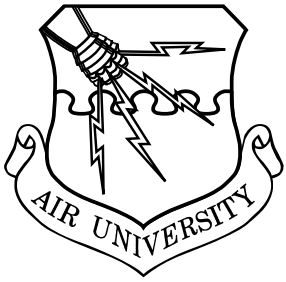
KICK THE TIRES AND LIGHT THE FIRES

Foundations of American Airpower

John T. Farquhar



Kick the Tires and Light the Fires

Foundations of American Airpower

John T. Farquhar, PhD
Lieutenant Colonel, USAF, Retired

Air University Press
Maxwell Air Force Base, Alabama

Front cover: Harley Copic, Glory in the Sun *(Courtesy of the Department of the Air Force Art Collection)*
Back cover: David Ray, B-17s over Europe *(Courtesy of the Department of the Air Force Art Collection)*

Published by Air University Press in June 2023
600 Chennault Circle, Building 1405
Maxwell AFB, AL 36112-6010

Dr. Paul Hoffman, *Director* — Donna Budjenska & Catherine Parker, *Project Editors*
Luetwinder T. Eaves, *Design and Production Managing Editor* — Catherine Smith, *Illustrator*
Cheryl Ferrell, *Print Specialist*

AIR UNIVERSITY PRESS

https://www.airuniversity.af.edu/AUPress/ Facebook:https://www.facebook.com/AirUnviPress
Twitter:https://twitter.com/aupress LinkedIn:https://www.linkedin.com/company/air-university-press/
Instagram:https://www.instagram.com/air_university_press/

Library of Congress Cataloging-in-Publication Data
Names: Farquhar, John T., 1958- author. | Air University (U.S.). Press, issuing body.
Title: Kick the tires and light the fires : foundations of American airpower / John T. Farquhar.
Other titles: Foundations of American airpower.
Description: Maxwell Air Force Base, Alabama : Air University Press, [2023] | In scope of the U.S. Government Publishing Office Cataloging and Indexing Program (C&I); Federal Depository Library Program (FDLP) distribution status to be determined upon publication. | Includes bibliographical references. | Summary: "'Kick the tires and light the fires': this popular, lighthearted phrase from a generation ago captures joyful enthusiasm and excitement and echoes when flying was fun, missions were thrilling, and airmen were "rarin' to go" (at least sometimes). This book serves as an introduction to American airpower studies and a textbook for exploring the foundations of today's United States Air Force. It seeks to build identity through an overview of Air Force heritage and an explanation of the concepts behind current theory and doctrine. The overview hopes to balance brevity with thoroughness and introduce the people, events, technology, and ideas associated with American airpower. It recognizes domestic and international contributions, acknowledging not only the US Army Air Service, Air Corps, Air Forces, and the US Navy's Aeronautical Bureau but also the influence of British, French, Italian, German, and Soviet air forces and international air theorists. "Foundations of American Airpower" stresses the relationship between airpower and strategy. Renowned air historian Phillip S. Meilinger says it best, "Air Power is an inherently strategic force." A primary theme of this work emphasizes that airpower is a strategic tool for policy makers but does not replace the need for sound, comprehensive strategy. Airpower is not a silver bullet that will magically solve problems; it is an instrument of strategy"—Provided by publisher.
Identifiers: LCCN 2022057990 | ISBN 9781585663231 (paperback)
Subjects: LCSH: United States. Air Force—History. | Airpower—United States—History. | Air warfare—History. | Strategy. | Nuclear warfare—United States.
Classification: LCC UG633 .F36 2023 | DDC 358.400973—dc23/eng/20230105 | SUDOC D 301.26/6:AM 3/2
LC record available at https://lccn.loc.gov/2022057990

Disclaimer

In memory of
John S. Farquhar, MD
1930–2022
Captain, US Army, 35th Regiment,
25th Infantry Division, Korea 1952–1953
Silver Star, Bronze Star, Purple Heart
"Always do your best, always have a plan,
lead by example."

Contents

Illustrations

Figures

Timelines

About the Author

Hailing from Fort Wayne, Indiana, John T. Farquhar graduated from the US Air Force Academy in 1980. He flew 4,600 hours as an RC-135 navigator with the 38th Strategic Reconnaissance Squadron (Strategic Air Command) and with the 38th Reconnaissance Squadron (Air Combat Command). Later, he served as Director of Wing Plans for the 55th Wing, Offutt Air Force Base; US European Command Theater Reconnaissance Scheduler for Operation Allied Force; and as a Strategic Plans Officer for Special Operations Command Central.

With a master's degree in US diplomatic history from Creighton University and a PhD from Ohio State University in American military history, Dr. Farquhar has taught at the US Air Force Academy for 30 years, specializing in airpower history, military theory, and strategy. His previous publications include *A Need to Know: The Role of Air Force Reconnaissance in War Planning, 1945–1953* (Air University Press, 2004); *The Armed Forces Officer* (Joint Staff, 2006); and chapters in *Educating Air Forces: Global Perspectives on Airpower Learning* (University Press of Kentucky, 2020) and *Military Strategy, Joint Operations, and Airpower* (Georgetown University Press, 2018).

Acknowledgments

The origins of this book are simple and specific. On 28 June 2016, Lt Col Dan Yinger, US Air Force, retired, and I were running along the Santa Fe Trail near the United States Air Force Academy when we realized that on that day 40 years previously, we entered Basic Cadet Training for the Class of 1980. We shared 40 years of memories and stories as classmates do and exchanged observations on teaching in the Military and Strategic Studies department where we worked. I expressed my frustration with the lack of a short, introductory text that captured our course material succinctly. Hence, this book is my attempt to meet the needs of bright, but time-stressed, officer candidates. Thus, my first thanks go to Dano for sharing nearly ten years of bouncing ideas while pounding the pavement.

My second collective thanks go to my friends and colleagues in the departments of History and Military and Strategic Studies at the United States Air Force Academy. My former commanders, brigadier generals, retired, Carl Reddel, Mark Wells, and Tom Drohan, as well as my current boss, Col Tom Swaim, have supported me and provided me opportunities. My former Ohio State professors Allan R. Millett and Williamson Murray honed my writing and intellectual skills. I also received tremendous intellectual guidance and inspiration from the Air Force Academy Department of History (DFH) pantheon: Budd Jones; Mike Terry; Mark "Clod" Clodfelter; Hector Chavez; Barney Ballinger; Mark Conversino; Mike Brumage, Royal Air Force (RAF); John Terino; John Shaw; Rob Ehlers; Mark Erickson; Robert Carriedo; Paul Bauman; Mark Grotelueschen; Dik Daso; Dan Moy; Doug Kennedy; Dave Oldfield, RAF; John Plating; Vance Skarstedt; Dave Stilwell; Jim Tucci; Ed Westermann; Bill Williams; John Abbatiello; and the rest of the other 145 DFHers that I have taught with. Upon my retirement from active duty, I was blessed with a teaching position in the Department of Military and Strategic Studies (DFMI) where I learned new perspectives, teaching techniques, and shared enthusiasm for contemporary strategy and challenges. I owe thanks to Steve Pomeroy; Ron Machoian; Jerry Boone; Eric Moody; Jeff Kaczmarczyk; Jasin Cooley; Trey Darnell; Mike Fowler; Joel Higley; Brent Talbot; Jim Titus; John Modinger; Martin Harris, RAF; Ryan Burke; Koji Takeoka, Japanese Air Self-Defense Force (JASDF); Paul Bezerra; Buddhika "Jay" Jayamaha; Johnny Farquhar; Cathy Brewer; and Kayla Georgiafandis; and the remaining 147

teammates that made teaching rewarding and fun. I also owe gratitude to the over 5,000 Air Force cadets that I have taught over 30 years; you keep me young and hopping.

"Think airpower!" wrote my friend and mentor, Phil Meilinger, colonel, US Air Force, retired, an unmatched airpower historian who has guided my thinking for over 30 years. His books are the gold standard, and I have drawn on his thoughts for much of this book. I admire his writing style and appreciate his mentorship over the years. He sponsored my quest for a PhD, which made my later teaching career possible.

Bringing this project to a published reality, I am indebted to my editor, Donna Budjenska, for prompt, concise, and astute improvements to the text; Dr. Dik Daso of the Air Force Historical Foundation for most of the illustrations; Ms. Rinata Bauzhanova for the graphic design of the timelines; and Dr. Paul J. Hoffman, director of Air University Press, for the final push to publication.

I also owe special thanks to my recently departed friends and mentors professor Joe Guilmartin, Col Steve Chiabotti, professor Dennis Showalter, Maj John Farrell, and Capt Dave Webster. We miss their intellect, guidance, and laughter.

Finally, I must thank my family: My father and his wife have inspired me and taught me to always do my best. My departed mother, who taught me to love reading. My brother and sisters for keeping me grounded. My children and their spouses. Last, but certainly not least, thank you to my beloved wife, still the friendliest, most genuine person I know, who remains willing to put up with all my foibles. Her love and patience made this book possible.

Introduction

Airpower—Ideas, Concepts, and Terms

"Kick the tires and light the fires": this popular, lighthearted phrase from a generation ago captures the fun of Air Force flying and anticipates the roar of engines and the surge of aircraft taking off for a challenging mission. This book serves as an introduction to American airpower studies and a source for exploring the foundations of today's United States Air Force. It seeks to build identity through an overview of Air Force heritage and an explanation of the concepts behind current theory and doctrine. The overview hopes to balance brevity with thoroughness and introduce the people, events, technology, and ideas associated with American airpower. It recognizes domestic and international contributions, acknowledging not only the US Army Air Service, Air Corps, Air Forces, and the US Navy's Aeronautical Bureau but also the influence of British, French, Italian, German, and Soviet air forces and international air theorists.

Foundations of American Airpower stresses the relationship between airpower and strategy. Renowned air historian Phillip S. Meilinger says it best, "Airpower is an inherently strategic force."[1] A primary theme of this work emphasizes that airpower is a strategic tool for policy makers but does not replace the need for sound, comprehensive strategy. Airpower is not a silver bullet that will magically solve problems; it is an instrument of strategy.

Although focused on airpower, this text recognizes joint operations—the cooperation and integration of land, sea, air, space, and cyberspace—as the key for tactical and operational success. This work asserts that to achieve optimum integration, Airmen must comprehend the evolution of airpower theory and doctrine. They must grasp the potential, possibilities, and limits of airpower. The authors of current online Air Force doctrine deserve credit for brevity and clarity, but this text seeks to expand comprehension by describing the evolution of both theory and doctrine—that is, how and why today's ideas came to be.

Terminology poses a mild challenge when reading this book because words and phrases mean different things at different times. In this text, *context* means studying the background factors of military power, including personalities, motivations, outcomes, and consequences. In other words, students explore the context to comprehend

and appreciate what happened in a military action or strategic event. Linked to context, *theory* refers to the concepts and principles that explain the how or why behind actions, the intellectual foundation for understanding the causes of events. Both context and theory use methods from history, political science, international relations, economics, and other fields to describe and explain the significance of military power.

The 10 March 2021 version of *Air Force Basic Doctrine* defines *airpower* as "the ability to project military power through control and exploitation in, from and through the air."[2] Along the same lines, two earlier definitions may prove useful: Brig Gen William "Billy" Mitchell wrote, "Air power may be defined as the ability to do something in the air. It consists of transporting all sorts of things by aircraft from one place to another."[3]

Air Chief Marshal of the Royal Air Force Lord Arthur Tedder said, "Air power is the ability to use the air spaces for offensive, defensive, and supply services, and to deny their use to the enemy."[4]

Military Theory and Doctrine

Military theory, in a general sense, provides a broad conceptual framework that organizes our thinking. More specifically, Webster's dictionary defines a theory as "a system of assumptions, accepted principles, and rules of procedure devised to analyze, predict, or otherwise explain the nature or behavior of a specified set of phenomena."[5] In other words, theory puts things known into a system. To some extent, theory simplifies the complexities of life and introduces principles and laws of behavior. Good military theory thus makes sense out of what otherwise would be an incomprehensible mass of observations and anecdotes. Theory also challenges the status quo; it combines things we observe in new ways and in turn forces a fresh look at current wisdom.[6]

Noted nineteenth-century Prussian military theorist Carl von Clausewitz states: "a working theory is an essential basis for criticism."[7] He emphasizes that military theory should inspire inquiry, the asking of questions, which leads to analytical investigation. In turn, the inquirer applies analysis to experience, which results in a "close acquaintance" and "thorough familiarity" with the subject.[8] Note that Clausewitz does not suggest that knowledge of theory alone would

result in the mastery of a subject; experience is imperative. Moreover, he and most military theorists do not consider military theory a rulebook or a checklist to be applied to a given situation. Military theory provides the foundation for weighing opportunities and constraints in strategic processes. It also focuses upon the timeless, unchanging aspects of the nature of war as well as on those dimensions of conflict that do change with societal evolution and advances in technology.

