nature and Nations*, published in 1762, 68 years after his death, Pufendorf argued that natural law mandated our sociability and, therefore, the requirement for stable society. This overwhelming need and drive to be social, according to Pufendorf, formed the highest natural law. Our moral duties as good citizens arise from this social mandate and, in turn, inform the just-war tradition by creating the need for international law and the LOAC required for a stable, safe society.[39]

Grotius expressed great faith in law and progress. His principles on justification of the resort to war and the conduct of warfare form a part of the just-war tradition that has come to be a central part of our contemporary system of international law.[40] Grotius' work and the key contribution of Pufendorf led to the international law of nations and the law of war that emerged in the second half of the nineteenth century.

The Law of War and Airpower

Nineteenth and Twentieth Century Developments

This study recognizes contemporary American airpower as the most discriminate weapon of war, and examines aerial precision in relation to the just-war tradition.[41] Therefore, this section describes the laws of war that developed in the nineteenth and twentieth centuries specifically regarding the criteria for just-war tradition, *jus in bello*.

The first modern statement of the law of war and the basis for much of subsequent international law was General Orders (GO) 100. This document, "Instructions for the Government of Armies of the United States in the Field," written by Dr. Francis Lieber at the request of President Lincoln during the American Civil War, laid down a code of law for federal troops to guide their actions in war. Most significantly, GO 100 defined *military necessity* as "those measures indispensable to securing the ends of war."[42] Military necessity, according to the document, permitted "direct destruction of life and limb of armed enemies, and of other persons whose destruction is incidentally unavoidable."[43] GO 100 foreshadowed the debate surrounding the principles of noncombatant immunity or discrimination and proportionality that remain in the forefront today. As Hehir describes it, "The primary moral criterion of just means appears to be the most intrinsically important guide to policy today."[44] Finally, GO 100 echoed just-war tradition sentiment by stating, "The ultimate object of all modern war is a renewed state of peace."[45]

Jurist W. Hays Parks has observed, "What is legal is not necessarily moral and what is moral is not always legal; but, particularly with regard to the law of war, the two are inextricably intertwined."[46] By the end of the nineteenth century, the first efforts were made to codify the just-war tradition in the form of international law. These attempts to universalize the concept of a valid law of war dealt specifically with the moral and legal aspects of armed conflict.

Beginning with the Hague Peace Conferences of 1899 and 1907 and continuing through the Washington Conference of 1922 and the Hague Commission of Jurists in 1923, the major world powers sought to codify a law of war for the very first time. Even following World War I, however, remarkably little treaty law directly concerned aerial warfare. A commission did adopt the Hague Rules of Air Warfare in 1923, but, as L. C. Green writes, these rules "never embodied into a treaty or officially declared to constitute a statement of law."[47] However, despite the fact that the Hague's air rules were never adopted formally by any nation for fear of restricting the potential of the new aerial weapon, they did constitute rules of customary law relating to air warfare at the beginning of World War II and have maintained the stature of formal international law ever since. These written rules, therefore, should be and are today regarded as the first "au-

thoritative attempt to clarify and formulate rules of law governing the use of aircraft in war."[48]

Parks summarizes the law of war pertaining to airpower, as it existed at the beginning of World War II, using two principles: "[First,] that the indiscriminate (that is, intentional) attack of the civilian population as such was prohibited, but that . . . [Second,] a legitimate military objective could be attacked wherever located so long as ordinary care was exercised in its attack; that is, that collateral civilian casualties were not the concern of the attacker but, by state practice, were regarded as an inevitable consequence of bombardment and a legitimate way to destroy the enemy's will to resist."[49] Green is correct when he states that while the Hague's air rules "do not, of themselves, amount to or express the law, they have played a role in the development of law concerning aerial warfare and, as such, cannot be peremptorily dismissed."[50] As evidenced by Parks' pre–World War II air-law principles, the Hague air rules tackled head-on the issue of discrimination and strategic bombing to forbid attacks against nonmilitary objectives and attacks for the *sole* purpose of terrorizing the civilian population.

When the Geneva conventions came up for review following World War II in 1949, again, specifics with regard to air warfare were not addressed. The 1949 conventions were solely concerned with "humanitarian law during armed conflicts."[51] It was not until the adoption in 1977 of the Protocol I addition to the Geneva conventions of 1949 that specific written attention was devoted to problems that were peculiar to aerial warfare.[52]

The modern law of war negotiates a judicious balance between military necessity and humanitarian principles. The Protocol I rules are of the utmost importance to decision makers and airpower strategists as they codify moral and legal attempts to maintain this delicate balance in a nondiscriminatory fashion.[53] While the United States has yet to ratify Protocol I (and most likely never will), its provisions greatly influence today's American airpower employment decisions. In short, the United States has not ignored "the first international document since 1907 which attempts to regulate the means and methods of warfare."[54] Indeed, the development of aerial precision since the Vietnam War and the provisions of Protocol I appear inextricably linked.

Detailing the many provisions of Protocol I is beyond the scope of this study. Therefore, the following summary is provided to capture the essence of the protocol and its relation to air warfare and aerial precision:

- The intentional bombing of civilians and civilian objects is illegal.
- Objectives aimed at from the air must be military objectives and identifiable as such.
- Any attack on a military objective must be conducted in such a way that civilian population in the vicinity are bombed not through negligence, but incidental collateral damage does not render the attack illegal, provided it is not excessive.[55]

- Attacks may only be directed against military objectives and must not be indiscriminate, and, to the extent feasible, both practicable or practically possible taking into account all existing circumstances to include those of a military character, be in accordance with the principle of proportionality and the rule against unnecessary suffering to avoid excessive damage to civilians and civilian objects.[56]
- The decision as to whether an aerial attack should be launched or not must be made by a commander in light of all knowledge available to him in the particular circumstances, and if, taking all these considerations into account, it transpires that civilian damage is likely to be excessive, the attack must be suspended or abandoned.[57]
- An attack that treats as a single military objective a number of clearly separated and distinct military objectives located in a city, town, village, or other area containing a similar concentration of civilians or civilian objects is illegal and indiscriminate.[58]

At the dawn of the twenty-first century, the just-war tradition remains an active part of international discourse. Witness the world debate prior to Operation Iraqi Freedom (OIF) in 2003. The criteria for *jus ad bellum* have remained essentially unchanged from the time of Grotius. Modern just-war debate tends to center upon the last-resort criteria. However, the criteria for *jus in bello* of discrimination and proportionality of means have become more and more refined particularly as the relationship between the principle of double effect and airpower has grown over time. The growing importance of these principles for *jus in bello* and the increased sensitivity to collateral damage and casualties across the spectrum of war relate directly to the development of aerial precision and the resulting moral sanctuary.

The Principle of Double Effect

Modern Interpretations

According to J. T. Johnson, the criteria for *jus in bello* for right conduct in war, as defined by "the moral principles of discrimination and proportionality," are quite modern descriptive inventions of just-war tradition theorists.[59] Classic just-war thinkers had previously defined noncombatants simply by listing the various classes of people who were exempted from harm while engaging in peaceful occupations during wartime.[60] Paul Ramsey, a twentieth-century Protestant theologian, sought to change the just-war-tradition lexicon by reintroducing the terms *discrimination* and *proportionality* back into the discussion of morality in warfare.[61] These terms are now synonymous in most just-war literature with *jus in bello*.

In the most modern sense, discrimination and proportionality are best examined through the lens provided by what is known as the principle of double effect. In the midst of the Combined Bomber Offensive during World

War II, Catholic priest and philosophy professor John C. Ford, S. J., established the principle being derived from the traditional criteria for *jus in bello*. Then Ramsey, whom J. T. Johnson described as "the central figure in the revival and redefinition of Christian just-war theory," was an important contributor to the debate beginning in the 1960s.[62] Finally, Walzer, with the publication of his book *Just and Unjust Wars* in 1977, dramatically entered into the double-effect fray. The principle of double effect and its ramifications on the employment of airpower and aerial precision are best understood using the works of these men.

Ford's 1944 article on obliteration bombing was a significant event in the modern evolution of the just-war tradition and its relation to airpower.[63] Prior to that time, according to Hehir, "just-war thinking had been reduced to rote repetition in the textbooks of ethics."[64] In the midst of World War II, Ford addressed the imperfection and unethical nature of the CBO as he saw it. Ford's argument about collateral damage in relation to *jus in bello* was completely original.[65] His analysis of the moral problems associated with obliteration bombing gave rise to the emergence of the principle of double effect after the war's conclusion.

According to Ford, the principle moral problem raised by the CBO was "the rights of noncombatants to their lives in wartime."[66] Ford viewed this as an absolute right and most Allied air strategists agreed. The problem, according to Ford, was the incredibly strong "appeal to the principle of double effect."[67] Ford defined the principle as follows: "The foreseen evil effect of a man's action is not morally imputable to him, provided that (1) the action in itself is directed immediately to some other result, (2) the evil effect is not willed either in itself or as a means to the other result, [and] (3) the permitting of the evil effect is justified by reasons of proportionate weight."[68]

In the midst of the CBO, Ford used the principle of double effect to make the case that discrimination was of higher moral priority than proportionality of means to an end.[69] Ford attempted to identify the line where legitimate military actions cease being permissible and become indiscriminate and immoral. He concluded the CBO air strategists "let go their bombs" and lived with themselves by "withholding their intentions."[70] During World War II the application of the principle of double effect was reduced to a straightforward mathematical formula.

For Ford this was the rub. An analysis of double effect requires "sound moral judgment" and "an immense amount of moral experience" by decision makers and air strategists.[71] Notwithstanding the novelty of the aerial weapon and strategic bombardment at the time, Ford judged the CBO as immoral because the proportionality of means to achieve "weighty excusing causes such as shortening the war, military necessity, and saving our own soldiers' lives" was given higher moral priority over discrimination.[72]

Ford deserves much credit for his just-war-tradition thought in the midst of a total war. While very contentious, his conclusions framed the debate that followed the war for years to come. The ethical dilemma of in-

discriminate bombing and the principle of double effect was the most controversial aspect of the criteria for *jus in bello* to emerge following World War II. In the 1960s and 1970s, Ramsey and Walzer, respectively, entered into the debate.

Hehir describes Ramsey's role in the resurgence of the just-war tradition in the latter half of the twentieth century as "unique."[73] Ramsey's writings were steadfastly focused on the criteria for *jus in bello* and, in particular, on the applications of double effect. Building on the issues first raised by Ford, Ramsey emphasized that the right intention of war was to defend life. Therefore, taking the life of even an unjust person, such as an enemy, should be avoided if at all possible.[74] Consequently, for Ramsey, discrimination or noncombatant immunity should be considered prior to any discussion of potential effects.[75]

Ramsey's interpretation of double effect was founded on the right intentions of political leaders and military commanders. Again, as Ford had claimed, the question remained as to where to draw the line between legitimate, discriminate, and moral; and illegitimate, indiscriminate, and immoral military action. Ramsey concluded, "This distinction is not determined by the amount of devastation or the number of deaths, but by the direction of action itself, i.e. by what is deliberately intended and directly done."[76] Like Ford, Ramsey held discrimination as a higher moral priority than proportionality of means.