Closely related to military theory, *military doctrine* seeks to capture how best to fight. Military doctrine often follows from military theory but is tempered by the fires of experience. A recent Department of Defense (DOD) dictionary defines doctrine as "fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgment in application."[9] Three pithy quotes further refine the concept of doctrine: "what we believe about the best way to do things" (Col Dennis M. Drew and Dr. Donald M. Snow); "that mode of approach that repeated experience has shown usually works best" (Maj Gen I. B. Holley Jr.); and "the central beliefs for waging war in order to achieve victory; the building material for strategy" (Gen Curtis E. LeMay).[10]

Academic scholars of strategy and war often concentrate upon theory and criticize military doctrine, but despite limitations, military doctrine plays a vital intermediary role spanning ideas and behavior. Military organizations rely on doctrine to train large numbers of people to sing from the same sheet of music; in other words, military doctrine produces in troops reasonably standard behaviors and actions that a commander can use in planning and executing operations and thus transform them into an instrument of his will.[11] Military analyst Colin S. Gray links military theory and doctrine in a thought-provoking way: "If strategic theory educates the mind by providing intellectual organization, defining terms, suggesting connections among apparently disparate matters, and offering speculative . . . postulates, strategic (and operational, and tactical) doctrine states beliefs. Doctrine teaches what to think and what to do rather than how to think and how to be prepared to do it."[12]

In sum, military organizations need both military theory and doctrine; one expands the intellectual horizons of Soldiers, Sailors, Marines, Airmen, and Guardians, and the other provides guidelines for action and enhances interoperability and war fighting.

Strategy, Tactics, and Operations

In one sense, strategy applies military theory and doctrine to distinct political problems, and this functional approach helps define strategy as a concept. Joint Publication (JP) 1–02 presents a definition of *strategy*: "a prudent idea or set of ideas for employing the instruments of power in a synchronized and integrated fashion to achieve theater, national, and/or multinational objectives."[13] Three well-known military theorists further explain strategy. B. H. Liddell Hart called it "the art of distributing and applying military means to fulfill the ends of policy."[14] J. C. Wylie described it as "a plan of action designed in order to achieve some end; a purpose together with a system of measures for its accomplishment."[15] Carl von Clausewitz defined it as "the use of the engagement for the purpose of war. The strategist must therefore define an aim for the entire operational side of the war that will be in accordance with its purpose. In other words, he will draft the plan of the war, and the aim will determine the series of actions intended to achieve it: he will, in fact, shape the individual campaigns and, within these, decide on the individual engagements."[16] Students notice the subtle differences in these definitions and should take note that strategy has different meanings depending upon both time and author. For example, Clausewitz, Antoine-Henri Jomini, and other nineteenth-century authors used strategy to refer to military campaigns. In the mid-twentieth century, Liddell Hart coined the term "grand strategy" to correct this narrow military scope and broaden the perspective of strategic thinking when he wrote, "The role of grand strategy—higher strategy—is to coordinate and direct all the resources of a nation, or band of nations, towards the attainment of the political object of the war—the goal defined by fundamental policy."[17]

At its simplest, strategy reconciles ends, ways, and means, with *ends* referring to national and military objectives, *ways* meaning national policies and military concepts, and *means* standing for national resources, military forces, and supplies available to the decision makers.[18]

While a definition of strategy provides the student a starting point for study, experts emphasize the limitations of a definitional approach. In *The Making of Strategy: Rulers, States, and War*, Williamson Murray and Mark Grimsley argue that "straightforward definitions go fundamentally astray, for strategy is a process, a constant adaptation to shifting conditions and circumstances in a world where

chance, uncertainty, and ambiguity dominate."[19] Colin Gray agrees but observes, "strategy is the bridge that relates military power to political purpose; it is neither military power *per se* nor political purpose. By strategy I mean *the use that is made of force and the threat of force for the ends of policy*" (emphasis in original).[20]

In contrast to the complexities associated with strategy, the concept of *tactics* is simple and direct. The recent DOD military dictionary defines tactics as "the employment and ordered arrangement of forces in relation to each other."[21] A slightly older version defined it slightly differently: "1. The employment of units in combat. 2. The ordered arrangement and maneuver of units in relation to each other and/or the enemy to utilize their full potentialities."[22] At the risk of making the concept too complicated, two other observations contribute to our understanding of tactics. Stefan T. Possony called tactics "a continuous competition of wits," and Rear Adm Henry E. Eccles called it "the immediate employment of any force or weapon to attain the objectives of strategy, as opposed to its comprehensive control, which is strategy."[23] Hence, *tactics* refers to the battlefield and *strategy* to the process of attaining objectives (ends) through planning (ways) and applying resources (means).

As armies expanded in scale with the Industrial Revolution, military theorists introduced the concept of *operations* or the operational level of war as a means to better control vast armies that numbered in the hundreds of thousands or even millions, along battlefronts that stretched thousands of miles. Pioneered by Soviet military thinkers in the late 1920s and 1930s, operational-level war bridges the gap between tactics and strategy. Current US joint doctrine states, "The operational level links strategy and tactics by establishing objectives needed to achieve the military end states and strategic objectives. It sequences tactical actions to achieve objectives."[24] Thus, the strategic level of war focuses on national policy, overall objectives, and theater strategy; operational-level war concentrates on campaigns and major operations; and the tactical level features small unit and crew actions, engagements, and battles.

Notes

(Notes are presented primiarily in shortened form. For full information see the relevant entry in the bibliography.)

1. Meilinger, *10 Propositions Regarding Air Power*, 1, 8.

2. Air Force Doctrine Publication (AFDP) 1, *The Air Force*, 6.

3. Mitchell, *Winged Defense*, xi.

4. Tedder, A*ir Power in War*, 30. Of interest, the official online Joint Publication (JP) 1-02, *DOD Dictionary of Military and Associated Terms,* does not include a definition for airpower. For an excellent essay exploring essential concepts regarding an older term, "aerospace," that explains airpower well, see "Aerospace Power," in Air Force Manual (AFM) 1–1, Volume 2, *Basic Aerospace Doctrine*, 71–78.

5. *Webster's II: The New Riverside University Dictionary* (1988), s.v. "theory."

6. On 19 July 2005, Dr. Dorri Karolick provided this valuable perspective in her review of an early lesson on this subject.

7. Clausewitz, *On War*, 157; and Handel, *Masters of Wa*r, 19.

8. Clausewitz, *On War*, 141; and Handel, *Masters of War*, 23.

9. The current JP 1-02 no longer has an entry for "doctrine," nor does JP 1, *Doctrine for the Armed Forces of the United States* (25 March 2013, Incorporating Change 1, 12 July 2017). The current publications describe the theory, purpose, and application of doctrine, but the definition is from the previous online version before Change 1.

10. AFM 1–1, *Basic Aerospace Doctrine*, 282. Although it is not current, this version of Air Force basic doctrine contains two volumes. Volume 1 presents a brief synopsis of doctrinal precepts, and volume 2 contains a series of thoughtful essays about the nature of war and air- and space power that are still useful.

11. Gray, *Modern Strategy*, 36.

12. Gray.

13. JP 1-02, *DOD Dictionary of Military and Associated Terms*, 203.

14. Liddell Hart, *Strategy*, 335; and Gray, *Modern Strategy*, 18.

15. Wylie, *Military Strategy: A General Theory of Power Control*, 13; and Gray, *Modern Strategy*, 18.

16. Clausewitz, *On War*, 177; and Handel, *Masters of War*, 37.

17. Liddell Hart, *Strategy*, 335–36; and Gray, *Modern Strategy*, 18.

18. JP 3–0, *Doctrine for Joint Operations*, I-4; and Lykke, "Defining Military Strategy," 2.

19. Murray and Grimsley, "Introduction: On Strategy," 1; and Gray, *Modern Strategy*, 19.

20. Gray, *Modern Strategy*, 17.

21. JP 1-02, *DOD Dictionary of Military and Associated Terms*, 210.

22. JP 1–02, as cited in AFM 1–1, *Basic Aerospace Doctrine of the United States Air Force*, vol. 2, March 1992, 306.

23. JP 1-02, 306.

24. JP 1, *Doctrine for the Armed Forces of the United States*, I-7, I-8.

Chapter 1

Strategic Foundations for Airmen

In a 1989 article, "Why Air Forces Do Not Understand Strategy," respected historian and former US Air Force officer Williamson Murray argued that early airpower theory blinded air leaders to the classical strategic framework for understanding war. Murray described an obsession with airpower's potential as a diversion from comprehending both strategy and the relationship of war and the state. Lofty technological promise enticed air leaders and led them to reject the interplay of tactics, operations, and strategy to achieve political ends. Furthermore, air leaders rejected interservice cooperation in favor of pursuing independent "strategic" bombing featuring airpower as a revolutionary, war-winning weapon.[1] Although perhaps less true in today's joint-service environment, Murray's argument still resonates, and hence this chapter will examine three classic strategic thinkers: Thucydides, Carl von Clausewitz, and Sun Tzu. Although many excellent strategy books and insightful thinkers span the ages, the "big three" classical strategists provide breadth, depth, and nuance for the foundational strategic ideas needed by emerging air, space, and cyber leaders.

Thucydides, Clausewitz, and Sun Tzu provide insights that enhance understanding of the nature of war—those elements common to all wars, fundamental to comprehending war's complexity and timelessness. Although separated in time, culture, and context, the thoughts of Thucydides, Clausewitz, and Sun Tzu complement each other and enrich a modern understanding of strategy and war's purpose.

Why Nations Go to War: Thucydides

Athenian Greek soldier, statesman, and strategic thinker Thucydides (c. 460–400 BC) wrote the *History of the Peloponnesian War*, one of the Western world's best books examining warfare and strategy. Thucydides examined three themes in his wide-ranging work: (1) war consists of both rational and irrational elements; (2) in vital, stressful matters, the irrational usually wins out over the rational; and (3) the moral and ethical standards of a society are the first casualty of war. Although vast in scope, Thucydides's masterpiece in-

cludes a passage of particular importance. In the "Debate at Sparta," Thucydides captures the reasons nations go to war—the moral, political, economic, and emotional elements involved in a society's most momentous decision. He also presents the first strategic assessment recorded through the Spartan King Archidamus. In this passage, Thucydides describes concepts that define Western strategic culture, including freedom, honor, democracy, bravery, and civic obligation. Unmatched in the array of issues, events, and people and the human dimension of warfare, Thucydides's *History of the Peloponnesian War* serves as a springboard for strategic thinking. Although he does not state it explicitly, Thucydides argues that both rational and irrational elements influence war. Any rational policy considerations that ignore the emotions and passions of the people are doomed to fail.

The debate at Sparta occurred at the outset of a 27-year war that engulfed the Greek world. At the heart of the conflict were two alliances of city-states, one led by Athens—a vibrant cosmopolitan center of culture and learning, a dynamic business hub, and a great sea power—versus the other coalition led by Sparta, the greatest land power of the age, a militaristic society dedicated to martial prowess and war, disdainful of the arts, commerce, and intellectualism. Athens led the Delian League, an alliance of city-states in theory but in practice an Athenian empire made possible by its navy and commercial wealth. Sparta headed a coalition of smaller, primarily rural city-states in the Peloponnese, a strategic peninsula defensible by land but vulnerable to naval raids. To ancient Athenians, the Spartans (often called Peloponnesians in the book) were known for being conservative, slow to anger, fierce, loyal, brave—and stupid. In the debate, Thucydides featured speeches of four groups: the Corinthians who were Spartan allies and trade rivals of Athens; a group of Athenian merchants who happened to be in Sparta; King Archidamus, an old, respected Spartan warrior; and Sthenelaidas, a Spartan ephor, one of the ruling oligarchy. At issue, the Corinthians claimed that Athens broke the truce that had stabilized the Greek world since the second Persian invasion of 480–479 BC, 47 years earlier, by instigating a revolt against a Corinthian colony. The Corinthians sought Spartan aid.

In the first speech, Corinthian speakers challenged the Spartan assembly with a bold, yet nuanced, appeal. They targeted Spartan identity, honor, treaty obligations, and power politics in terms recognizable to a modern audience:

> Spartans, what makes you somewhat reluctant to listen to us others, if we have ideas to put forward, is the great confidence which you have in your own constitution and in your own way of life. This is a quality which certainly makes you moderate in your judgments; it is also, perhaps, responsible for a kind of ignorance which you show when you are dealing with foreign affairs. Many times before now we have told you what we were likely to suffer from Athens, and on each occasion, instead of taking to heart what we were telling you, you chose instead to suspect our motives and to consider that we were speaking only about our own grievances. The result has been that you did not call together this meeting of our allies before the damage was done; you waited until now, when we are actually suffering from it. And of all these allies, we have perhaps the best right to speak now, since we have the most serious complaints to make. We have to complain of Athens for her insolent aggression and of Sparta for her neglect of our advice.[2]

The Corinthians continued in their appeal to liberty and to fairness: "And it is you who are responsible for this. . . . Since [the Persian War] you have withheld freedom not only from those who have been enslaved by Athens but even from your own allies. When one is deprived of one's liberty one is right in blaming not so much the man who puts fetters on as the one who had the power to prevent him, but did not use it."[3]

Next, the Corinthians goaded the Spartans by contrasting the societal traits of the two superpowers—a somewhat risky move, but a calculated appeal to Spartan pride:

> Men who are capable of real action first make their plans and then go forward without hesitation while their enemies have still not made up their minds. As for the Athenians, we know their methods and how they gradually encroach upon their neighbors. Now they are proceeding slowly because they think that your insensitiveness to the situation enables them to go on their way unnoticed; you will find that they will develop their full strength once they realize that you do see what is happening and are still doing nothing to prevent it.
>
> You Spartans are the only people in [Greece] who wait calmly on events, relying for your defense not on action but on making

> people think that you will act. You alone do nothing in the early stages to prevent an enemy's expansion; you wait until your enemy has doubled his strength. Certainly you used to have the reputation of being safe and sure enough: now one wonders whether this reputation is deserved. . . . Instead of going out to meet them, you prefer to stand still and wait till you are attacked, thus hazarding everything by fighting with opponents who have grown far stronger than they were originally.[4]

Not satisfied with this challenge, the Corinthians drove the point home:

> The Athenian is always an innovator, quick to form a resolution and quick at carrying it out. You, on the other hand, are good at keeping things as they are; you never originate an idea, and your action tends to stop short of its aim. Then again, Athenian daring will outrun its resources; they will take risks against their better judgment, and still, in the midst of danger, remain confident. But your nature is always to do less than you could have done, to mistrust your own judgment, however sound it may be, and to assume that dangers will last forever. Think of this too: while you are hanging back, they never hesitate; while you stay home, they are always abroad; for they think that the farther they go the more they will get, while you think that any movement may endanger what you have already. If they win a victory, they follow it up at once, and if they suffer defeat, they scarcely fall back at all.[5]

Having delivered these rhetorical broadsides, the Corinthians concluded with an appeal to unity and alliance:

> Your inactivity has done harm enough. Now let there be an end to it. Give your allies . . . the help you promised and invade [Athens] at once. Do not let your friends and kinsmen fall into the hands of the bitter enemies. Do not force the rest of us in despair to join a different alliance. . . . The people who break a treaty of alliance are the ones who fail to give the help they swore to give, not those who have to look elsewhere because they have been left in the lurch. But if you will only make up your minds to act, we will stand by you. . . . Think carefully over your decision. From your fathers was handed down to you the leadership of the Peloponnese. Maintain its greatness.[6]

Immediately after the Corinthian speech, a group of Athenians in Sparta on other business asked to respond. They explained that they would not defend Athens against Corinthian claims but urged further deliberation and postponing any decision:

> We shall make no reply to the charges which these cities have made against us. Your assembly is not a court of law, competent to listen to pleas either from them or from us. Our aim is to prevent you coming to the wrong decision on a matter of great importance through paying too much attention to the views of your allies. At the same time, we should like to examine the general principles of the argument used against us and to make you see that our gains have been reasonable enough and that our city is one that deserves a certain consideration.[7]

Further, the Athenians emphasized Athens's strength and proud record against the Persian invasions of the recent past. In the first invasion, the Athenians defeated the Persians at Marathon. In the second, the Athenians voluntarily abandoned their home city and led the Greek resistance from their ships and island strongholds, culminating in the great naval victory at Salamis: "And the courage, the daring that we showed were without parallel. With no help coming to us by land, with all the states up to our frontier already enslaved, we chose to abandon our city and to sacrifice our property; then, so far from deserting the rest of our allies in the common cause or making ourselves useless to them by dispersing our forces, we took to our ships and chose the path of danger, with no grudges against you for not having come to our help earlier."[8]

The Athenians next discussed the origins of their empire in matter-of-fact terms:

> We did not gain this empire by force. It came to us at a time when you were unwilling to fight on to the end against the Persians. At this time our allies came to us of their own accord and begged us to lead them. It was the actual course of events which first compelled us to increase our power to its present extent: fear of Persia was our chief motive, though afterwards we thought, too, of our own honor and our own interest. Finally there came a time when we were surrounded by enemies, when we had already crushed some revolts, when you had lost the friendly feelings that you used to have for us and begun to

> arouse our suspicion: at this point it was clearly no longer safe for us to risk letting our empire go, especially as any allies that left us would go over to you. And when tremendous dangers are involved no one can be blamed for looking to his own interest.[9]

The Athenian representatives ended their presentation with confidence, with a degree of hubris, and in terms evoking modern power politics:

> So it is with us. We have done nothing extraordinary, nothing contrary to human nature in accepting an empire that was offered to us and then in refusing to give it up. Three very powerful motives prevent us from doing so—security [fear], honor, and self-interest. And we were not the first to act in this way. Far from it. It has always been a rule that the weak should be subject to the strong; and besides, we consider that we are worthy of our power. Up till the present moment you, too, used to think we were; but now, after calculating your own interest, you are beginning to talk in terms of right and wrong. Considerations of this kind have never yet turned people aside from the opportunities of aggrandizement offered by superior strength.[10]

Contrasting the nature of power with moral imperatives of right and wrong, the Athenians then cautioned the Spartans on both the consequences and uncertainties of war: "Think, too, of the great part that is played by the unpredictable in war: think of it now, before you are actually committed to war. The longer a war lasts, the more things tend to depend on accidents. Neither you nor we can see into them: we have to abide their outcome in the dark. And when people are entering upon a war they do things the wrong way round. Action comes first, and it is only when they have already suffered that they begin to think."[11]

Thucydides next chronicled the guidance offered by Sparta's King Archidamus, a respected old warrior with a reputation for both "intelligence and moderation." In contrast to the unnamed Corinthian and Athenian speakers, Archidamus presented a cautious but sound strategic assessment:

> Spartans, in the course of my life I have taken part in many wars, and I see among you people of the same age as I am. They and I have had experience, and so are not likely to share in what may be a general enthusiasm for war, nor to think that war is a

> good thing or a safe thing. . . . When we are engaged with Peloponnesians and neighbors, the forces on both sides are of the same type, and we can strike rapidly where we wish to strike. With Athens it is different. Here we shall be engaged with people who live far off, people also who have the widest experience of the sea and who are extremely well equipped in all other directions, very wealthy both as individuals and as a state, with ships and cavalry and hoplites, with a population bigger than that of any other place in [Greece], and then, too, with numbers of allies who pay tribute to them. How, then, can we irresponsibly start a war with such a people? What have we to rely upon if we rush into it unprepared? Our navy? It is inferior to theirs, and if we are to give proper attention to it and build it up to their strength, that will take time. Or are we relying on our wealth? Here we are at an even greater disadvantage: we have no public funds, and it is no easy matter to secure contributions from private sources. Perhaps there is ground for confidence in the superiority which we have in heavy infantry and in actual numbers, assets which will enable us to invade and devastate their land. Athens, however, controls plenty of land outside Attica and can import what she wants by sea. And if we try to make her allies revolt from her, we shall have to support them with a fleet, since most of them are on the islands. What sort of war, then, are we going to fight? If we can neither defeat them at sea nor take away from them the resources on which their navy depends, we shall do ourselves more harm than good.[12]

True to the Spartan sense of self, Archidamus refused to cower to Athenian power, yet he appealed to reason. Archidamus did not say "no" to war, but "not now":

> Not that I am suggesting that we should calmly allow them to injure our allies and should turn a blind eye to their machinations. What I do suggest is that we should not take up arms at the present moment. Instead, we should send to them and put our grievances before them; we should not threaten war too openly, though at the same time we should make it clear that we are not going to let them have their own way. In the meantime, we should be making our own preparations by winning over new allies . . . we can increase our naval and financial resources.[13]

Archidamus answered similarly the Corinthian challenge to Spartan honor:

> Let no one call it cowardice if we, in all our numbers, hesitate before attacking a single city. They have just as many allies as we have, and their allies pay tribute. And war is not so much a matter of armaments as of the money which makes armaments effective: particularly is this true in a war fought between a land power and a sea power. . . . As for being slow and cautious—which is the usual criticism made against us—there is nothing to be ashamed of in that. . . . "Slow" and "cautious" can equally well be "wise" and "sensible."[14]

Archidamus thus concluded by recommending Sparta take time in making a decision. Instead of voting for war, the assembly should be confident in Spartan strengths, send a mission to Athens, and call for arbitration while preparing for war: "And it is right and proper for us to put our hopes in the reliability of our own precautions rather than in the possibility of our opponent making mistakes. There is no need to suppose human beings differ very much from another: but it is true, that the ones who come out on top are the ones who have been trained in the hardest school."[15]

The final speech in the debate featured Sthenelaidas, one of the elected ephors who ran the city-state. His oration rallied Spartan emotions:

> I do not understand these long speeches which the Athenians make. Though they said a great deal in praise of themselves, they made no attempt to contradict the fact that they are acting aggressively against our allies and against the Peloponnese. And surely, if it is the fact that they had a good record in the past against the Persians and now have a bad record as regards us, then they deserve to pay double for it, since, though they were once good, they have now turned out bad. We are the same then and now, and if we are sensible, we shall not allow any aggression against our allies and shall not wait before we come to their help. . . . And let no one try to tell us that when we are being attacked we should sit down and discuss matters; these long discussions are rather for those who are mediating aggression themselves. Therefore, Spartans, cast your votes for the honor of Sparta and for war! Do not allow the Athenians to grow still

> stronger! Do not entirely betray your allies! Instead let us, with the help of heaven, go forward to meet the aggressor![16]

Short, simple, to the point, Sthenelaidas swayed the Spartan assembly for war. Thucydides's "The Debate at Sparta" sets the stage for the greatest war in the ancient Greek world and captures the key reasons why nations go to war: fear (security), honor, and self-interest.

War as Political Instrument: Clausewitz

Carl von Clausewitz's book *On War* constitutes the greatest single book in Western culture devoted to the theory and practice of warfare. Rivaled only by Thucydides's *History of the Peloponnesian War* for its grasp of both the rational and irrational dimensions of war, Clausewitz's work provides a foundation for comprehending military theory and strategy. Acknowledged as a timeless masterpiece, the book discusses a vast range of issues that span the nature of war, military theory, politics, strategy, and tactics. Clausewitz provides a conceptual framework that promotes an intellectual approach to the study of war and its relationship to the state. Because his book represents a kind of intellectual wrestling match, Clausewitz requires careful reading and deep thinking.[17]

As renowned British historian Michael Howard remarked, "Clausewitz was no desk soldier."[18] Born in 1780 to a family of minor nobility, Clausewitz first engaged in combat as a 12-year-old officer cadet who then experienced the Napoleonic Wars that dominated Europe from 1795 to 1815.[19] Although he never commanded a unit in combat, Clausewitz fought in actions ranging from small-unit engagements to the epic battles of Borodino and Waterloo. His firsthand combat experience, high-level staff duties, and intense military education supported his quest to create a universal military theory.[20]

Reflecting on his experience, Clausewitz presented five central ideas that helped define the nature of war:

1. The dual nature of war—tension between war's theoretical unchecked violence and limits imposed by politics and "fog and friction."
2. War as an instrument of politics.
3. The paradoxical trinity—war as a balance of passion, chance, and reason.

4. Fog and friction.
5. Military genius as a counter to fog and friction.

Clausewitz's "dual nature of war" represented a theoretical attempt to explore war's essential nature. In his opening section, Clausewitz presented a thesis that the ideal, or "absolute," form of war is total war: "War is thus an act of force to compel our enemy to do our will. . . . If one side uses force without compunction . . . [it] will force the other side to follow suit; each side will drive the other to extremes."[21] In its absolute form, "there is no logical limit to the application of . . . force."[22] On the other hand, Clausewitz countered with an antithesis: in reality, political objectives and "fog and friction" (chance, uncertainty, fatigue, fear, and other factors) imposed limits on the violence of war. Therefore, understanding Clausewitz's dialectical approach provides a key to unlocking Clausewitz's insights.[23] To repeat, Clausewitz envisioned a dual nature of war, a battle between absolute vs. limited war—war in theory versus real war.