J. T. Johnson provides an excellent summary of Ramsey's thought of *jus in bello*.[77] Ramsey initially developed his just-war ideas in the context of the nuclear debate of the 1960s. At that time, the important question on most everyone's mind dealt primarily with the relative morality of countervalue and counterforce nuclear targeting. Ramsey argued in favor of counterforce targeting based on his interpretations of the discrimination and proportionality criteria for *jus in bello*. He defined *discrimination* as the "avoidance of direct, intentional harm to noncombatants" and *proportionality* as "making sure that the benefits to be gained from the use of force outweigh the harm."[78] Noncombatants received a measure of protection in both of these criteria. Discrimination gave them an "exceptionless [*sic*] moral immunity" from direct, intentional attack, while proportionality worked "to minimize the magnitude of that harm" in cases where they are at risk of unintended collateral harm.[79] Ramsey's position on discrimination was clear. He wrote, "We do not need to know who and where the noncombatants are in order to know that indiscriminate bombing exceeds the moral limits of warfare."[80] To define proportionality, Ramsey turned to the principle of double effect.

Ramsey's writings on double effect continue to reverberate today. He recognized that collateral harm to noncombatants would likely occur whenever morally legitimate targets were attacked. This was regrettable and, therefore, should be minimized so far as possible because of the "moral requirement of proportionality."[81] However, because noncombatant harm was secondary, an attack with a legitimate purpose was not forbid-

den by the criterion of discrimination. This was Ramsey's primary argument in favor of counterforce nuclear targeting.

Ramsey believed proportionality and double effect imposed moral restrictions on the choice of targets and the types of weapons used in an attack.[82] These moral restrictions transcend the nuclear debate of the 1960s and relate directly on modern efforts to achieve perfect aerial precision. In 1961 Ramsey quoted and endorsed the words of Thomas E. Murray, "We should attempt to hold the use of force down to the minimum necessary for accomplishing the multiple ideas inherent in the moral idea of war—the military end of terminating the effectiveness of the enemy's armed forces; the political end of achieving the proper order of power relationships for a stable and just international framework and the moral end of peace itself."[83] As ironic as it seems for all his writings on the subject, this is Ramsey's legacy.

Walzer's *Just and Unjust Wars*, rightly described as "the most influential academic reconsideration of the [just-war] tradition [by one scholar] in recent times," is very comprehensive and thought provoking.[84] Much of it is beyond the scope of this study. However, Walzer's thoughts on the principle of double effect are pertinent to this analysis. First, he advocates the position that the discrimination and proportionality criteria of *jus in bello* can be overridden "in extreme cases."[85] Paraphrasing Immanuel Kant, Walzer proposes the following maxim: "Do justice unless the heavens are (really) about to fall."[86]

This view is commonly described as a case of "supreme emergency," a phrase Walzer took from a 1939 speech by Winston Churchill.[87] Simply put, for Walzer, there are specific situations in war when the criteria for *jus in bello* can be openly violated. These situations occur "only when we are face-to-face not merely with defeat but with a defeat likely to bring disaster to a political community."[88] The key point here is recognizing just how high Walzer places the supreme emergency judgment bar. Violations of discrimination and proportionality are not permitted to avoid any military defeat. Rather, such violations are only permitted to avoid the death of a legitimate political system writ large.

Second, Walzer argues the principle of double effect should be the product of what he calls a "double intention."[89] Walzer does not question the validity of three of the four aspects of double effect, namely, the act must be a legitimate act of war, the direct effect is morally acceptable, and the good effect is sufficiently good to compensate for allowing the evil effect. Double effect is "in need of correction," according to Walzer, because it lacks "a positive commitment to save civilian lives."[90] Walzer proposes a "due care" clause as an additional requirement to the principle of double effect. For him, if double effect is to allow the collateral harm of noncombatants, then the harm must be minimized to the greatest extent possible. In the end, if saving noncombatant lives requires risking those of combatants, the "risk must be accepted."[91]

The works of Ford, Ramsey, and Walzer, particularly on the principle of double effect, have certainly influenced the moral debate surrounding the use of discriminate airpower. All three theorists give highest priority to the discrimination criterion and the almost sacrosanct protection of noncombatants. A brief review of two recent uses of US airpower reveals the depth of their influence.

Hehir examined the 1991 Gulf War in Iraq and questioned the overall air war on proportionality grounds.[92] While recognizing US targeting strategies as sufficiently discriminate during the war, he concluded that proportionality issues had not been framed and pursued adequately by the United States. He wrote, "The effect of using [high-tech weaponry] on communications facilities, electrical grids, and other strategically appealing targets undoubtedly punishes the civilian population. The criterion of proportionality is therefore left with new burdens in assessing the *jus in bello*."[93] Hehir's assessment recalls Walzer's correction to the principle of double effect. This is a dilemma that will be further examined in chapter 4 of this study.

More recently, Max Boot argues that too much concern over the criteria for *jus in bello* has hampered the air effort during Operation Iraqi Freedom.[94] According to Boot, lawyers, who decide if the expected benefits outweigh the risks of civilian casualties, are vetting all targets in Iraq. In addition, dozens of important targets have been placed off limits because of fears of "high collateral damage."[95] OIF may be a case where moral standards and the corresponding application of the criteria for *jus in bello* have changed because aerial-precision technology has changed. This, too, is a dilemma to be amplified later in this study.

The idea that right conduct in war is defined by the criteria of discrimination and proportionality is fundamental to the modern just-war tradition. The principle of double effect is a twentieth-century addition to the tradition. For this, Ford, Ramsey, and Walzer deserve much credit. Their modern interpretations of the criteria for *jus in bello* greatly influence the employment of airpower today. Aerial precision offers a moral opening for those concerned with discrimination and proportionality issues. It is clear that precision-guided munitions make it far, far easier to observe the criteria for *jus in bello* than in the past.

Conclusion

Asking just-war questions is a moral obligation for decision makers and Airmen. The just-war tradition represents one way of reflecting on the moral problems associated with the use of military force. It is a tradition deeply rooted in historical and political practice. Decision makers and airpower strategists who must assess, decide, and act in this age of modern warfare and aerial precision cannot escape its influence.

Amoral realists hold that war is hell, within which anything goes. Practical realists believe, to the contrary, that war is "a rule-governed activity."[96] The criteria for *jus in bello* represent the modern rules of war. That is not

to say that the criteria for *jus ad bellum* are unimportant. Peace is most always preferable to war, and, for that reason alone, the criteria for *jus ad bellum* remain indispensable to decision makers and airpower strategists.

This study argues that the moral, social, and political currents swelling around airpower and the pursuit of perfect aerial precision today are profound. They are no less weighty in their own right than those that swept the seventeenth century in Grotius' time when the modern nation-state first emerged. As historian Tami Davis Biddle predicted in 1994, ethics and efficiency are converging in the drive toward perfect aerial precision.[97] The pursuit of perfect aerial precision, however, has created significant dilemmas when one considers both thematic branches of the just-war tradition.

Notes

1. James Turner (J. T.) Johnson defines the *just-war tradition* somewhat differently as "a body of moral, legal, and political wisdom that has developed over the history of Western culture on the justification of armed force and the limits of justified use of such force." See J. T. Johnson, "Just War," 183.
2. Childress, "Just-War Theories," 433.
3. Hehir, "Moral Calculus," 125.
4. Davidson, "Just-War Criteria."
5. Walzer, *Just and Unjust Wars*, 21.
6. Quoted in Woodward, "Ancient Theory."
7. Hehir, "Kosovo: A War of Values," 405.
8. Hunter, "Rethinking Just War."
9. Within the just-war tradition, the terms *criteria* and *principles* are often used interchangeably. With the notable exception of the "principle of double effect" to be discussed later in this chapter, I will resist this interchange. When I speak of just-war criteria, I mean a specific or codified set of rules of conduct by which the decision to go to war and the means employed during the war may both be evaluated.
10. J. T. Johnson, *Morality and Contemporary Warfare*, 27–38.
11. Walzer, *Just and Unjust Wars*, 41.
12. "Ethics of War," BBC, 15.
13. Draper, "Grotius' Place," 179.
14. Taylor, "Just and Unjust Wars," 227.
15. Ibid.
16. Quoted in J. T. Johnson, *Morality and Contemporary Warfare*, 42; also see note 2.
17. Ibid., 45.
18. Aquinas, *Summa Theologiae*.
19. Wray Johnson, "Just War."
20. Edwards, *Hugo Grotius*, 10.
21. Grotius, *On the Law of War*, bk. 1, chap. 1, sec. 10. Hereafter cited using book, chapter, and section of *On the Law of War* online edition.
22. Draper, "Grotius' Place," 199.
23. Edwards, *Hugo Grotius*, 116.
24. See Copleston, *History of Philosophy*, 328–34.
25. Grotius, *On the Law of War*, bk. 2, chap. 22, sec. 5.
26. Ibid.
27. Ibid., bk. 2, chap. 22, sec. 6; and bk. 2, chap. 22, sec. 12.
28. Ibid., bk. 2, chap. 24.
29. Ibid., bk. 2, chap. 24, sec. 8.

30. Ibid., bk. 3, chap. 25, sec. 2.
31. Ibid., bk. 3, chap. 1, sec. 1.
32. Ibid., bk. 3, chap. 19, sec. 1.
33. Ibid., bk. 1, chap. 1, sec. 14.
34. J. T. Johnson, *Morality and Contemporary Warfare*, 37.
35. Wray Johnson, "Just War."
36. Edwards, *Hugo Grotius*, 178.
37. Ibid.
38. Ibid.
39. "Samuel von Pufendorf," *Internet Encyclopedia of Philosophy*.
40. Draper, "Grotius' Place," 207.
41. For a detailed, well-researched, and valid argument for airpower as "the most discriminate weapon of war," see Meilinger, "Winged Defense," 103–23.
42. Quoted in Parks, "Air War," 7.
43. Ibid.
44. Hehir, "Kosovo: A War of Values," 403.
45. Parks, "Air War," 8.
46. Ibid., 4.
47. Green, *Contemporary Law*, 173.
48. Green, *Essays*, 137.
49. Parks, "Air War," 31.
50. Green, *Essays*, 138.
51. Ibid., 140.
52. Ibid.
53. For specific provisions regarding aerial warfare found in the 1977 Protocol I addition to the Geneva conventions of 1949, see pt. 4, "Civilian Population," sec. I, "General Protection against Effects," International Committee of the Red Cross, "International Humanitarian Law."
54. Green, *Essays*, 142.
55. Ibid., 144; and Green, *Contemporary Law*, 176–77.
56. Green, *Contemporary Law*, 183.
57. Green, *Essays*, 144.
58. Green, *Contemporary Law*, 177.
59. J. T. Johnson, *Morality and Contemporary Warfare*, 133.
60. Ibid. John C. Ford provides a representative list numbering more than 100 to include fishermen, glove makers, and prison inmates, to name just three. See Ford, "Morality of Obliteration Bombing," 283–84.
61. J. T. Johnson, *Morality and Contemporary Warfare*, 133.
62. J. T. Johnson, "Just War," 184.
63. Ford defines *obliteration bombing* as "the strategic bombing, by means of incendiaries and explosives, of industrial centers of population in which the target to be wiped out is not a definite factory, bridge, or similar object, but a large area of a whole city, comprising one-third to two-thirds of its whole built-up area, and including by design the residential districts of workingmen and their families." See Ford, "Morality of Obliteration Bombing," 267.
64. Hehir, "Just War Theory," 239–40.
65. Ford, "Morality of Obliteration Bombing," 5.
66. Ibid., 269.
67. Ibid., 289.
68. Ibid.
69. Ibid., 5.
70. Ibid., 289.
71. Ibid., 289–90.
72. Ibid., 289 and 308–09.
73. Hehir, "Just War Theory," 240.