Inherent in his concept of the dual nature of war, Clausewitz argued that war is an instrument of politics. His observation "war is merely the continuation of policy by other means" became arguably the single most quoted passage of *On War*.[24] Nations go to war to achieve a political purpose, and politics provides the reason for war. Clausewitz's original word *Politik* means either politics or policy in English, where "politics" refers to the conduct of political affairs (the battle of ideas that make governments work), and "policy" means a plan of action—"those political acts that lead to war, determine its purpose, influence its conduct, and bring about its termination."[25] Note that both concepts apply: war is a continuation of policy by other means, referring to diplomacy, international affairs, and political objectives as described above; and war is a continuation of politics, both domestic and international. The competition of political leaders, parties, factions, and ideas does not cease during a war. Hence, Clausewitz stressed that war is a political instrument of the policy maker. He attacked the notion of military necessity overriding political objectives: "Subordinating the political point of view to the military would be absurd, for it is policy that has created war. Policy is the guiding instrument and war only the instrument, not vice versa. No other possibility exists, then, than to subordinate the military point of view to the political."[26]

Further developing both the nature of war and its political dimension, Clausewitz introduced a theoretical construct known as the "paradoxical trinity":

> War is more than a true chameleon that slightly adapts its characteristics to the given case. As a total phenomenon its dominant tendencies always make war a paradoxical trinity—composed of primordial violence, hatred, and enmity, which are to be regarded as a blind natural force; of the play of chance and probability within which the creative spirit is free to roam; and of its element of subordination, as an instrument of policy, which makes it subject to reason alone.
>
> The first of these three aspects mainly concerns the people; the second the commander and army; the third the government. The passions that are to be kindled in war must already be inherent in the people; the scope which the play of courage and talent will enjoy in the realm of probability and chance depends on the particular character of the commander and the army; and the political aims are the business of the government alone.[27]

He emphasized that a genuine theory of war must address all three aspects and their relationships to each other. He described the theory as being an object that "maintains a balance between the three entities, like an object suspended between three magnets."[28] While some scholars simplify the trinity as a triangle depicting people, commander and army, and government, others emphasize violence or passion, chance and probability, and reason.[29] Although the people, commander/army, and government triangle appeals for its simplicity, the passion, chance, and reason triangle better captures Clausewitz's key insights that wars are inherently psychological and war's nature transcends groups and culture. In sum, the paradoxical trinity proved a valuable conceptual tool for understanding how the people, the government, and the military interact in war.

If Clausewitz's paradoxical trinity provided an overall conceptual framework for how to think about war, his emphasis on "friction" reflected his 20 years of combat experience. In other words, "Everything in war is very simple, but the simplest thing is difficult. The difficulties accumulate and end by producing a kind of friction that is inconceivable unless one has experienced war."[30] Clausewitz portrayed friction

as the idea that distinguishes real war from war on paper. He understood that military organizations are composed of individuals, each of whom retains a potential for friction ("Murphy's law," in other words—"anything that can go wrong, will"). Moreover, friction is always in contact with uncertainty, chance, and probability, elements he described as the "fog" of war. Therefore, the combination of fog and friction causes effects that cannot be measured nor entirely anticipated.[31] Summing up, Clausewitz cautioned: "Action in war is like a movement in a resistant element. Just as the simplest and most natural of movements, walking, cannot be easily performed in war, so in war it is difficult for normal efforts to achieve even moderate results."[32]

Clausewitz presented a potential answer to fog and friction in the concept of military genius. Specifically, he defined genius as "a highly developed mental aptitude for a particular occupation. . . . Gifts of mind and temperament that in combination bear on military activity. . . . Genius consists *in a harmonious combination of elements*, in which one or the other ability may predominate, but none may be in conflict with the rest" (emphasis in original).[33]

What did Clausewitz mean by "military genius"? What elements comprise the idea? Since wars are filled with danger, courage is the first requirement. "Courage is of two kinds: courage in the face of personal danger and courage to accept responsibility." Since war features physical exertion and suffering, a leader must possess "a certain strength of body and soul." Clausewitz continued, "War is the realm of uncertainty; three quarters of the factors on which action in war is based are wrapped in a fog of greater or lesser uncertainty. A sensitive and discriminating judgment is called for; a skilled intelligence to scent out the truth." Moreover, since war is "the realm of chance," Clausewitz called for a "quick recognition of a truth the mind would ordinarily miss or would perceive only after long study and reflection." He further explained the concept with a French term, *coup d'oeil*, "*an intellect, that even in the darkest hour, retains some glimmerings of the inner light which leads to truth*" (emphasis in original). Linked to this instinctive ability, Clausewitz stressed determination, "the courage to follow this faint light wherever it may lead." While Clausewitz acknowledged the importance of intelligence, his concept of military genius emphasized physical and moral courage, physical and moral strength, an instinctive grasp of truth, and determination.[34]

In Clausewitz's view, a brilliant mind could be a detriment to a military leader: "Intelligence alone is not courage; we often see that

the most intelligent people are irresolute. . . . In short, we believe that determination proceeds from a special type of mind, from a strong rather than a brilliant one."[35] Since the clock rules every military plan, intelligence must be matched with resolve and the ability to make a decision.[36] Military genius combined strength of mind with strength of character. In explaining strength of mind, Clausewitz focused on the mental and physical energy required to meet the unexpected. He called for staunchness, the will's resistance to a heavy blow; endurance, the will's capability for prolonged resistance; and self-control, "the gift of keeping calm under the greatest stress."[37] He characterized strength of character as the ability to stick to convictions.[38] In sum, Clausewitz's "military genius" blended intelligence, temperament, and action: "Truth in itself is rarely sufficient to make men act. Hence the step is always from cognition to volition, from knowledge to ability. The most powerful springs of action in men lie in his emotions. He derives his most vigorous support . . . from that blend of brains and temperament which we have learned to recognize in the qualities of determination, firmness, staunchness, and strength of character."[39]

Clausewitz recognized that war is not conducted against an inanimate object: "War, however, is not the action of a living force upon a lifeless mass . . . but always the collision of two living forces."[40] Too often military theorists reduced war to objective, quantifiable factors.[41] Clausewitz rejected this tendency and stressed the uncertain and variable. In war the enemy is a living being who thinks and reacts, quite often in unexpected ways. Therefore, theory cannot lead to complete understanding, but it can strengthen and refine judgment. Military theory can show how one thing is related to another, and it can separate the important from the unimportant.[42] To recap, Clausewitz provided ideas to stimulate thinking and an intellectual process to educate our minds. Those looking for formulas to solve problems or concrete principles for success will be disappointed.[43]

The Art of War: Sun Tzu

Joining Clausewitz as a pillar of strategic thought, Chinese military philosopher Sun Tzu assumes a special place in military theory. Like Clausewitz and Thucydides, Sun Tzu provides pithy, quotable statements that contain genuine pearls of wisdom.[44] Scholars disagree over whether Sun Tzu ("Master Sun") actually constitutes a historical

figure (sometimes named Sun Wu, Sun Zi, or other transliterations, who lived between 500 and 200 BCE) or simply a body of knowledge (i.e., the *Sun Tzu* represents observations of a series of scholars assembled over time), but for simplicity's sake, this text will treat Sun Tzu as an individual person.[45] Translations of Sun Tzu vary widely, but readers will like his brevity, simplicity, and wisdom.[46] Of the classic strategic theorists, Sun Tzu best articulates the relationship of war, strategy, and economics.[47]

"War is a matter of vital importance to the state; a matter of life and death, the road either to survival or to ruin. Hence, it is imperative that it be studied thoroughly."[48] From the outset, Sun Tzu's work differed in approach from *On War.* Whereas Clausewitz used dialectical reasoning to create a rational argument, Sun Tzu presented a series of succinct conclusions.[49] While Clausewitz focused on a narrow, in-depth examination of war and combat, Sun Tzu articulated a broad perspective encompassing both military and nonmilitary (diplomatic, economic, psychological, and other) factors.[50]

In his first chapter Sun Tzu outlined foundational ideas for the strategist. Before entering a war, he argued, the wise must calculate and assess the probability of success: "Therefore, appraise [war] in terms of the five fundamental factors and make comparisons of the various conditions of the antagonistic sides in order to ascertain the results of a war. The first of these factors is politics; the second, weather; the third, terrain; the fourth, the commander; and the fifth, doctrine. Politics means the thing which causes the people to be in harmony with their ruler so that they will follow him in disregard of their lives and without fear of any danger."[51]

The sovereign or military advisor must answer seven questions:

1. Which ruler is wise and more able?
2. Which commander is more talented?
3. Which army obtains the advantages of nature and the terrain?
4. In which army are regulations and instructions better carried out?
5. Which troops are stronger?
6. Which army has the better-trained officers and men?
7. Which army administers rewards and punishments in a more enlightened and correct way?[52]

Contrasting Clausewitz's emphasis on battle, Sun Tzu stressed deception as the key to victory: "All warfare is based on deception. Therefore, when capable of attacking, feign incapacity; when active in moving troops, feign inactivity. When near the enemy, make it seem that you are far away; when far away, make it seem that you are near. Hold out baits to lure the enemy. Strike the enemy when he is in disorder. . . . Avoid the enemy for the time being when he is stronger."[53] Many authorities consider this passage as Sun Tzu's essential contribution to comprehending warfare.

In his chapter "Waging War," Sun Tzu presented another key precept—avoid prolonged war: "A speedy victory is the main object in war. If this is long in coming, weapons are blunted and morale depressed. If troops are attacking cities, their strength will be exhausted. When the army engages in protracted campaigns, the resources of the state will fall short. . . . Thus, while we have heard of stupid haste in war, we have not yet seen a clever operation that was prolonged. For there has never been a protracted war which benefited a country. . . . Hence, what is valued in war is victory, not prolonged operations."[54]

In "Offensive Strategy," Sun Tzu outlined his ideal: victory without fighting: "Generally, in war the best policy is to take a state intact; to ruin it is inferior to this. To capture the enemy's entire army is better than to destroy it; . . . For to win one hundred victories in one hundred battles is not the acme of skill. To subdue the enemy without fighting is the supreme excellence." He then proposed what some call "the four attacks" that prioritized strategic operations: "Thus, what is of supreme importance in war is to attack the enemy's strategy. Next best is to disrupt his alliances by diplomacy. The next best is to attack his army. And the worst policy is to attack cities. Attack cities only when there is no alternative. . . . Thus, those skilled in war subdue the enemy's army without battle. They capture the enemy's cities without assaulting them and overthrow his state without protracted operations. Their aim is to take all under heaven intact by strategic considerations."[55] In other words, the enemy's center of gravity (to use Clausewitz's concept) is the enemy's strategy and alliances. Victory will go to those who understand the enemy's vision of ends, ways, and means. How does the enemy plan to defeat you? For Sun Tzu, diplomatic moves are as important as military maneuvers.

"Offensive strategy" concluded with perhaps Sun Tzu's most famous line: "Therefore, I say: Know the enemy and know yourself; in a hundred battles, you will never be defeated." Unfortunately, many

readers ignore the remainder of the passage: "When you are ignorant of the enemy but know yourself, your chances of winning or losing are equal. If ignorant both of your enemy and of yourself, you are sure to be defeated in every battle."[56] Readers generally agree with Sun Tzu's prescriptions; tough thinking occurs not in reading Sun Tzu but in figuring out how to bring his ideas to fruition. How does a commander or political leader actually accomplish them?

In his latter chapters, Sun Tzu presented a number of astute observations suited for the tactical and operational levels of war. He demonstrated considerable powers of observation and attention to detail. He continued his themes of deception, surprise, and using terrain and maneuver for advantage. Some of his observations pertained primarily to land warfare, and others illustrated ancient China's unique context. Along the same lines, although his "Maneuvering" chapter examined tactical maneuvers and how to gain a position of advantage, Sun Tzu again stressed deception and wise alliances: "One who is not acquainted with the designs of his neighbors should not enter into alliances with them. Those who do not know the conditions of the mountains and forests, hazardous defiles, marshes and swamps, cannot conduct the march of an army. Those who do not use local guides are unable to obtain the advantages of ground. Now, war is based on deception. Move when it is advantageous and create changes in the situation by dispersal and concentration of forces."[57] In other words, what are the political objectives of your allies? What do they seek from the alliance? To what extent do their objectives match your own?

Sun Tzu concluded his operational chapters with a summary: "If I know that my troops are capable of striking the enemy, but do not know that he is invulnerable to attack, my chance of victory is but half. If I know that the enemy is vulnerable to attack, but do not know that my troops are incapable of striking him, my chance of victory is but half. . . . And, therefore, I say: Know the enemy, know yourself; your victory will never be endangered. Know the ground, know the weather; your victory will then be complete."[58] Along the same lines, Sun Tzu provided a stunning philosophical observation: "If not in the interests of the state, do not act. If you cannot succeed, do not use troops. If you are not in danger, do not fight a war. A sovereign cannot launch a war because he is enraged, nor can a general fight a war because he is resentful. For while an angered man may again be happy, and a resentful man again be pleased, a state that has perished cannot be restored, nor can the dead be brought back to life."[59] The

passage reinforced Sun Tzu's emphasis on rational calculation before entering a war and to reject emotional policy responses. Like Clausewitz's fog and friction observations and military genius thoughts, the irrational and emotional realms of war are ever present and often triumph over cold rationality. It also echoed Thucydides's theme regarding war's irrational elements overcoming rationality.