74. Davidson, "Just War Criteria."
75. Ibid.
76. Ford, "Morality of Obliteration Bombing," 5.
77. This summary is based on J. T. Johnson, *Morality and Contemporary Warfare*, 131; and J. T. Johnson, "Paul Ramsey," 136–44.
78. J. T. Johnson, "Paul Ramsey," 137.
79. J. T. Johnson, *Morality and Contemporary Warfare*, 131.
80. J. T. Johnson, "Paul Ramsey," 139.
81. Ibid., 140.
82. Ibid., 140–41.
83. J. T. Johnson, "Just War," 192.
84. Rengger, "On the Just-War Tradition," 355.
85. Walzer, *Just and Unjust War*, 231.
86. Ibid.
87. Ibid., 251.
88. Ibid., 268.
89. Walzer writes, "First, that the 'good' be achieved; second, that the foreseeable evil be reduced as far as possible." Ibid., 155.
90. Ibid., 155–56.
91. Ibid.
92. This analysis is based on Hehir, "Just War Theory," 243, 247–48; and, Hehir "Moral Calculus," 125–26.
93. Hehir, "Just War Theory," 247.
94. Boot, "Sparing Civilians, Buildings."
95. Ibid.
96. Childress, "Just-War Theories," 434.
97. Biddle, "Air Power," 141.

Chapter 4

The Dilemmas of Perfect Aerial Precision

Ethics are not logically, externally related to politics. These two distinguishable elements are together in the first place, internally related.

—Paul Ramsey

To soldiers, optimism comes less easily, for no historical phenomenon has proven more resistant to simplified prescriptions than the subject of their profession.

—Andrew J. Bacevich

In many cases today, war means bringing power, particularly air power, to bear against civil society.

—Eliot A. Cohen

In each question of war or the use of force, the consideration of its worth is often a delicate balance of politics, strategy, and ethics. Yet, in the theory and practice of strategy, Colin Gray observes: "Moral discourse often tends to be missing in action."[1] Consequently, Gray asserts, "Ethics is a formally neglected dimension of strategy."[2] The importance of moral reasoning in political and military affairs cannot be overstated. It can be shown to infuse, limit, or enable every decision in these realms. Hence, ethics in war is not oxymoronic. It exists and exerts a profound influence, whether the individual is aware of it or not. Likewise, pacifism is not the only available moral pathway. On occasion, as the discussion of the just-war tradition in the previous chapter shows, the application of violence may be unavoidable. Indeed, moral theories form the basis of what it means to be human, and political decision makers and military strategists neglect them at risk of great peril.[3]

There are moral, social, and political dilemmas associated with the emergence of a potentially perfect precision capability that may not be readily apparent to politicians and strategists. This study identifies three such dilemmas— (1) the decision to go to war, (2) casualty avoidance and the moral sanctuary, and (3) centralized control with centralized execution—and shows how the just-war tradition and moral reasoning significantly influence all of these. These examples are not exhaustive, but are representative of the kinds of dilemmas created by the interaction of an

emerging technology, aerial precision, and an established, accepted moral theory, the just-war tradition. It is intended to shed light on the sometimes counterintuitive outcomes of seemingly appropriate policies and strategies. In the end, this study generates more questions than answers, and this is its intent.

Pure moral reasoning is called deontology. One obeys a moral principle not because of the consequences of disobedience, but because it is right to do so. The just-war tradition is based on deontological principles and not on contingent judgments about the nature of modern warfare or cost-benefit calculations. In the emerging American way of war, the just-war tradition is essential and nonnegotiable. This is becoming increasingly evident, reaching a peak most recently in OIF. As military technological advances continue almost unabated, that is how it must remain for decision makers and strategists alike.

Public policy analyst George Weigel wrote, "No aspect of the human condition falls outside the purview of moral reasoning and judgment."[4] The dilemmas identified in this study demand moral scrutiny. To paraphrase Weigel, there is no Archimedean point outside the moral universe from which even the wisest politician or strategist can leverage perfect aerial precision.[5]

A New American "Go-to-War" Regime?

Regimes, according to Everett Dolman, are important components of the modern international security environment and are poorly understood outside the academic world.[6] Stephen Krasner describes them as "sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area of international relations. Principles are beliefs of fact, causation, and rectitude. Norms are standards of behavior defined in terms of rights and obligations. Rules are specific prescriptions or proscriptions for action. Decision-making procedures are prevailing practices for making and implementing collective choice."[7]

It is important to note several key features of a regime for the purpose of this analysis.[8] Regimes are not temporary arrangements or ad hoc agreements; they are lasting structures. The issue areas of particular regimes can be specified or limited. Principles and norms provide the basic defining characteristics of a given regime and are not easily changed. Rules and decision-making procedures, however, can change without altering the fundamental purpose of the regime. Successful regimes shape behavior through habituation, making expectations of future actions more predictable. Krasner summarizes regime change this way: "Change within a regime involves alterations of rules and decision-making procedures, but not of norms or principles; change of a regime involves alteration of norms and principles; and weakening of a regime involves incoherence among components of the regime or inconsistency between the regime and related behavior."[9]

The first dilemma is the distinct possibility that the pursuit of perfect aerial precision is changing the traditional American go-to-war or use-of-military-force regime that is derived directly from our historical experience and the just-war tradition. According to Donald J. Puchala and Raymond F. Hopkins, a regime exists where there is discernibly patterned behavior accounted for by principles, norms, and rules.[10] In the traditional American go-to-war regime, these principles, norms, and rules are easily characterized as derivations of the just-war tradition.

The fundamental principle of the American go-to-war regime is that war is bad, undesirable, and should be avoided if at all possible. The criterion of last resort for *jus ad bellum* clearly embodies this principle. Although modified by the current US National Defense Strategy that now postulates preventive (or preemptive) wars in defense of vital American interests, the principle that war should be avoided if another option exists that will effectively address the problem is intact. This is simply because people die during war, and therefore, war should be avoided. No politician or strategist can challenge or change that fact. Both world wars in the twentieth century were total wars characterized by the dehumanization of war itself and the combatants who fought in them. Mass deaths became statistics. The enemy was portrayed as subhuman, thus easier to kill. The postwar advent of nuclear weapons and the threat of national annihilation contributed further to this dehumanization process. There is no place in all-out nuclear war for the desirable traits of courage or loyalty to emerge and to be lauded. The very decision to go to war is sensor dependent, machine calculated, and void of emotion, so that the logic of mutual assured destruction can proceed.[11] War and the use of force were thought to be less likely in this dehumanized context, and fortunately, nuclear war has been so far avoided. Unfortunately, conventional war has continued, despite the guiding strength of the fundamental principle of the American go-to-war regime.

The principle that war *ought to* be avoided does not mean that it *must* be avoided. The just-war tradition also brings a desirable moral dimension to the pragmatism that accepts as a norm that war is sometimes necessary. The remaining six criteria for *jus ad bellum* comprise the regime's norms and provide moral guidance for the decision to choose the option of using military force. These accepted norms carry with them fundamental policy implications. In that light, J. T. Johnson is correct in his assessment that "there is a place for the use of force under national authority in resistance to armed attack, but also a place for the employment of military means in response to broader kinds of threats to national security, and to the values and structures that define the international order."[12]

The American go-to-war regime, based on the principles and norms described, remains essentially unchanged in the twenty-first century. With few exceptions, to include the use of atomic weapons against Japan at the conclusion of World War II, the rules of the American regime have mirrored the just-war tradition criteria of discrimination and proportionality for *jus in bello*.[13] Simply put, if war becomes necessary, it must then be conducted

discriminately and proportionally in accordance with the just-war tradition. So strong is this sense of rightness in war that the United States has been a strict adherent of the Geneva protocols governing conduct in war, even (and especially) when the enemy does not likewise comply. Even when the rules in war appear to break down, as could be argued for some units in the Vietnam War, egregious violations of the essential norms are met with disbelief and condemnation and swiftly punished. In 1926 air theorist William Sherman echoed the spirit of the American regime when he wrote, "There has always been a sentiment among mankind to mitigate the horrors of war, as far as the nature of the thing permits."[14]

The decision-making procedures developed to carry out the rules of the American war regime have changed over time, and this is to be expected within a long-standing regime. So long as the individual rules and procedures comply with the overarching principles and norms, the regime remains robust. Typically, changes in rules and procedures are made in response to technological developments. Most recently the advent of the mass use of precision-guided munitions and the priority given to joint military operations embody these procedures. As will be shown, the pursuit of aerial precision and improved joint training and capabilities have been and remain driven by the desire to follow the rules of the American war regime.

The American go-to-war regime reflects Krasner's top-down model. The regime is deliberative by design. The problem to be investigated is that perfect aerial precision threatens to change the fundamental structure of the regime. At best the development of perfect aerial precision weakens the traditional American go-to-war regime because it creates incoherence among the regime's top-down components and inconsistencies between the regime and related behavior. The top-down nature of the regime is inverted, becoming bottom-up driven.

At worst, different norms and principles could emerge due to a perfect aerial-precision capability. Because perfect aerial precision enables unprecedented levels of discrimination and proportionality, it threatens to lessen the importance of or even remove completely the criteria for *jus ad bellum* of the just-war tradition on which the current regime's principles and norms are so firmly founded. By appearing to lessen the likelihood of casualties, the horror of war is thus diminished. Is the unintended consequence of adhering to the just-war tradition by following the rules of the regime the increased likelihood of violence? Perhaps so.

In the past, issues involving ethics and military necessity tilted toward the latter because perfect discrimination was not possible. Given the potential of perfect aerial precision to achieve unprecedented levels of discrimination, important ethical issues reemerge that threaten to change the American go-to-war regime. Given perfect aerial precision in the future, war becomes less destructive and force more precisely focused on legitimate military targets and combatants. War is then, in effect, rehumanized. Perfect PGMs make it far, far easier to observe the just-war principles of discrimination and proportionality, thereby making war more likely.

The current regime is based on the principle that all human life has inherent value. Despite the fact that both the Allies and the Axis were guilty of indiscriminate aerial bombing at one time or another, it is equally true; however, that at the time there did not seem to be alternatives. As Parks concludes, bomber forces bombed as accurately as possible given their capabilities and their opposition.[15] Discrimination and proportionality were dependent upon military effectiveness. Unfortunately, too many noncombatants on all sides died in strategic bombing attacks. These casualties were accepted as an undesirable but necessary consequence in the pursuit of greater goods—victory and peace.