Sun Tzu's *The Art of War* closed with a "Use of Spies" chapter that succinctly linked the military, political, economic, and psychological aspects of war:

> Now, the reason a brilliant sovereign and a wise general conquer the enemy whenever they move and their achievements surpass those of ordinary men is their foreknowledge of the enemy situation. This "foreknowledge" cannot be elicited from spirits, nor from gods, nor by analogy with past events, nor by astrologic calculations. It must be obtained from men who know the enemy situation. . . . There is no place where espionage is not possible. . . . And, therefore, only the enlightened sovereign and the wise general who are able to use the most intelligent people as spies can achieve great results. Spy operations are essential in war: upon them the army relies to make its every move.[60]

Summary

In summary, the concepts of Thucydides, Clausewitz, and Sun Tzu emphasize fundamental strategic ideas vital to today's air and space officers. Many ideas overlap and most complement each other; the inherent differences in time, culture, and context of the masters of strategy reinforce the universality of strategic thought. Many other works, both ancient and contemporary, explore strategy and should be studied, but they do not replace the wisdom of the big three. Students will benefit from mastering the ideas and comprehending the thinking involved in classic strategy.

Thucydides's *History of the Peloponnesian War* represents not only the first modern history and first political science text but also explores the human dimension of war. Among its primary teachings are the following:

> Wars are both rational and irrational. In vital issues and times of stress, the irrational (emotional) overrides the rational.

Reasons nations go to war: fear (security), honor, and self-interest.

"The longer a war lasts, the more things tend to depend on accidents."[61]

"And when people are entering upon a war they do things the wrong way round. Action comes first, and only when they have already suffered that they begin to think."[62]

War is economic, not so much a matter of armaments as of the money which makes armaments possible, particularly between a land power and a sea power, equally true with air and space.

Written as a dialectic, a form of intellectual argument, Clausewitz's *On War* introduced fundamental ideas for comprehending warfare and provided a basis for strategic thinking. He believed the role of military theory is to educate the mind. Military theory provided tools for thought but not a checklist for action. Clausewitz stressed that war is not performed against an inanimate object but is always the collision of two living forces—that is, your enemy gets a vote in war's outcome. Although ideas abound in *On War*, the following strategic ideas provide a foundation:

War has a dual nature marked by ever increasing violence (absolute or theoretical war) and limits imposed by politics and "fog and friction" (real war).

War as an instrument of politics; political objectives trump military necessity.

The paradoxical trinity—success in war is a balance of passion, chance, and reason represented by the people, military, and government.

"Fog and friction" limits both absolute violence and normal efficiency.

Military genius (courage, intelligence, determination, character) counters fog and friction.

Sun Tzu's *Art of War* presented a host of political, economic, and social observations that described the character and nature of war. Among the most famous and influential are the following ideas:

All warfare is based on deception.

A speedy (or swift) victory is the main object of war.

Prolonged war never benefits a country.

Subdue the enemy without fighting.

Attack the enemy's strategy, alliances, army, and last, his cities.

Know yourself and know your enemy.

One must know the designs (intentions, aspirations, perspective) of current and potential allies.

Speed is the essence of war.

If you cannot succeed, do not use troops. If you are not in danger, do not fight.

There is no place where espionage is not possible (for your enemy and for yourself).

In conclusion, by introducing foundational, classic strategic concepts, this chapter hopes to counter Williamson Murray's critique of airpower's strategic ignorance.

Notes

(Notes are presented primarily in shortened form. For detailed information, see the corresponding entry in the bibliography.)

1. Murray, "Why Air Forces Do Not Understand Strategy," 34–35.
2. Thucydides, *History of the Peloponnesian War*, 73–74. This translation captures the brilliance of ancient Greek oration; however, Robert B. Strassler, ed., *The Landmark Thucydides: A Comprehensive Guide to the Peloponnesian War* (New York: Simon & Schuster, 1996), provides useful maps, pictures, textual summaries, and an excellent introduction by Victor Davis Hanson.
3. Thucydides, *History of the Peloponnesian War,* 74.
4. Thucydides, 75.
5. Thucydides, 75–76.
6. Thucydides, 77.
7. Thucydides, 78.
8. Thucydides, 79.
9. Thucydides, 79–80.
10. Thucydides, 80.
11. Thucydides, 81–82.
12. A hoplite was the heavy infantryman of ancient Greece equipped with a bronze helmet, armor, spear, sword, and a round shield known as a *hoplon.* O'Connell, *Of Arms and Men,* 50; and Thucydides, *History of the Peloponnesian War*, 82–83.
13. Thucydides, *History of the Peloponnesian War*, 83.

14. Thucydides, 84.
15. Thucydides, 85.
16. Thucydides, 86.
17. This portion of the chapter synthesizes a number of highly regarded texts including Clausewitz, *On War*; Paret, "Clausewitz"; Handel, *Masters of War: Classical Strategic Thought*; Gray, *Modern Strategy;* and Howard, *Clausewitz.* Additionally, three introductory essays to the Howard and Paret translation of *On War* prove valuable: Peter Paret, "The Genesis of On War"; Michael Howard, "The Influence of Clausewitz"; and Bernard Brodie, "The Continuing Relevance of On War."
18. Howard, *Clausewitz,* 6.
19. Paret, "Clausewitz," 188; and Howard, *Clausewitz*, 6.
20. Paret, "Clausewitz," 195.
21. Clausewitz, *On War*, 75–76.
22. Clausewitz, 77.
23. Some scholars refer to "limited" war instead of "real" war. I will use "absolute" and "ideal" war as equivalent terms and consider "real" and "limited" war as synonyms. Paret, "The Genesis of *On War,*" 22; and Paret, "Clausewitz," 199–200.
24. Clausewitz, *On War*, 87.
25. *The American Heritage Dictionary*, 2nd College ed. (1985), s.v. "politics" and "policy"; and Paret, "Clausewitz," 210.
26. Clausewitz, *On War*, 607.
27. Clausewitz, 89. In translating Clausewitz, Michael Howard and Peter Paret will also call the "paradoxical" trinity the "remarkable" trinity. In the original hardback translation, they used "remarkable," but they changed it to "paradoxical" in the 1984 paperback translation. To avoid confusion, I will only use "paradoxical" trinity for the concept.
28. Clausewitz, *On War*, 89.
29. Chun, *War, Military Theory, and Strategy*, 29; and Paret, "Clausewitz," 201. Additionally, Michael Handel provides an interesting examination of multiple triangles and vectors in "The Supreme Act of Judgment: Understanding the 'Nature of War' and the 'Trinitarian Analysis," Masters of War: Classical Strategic Thought, 91–117; see especially 102–7.
30. Clausewitz, *On War*, 119.
31. Clausewitz, 119–21.
32. Clausewitz, 120.
33. Clausewitz, 100.
34. Clausewitz, 100–2.
35. Clausewitz, 102–3.
36. Gray, *Modern Strategy*, 42.
37. Clausewitz, *On War*, 105–6.
38. Clausewitz, 107.
39. Clausewitz, 112.
40. Clausewitz, 77, 149.
41. Murray and Grimsley, "Introduction: On Strategy," 1.
42. Paret, "Clausewitz," 193.
43. Ironically, many military and civilian policy makers tend to use *On War* as a book of quotations and cite passages for justifying positions and to stifle debate.
44. Although most Western scholars have adopted "Sun Zi" as the most appropriate translation in accordance with the *pinyin t*ransliteration system, the traditional and most common translation, "Sun Tzu," is used by Yuan Shibing, the translator of General Tao Hanzhang's *Sun Tzu's Art of War: The Modern Chinese Translation* (New

York: Sterling Innovation, 2007). To avoid student confusion, "Sun Tzu" will be used for this text.

45. In 2009 the National Defense University sponsored a "Teaching Sun Zi" conference where the consensus of American scholars present agreed that *The Art of War* represented the thoughts of a number of different scholars that evolved over time. This contrasts the current Chinese interpretation that stresses Sun Zi as a historical person. Some in China view Western debates over the authenticity of Sun Zi/Sun Tzu as an attempt to rob China of a national hero and to cast doubt on China's historical greatness. Regardless of these issues, I find it best for this text to treat Sun Tzu as a person.

46. There are 251 editions of Sun Tzu's writings. In addition to General Tao Hanzhang's recent Chinese interpretation, I recommend Roger T. Ames's *Sun Tzu: The Art of Warfare*, Ralph Sawyer's *Sun Tzu: The Art of War*, and Samuel B. Griffith's *Sun Tzu: The Art of War* as the most readable scholarly versions, as well as my students' favorite, Tsai Chih-Chung's (translated by Brian Bruya) *Sunzi Speaks: The Art of War*, which is a comic book version produced by a respected Taiwanese political cartoonist.

47. Handel, *Masters of War*, 3.

48. Hanzhang, *Sun Tzu's Art of War: The Modern Chinese Translation,* 22.

49. Handel, *Masters of War*, 23.

50. Handel, 22.

51. Although General Tao Hanzhang's translation proves readable for most students, this passage represents a significant departure from other English translations. Whereas the Hanzhang translation states: "The first of these is *politics; . . . Politics* means the thing which causes the people to be in harmony with their ruler," other translations differ. Samuel Griffith translates the same passage: "The first of these is *moral influence . . . . By moral influence* I mean that which causes the people to be in harmony with their leaders." Ralph Sawyer uses the word *Tao* (which means "the Way"): "the *Tao* causes the people to be fully in accord with their ruler." Brian Bruya and Tsai Chih Chung also use the *Dao:* "Establishing a moral cause means that there must be a common conviction shared by the both the people and the government" (emphasis added in each case). There is a difference between the word "politics" and the term "Tao" (or Dao) or "moral influence" used by the other translations. Perhaps it is a subtle difference, but the Tao implies a moral, philosophical, or spiritual dimension missing from "politics." Although "politics" fits Clausewitz's emphasis, the "moral influence" or "Tao" concept better captures Sun Tzu's association of harmony between the people and ruler. Hanzhang, *Sun Tzu's Art of War*, 22; Sun Tzu, *The Art of War*, trans. Griffith, 63–64; Sun Tzu, *The Art of War*, trans. Sawyer, 167; and Tsai Chih-Chung, *Sunzi Speaks: The Art of War,* 24–25.

52. Hanzhang, *Sun Tzu's Art of War,* 23–24.

53. Hanzhang, 24–25.

54. Hanzhang, 29–30.

55. Hanzhang, 33–34.

56. Hanzhang, 36.

57. Hanzhang, 56–57.

58. Hanzhang, 76.

59. Hanzhang, 89–90.

60. Hanzhang, 94, 96.

61. Thucydides, *History of the Peloponnesian War*, 81–82.

62. Thucydides, 82.

Chapter 2

The Influence of Sea Power upon Air, Space, and Cyber Theory

To what extent do theories of sea power influence the development of air, space, and cyber power? Before answering this central question, one must explore the term "sea power," originated by Alfred Thayer Mahan, America's most celebrated strategic thinker, and modified by British naval theorist Julian Corbett, both writing in the late nineteenth and early twentieth centuries. In his most famous book, *The Influence of Sea Power Upon History 1660–1783*, Mahan explained:

> The history of Sea Power is largely, though by no means solely, a narrative of contests between nations, of mutual rivalries, of violence frequently culminating in war. The profound influence of sea commerce upon the wealth and strength of countries was clearly seen long before the true principles which governed its growth and prosperity were detected. To secure to one's own people a disproportionate share of such benefits, every effort was made to exclude others, either by peaceful legislative methods of monopoly or prohibitory regulations, or, when these failed, by direct violence. . . . Therefore, the history of sea power, while embracing its broad sweep all that tends to make a people great upon the sea or by the sea, is largely a military history.[1]

Unfortunately, this passage described, but failed to define, sea power. Although he coined the term, Alfred T. Mahan never defined it precisely. In his historical writings, Mahan referred to sea power in two senses: (1) command of the sea through naval superiority and (2) that combination of maritime commerce, overseas possessions, and privileged access to foreign markets that produces national "wealth and greatness."[2] Reflecting his era, Mahan stated succinctly: "(1) Production; (2) Shipping; (3) and Colonies and Markets—in a word, sea power."[3]

In his many writings, Alfred Thayer Mahan (1840–1914) earned international renown as the father of sea power. He viewed the rise of Great Britain's maritime empire as the key to world power. Mahan argued that the principal mission of a navy was to control the sea. He envisioned the sea as "a great highway" or, more specifically, "lines of travel" called trade routes or lines of communication. A great power seeks to exploit lines of communication while denying them to the

enemy. In a conflict with a sea power, a navy's battle fleet comprising capital ships (called ships of the line in the age of sail or battleships in the steam era) must destroy or neutralize the enemy's fleet in decisive battle. Commerce raiding, or *guerre de course*, serves as an alternate, but weaker, means of naval war. Fast cruisers to raid the enemy's merchant marine could impose economic pain but would not replace the need to command the sea, which is only possible through a superior battle fleet.[4]

Perhaps because of the volume of Mahan's writings, his formalistic writing style, and his dependence upon historical narrative instead of articulating a theory, many readers focus on his chapter "Discussion of the Elements of Sea Power" as the essence of his thought. The chapter outlined six principal conditions affecting sea power.

Geographical Position

A nation's geographic location conveys advantage or disadvantage in both proximity to opposing land or naval powers or to maritime lines of communication. An island nation positioned near major routes (Britain or Japan) is poised for command of the sea. Island nations allow concentration on naval forces without the diversion of land threats. Although not an island, the United States benefited from the absence of a close land power.

Physical Conformation

As Mahan stated, "Numerous and deep harbors are a source of strength and wealth, and doubly so if they are the outlets of navigable streams, which facilitate the concentration in them of a country's internal trade; but by their very accessibility they become a source of weakness in war, if not properly defended."[5] Mahan pointed to the long, narrow, mountainous Italian peninsula and Florida's extensive coastline as strategic challenges for naval strategists.

Extent of Territory

"As regards the development of sea power, it is not the total number of square miles which a country contains, but the length of its coastline and the character of its harbors that are to be considered."[6] Mahan pointed out that during the American Civil War, the South suffered strategically by having a vast coastline with beaches and nu-

merous inlets favorable for landing while possessing relatively few, widely spaced ports suitable for naval defense.

Number of Population

Similar to the extent and physical conformation of the coast, Mahan observed the following regarding population: "it is not only the grand total, but the number following the sea, or at least readily available for employment on ship-board and for the creation of naval material, that must be counted."[7] A large population familiar with the sea, working in maritime occupations, provides a naval reserve force. He worried that the "United States has not the shield of defensive power behind which time can be gained to develop its reserve of strength."[8]

National Character

Mahan wrote during a time where Social Darwinism and belief in mercantile capitalism prevailed:[9]

> If sea power be really based upon a peaceful and extensive commerce, aptitude for commercial pursuits must be a distinguishing feature of the nations that have at one time or another been great upon the sea. . . . All men seek gain and, more or less, love money; but the way in which gain is sought will have a marked effect upon the commercial fortunes and the history of the people inhabiting a country. . . . The tendency to trade, involving of necessity the production of something to trade with, is the national characteristic most important to the development of sea power.[10]

Unashamed, Mahan argued for building American naval power, overseas trade, coaling stations needed for a world-class fleet, and where appropriate, colonies. He represented the confidence of an America on the brink of world power: "The instinct for commerce, bold enterprise in the pursuit of gain, and a keen scent for the trails that lead to it, all exist; and if there be in the future any fields calling for colonization, it cannot be doubted that Americans will carry to them all their inherited aptitude for self-government and independent growth."[11]

Character of Government

Mahan viewed the British Empire as the model for fostering sea power:

> [T]he most brilliant successes have followed where there has been intelligent direction by a government fully imbued with the spirit of the people and conscious of its true general bent. Such a government is most certainly secured when the will of the people, or of their best natural exponents, has some large share in making it; but such free governments have sometimes fallen short, while on the other hand despotic power, wielded with judgment and consistency, has created at times a great sea commerce and a brilliant navy with greater directness than can be reached by the slower processes of a free people.[12]

Mahan praised the British government for a long-term, determined, single-minded pursuit of sea power. In turn, he challenges the United States: "Whether a democratic government will have the foresight, the keen sensitiveness to national position and credit, the willingness to insure its prosperity by adequate outpouring of money in times of peace, all which are necessary for military preparation, is yet an open question."[13] Mahan concluded the chapter with the strategic formula stated earlier: "(1) Production; (2) Shipping; (3) and Colonies and Markets—in a word, sea power."[14] He asserts that history shows world power is derived from the favorable combination of geographic, national, and governmental attributes.

Writing a generation later than Mahan, Julian Corbett (1854–1922) refined and challenged a number of Mahan's famous precepts. A lecturer at Britain's Royal Naval College, Corbett argued that naval warfare must be viewed in the broader strategic context and that land and maritime operations must be linked to serve a common strategic end. Whereas many scholars dub Mahan the "Jomini of the Sea," Corbett drew from Clausewitz's *On War* for inspiration in his best-known book, *Some Principles of Maritime Strategy* (1911). Many contemporary readers find Corbett both easier to read than Mahan and more applicable to current conditions. Corbett agreed with Clausewitz that military theory ought to educate the leader's mind but cannot provide a practical guide to battlefield action: "Theory is, in fact, a question of education and deliberation, and not of execution at all."[15]

In discussing "Command of the Sea," Corbett distilled Mahan's concepts. He agreed with the basic idea of the American strategist: "The Object of naval warfare must always be directly or indirectly either to secure the command of the sea or to prevent the enemy from securing it."[16] Yet, Corbett observed a fallacy in the thinking of Mahan's adherents who assumed that once a belligerent lost command of the sea, it automatically passed to the adversary. Instead, Corbett noted, "the normal position is not a commanded sea, but an uncommanded (*sic)* sea . . . . Command is normally in dispute."[17] Moreover, command of the sea "can never in practice be absolute."[18] Command of the sea is not identical with conquest of territory on land. The sea is too vast, and humans cannot live on the water: "The only right we or our enemy can have on the sea is the right of passage; . . . Command of the sea, therefore, means nothing but the control of maritime communications, whether for commercial or military purposes. The object of naval warfare is the control of communications, and not in land warfare, the conquest of territory. The difference is fundamental."[19]

With his emphasis on lines of communication, Corbett challenged Mahan's emphasis on decisive battles by fleets of capital ships. Defeating an enemy's battle fleet is important, but only as a means to an end. The end, or object, of naval strategy must be maritime communications: "By occupying maritime communications and closing points of distribution in which they terminate we destroy the national life afloat, and thereby check the vitality of that life ashore so far as one is dependent on the other."[20] In this reasoning, Corbett disputed Mahan's contention that commerce destruction, or *guerre de course,* is a weaker form of war. Corbett considered the idea that war consists entirely of battles or fleets an error: "It ignores the fundamental fact that battles are only the means of enabling you to do that which really brings war to an end—that is to exert pressure on the citizens and their collective life."[21] Thus, Corbett viewed commerce raiding and blockade valuable instruments of economic war.

Like Mahan, Corbett comprehended the importance of production, shipping, and commerce. He stressed the importance of commercial and financial aspects of national and foreign policy and discussed an organized system of operations "to secure a real strategic control of the enemy's maritime communications."[22] Specifically, Corbett called for tactical commercial blockade (blockade of ports) supplemented by strategic blockade (blockade of great trade routes).

In sum, Corbett argued, "The current term 'Commerce destruction' is not in fact the logical expression of the strategic idea. To make the position clear we should say, 'Commerce prevention.' "[23]

Ironically, although Alfred Thayer Mahan participated in both blockade and amphibious operations during the American Civil War, Julian Corbett highlighted the importance of joint operations in his naval theory. Corbett explored the attack, defense, and support of military operations.[24] He recognized the importance of safeguarding army forces transported across the sea, the safe and effective debarkation of those troops either in protected friendly ports or on hostile shores, and the imperative of providing support for land forces in amphibious operations. Ahead of his time, Corbett called for responsible joint army and navy planning staffs. He recognized the navy's hesitation to divert a battle fleet intended "to deal with the enemy's battle squadron and its men to fight ships."[25] Yet, he stated, "alone and unaided the army cannot depend on getting itself ashore, it cannot supply itself, it cannot secure its retreat, nor can it avail itself of the highest advantages of an amphibious force, the sudden shift of base or line of operation. These things the fleet must do for it, and it must do them with its men."[26]

He noted that the army will always seek to land as near the objective as possible, while the navy will tend to think in the opposite direction, to land away from the enemy's strength to protect forces from land or naval interference. To bridge gaps in perspective, experience, and expertise, Corbett called for a "joint superior staff," composed of both naval and army officers.[27]

Most Air Force personnel find theories of sea power a bit uncomfortable since most Air Force professional military education and civilian strategic studies graduate programs spend little time on the subject. With this in mind, renowned strategic theorist Colin S. Gray presented a useful overview in his book *Modern Strategy* entitled "Mahan Was (Mainly) Right." Gray argued that Mahan was right in emphasizing the influence of sea power in history. Although sea power no longer enjoys the prominence it once had, it remains a great enabling instrument of strategy. Sea power becomes a prerequisite for global reach and the economic instrument of national power. Modern navies have proven remarkably adaptable and flexible in their use of evolving technologies, to include air, space, and cyberspace. In fact, emerging technologies have made modern navies even more powerful and effective in exploiting the strategic attributes described

initially by Mahan. Both Gray and Mahan pointed out that 71 percent of the world's surface area is water and that the vast majority of the world's population lives within 200 kilometers of the sea. Additionally, Gray agreed with Mahan in observing that a second-class navy will struggle to survive because there is no advantage of terrain (i.e., no mountains or jungles to hide in). Underwater operations made possible by submarines are a partial exception to this. Gray correctly observed that a chief limitation of sea power is the time required to achieve a strategic effect. Because it is inherently economic warfare, sea power's blockades, commerce raiding, and economic destruction may take years to yield results (although the results may be decisive). Gray also agreed with Mahan in that "sea power has to earn the right through combat at sea before it can work as a strategic instrument to help decide whether a war can be won."[28] Hence, Gray accepted Mahan's emphasis on sea power as critical to world power, that the core of sea power is the battle fleet, and that the offense is the best defense at sea. Gray rejected contemporary critics over this point by arguing that a belligerent must control the sea in order to use it, in contrast to the weaker foe who can at best hope to deny such control. To command the sea, one must be willing and able to give battle on demand. Commerce raiding, or *guerre de course*, strategies do not replace sea control through decisive battle. Gray acknowledged Julian Corbett's significant contributions and the logic of his ideas, but in the end, as his chapter title said, "Mahan was (mainly) right."[29]

Summary

"The Father of Sea Power," Alfred Thayer Mahan established the precepts of naval strategy and the core concepts that will define naval warfare and profoundly influence later air and space power theories. In sum, Mahan argued that sea power is the key to world power as shown by history. He believed command of the sea can be attained through decisive battles won by the main battle fleet and that commerce raiding (*guerre de course*) is the weaker form of naval war. In his "Elements of Sea Power," Mahan described command of the sea as production, shipping, and colonies and markets. In addition, he listed the elements of sea power as (1) geographical position, (2) physical conformation, (3) extent of territory, (4) number of population, (5) character of the people, and (6) character of the government. In many

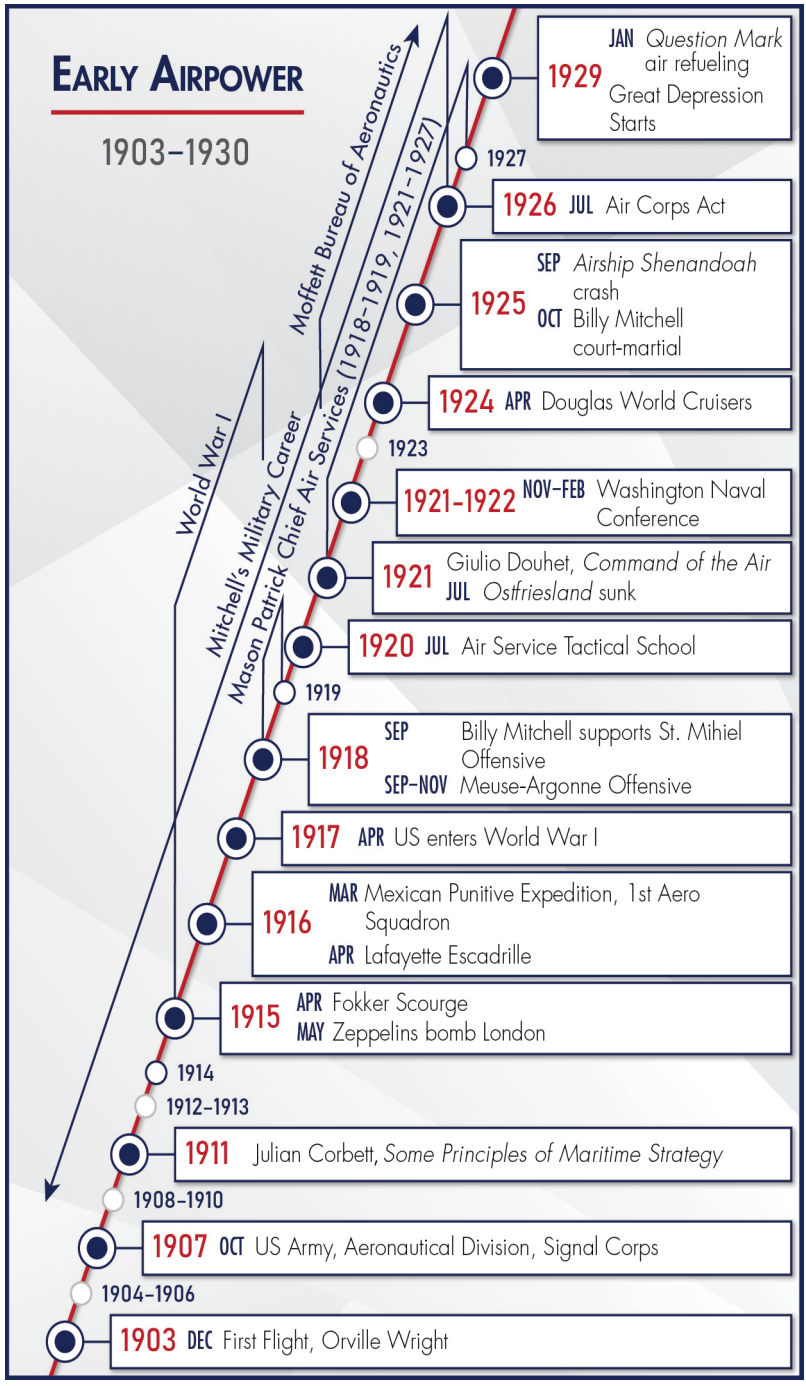
ways, Mahan's ideas form a baseline for air and space theory. Air and space domains share some common elements with the sea yet retain unique characteristics. Certainly Mahan proves of value to contemporary thinkers—that is, what do you do when tasked to form a theory of space or cyber warfare? Start with Mahan, of course!