Perfect aerial precision would eliminate this effect. The principle that war is undesirable, today, reflects the attitudes of decision makers and strategists conscious of excessive combatant and noncombatant casualties. Remove those casualties, and the regime's fundamental principle changes. The highest principle, that war is undesirable and should be avoided wherever possible, is replaced by the principle that casualties are undesirable and should be avoided wherever possible. This tiny change allows for, and possibly encourages, war whenever and wherever casualties can be kept to precise and justifiable limits. This rehumanization of war would make war less bad, perhaps often desirable, and thereby lessen the compulsion to avoid it.

The current debate surrounding the preemptive use of force by the United States is a debate about the traditional American go-to-war principles and norms. The pursuit of a perfect aerial-precision capability fuels the fire of this debate. Given this emerging capability, it is possible to argue that war is now *required* in some cases and should no longer be seen as a last resort. This would be a clear misunderstanding, however. The Congressional Research Service (CRS) defines the preemptive use of military force as "the taking of military action by the US against another nation so as to prevent or mitigate a presumed *military* attack or use of force by that nation against the US" (emphasis in original).[16] According to the CRS, the United States has never, to date, engaged in a preemptive military attack against another nation.[17] While this interpretation is open for some debate in light of OIF, the fact that the debate is even taking place at all is due in large part to the development of advanced aerial precision.

The use of preemptive military force does call into question the utility of the criteria for *jus ad bellum* within the just-war tradition. War becomes a frequent requirement under certain conditions rather than a sometime necessity. The use of force is no longer a last resort but rather a possible first choice. Gen Bernard E. Trainor, USMC, retired, observed as much following Operation Allied Force when he wrote, "The 'air option' remains an attractive form of coercive diplomacy. That is the danger. It may become too attractive for future generations of decision makers and make force the first option rather than the last."[18] Karl Mueller echoes the point even stronger, "As airpower continues to develop its precision-targeting and attack capabilities, and as nonlethal weapons enter the military inventory,

the traditional association of military force with maximum destruction will become increasingly outdated, and the last-resort principle will eventually have to be abandoned."[19]

The lure of sterile, distant, clean, and perfect aerial precision seems embedded in the human psyche. Author Dave Grossman calls it the "myth of distant punishment."[20] Decision makers and strategists often seem unable to move beyond their fascination with high-tech hardware toward thinking about the sociopolitical ramifications of employing it. The traditional American go-to-war regime contributes to this, and rightly so. The decision to use military force should not be an easy one. Yet, as PGMs become more and more precise, the traditional American regime could change. Perfect aerial precision uniquely seems to offer the United States both military efficiency and an unparalleled opportunity to seize the moral high ground. The allure of military advantage without political limitations is extremely powerful. Yet, as Dolman rightly observes, a technology-driven strategy "abandons foresight and follows the apparatus wherever it leads."[21] The dilemma is that perfect aerial precision could make war and the use of force more, rather than less, likely, and this is not necessarily a good thing for the United States in the long term.

Over 80 years ago, German physicist Werner Heisenberg postulated a theory known as the uncertainty principle. He concluded that in subatomic physics, the observer becomes part of the observed system. Through the act of measurement, the physicist himself becomes part of the observed reality. So that paradoxically, the more precisely the position is determined, the less precisely the momentum is known. With the development of perfect aerial precision, this study proposes an ethical macroscopic corollary to Heisenberg's microscopic principle: The more precise PGMs become, the less authoritative the traditional American go-to-war regime becomes for decision makers and strategists. As Fareed Zakaria recently wrote, "Many people believe that the limited, precise targeting we are moving toward isn't really war."[22] The traditional American go-to-war regime is most certainly changing due to the ongoing quest for perfect aerial precision. The dilemma is whether these changes are good or bad.

Casualty Avoidance and the Moral Sanctuary

Following the recent US military campaign in Afghanistan, reporter Thomas Ricks described the new American way of war as "one built around weapons operating at extremely long ranges, hitting targets with unprecedented precision, and relying as never before on gigabytes of targeting information gathered on the ground, in the air, and from space."[23] Ricks is essentially accurate in his description. However, there is an implicit moral imperative that guides this new American way of war, namely, that such precision and lethal military capability be used with the greatest of care to avoid noncombatant casualties and minimize collateral damage.[24] Unlike what Ricks describes, this moral imperative is not new. It is derived di-

rectly from the just-war tradition. This imperative carries with it great ethical obligations. Modern military "technology," remarked a Pentagon spokesman recently, "has given us a great capability and a great responsibility" to be more discriminating.[25] This statement recognizes the importance of these obligations.

Aerial bombing campaigns will always carry the risk of killing innocent noncombatants (or unintended combatants). In war, noncombatants can die in predominantly three ways as a direct result of military action. First, they die if combatants disregard the laws of war and purposely target them. This would be a crime against humanity, and US perpetrators would be prosecuted in accordance with the *Uniform Code of Military Justice*. Second, noncombatants can become unintended casualties as a result of weapon systems malfunction, human error, or the fog of war. Such losses are regrettable, and while efforts will be made to prevent the incidents from happening again, no legal culpability is normally assessed. Third, noncombatants can die due to the collateral damage resulting from an attack on a legitimate military target judged appropriate according to the application of the principle of double effect.[26] Today, in most all cases, the United States seeks to minimize collateral damage and avoid civilian casualties.

Perfect aerial precision would greatly enhance American efforts to maintain this highest of moral standards. The development of aerial precision, as we have seen, has been characterized by an intense desire to overcome ethical injunctions against engaging noncombatants. It is clear that indiscriminate bombing causes broad collateral damage and blatantly disregards American moral virtues that include the dignity and natural rights inherent in every individual. This fact is not in question. The dilemma is just how far a perfect aerial-precision capability would raise the moral high bar. Given the new American way of war and historically sound efforts to follow the criteria for *jus in bello* in the just-war tradition, this study postulates the emergence of a new moral sanctuary associated with a perfect aerial-precision capability.[27] Within this moral sanctuary, the more precise our aerial weapons become, the more morally repugnant collateral damage and all casualties become to Americans. Our efforts to achieve casualty avoidance on and off the battlefield would now not only include noncombatants (in accordance with the just-war tradition) and American or allied combatants, but also enemy combatants. The emerging moral sanctuary might then call into question whether the principle of double effect remains justifiable in the future.

Carl von Clausewitz wrote, "War is not a mere act of policy, but a true political instrument, a continuation of political activity by other means."[28] Because war or the use of military force is a political act, any attempt by the United States to forego all concerns of collateral damage in this age of instant media would be an act of political suicide. Thomas Ehrhard describes current US efforts to limit collateral damage as "nothing short of an obsession."[29] For it not to be, argues Ehrhard, would be "anti-Clausewitzian."[30]

Perfect aerial precision threatens to strengthen this obsession even further to include limiting enemy combatant casualties as well.

The roots of this new moral sanctuary reach deep into the just-war tradition. Within the tradition there is an understanding, implicit or explicit, of how to consider and treat enemy combatants. Michael Walzer calls this relatively obscure concept the "moral equality of soldiers."[31] The criterion of right intention for *jus ad bellum* and the criterion of proportionality of means for *jus in bello* provide the moral foundation for the concept. The former is best described as a respect for the dignity of individuals. J. T. Johnson describes the latter as avoiding the gratuitous or unnecessary harm of others.[32] The moral equality of soldiers principle historically served to humanize the enemy. The emergence of a moral sanctuary due to perfect aerial precision, however, uses the principle to rehumanize enemy combatants.

Writing in response to the shocking events of 11 September 2001, Martin Cook declared, "Military necessity permits actions that might otherwise be ethically questionable."[33] While acts in defense of the state's *survival* are often accorded as an ambiguous moral threshold, the current war on terrorism does not have such an imperative. The emerging moral sanctuary would not permit such actions. The fundamental concept of the moral equality of soldiers is that the enemy combatant has inherent dignity and worth. While soldiers are not often responsible for the *jus ad bellum* declaration of war, they are always accountable for how enemy combatants (and noncombatants) are considered and treated within war (*jus in bello).*

Over time, a theory has emerged that the less face-to-face contact combatants have with one another, the easier it is to dehumanize or objectify and then kill each other. According to Grossman, increasing the distance between combatants allowed for an increase in the degree of aggression during all recent conflicts.[34] Airpower contributed to this trend by separating the Airman from the soldier in the trenches, both physically and culturally. However, with the emergence of perfect aerial precision and the ability to better identify and discriminate targets, the moral sanctuary restores the dignity and worth to all enemy combatants that appeared lost during total or indiscriminate war.

From a purely military standpoint, there may appear to be a conflict between accomplishing the mission to defeat the enemy and expressing compassion toward that very same enemy. Such compassion during war might yield a military advantage to the adversary and put US combatants at risk. The principle of double effect addresses these valid concerns that any competent commander would have. Perfect aerial precision and the moral sanctuary, however, reintroduce compassion as a military virtue. According to A. J. Coates, "what lies behind the criterion of proportionality is a basic respect for life" that demands commanders not to inflict undue or unnecessary suffering on their adversaries.[35] Perfect aerial precision will likely reinvigorate this respect for life and the moral equality of soldiers in the form of the new moral sanctuary.

The dilemma boils down to an assessment of what constitutes disproportionate casualties during warfare and made increasingly discriminate

by aerial precision. According to recent Department of Defense (DOD) statistics, though the total number of participating soldiers, Airmen, sailors, and marines has varied tremendously in each engagement from World War I to the present, total US casualties have decreased dramatically since Vietnam.[36] In World Wars I and II, the Korean War, and the Vietnam War, the casualty ratio remained constant, averaging one in 15. During Desert Storm in 1991 (the first true aerial-precision war), the ratio decreased to one in 784. The latest figures from Iraqi Freedom in 2003 indicate an even greater acceleration of this trend. As of 3 April 2003, the ratio had decreased to only one in 1,485. The new moral sanctuary captures this trend and transposes it to enemy combatants as well. While exact figures for enemy casualties are next to impossible to calculate, the expectation of lower enemy casualty rates in this era of advanced aerial precision continues to grow in both military and civilian circles. In the moral sanctuary, disproportionate enemy casualties equate to disproportionate damage in the spirit of the just-war tradition. As Michael Ignatieff recently wrote, "War ceases to be just when it becomes a turkey shoot."[37]

Perfect aerial precision allows for the possibility of victory without a huge cost in human lives. Military analyst William Arkin calls this a strategy that favors "focus over scale."[38] Max Boot writes, "In many ways, the U. S. has gone beyond the chivalrous warfare of the 18th and 19th centuries. Nowadays, the military tries to spare not only civilians, but enemy combatants as well."[39] As Boot recounts on 9 March 1945, more than 300 Boeing B-29 Superfortresses bombed Tokyo, Japan, killing an estimated 84,000 people, mostly civilians.[40] In total contrast, during Iraqi Freedom, bombs fell precisely on Baghdad, while shopkeepers kept their stores open and cafes served lunch. In addition, prior to the movement of US ground forces to engage elements of Iraq's Republican Guard arrayed to protect the approaches to Baghdad, the aerial weapons of first choice were leaflets, not bombs. The goal was to give Iraqi military units an opportunity to surrender before precise joint air and ground operations destroyed them. This practice exemplifies the emerging moral sanctuary.