Like Alfred Thayer Mahan, Julian Corbett provided a valuable conceptual foundation for air and space theorists, observing that most naval theorists make a common error with the term "command of the sea"—you cannot "conquer the sea." Most often neither side has command; most often, the sea is "uncommanded." He believed the object of naval warfare is control of communications, not conquest of territory. Command of the sea means control of maritime communications. Corbett further explained that command of the sea means the enemy can no longer attack our lines of passage and communication effectively and that he cannot use or defend his own. Whereas Mahan stands as the most influential and important American strategic thinker, Julian Corbett appears more appropriate for contemporary strategists. Both serve as models for contemporary air and space theorists.

Notes

1. Mahan, *The Influence of Sea Power Upon History*, 1.
2. Crowl, "Alfred Thayer Mahan: The Naval Historian," 451.
3. Mahan, *Influence of Sea Power*, 71; and Crowl, "Alfred Thayer Mahan," 451.
4. Mahan, *Influence of Sea Power*, 25–29.
5. Mahan, 35.
6. Mahan, 43.
7. Mahan, 45.
8. Mahan, 49.
9. Social Darwinism argues that nations compete for strength and power according to biological principles of natural selection and survival of the fittest made popular in the 1870s, and mercantile capitalism (or mercantilism) refers to an economic theory designed to maximize exports and minimize imports, often associated with maintaining colonies and captive markets favoring a colonial power.
10. Mahan, *Influence of Sea Power*, 50–53.
11. Mahan, 57–58.
12. Mahan, 58.
13. Mahan, 67.
14. Mahan, 71.
15. Corbett, *Some Principles of Maritime Strategy*, 3.
16. Corbett, 77.
17. Corbett.
18. Corbett, 90.
19. Corbett, 79–80.
20. Corbett, 80.
21. Corbett, 83.

22. Corbett, 82. Corbett uses the word "strategical," but I substituted the word "strategic" to match contemporary usage.
23. Corbett, *Some Principles of Maritime Strategy*, 81.
24. Corbett, 255.
25. Corbett, 269.
26. Corbett, 270.
27. Corbett, 275.
28. Gray, *Modern Strategy*, 217–27.
29. Colin Gray does not fully address Corbett's arguments that "command of the sea" and "control of the sea" may not be possible.


EARLY AIRPOWER
1903–1930
Moffett Bureau of Aeronautics
Mason Patrick Chief Air Services (1918-1919, 1921-1927)
Mitchell's Military Career
World War I
1929 JAN Question Mark air refueling
Great Depression Starts
1927
1926 JUL Air Corps Act
1925 SEP Airship Shenandoah crash
OCT Billy Mitchell court-martial
1924 APR Douglas World Cruisers
1923
1921–1922 NOV–FEB Washington Naval Conference
1921 Giulio Douhet, Command of the Air
JUL Ostfriesland sunk
1920 JUL Air Service Tactical School
1919
1918 SEP Billy Mitchell supports St. Mihiel Offensive
SEP–NOV Meuse-Argonne Offensive
1917 APR US enters World War I
1916 MAR Mexican Punitive Expedition, 1st Aero Squadron
APR Lafayette Escadrille
1915 APR Fokker Scourge
MAY Zeppelins bomb London
1914
1912–1913
1911 Julian Corbett, Some Principles of Maritime Strategy
1908–1910
1907 OCT US Army, Aeronautical Division, Signal Corps
1904–1906
1903 DEC First Flight, Orville Wright

Chapter 3

Airpower as a Revolutionary Domain

Although history records man's dream of flight in myth and legend from ancient times, two French brothers, Joseph Michael and Jacques Ètienne Montgolfier, launched the first modern hot-air balloon on 19 September 1783. A month later, on 15 October 1783, the Montgolfier brothers launched another balloon with Jean François Pilâtre de Rozier as the first man to "fly." Even with the first balloon ascents, observers noted the military potential of aviation. In 1794, the French organized an "Aerostatic Corps," and balloons accompanied armies of the French Revolution until an unimpressed Napoleon disbanded the unit in 1798. Regardless, balloons advanced in size and capacity so that by September 1861, a "Balloon Corps" provided aerial observation for the Union Army during the American Civil War. Headed by Thaddeus S. C. Lowe, the Union balloon corps reported Confederate movements and provided artillery spotting by telegraph during the Peninsula Campaign of 1862. Unfortunately, the early balloons proved fragile, vulnerable to weather, immobile, and of limited value. The following year, Union commanders abandoned the experimental craft.[1]

After a brief resurgence during the Spanish-American War where the US Army Signal Corps's sole balloon directed artillery fire at the Battle of San Juan Hill, aviation languished in the United States military before the First World War. In Europe, balloons, gliders, and aerodynamics advanced rapidly. By 1853, Britain's Sir George Cayley created a glider with fixed wings, cambered airfoil, horizontal and vertical stabilizers, and other elements of modern aircraft. Continuing Cayley's pioneering work, German engineer Otto Lilienthal systematically produced flying machines similar to today's hang gliders. From 1891 until his death in a crash five years later, Lilienthal developed 18 types of gliders and greatly advanced aerodynamic theory. The publicity generated by Lilienthal and others spurred imaginative people on both sides of the Atlantic, including Orville and Wilbur Wright, who traced their aviation interest to an 1894 article about Lilienthal.[2]

Drawing upon a systematic study of existing aeronautical literature, practical experience with tools and manufacturing from their bicycle shop, and a reservoir of confidence, the Wright brothers developed the first heavier-than-air, powered aircraft. With the assis-

tance of American Octave Chanute, whose book *Progress in Flying Machines* provided their foundation in aeronautics, the Wrights repeated and furthered Lilienthal's experiments. From 1900 to 1902, the Wrights conducted over a thousand glides from Kill Devil Hills, near Kitty Hawk, North Carolina. After perfecting wing warping, elevators, rudders for control, and a four-cylinder, twelve-horsepower, water-cooled engine developed by their mechanic Charles Taylor, the Wrights attempted the first powered flight on 14 December 1903. Despite stalling the aircraft upon takeoff and crashing three seconds later, Orville and Wilbur emerged unhurt and confident of success. At 10:35 am on 17 December 1903, Orville Wright successfully flew 120 feet in 12 seconds: the first recorded flight of an aircraft. Alternating pilot duties, the brothers flew three more flights with Wilbur flying 852 feet and staying aloft 59 seconds on their fourth attempt. By 1905, Wright Flyer No. 3 constituted the first practical airplane with one flight lasting 39 minutes and covering 24 miles.[3]

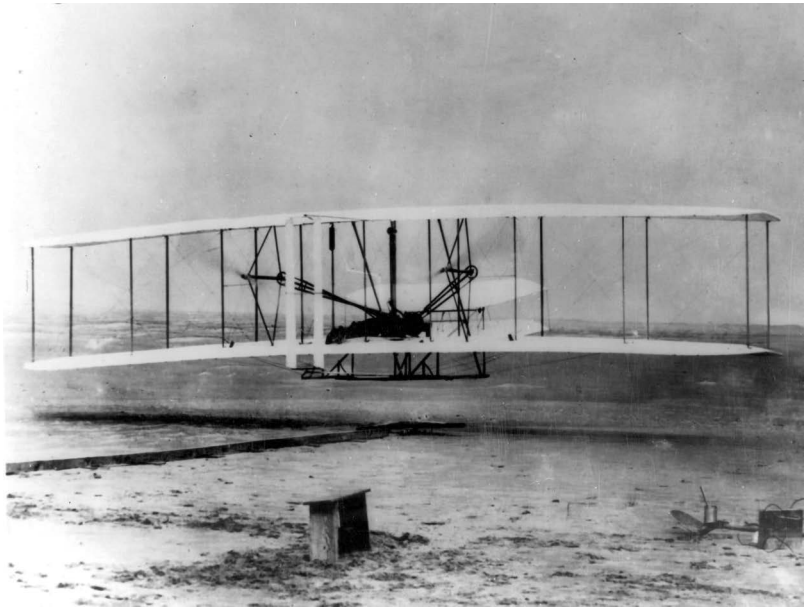


Fig. 1. This picture shows either Orville or Wilbur Wright taking off in a Wright Flyer on 17 December 1903 on Kill Devil Hills close to Kitty Hawk, North Carolina. Note the wooden track used to launch the biplane. Courtesy of Dr. Dik Daso, Air Force Historical Foundation (AFHF) archive.

Despite the Wrights' repeated attempts to interest the US Army in their invention, American military authorities rejected the Wright Flyer. United States Signal Corps leaders reacted in part to a highly publicized failure of Samuel P. Langley's steam-powered "Aerodrome" in October 1903. Although a highly respected scientist and Secretary of the Smithsonian Institution, Langley's failure subjected the inventor and the Army to public ridicule and Congressional criticism for the "waste" of a $50,000 government grant. Only President Theodore Roosevelt's intervention reversed the trend, and, as a result, on 1 August 1907, the US Army established an Aeronautical Division of the Signal Corps, considered the first step toward the United States Air Force.[4]

The Early Days of the US Air Service, 1907–1917

In its inaugural decade, US military aviation proved to be an interesting novelty and wonderful public entertainment, but little else. By December 1907, the new Army Air Service established specifications for bidding on an American military aircraft. To gain the contract, the flying machine had to be able to carry two persons of 350 pounds combined weight and fly for 125 miles at an average speed of 40 miles per hour. The Air Service received 41 bids, of which three were accepted; only one, submitted by the Wright brothers, produced a flyable aircraft. By September 1908, the Wright Type A Military Flyer set an altitude record of 310 feet and an endurance record of over an hour airborne and had successfully carried the first military observer, Lt Frank P. Lahm. Unfortunately, on 17 September 1908, the new aircraft suffered the first military aviation fatality. Lt Thomas E. Selfridge died and Orville Wright suffered a broken pelvis and crushed ribs among other injuries. Still, on 30 July 1909, pilot Orville Wright and Lt Benjamin D. Foulois, navigator-observer, flew a successful "cross-country" flight from Fort Myer to Alexandria, Virginia, at an average speed of 42.5 mph. By 2 August, the Army accepted the plane, designated "Signal Corps Aeroplane No. 1," and awarded the Wrights $25,000 plus a $5,000 performance bonus.[5]

Initially, United States Army Air Service operations were amateur and almost comical in their naiveté. In October 1909, Wilbur Wright trained Lieutenants Frank P. Lahm and Frederic E. Humphreys to fly and on 26 October, they became the first Army pilots to solo. By 5

November, they had crashed the Army's plane, and within weeks, they were transferred out of aviation. In March 1910, Lt Benjamin D. Foulois received orders to become the Signal Corps's pilot. He later recalled the words of Chief of the Signal Corps, Brig Gen James Allen: "Don't worry. You'll learn the techniques as you go along . . . just take plenty of spare parts and teach yourself to fly." After corresponding with the Wright brothers for tips to "avoid basic disasters," Foulois eventually flew 61 flights between March and September. To his chagrin, Foulois learned that the aviation service was allotted only $150 for operations; at times, he had to pay for fuel and repairs out of his own pocket. Fortunately, in early 1911 Congress authorized $125,000 for military aviation and three more pilots joined Foulois fresh from aviation pioneer Glenn Curtiss's flying school.[6]