Boot is correct when he writes, "Moral standards have changed because technology has changed."[41] The dilemma of casualty avoidance and the moral sanctuary is already emerging. A perfect aerial-precision capability would strengthen the influence of the moral sanctuary on political decision makers and military strategists. The next dilemma may then be what to do when an inhumane adversary uses our humanity against us.

Centralized Control, Centralized Execution

One of the most established tenets of the use of airpower is that offensive air operations should be characterized predominantly by centralized control, command, and planning and by decentralized execution. Perfect aerial precision threatens to turn this airpower tenet inside out, however. As technical capacities for battlespace management multiply, centralized control

and centralized execution may become recognized as the more effective means of employing aerial precision within the constraints of the just-war tradition. Remote commanders and high-level decision makers could make tactical-execution decisions in real time. The moral dilemma inextricably tied to the question of whether centralized control is best complimented by decentralized or centralized execution thus merits serious consideration.

Any discussion of the human element in war must begin with leadership.[42] Human factors, according to Jeffrey Cooper, "have as much [if not more] to do with military effectiveness than the technical performance of any weapon systems."[43] According to US Army Field Manual 3-0, *Operations*, leadership is the most dynamic element of combat power.[44] It focuses all the other elements and is the primary catalyst creating conditions for military success. Audacious and competent leaders, according to doctrine, make the difference in battle. Battle command, the "exercise of command in operations against a hostile, thinking enemy," is that aspect of leadership most critical for military success.[45] With or without a perfect aerial-precision capability, the ability of air commanders to exercise battle command and leadership is essential to the maintenance of American military capacity.

Courage and leadership both empower and cultivate initiative. Initiative is not a uniquely American warrior trait, but US military capacity and doctrine would be moot without it. During World War II, the concept of *Auftragstaktik* (literally mission tactics) was central to the German war-fighting philosophy. Drill manuals at the time stipulated that commanders should give their subordinates general directions on what to do, while allowing them total freedom to determine how to do it. This approach developed thinking leaders who improvised, adapted, and overcame to exercise sound tactical judgments.[46] *Auftragstaktik* has traditionally been codified in the "old" American way of war through the use of commander's intent and the tenet of centralized control with decentralized execution.

The emergence of a network-centric-warfare environment threatens to change the doctrinal concept of decentralized execution, and in the process could degrade the ability of military commanders to display initiative.[47] Aerial precision is a key component of this "new" environment. Ideally, in network-centric warfare, the senior commander has an unhindered, all-encompassing view of the contemporary operating environment due to the capabilities provided by space-based systems, such as the global positioning system and complex communications architectures. With the threat of being second-guessed always hanging overhead, the initiative of subordinate commanders could therefore be stifled because individuals lead and act differently while being watched.[48] In this way, initiative could be rendered obsolete if centralized control and centralized execution methods of military operations become the norm. As Cooper notes, no other nation emboldens the critical human element in combat more than does the United States.[49] Therefore, the question becomes can the time-tested doctrine of *Auftragstaktik* and the initiative of subordinate commanders

endure in an environment characterized by increasing aerial precision and network-centric warfare?

Two recent military operations clearly illustrate this moral dilemma. In November 2002, a US RQ-1 Predator unmanned aerial vehicle (UAV) launched a single AGM-114C Hellfire precision missile into an automobile traveling through the Yemeni desert, killing all six occupants. Among the dead was Qaed Salim Sinan al-Harethi, the reported al-Qaeda mastermind behind the October 2000 terrorist attack against the US Navy destroyer USS *Cole*.[50] Ricks reported that in October 2001, during Operation Enduring Freedom in Afghanistan, the US Air Force believed it had top Taliban and al-Qaeda leaders in its sights using Predators UAVs armed with Hellfire missiles as many as 10 times but was unable to gain clearance to fire in sufficient time to kill these individuals.[51]

Both the successful use of the Predator UAV and Hellfire combination in Yemen and the failure of senior commanders to authorize its timely execution in Afghanistan raise moral questions. Dubbed "Predator Morality" by the *Wall Street Journal*, the use of an UAV armed with PGMs calls into question the future status of the traditional human element of war.[52]

According to Evan Thomas and Mark Hosenball, the Bush administration apparently spent little time debating the morality of using Predator UAVs to "hunt and kill al-Qaeda men in their lairs."[53] In contrast, Ted Westhusing describes a sloth-like US Central Command targeting process where nothing short of an obsession to avoid noncombatant casualties prevented timely use of the Hellfire-armed Predators against key enemy leaders.[54] These two examples describe several facets of command and initiative dilemma brought about in part through the proven success of aerial precision. The network-centric-warfare environment, enhanced by aerial precision, could completely erode traditional forms of military leadership and decision making. According to Sam Sarkesian, commanders may fall into a "ready, aim, aim, aim, aim, aim" trap.[55] Here decision makers wait for that final key piece of information before making and implementing a decision, always poised to give the word but ultimately never firing.[56] At the other extreme, aerial precision gives commanders the ability to watch patiently and strike quickly and discriminately, like a sniper lying in wait.

This is why leadership is an art and not a science. There are no systematic rules for the exercise of initiative. Aerial precision and the drift toward centralized control with centralized execution foster a complex decision-making environment where the exercise of initiative is made more difficult. Once again the moral and ethical dilemmas of war are magnified by the pursuit of perfect aerial precision. Such warfare, according to Ignatieff, is a seductive and dangerous illusion, because it muddies the influence of the human element.[57]

Conclusion

Full appreciation of the many moral, social, and political dilemmas associated with the emergence of a potentially perfect precision capability

remains elusive. This study identified three such dilemmas—the decision to go to war, casualty avoidance and the moral sanctuary, and centralized control with centralized execution—and showed how the just-war tradition of moral reasoning influences them significantly. These examples are certainly not exhaustive. They are, however, representative of the kinds of issues inherent in interaction of an emerging technology and an established, accepted moral theory.

Russell F. Weigley noted in his 1977 classic, *The American Way of War*, that "to seek refuge in technology from hard questions of strategy and policy [was a] dangerous American tendency."[58] The intent in describing these dilemmas is to shed light on the sometimes counterintuitive, technology-driven outcomes of generally desirable policies and strategies. If the reader has more questions than answers at this point, then this study has fulfilled its intent.

Notes

1. Gray, *Modern Strategy*, 30.
2. Ibid.
3. Weigel, "Moral Clarity," 21.
4. Ibid.
5. Ibid.
6. Dolman, *Astropolitik*, 87.
7. Krasner, "Structural Causes," 2.
8. The features described are taken from Dolman, *Astropolitik*, 87–89; and Krasner, "Structural Causes," 1–5.
9. Krasner, "Structural Causes," 5.
10. Puchala and Hopkins, "International Regimes," 63.
11. See particularly Rhodes, Power and MADness, especially chap. 6, "Doomsday Machines," for a fascinating description of the dehumanizing illogic of nuclear policy.
12. J. T. Johnson, "Broken Tradition." This is an insightful essay that argues against what some believe is a "presumption against war" inherent to the just-war tradition. Such beliefs, Johnson concludes, are prudential because they are based on conditions in the world that are not only subject to change but also fated to change.
13. According to Lawrence Freedman, "The eventual strategic use of the bomb was determined by the conditions prevailing at the time at which the first bomb became available." President Truman's stated intent was to limit the casualties (both US and Japanese) and damage of a full-scale assault of the Japanese home islands. See Freedman, "Strategy of Hiroshima," 76–97. This illustrates that "the exception proves the rule." It was proportional if the anticipation of not using the atom bomb (when its full ramifications were not clearly understood) were worse than doing so.
14. Sherman, *Air Warfare*, 213–14.
15. Parks, "Air War," 54.
16. Grimmett, *U.S. Use of Preemptive*, 1–2.
17. Ibid.
18. Trainor, "Perfect War."
19. Mueller, "Politics, Death, and Morality," 16.
20. Grossman, "Morality of Bombing."
21. Dolman, *Astropolitik*, 148.
22. Zakaria, "Face the Facts," 53.
23. Quoted in Kelly, "American Way."

24. It is possible to make a pragmatic argument that the desire to avoid noncombatant casualties and minimize collateral damage merely reflects aspirations to maximize overall efficiency. These arguments are made absent any consideration of the just-war tradition.

25. US Army Maj Gen Stanley A. McChrystal, Joint Staff vice-director for Operations, as quoted in Gilmore, "Precision Munitions."

26. Of note, starvation, lack of access to medicines, and so forth, can also lead indirectly to noncombatant casualties.

27. A sanctuary is defined as a sacred and inviolable asylum or a place of refuge or protection.

28. Clausewitz, *On War*, 87.

29. Col Thomas Ehrhard, US Air Force, School of Advanced Air and Space Studies, interviewed by author, 31 March 2003.

30. Ibid.

31. Walzer, *Just and Unjust Wars*, 34–41.

32. J. T. Johnson, *Morality and Contemporary Warfare*, 28.

33. Cook, "Ethical Issues."

34. Grossman, *On Killing*, 156.

35. Coates, *Ethics of War*, 227.

36. Quoted in Lewis, "Counting Casualties." The following analysis is based on DOD statistics as presented in Lewis' article. In the DOD study, casualties represent individuals both killed and wounded. The casualty ratio used here compares total number of casualties to the total number of military participants in a given theater of operations.

37. Ignatieff, *Virtual War*, 161.

38. Arkin, "War of Subtle Strategy."

39. Boot, "Sparing Civilians."

40. Ibid.

41. Ibid.

42. This discussion of leadership and initiative is based on a previous work by this author. See Murray, "Battle Command," 46–51.

43. Cooper, "Strategy," 85.

44. US Army Field Manual 3-0, *Operations*, 4–7.

45. Ibid., 5-1.

46. Nelsen, "Auftragstaktik," 27.

47. For an in-depth discussion of network-centric warfare, see Alberts, Garska, and Stein, *Network Centric Warfare*. Note that while the concept of network-centric warfare has been popularized lately, its moral and ethical ramifications have been given much less thought than the pure technological limitations, such as bandwidth requirements.

48. Jeremy Bentham described this tendency as the "Panopticon effect" when designing his radical eighteenth-century penitentiary "as a mill for grinding rogues honest." See Mill and Bentham, *Utilitarianism*, 33.

49. Cooper, "Strategy," 85.

50. For specific details of this operation, see Thomas and Hosenball, "The Opening Shot," 48–49; and Crawley and Svitak, "UAV Strike," 16.

51. See Ricks, "Target Approval," and Westhusing, "Targeting Terror," 128–35.

52. "Predator Morality."

53. Thomas and Hosenball, "Opening Shot," 48.

54. Westhusing, "Targeting Terror," 130.

55. Sarkesian, "Sorcerer's Apprentice," 239.

56. Ibid., 239–40.

57. Ignatieff, *Virtual War*, 212–14.

58. Weigley, *American Way*, 416.

Chapter 5

Conclusions

When it is not a question of acting oneself but of persuading others in discussion, the need is for clear ideas and the ability to show their connection with each other.

—Carl von Clausewitz

There are no easy answers, but there are simple answers. We must have the courage to do what we know is morally right.

—Ronald Reagan

If the purpose of our endeavors is to create a better world, then we require a special sort of creativity that blends thought and imagination without negating obstacles to change. We require, in effect, an understanding of those elements of structure that resist change, as well as a feel for the possibilities of innovation that lie within the shadowland cast backward by emergent potential structures of power.

—Richard A. Falk

The full effects of the revolution in precision guidance are only just becoming apparent.

—Michael Ignatieff

Through the first half of the twentieth century, a robust aerial-precision capability was a major, if unrealized, goal of airpower theorists and tacticians the world over. Some of the hurdles airpower needed to surmount included limitations of basic aerodynamics, distance, geography, night operations, weather, and guidance. It was widely perceived that such technical difficulties could be overcome with dedicated funding and sustained scientific research and development. The payoff was a more lethal, efficient, and effective weapon with a compelling cost-utility argument. Area bombing, while potentially devastating, had severe political, economic, and military disadvantages that the promise of mass precision bombing would sweep aside.

The toughest challenge, however, was to overcome ethical injunctions against engaging and/or killing noncombatants. Indiscriminate area bombing causes broad collateral and unintended damage and blatantly disregards declared American moral values. While the movement toward total war began well before the Wright Brothers, the traditional moral sanctuary of noncombatants was increasingly violated, largely with the rise of strategic bombing.

In partial response, the latter half of twentieth-century airpower development has been more attentive to the technical development of precision-guided munitions. The actual transition was accomplished during the Vietnam War. Today, with the experiences of Operations Desert Storm, Allied Force, and, most recently, Enduring Freedom and Iraqi Freedom, aerial precision is clearly the centerpiece of US airpower operations. In the process, aerial precision has become airpower's contribution to the just-war tradition.

Aerial precision is not only a proven tool of US combat capability, it also now represents a moral obligation that will continue to exert increasing influence. Airpower is the most flexible, discriminate, and proportionally lethal and nonlethal weapon of choice in the American arsenal. It will likely become the preferred first-choice US military instrument of national power for prosecuting military operations. It has the potential to provide the nation's political leaders with the means to achieve national strategic objectives with minimal loss of life. American airpower in the twenty-first century will be characterized by the use of aerial precision to achieve national strategic objectives, causing less, not more, death and destruction within the just-war tradition.

The Shadowland

War is a rule-governed activity characterized by the conditioned, regulated, and measured application of force, military potential, and patience. When decision makers attempt to exert influence in the international realm to achieve a chosen effect, they may choose military action as the means. If the result of that action is violent death within an adversary's population, then the military action is equivalent to conventional, protracted revolutionary or internal *war*—declared or not. All forms of war fall under international norms and standards, and so the regulation of force, military potential, and patience is a moral and ethical imperative. Domestic values and popular support also influence the decision-making process. An effort to conduct military operations under morally justified conditions and with the intent to minimize the loss of life and property is an increasingly important part of the emerging twenty-first-century American way of war. This has not always been the case.

War has traditionally been characterized by the desire to use overwhelming force to achieve quick and decisive victory. Moral and ethical concerns, under this model, were often relegated to trivial significance. At best, morality could be linked directly with how quick and decisive a campaign was; quick wars were better than long ones, and decisive ones limited future disputes. Yet, even this trite justification could be casually disregarded. As Colin Gray observes, "No sound strategic history of the twentieth century would spend many pages on morality and ethics as independent shapers of strategic behavior."[1] Nonetheless, Gray's interpretation appears decidedly anti-Clausewitzian. Holistically, war, an extension of policy by other means, is a profoundly human instrument. It is a fundamental part

of the human condition. Ethics in war is not a triviality. War, by its violent nature, directly and immediately engages our moral judgment.

In the twenty-first century, the American purpose of war, while never neglecting vital security interests, will be to advance peace, human rights, and the liberal democratic principle of self-determination. Americans, in the main, embrace a universalistic ethic that assigns basic rights and respect to individuals by virtue of their humanity. Their government explicitly recognizes the moral worth of all persons. This essential American ethic symbolizes the nation's moral stance and will be the essential characteristic of the American way of war in this new century.

Americans possess an outlook best described as practical realism, recognizable in the pure offensive, amoral realism found in Thucydides' *History of the Peloponnesian War*, but informed by the obligations of moral and ethical reasoning. Thus, American decisions to wage and conduct war have tended to be in accordance with the just-war tradition, based in Judeo-Christian principles, and with international law, based in secular-rationalist principles. These elements combine to make all aspects of war rule-governed activities. Rules can be broken, of course, but doing so has severe repercussions that are receiving increased attention in a world where technology and morality are permanently intertwined.

Perfect aerial precision is a theoretical construct, so far, not completely realized in combat. It does represent a potential means for achieving American objectives while maintaining the United States' status as the world's lone superpower. But the potential ahead casts a shadowland behind. Within the shadowland, as revealed in Falk's epigraph at the beginning of this chapter, it is possible to discern openings that contain significant potential for change, including the prospect of exerting unprecedented influence on the character of the emergent system. The potential of perfect aerial precision appears limitless. Yet, as we have seen, there are dilemmas that must be discerned with special attention to the particulars.

Twenty-First-Century Airpower Characteristics

American air operations will progressively be conducted on strategic and operational levels strictly under just-war principles, minimizing casualties on all sides in order to bring about a swift and equitable end to conflicts. It is clear, in the most Clausewitzian sense, that there is a relationship between legitimacy, collateral damage, and friendly and noncombatant casualties. As munitions become more and more precise, this relationship is likely to include enemy combatant casualties as well. Ignatieff correctly observes that in the twenty-first century, war will cease to be moral when it becomes a "turkey shoot."[2] Today the American concern for limiting collateral damage often appears to be an obsession. In the twenty-first century, this obsession will continue to intensify and thereby greatly influence future air operations.

If the American way of war is the conditioned, regulated, and measured application of force, military potential, and patience, then the essence of airpower will be found in the inherent discriminate and proportional flexibility of precision. Again, aerial precision is airpower's modern contribution to the just-war tradition. To apply morality to air operations, the United States will likely employ PGMs to wage effective campaigns and to minimize both enemy noncombatant and combatant casualties. It will use lethal and nonlethal means that target military capabilities to reduce collateral and unintended damage in ways unimaginable just 10 short years ago. Precision-guided munitions may have created a new sense of moral urgency in the American psyche so that in cases requiring application of force, if precision strike is possible, then its use will be imperative.

Aerial precision has obviously changed the way war is conducted. Over the last century, airpower has overcome many physical and political sanctuaries to become the dominant arm of American military force. The last sanctuary to emerge may be best described as a moral one, where less killing and destruction is preferred more than overwhelming force with the potential for indiscriminate killing and widespread destruction.

Adversaries will surely seek to exploit this sanctuary, making the decision to go to war and American conduct during war extremely difficult. Military targets will be collocated with facilities like hospitals and schools. Combatants will continue to pose as noncombatants, or use noncombatants to shield themselves. Ingenious new methods to exploit American ethical limitations in war will be devised, but this retreat into barbarism enhances rather than detracts from the moral imperative. How Airmen respond to the challenge of maintaining military superiority without violating the moral sanctuary will define the next century's American way of war.

Modern airpower has two incredible strengths to assist in this effort—discrimination and proportionality. It is not without weakness, however—the major detraction being a capacity for "gratification without commitment."[3] Both these strengths and this weakness converge to form the two most important issues for my twenty-first century-American theory of airpower—casualty avoidance and risk aversion. Despite the increased per-weapon lethality of aerial precision, an expectation of fewer casualties on all sides is generally accepted. At the same time, as technology yields more standoff PGMs, Airmen are subject to less risk. Unless aerial precision is made increasingly accurate (aiming toward a theoretically perfect precision), developments could undermine a fundamental premise of the just-war tradition. Airmen, by their profession and the American ethic, are expected to assume more risk to themselves in order to avoid killing noncombatants.

Just war, in the new American way of war, represents the convergence of ethics and efficiency. In the twenty-first century, airpower using aerial precision will afford political leaders the option to apply a minimum level of violence necessary for accomplishing their ends within moral bounds. Military strategists must then recognize and plan for this political and moral imperative.

The Future

The symbol of America's military prowess is now the PGM and not the mushroom cloud, and the preferred ordnance for attacking military targets in the future will likely remain PGMs. That said, political constraints and aims will continue to shape air operations. Airpower's effectiveness in the future should be far more of the mind than of the machine. An invigorated sense of American morality, empowered by aerial precision, will demand less destruction and certainly less killing of both noncombatants and enemy combatants. Unmanned technologies and currently untapped space power will also feed into this moral imperative to create a demand for more precise, perhaps even perfect, weapons. These emerging moral inhibitions will also demand better intelligence, surveillance, and reconnaissance capabilities. Airpower is targeting, and targeting is intelligence.[4] This will continue to be the case in the future.

This American brand of practical realism is not without significant hurdles. In the future, adversaries will seek advantage by exploiting American morality and its dedication to just-war principles, particularly considerations for *jus in bello*. In addition, the material influence on airpower effectiveness could continue to demand high-tech, politically visible aircraft like the F/A-22 and the Joint Strike Fighter to the detriment of the human dimension of warfare. Network-centric warfare also threatens the foundation of the human dimension. In an age of limited resources, the tendency to train as one has fought in the past also represents a significant hurdle. In the past, airpower wrought untold destruction in support of the attainment of national strategic objectives. In the future, airpower will be asked to accomplish the same objectives with exactly opposite means.

Finally, the effectiveness of American airpower in the twenty-first century will rest upon a continued strong relationship between the American people and their government. Aerial precision presents political leaders with the opportunity to achieve national objectives with minimal loss of life. To use airpower in ways that do not support this moral imperative could threaten this sacrosanct relationship.

Final Thoughts

Airmen in the twenty-first century must adeptly handle a double-edged sword. Advancing technologies have wrought dramatic developments in airpower capabilities. Aerial precision is the most promising of these emerging technologies. On the other side, the very speed and extent of these technological developments have made it difficult to formulate enduring concepts for airpower employment. If one begins at the most fundamental level of war—the human dimension—answers await, and a sound, fully articulated airpower theory will likely emerge.

American airpower has a distinct moral component in accordance with the American maxim that the most rational objective of any state is to pur-

sue its vital security interests without resort to war or violence. In the twenty-first century, in accordance with the just-war tradition, less, not more, killing and destruction will be the norm if war becomes the option of choice. Airmen, as thinkers and not just doers, have a moral obligation to pursue this option using aerial precision. The moral inhibitions of American air commanders, politicians, and the American people will continue to enhance the influence of the just-war tradition in pursuit of US national interests. Aerial precision, as airpower's modern contribution to the just-war tradition, is therefore the foundation of American airpower theory in the twenty-first century.

Everett Dolman notes that no one "can reliably predict the unforeseen (by definition), but we can identify trends and broad changes that seem likely to impact US defense policy and military operations for the next several decades."[5] The quest for perfect aerial precision represents one of the most significant future trends for political decision makers and military strategists alike. Better, more just, and clear political and military decisions cannot escape the dilemmas identified in this work. As author Walter J. Boynes rightly points out, "No military service in history has ever had placed upon it the requirement for victory at a minimum cost to both sides."[6]

Notes

1. Gray, *Modern Strategy*, 69.
2. Ignatieff, *Virtual War*, 161.
3. Cohen, "Mystique of U.S. Air Power," 109.
4. Meilinger, *10 Propositions*, 20.
5. Dolman, "Military Intelligence," 27.
6. Boyne, *Beyond Wild Blue*, 7.

Bibliography

Alberts, David S., John J. Garska, and Frederick P. Stein. *Network Centric Warfare: Developing and Leveraging Information Superiority*. 2d ed. rev. Washington, D.C.: Department of Defense C4ISR Cooperative Research Program, 2000.

Amstutz, Mark R. *International Ethics: Concepts, Theories, and Cases in Global Politics*. Lanham, Md.: Rowman & Littlefield Publishers, Inc., 1999.

Aquinas, Thomas. "Whether It Is Always Sinful to Wage War?" In *The Summa Theologiae of St. Thomas Aquinas*. 2d and rev. ed. Translated by Fathers of the English Dominican Province. London: Burns, Oates, and Washburne Ltd., 1920. http://www.newadvent.org/summa/304001.htm.

Arkin, William M. "A War of Subtle Strategy." *Los Angeles Times*, 23 March 2003.

Biddle, Tami Davis. "British and American Approaches to Strategic Bombing: Their Origins and Implementation in the World War II Combined Bomber Offensive." *Journal of Strategic Studies* 18, no. 1 (March 1995): 91–144.

———. *Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas about Strategic Bombing, 1914–1945*. Princeton, N.J.: Princeton University Press, 2002.

Boot, Max. "Sparing Civilians, Buildings, and Even the Enemy." *New York Times*, 30 March 2003.

Boyne, Walter J. *Beyond Wild Blue: A History of the United States Air Force, 1947–1997*. New York: St. Martin's Griffin, 1997.

Buckley, John D. *Air Power in the Age of Total War*. Bloomington, Ind.: Indiana University Press, 1999.

Chambers, John Whiteclay, II, Fred Anderson, Lynn Eden, Joseph T. Glatthaar, Ronald Spector, G. Kurt Piehler, eds. *The Oxford Companion to American Military History*. Oxford: Oxford University Press, 1999.

Childress, James F. "Just-War Theories: The Bases, Interrelations, Priorities, and Functions of Their Criteria." *Theological Studies* 39, no. 3 (September 1978): 427–45.

Clark, Gen Wesley K., retired. *Waging Modern War: Bosnia, Kosovo, and the Future of Combat*. New York: Public Affairs, 2001.

Clausewitz, Carl von. *On War*. Edited and translated by Michael Howard and Peter Paret. Princeton, N.J.: Princeton University Press, 1976.

Clodfelter, Mark. *The Limits of Airpower: The American Bombing of North Vietnam*. New York: Free Press, 1989.

Coates, A. J. *The Ethics of War*. New York: Manchester University Press, 1997.

Cohen, Eliot A. "The Mystique of U. S. Air Power." *Foreign Affairs* 73, no. 1 (January/February 1994).

Cook, Martin L. "Ethical Issues in Counterterrorism Warfare." Markkula Center for Applied Ethics, Santa Clara University, September 2001. http://www.scu.edu/ethics/publications/ethicalperspectives/cook.html.

Cooper, Jeffrey R. "Strategy." In *Air and Space Power in the New Millennium*, edited by Daniel Gouré and Christopher M. Szara, 72. Washington, D.C.: Center for Strategic & International Studies, 1997.

Copleston, Frederick C., S. J. *A History of Philosophy*. Vol. 3. *Late Medieval and Renaissance Philosophy: Ockham, Francis Bacon, and the Beginning of the Modern World*, 1953. Reprint, New York: First Image Books, 1993.

Cordesman, Anthony H. "The Persian Gulf War." In *The Oxford Companion to American History*, edited by Paul S. Boyer, Melvin Dubofsky, Erik H. Monkkonen, Ronald L. Numbers, David M. Oshinsky, and Emily S. Rosenberg. 589–90. New York: Oxford University Press, 2001.

Crane, Conrad C. *Bombs, Cities, and Civilians: American Airpower Strategy in World War II*. Lawrence, Kans.: University of Kansas Press, 1993.

Crawley, Vince, and Amy Svitak. "UAV Strike Raises Moral Questions." *Air Force Times*, 18 November 2002.

Davidson, Donald L. "The Just-War Criteria: A Contemporary Description." In *Nuclear Weapons and the American Churches: Ethical Positions on Modern Warfare*, 19–40. Boulder, Colo.: Westview Press, 1983.

Davis, Richard G. "Strategic Bombardment in the Gulf War." In *Case Studies in Strategic Bombardment*, edited by R. Cargill Hall, 527–621. Washington, D.C.: Government Printing Office, 1998.

Dolman, Everett C. *Astropolitik: Classical Geopolitics in the Space Age*. London: Frank Cass Publishers, 2002.

———. "Military Intelligence and the Problem of Legitimacy: Opening the Model." *Small Wars and Insurgencies* 11, no. 1 (Spring 2000): 26–43.

Draper, G. I. A. D. "Grotius' Place in the Development of Legal Ideas about War." In *Hugo Grotius and International Relations*, edited by Hedley Bull, Benedict Kingsbury, and Adam Roberts, 177–208. Oxford: Clarendon Press, 1990.

Drew, Dennis M. "U. S. Airpower Theory and the Insurgent Challenge: A Short Journey to Confusion." *Journal of Military History* 62, no. 4 (October 1998): 809–32.

Edwards, Charles S. *Hugo Grotius, the Miracle of Holland: A Study in Political and Legal Thought*. Chicago: Nelson-Hall, 1981.

The Ethics of War. BBC Online. http://www.bbc.co.uk/religion/ethics/war/jwintro.shtml.

Finn, Chris. "The Broader Implications of the Increasing Use of Precision Weapons." *Royal Air Force Air Power Review* 4, no. 1 (Spring 2001): 35–56.

Ford, John C. "The Morality of Obliteration Bombing." *Theological Studies* 5 (1944): 261–309.

Freedman, Lawrence. "The Strategy of Hiroshima." *Journal of Strategic Studies* 1, no. 1 (May 1978): 76–97.

Fulghum, David A. "JDAM Sales Expected to Reach $6 Billion." *Aviation Week and Space Technology*, 28 October 2002, 30.

Gilmore, Gerry J. "Precision Munitions Provide 'Great Capability,' Carry 'Great Responsibility.' " *American Forces Press Service*, 3 April 2003. http://www.defenselink.mil/news/apr2003/n04032003_200304037.html.

Glosson, Buster C. "Impact of Precision Weapons on Air Combat Operations." *Airpower Journal* 7, no. 2 (Summer 1993): 4–10.

Gordon, Michael R., and Bernard E. Trainor. *The Generals' War: The Inside Story of the Conflict in the Gulf*. Boston: Little, Brown and Company, 1995.

Gray, Colin S. *Modern Strategy*. Oxford: Oxford University Press, 1999.

Green, L. C. *The Contemporary Law of Armed Conflict*. Manchester, N.Y.: Manchester University Press, 1993.

———. *Essays on the Modern Law of War*. Dobbs Ferry, N.Y.: Transnational Publishers, Inc., 1985.

Griffith, Charles. *The Quest: Haywood Hansell and American Strategic Bombing in World War II*. Maxwell Air Force Base, Ala.: Air University Press, 1999.

Grimmett, Richard F. *U. S. Use of Preemptive Military Force*. Washington, D.C.: Congressional Research Service, Library of Congress 2002. http://library.nps.navy.mil/uhtbin/hyperion-image/CRS-RS21311.pdf.

Grossman, Dave. *On Killing: The Psychological Cost of Learning to Kill in War and Society*. Boston: Little, Brown and Company, 1995.

———. "The Morality of Bombing: Psychological Responses to 'Distant Punishment.' " *Killology Research Group*. Jonesboro, Ark.: *Academic Press*, 2000. http://www.killology.com/art_bombing.htm.

Grotius, Hugo. *On the Law of War and Peace*. Edited and translated by Wei Wilson Chen. Whitefish, Mont.: Kessinger Publishing, 2004. http://faculty.cua.edu/Pennington/Law508/GrotiusBook1.html, http://faculty.cua.edu/Pennington/Law508/GrotiusBook2.html, http://faculty.cua.edu/Pennington/Law508/GrotiusBook3.html.

Hallion, Richard P. *Precision-Guided Munitions and the New Era of Warfare*. Air Power Studies Centre Paper, no. 53. Fairbairn, Australia: Royal Australian Air Force, 1995. http://www.fas.org/man/dod-101/sys/smart/docs/paper53.htm.

Hehir, J. Bryan. "Just War Theory in a Post–Cold War World." *Journal of Religious Ethics* 20, no. 2 (Fall 1992): 237–57.

———. "Kosovo: A War of Values and the Values of War." In *Kosovo: Contending Voices on Balkan Intervention*, edited by William Joseph Buckley, 399–405. Grand Rapids, Mich.: William B. Eerdmans Publishing Company, 2000.

———. "The Moral Calculus of War: Just but Unwise." *Commonweal* 118, no. 4 (22 February 1991): 125–26.

Hendren, John. "Afghanistan Yields Lessons for Pentagon's Next Targets." *Los Angeles Times*, 21 January 2002.

Holley, I. B. *Ideas and Weapons*. 1953. Reprint, Washington, D.C.: Government Printing Office, 1997.

Hone, Thomas C. "Strategic Bombing Constrained: Korea and Vietnam." In *Case Studies in Strategic Bombardment*, edited by R. Cargill Hall, 469–526. Washington, D.C.: Government Printing Office, 1998.

Howard, Michael E., George J. Andreopoulos, and Mark R. Shulman. *The Laws of War: Constraints on Warfare in the Western World*. New Haven, Conn.: Yale University Press, 1994.

Hunter, Chance. "Rethinking Just War." *Ethics News and Views* 11, no. 1 (Fall 2002). http://ethics.emory.edu/news/archives/000089.html#more (accessed 8 November 2006).

Ignatieff, Michael. *Virtual War: Kosovo and Beyond*. New York: Metropolitan Books, 2000.

International Committee of the Red Cross. "International Humanitarian Law—Treaties & Documents, Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977, Part IV, Civilian population, Section I, General protection against effects of hostilities, Chapter VI, Civil defence." http://www.icrc.org/ihl.nsf/COM/470-750078?OpenDocument (accessed 8 November 2006).

Jackson, Jeffrey A. "Global Attack and Precision Strike." In *Air and Space Power in the New Millennium*, edited by Daniel Gouré and Christopher M. Szara, 106–16. Washington, D.C.: Center for Strategic & International Studies, 1997.

Jacobs, W. A. "The British Strategic Air Offensive against Germany in World War II." In *Case Studies in Strategic Bombardment*, edited by R. Cargill Hall. Washington, D.C.: Government Printing Office, 1998.

Johnson, James Turner. "The Broken Tradition." *National Interest* 45 (Fall 1996) 27–36. http://www.highbeam.com/library/docfree.asp?DOCID=1G1:18827110&ctrlInfo=Round20%3AMode20c%3ADocG%3AResult&ao= (accessed 22 January 2003).

———. "Just War in the Thought of Paul Ramsey." *Journal of Religious Ethics* 19, no. 2 (Fall 1991): 183–207.

———. *Morality and Contemporary Warfare*. New Haven, Conn.: Yale University Press, 1999.

———. "Paul Ramsey and the Recovery of the Just War Idea." *Journal of Military Ethics* 1, no. 2 (2002): 136–44.

Johnson, Wray. "Just War and Law of War: A Primer." Huntingdon College program in Political Science and Liberal Arts Symposium in Justice Faculty Guest Essay on Justice in War, 8 April 2001. http://fs.huntingdon.edu/jlewis/Outlines/SajustWarWray.htm.

Keaney, Thomas A., and Eliot A. Cohen. *Revolution in Warfare? Air Power in the Persian Gulf*. Annapolis, Md.: Naval Institute Press, 1995.

Keegan, John. "The Changing Face of War." *Wall Street Journal*, 27 November 2001.

Keeter, Hunter. "Pentagon Estimates 70 Percent PGM Use in Possible War with Iraq" (precision-guided munitions). *Defense Daily*, 6 March 2003.

Kelly, Michael. "The American Way of War." *Atlantic Monthly* 289, no. 6 (June 2002). http://www.theatlantic.com/issues/2002/06/kelly.htm.

Krasner, Stephen D. "Structural Causes and Regime Consequences: Regimes as Intervening Variables" In *International Regimes*, edited by Stephen D. Krasner, 1–21. Ithaca, N.Y.: Cornell University Press, 1983.

Kurtz, Howard. "Explosive Analyst: William Arkin, Giving Opinions Left and Right." *Washington Post*, 24 May 2002.

Lambeth, Benjamin S. *The Transformation of American Air Power*. Ithaca, N.Y.: Cornell University Press, 2000.

League of Nations Publications. Sales no. 1933/ix/10.

Lewis, Adrienne. "Counting Casualties." *USA Today*, 4 April 2003.

Loeb, Vernon. "Bursts of Brilliance." *Washington Post*, 15 December 2002.

McFarland, Stephen L. *America's Pursuit of Precision Bombing, 1910–1945*. Washington, D.C.: Smithsonian Institution Press, 1995.

McFarland, Stephen L., and Wesley Phillips Newton. "The American Strategic Air Offensive against Germany in World War II." In *Case Studies in Strategic Bombardment*, edited by R. Cargill Hall, 183–252. Washington, D.C.: Government Printing Office, 1998.

Meilinger, Phillip S. "Airpower: Observations from the Past Decade." *Royal Air Force Air Power Review* 4, no. 1 (Spring 2001): 48–68.

———. "A Matter of Precision." *Foreign Policy* 123, March/April 2001, 78–79.

———. "Precision Aerospace Power, Discrimination, and the Future of War." *Royal Air Force Air Power Review* 4, no. 3 (Autumn 2001): 14–26.

———. *10 Propositions Regarding Air Power*. Washington, D.C.: Air Force History and Museums Program, 1995.

———. "Towards a New Airpower Lexicon or Interdiction: An Idea Whose Time Has Finally Come." *Airpower Journal* 7, no. 2 (Summer 1993): 39–47.

———. "Trenchard and 'Morale Bombing': The Evolution of Royal Air Force Doctrine before World War II." *Journal of Military History* 60 (April 1996): 243–70.

———. "Winged Defense: Airwar, the Law, and Morality." *Armed Forces & Society* 20, no. 1 (Fall 1993): 103–23.

Mets, David R. *The Long Search for a Surgical Strike: Precision Munitions and the Revolution in Military Affairs*, CADRE Paper No. 12. Maxwell Air Force Base, Ala.: Air University Press, 2001.

———. "Stretching the Rubber Band: Smart Weapons for Air-to-Ground Attack." In *Technology and the Air Force*, edited by Jacob Neufeld, George M. Watson, and David Chenoweth, 122–136. Washington, D.C.: Government Printing Office, 1997.

Mill, John Stuart, and Jeremy Bentham, *Utilitarianism and Other Essays*. Edited by Alan Ryan. London: Penguin Books, 1987.

Momyer, William W. *Air Power in Three Wars: World War II, Korea, and Vietnam*. Washington, D.C.: Government Printing Office, 1978.

Morrow, John H., Jr. *The Great War in the Air: Military Aviation from 1909 to 1921*. Washington, D.C.: Smithsonian Institution Press, 1993.

Mueller, Karl P. "Politics, Death, and Morality in US Foreign Policy." *Aerospace Power Journal* 14, no. 2 (Summer 2000): 12–16.

Murray, Scott F. "Battle Command, Decisionmaking, and the Battlefield Panopticon." *Military Review* 82, no. 4 (July–August 2002): 46–51.

Nelsen, John T, II. "*Auftragstaktik*: A Case for Decentralized Combat Leadership." In *The Challenges of Military Leadership*, edited by Lloyd Matthews and Dale E. Brown, 26–39. McLean, Va.: Pergamon-Brassey's International Defense Publishers, Inc., 1989.

Parks, W. Hays. "Air War and the Law of War." *Air Force Law Review* 32, no. 1 (1990): 1–225.

———. "'Precision' and 'Area' Bombing: Who Did Which, and When?" *Journal of Strategic Studies* 18, no. 1 (March 1995): 145–74.

Peterson, Scott. "Smarter Bombs Still Hit Civilians." *Christian Science Monitor*, 2 October 2002.

"Predator Morality: Precision Weapons Produce a Just War." *Wall Street Journal*, 20 February 2002.

Puchala, Donald J., and Raymond F. Hopkins. "International Regimes." In *International Regimes*, edited by Stephen D. Krasner, 61–91. Ithaca, N.Y.: Cornell University Press, 1983.

Quester, George H. *Deterrence before Hiroshima: The Airpower Background of Modern Strategy*. New Brunswick, N.J.: Transaction Books, 1986.

Rengger, Nicholas. "On the Just War Tradition in the Twenty-first Century." *International Affairs* 78, no. 2 (2002): 353–63.

Rhodes, Edward. *Power and Madness: The Logic of Nuclear Coercion*. New York: Columbia University Press, 1989.

Ricks, Thomas E. "Target Approval Delays Cost Air Force Key Hits." *Washington Post*, 18 November 2001.

Rip, Michael Russell, and James M. Hasik. *The Precision Revolution: GPS and the Future of Aerial Warfare*. Annapolis, Md.: Naval Institute Press, 2002.

Roche, James G. "The Secretary's Vector." Office of the Secretary of the Air Force, 14 January 2003. http://www.loanational.org/hill/documents/SecAF%20Vector%20Core%20Competencies.doc.

"Samuel von Pufendorf." *Internet Encyclopedia of Philosophy*. http://www.utm.edu/research/iep/p/pufendor.htm.

Sargent, Richard L. "Weapons Used in Deliberate Force." In *Deliberate Force: A Case Study in Effective Air Campaigning*, edited by Robert C. Owen, 258–67. Maxwell Air Force Base, Ala.: Air University Press, 2000.

Sarkesian, Sam C. "The Sorcerer's Apprentice: Social Science and the American Military." In *Tooling for War: Military Transformation in the Industrial Age*, edited by Stephen D. Chiabotti, 231–46. Chicago: Imprint Publications, 1996.

Sherman, William C. *Air Warfare*. 1926. Reprint, Maxwell Air Force Base, Ala.: Air University Press, 2002.

Sherry, Michael. *The Rise of American Air Power: The Creation of Armageddon.* New Haven, Conn.: Yale University Press, 1987.

Sherwood, John Darrell. "U.S. Air Operations in the Vietnam War." In *The Oxford Companion to American Military History*, edited by John Whiteclay Chambers II, Fred Anderson, Lynn Eden, Joseph T. Glatthaar, Ronald Spector, and G. Kurt Piehler, 768–69. Oxford: Oxford University Press, 1999.

Stewart, Oliver. "The Doctrine of Strategic Bombardment." *Journal of the Royal United Services Institute*, February 1936, 95–101.

Taylor, Telford. "Just and Unjust Wars." In *War, Morality, and the Military Profession*, edited by Malham M. Wakin, 245–58. Boulder, Colo.: Westview Press, 1986.

Thomas, Evan, and Mark Hosenball. "The Opening Shot." *Newsweek*, 18 November 2002, 48–49.

Thompson, Mark. "The Tools of War." *Time*, 21 October 2002.

Trainor, Bernard E. "The Perfect War Led America's Military Astray." *Wall Street Journal*, 2 August 2000.

United States Army Field Manual 3-0, *Operations,* 14 June 2001.

The United States Strategic Bombing Surveys (European War) (Pacific War). 1945. Reprint, Maxwell Air Force Base, Ala.: Air University Press, 1987.

Walzer, Michael. *Just and Unjust Wars: A Moral Argument with Historical Illustrations*. 3d ed. New York: Basic Books, 1977.

Warden, Col John A., III. "The Enemy as a System." *Airpower Journal*, Spring 1995, 40–55.

Weigel, George. "Moral Clarity in a Time of War." *First Things: A Monthly Journal of Religion and Public Life,* January 2003, 20–27.

Weigley, Russell F. *The American Way of War*. New York: Macmillan, 1977.

Weinberger, Sharon. "Franks: Future Conflicts May Call for Different Force Mix." *Aerospace Daily*, 20 February 2002.

Westhusing, Ted. "Targeting Terror: Killing Al Qaeda the Right Way." *Journal of Military Ethics* 1, no. 2 (2002): 128–35.

Wilson, Donald. "Origins of a Theory of Air Strategy." *Aerospace Historian* 18 (Spring 1971): 19–25.

———. *Wooing Peponi*. Carmel, Calif.: Angel Press, 1973.

Woodward, K. L. "Ancient Theory and Modern War." *Newsweek*, 11 February 1991, 47.

Worden, Mike. *Rise of the Fighter Generals: The Problem of Air Force Leadership, 1945–1982.* Maxwell Air Force Base, Ala.: Air University Press, 1998.

Zakaria, Fareed. "Face the Facts: Bombing Works." *Newsweek*, 3 December 2001. http://www.fareedzakaria.com/ARTICLES/newsweek/120301.html.

The Moral and Ethical Implications of Precision-Guided Munitions

Air University Press Team

Chief Editor
James S. Howard

Copy Editor
Darlene H. Barnes

Cover Art and Book Design
L. Susan Fair

Composition and Prepress Production
Ann Bailey

Quality Review
Lula Barnes

Print Preparation
Joan Hickey

Distribution
Diane Clark