Although not appreciated at the time, US military aviation was falling behind European powers. By the end of 1911, the French had produced 353 aviators versus 26 American pilots, of whom only eight were military. Additionally, by 1913 France and Germany had spent $22 million each on military aviation, Russia $12 million, and Belgium $2 million, compared to just $430,000 for the United States. The extreme danger associated with flying contributed to the meager funding. Of the first 48 American military pilots, 12 were killed in flying accidents. In 1911, a death occurred every 65 flight hours.[7]

America's first combat experience with military aviation demonstrated the nation's ill preparedness. When Francisco "Pancho" Villa's Mexican forces raided Columbus, New Mexico, in March 1916, the Army's 1st Aero Squadron accompanied Gen John J. Pershing's "punitive expedition." The squadron's eight aircraft, 10 pilots, and 84 enlisted men under the command of Capt Benjamin Foulois sought to provide aerial scouting for the ground forces. Unfortunately, mountain weather, dust, and extreme temperatures wreaked havoc with Foulois's underpowered Curtiss JN-3 Jennies. After a month of operations, only two of the original eight JN-3s were still flyable. Despite heroic efforts to keep at least some aircraft flying until the end of the operation in 1917, the Air Service accomplished little of value. Nevertheless, the 1st Aero Squadron gained valuable experience, and its lackluster performance highlighted the need for better equipment and bigger budgets.[8]

The First Air War, 1914–1918

During the First World War, aircraft evolved from an entertaining novelty to a deadly weapon of war. Along the Western Front, artillery proved to be the "queen of battle" and primary cause of death. As a result, observation, artillery spotting, and reconnaissance emerged as the airplane's most important contribution to the war effort. By 1915 pursuit aircraft (better known today as fighters) were developed to deny the enemy use of the air. After early attempts to down enemies with pistols, rifles, and bombs, French pilot Roland Garros attached steel plates to the propeller of his Moraine-Saulnier Type L monoplane that enabled him to fire a machine gun through the propeller arc. He earned wide acclaim as the war's first "ace," the name newspapermen coined when he had shot down five German aircraft. When engine trouble forced Garros to land behind enemy lines on 19 April 1915, the Germans studied his innovation. Dutch-born Anthony Fokker then created the first true fighter plane, the Fokker *Eindecker,* by using an interrupter gear to enable a machine gun to fire through the propeller unimpeded. (Although placing machine guns on the wings might seem more logical, frequent jamming required the pilot to be able to reach machine guns while in flight.) By 1915, the "Fokker scourge" threatened Allied reconnaissance balloons and aircraft. Eventually, the Allies developed their own interrupter gear that began a seesaw pattern of rapid technological advancement of aircraft and aerial weaponry.[9]

By the end of World War I, airmen had pioneered most of today's aerial missions, including photographic reconnaissance, close air support for ground troops, battlefield interdiction, and strategic attack in both day and night operations. Especially noteworthy, the German air service inaugurated long-range strategic bombardment of London as early as 1915 with its massive Zeppelin dirigibles. By 1917, the Germans flew multi-engined Gotha bombers. Although the raids inflicted little significant damage, they seized British public opinion and alerted many to the terrible potential of long-range aerial attack.[10]

Despite the vital military importance of reconnaissance and artillery spotting, fighter pilots captured the public's imagination. In a war dominated by the horrors of trench warfare where men lived like rats and were slaughtered by the hundreds of thousands in futile stalemate, the fighter pilot returned war to an earlier era where the

individual still mattered. Newspapers portrayed the daring, skill, and chivalry of the "knights of the air" to an adoring public. Following Roland Garros, the French produced such renowned aces as René Fonck with 75 kills, Charles Nungesser with 45, and the beloved Georges Guynemer, who totaled 54 aerial victories. An unlikely hero, Guynemer had been twice rejected for service for ill health, but his dash and courage became legendary. When Guynemer disappeared on 11 September 1917, the entire French nation mourned for their hero—in stark contrast to the thousands of faceless soldiers killed in the mud of the trenches.[11]

Like the Allies, Germany publicized "aces" as a means of fostering public support for the war effort. Germany's first ace, Max Immelmann, developed a revolutionary technique to reverse direction of an aircraft that still bears his name (the Immelmann turn). Considered by many to be the "father of fighter aviation," Germany's Oswald Boelcke scored 40 kills and pioneered squadron tactics. Still perhaps the most famous ace of all, Manfred von Richthofen, flew a trademark scarlet Fokker triplane that earned him the name "the Red Baron." Shortly after his 80th victory, Richthofen suffered the fate of many aerial heroes when Canadian Roy Brown downed him on 21 April 1918 (although a British antiaircraft battery and an Australian machine gun team also claimed the shoot down).[12]

Not to be outdone by the French and Germans, the British exulted in the aerial achievements of fighter pilots as diverse and colorful as the empire itself. Britain's leading ace with 73 kills was Edward "Mick" Mannock, of English and Scottish descent, who was killed by ground fire while aiding a novice wingman. Canadian Billy Bishop scored 72 aerial victories, including one engagement where he destroyed three Fokker D-IIIs singlehandedly. Another Canadian, Maj Raymond Collishaw, joined the list of aces with 60 kills, South African Capt A. W. Beauchamp-Proctor added 54, Irishman Capt G. E. H. McElroy tallied 46, and Welsh pilot Capt J. I. T. Jones downed 40 enemy aircraft.[13]

Americans entered the ranks of aerial heroes even before the United States entered the war. Inspired by Harvard graduate Norman Prince, the French air service established the *Escadrille Americaine* for American volunteers on 21 March 1916. Later renamed the Lafayette Escadrille, this famous squadron flew French Nieuport 17 fighters and provided valuable experience when the United States entered the war. Perhaps the most famous product of the squadron, French-born American Raoul Lufbery, shot down 17 German planes before trans-

ferring to the American air service. He later commanded the famous "Hat in the Ring" 94th Aero Squadron before his death on 19 May 1918.[14]

Fig. 2. During World War I, Americans flew primarily French aircraft, as seen in this view of a Nieuport N17 of the Lafayette Escadrille. Courtesy of National Air and Space Museum (NASM).

Of the 767 United States pilots and 481 observers in action during 1918, Capt Edward V. "Eddie" Rickenbacker and Lt Frank Luke Jr. achieved the most fame. Rickenbacker was already a renowned race car driver before the war, having set a world speed record in 1914. Older than most pilots, the 28-year-old became America's "Ace of Aces" with 26 confirmed kills (22 aircraft and 4 balloons). Opposite in temperament, the brash, ill-disciplined Frank Luke emerged as the only ace awarded the Congressional Medal of Honor during the war (Rickenbacker would be awarded one in 1931). Known as the "Arizona Balloon Buster," Luke downed 14 German balloons and four aircraft in 17 days. His spectacular career ended on 29 September 1918 when he dropped a note to a nearby American balloon company: "Watch out for burning balloons." In a solo attack witnessed by the soldiers, he shot down three enemy balloons and two aircraft before enemy ground fire forced him down. Seriously wounded, he died with pistol in hand.[15]

Although not an ace, William "Billy" Mitchell emerged as the outstanding American air combat commander of the war. Supremely

confident and abrasive, Mitchell clashed with his superiors, including aviation pioneer Brig Gen Benjamin Foulois. Nevertheless, Foulois recognized Mitchell's leadership and recommended him for the top combat position, Chief of Air Service, First Army. In September 1918, Mitchell massed 1,481 aircraft of American, French, British, and Italian units to support General Pershing's St. Mihiel offensive. Mitchell emphasized concentrated, mass attacks to overwhelm enemy airpower and punish German ground forces. In four days, Allied Airmen flew 3,300 combat sorties and dropped 75 tons of explosives. Lauded as a success by General Pershing, Mitchell refined his tactics during the Meuse-Argonne offensive beginning 26 September 1918 where 700 American aircraft faced 500 German planes in a rugged air-to-air struggle.[16]

By the Armistice of 11 November 1918, airpower had contributed an important, but not decisive, role in the Allied victory. Although observation, reconnaissance, and artillery spotting emerged as the most significant missions, close air support, interdiction, and strategic bombardment showed promise. Eclipsing all other roles, the image of the glamorous fighter ace captured public attention with his brightly painted aircraft, leather jacket, and flying scarf. By the end of the war, the French SPAD XIII, flown by many American aces, also represented the deadly future with a ceiling of over 20,000 feet, top speed of over 130 mph, and superb maneuverability. With the Lafayette Escadrille paving the way, the United States Air Service claimed 781 enemy aircraft and 73 balloons destroyed at a cost of 289 American aircraft, 48 balloons, and 569 battle casualties. With Rickenbacker, Luke, and Mitchell household names and aviation technology advancing rapidly, the air service looked to a bright future.[17]

Giulio Douhet's *Command of the Air* (1921)

According to early airpower theorists, airpower revolutionized war. The speed, range, altitude, and flexibility provided by aircraft transformed both war's character and its nature. Airpower enabled the third dimension to be exploited for military purposes.[18] Early airpower thinkers witnessed the dawn of flight and its rapid evolution as an instrument of war during the First World War. Equally important, influential policy makers, thinkers, and writers experienced the carnage and despair of World War I trench warfare that dominated the

Western world. Contemporary readers cannot grasp the physical, emotional, and psychological toll inflicted by the Great War, but consider that on 1 July 1916, the British lost 57,470 casualties on the first day of the Battle of the Somme and then averaged World Trade Center–level losses (roughly 3,000) each day for the next four and a half months while the Germans lost comparable numbers, and this was only one battle. With airpower's early context already outlined, Italian Air Marshal Giulio Douhet and William "Billy" Mitchell introduced the concept of strategic air war as the foundation for an independent air force.

Giulio Douhet (1869–1930) gained recognition as the first theorist to write seriously about the use of the airplane in war. He noted the potential of military aviation as early as 1909 and thereafter urged his Italian countrymen to support its rapid development. His most famous work, *The Command of the Air*, was the first major effort to expound a comprehensive theory of airpower.[19] Essentially, Douhet proposed two essential uses for an air force: to gain command of the air and to shatter the enemy's will to fight by attacking population centers.

In a chapter titled, "The Offensive Air Arm," Douhet advances essential tenets of airpower theory that remain relevant today:

> Because of its independence of surface limitations and its superior speed—superior to any other known means of transportation—the airplane is the offensive weapon par excellence.
>
> The greatest advantage of the offensive is having the initiative in planning operations—that is, being free to choose the point of attack and able to shift its maximum striking forces; whereas the enemy, on the defensive and not knowing the direction of the attack, is compelled to spread his forces thinly to cover all possible points of attack along his line of defense, relying upon being able to shift them in time to the sector actually attacked as soon as the intentions of the offensive are known.[20]

Writing at a time of rudimentary telephone and radio communications and before radar, Douhet believes aircraft are undetectable and invulnerable to ground defenses:

> [Antiaircraft guns] amounted to nothing but a useless dispersion of enormous quantities of our national resources, sometimes wasted on the notion of preventing, not an actual attack,

> but a possible one! . . . Similarly, there is no practical way to prevent the enemy from attacking us with his air force except to destroy his air power before he has a chance to strike at us. . . . [T]he surface of the earth, both solid and liquid, should be defended from aerial attack, not by scattering guns and planes over its whole extent, but by preventing the enemy from flying. In other words, by "conquering the command of the air."[21] . . .
>
> The very magnitude of possible aerial offenses cries for an answer to the question, "How can we defend ourselves against them?" To this I have always answered, "By attacking." . . . For a nation to be equipped with an air force intended for aerial combat alone is not only to jeopardize the home front, but also to preclude any possibility of offensive action against enemy objectives—a condition of profound aerial inferiority.[22]

Thus, Douhet's concept of "command of the air" emerges as a primary theme of early airpower theory. He captures the concept in a single sentence: "Conquering the command of the air implies positive action—that is, offensive and not defensive action, the very action best suited to air power."[23]

Reflecting the experiences and mindset of World War I, Douhet's chapter "The Magnitude of Aerial Offensives" presents ideas on employing airpower. He assumes the next war will be a total war with both the enemy's industrial base and civilian population as valid targets: "The guiding principle of bombing actions should be this: *the objective must be destroyed completely in one attack, making further attack on the same target unnecessary*. . . . The complete destruction of the objective has moral and material effects, the repercussions of which may be tremendous. To give us some idea of the extent of these repercussions, we need only envision what would go on among the civilian population of congested cities once the enemy announced that he would bomb such centers relentlessly, making no distinction between military and nonmilitary objectives" (emphasis in original).[24]

In the chapter, Douhet fails to provide much detail regarding aerial targets but describes sobering weapons effects: "In general, aerial offensives will be directed against such targets as peacetime industrial and commercial establishments; important buildings, private and public; transportation arteries and centers; and certain designated areas of civilian population as well. To destroy these targets three kinds of bombs are needed—explosive, incendiary, and poison gas—appor-

tioned as the situation may require. The explosives will demolish the target, the incendiaries set fire to it, and the poison-gas bombs prevent fire fighters from extinguishing the fires."[25]

Continuing his ideas on employing offensive airpower, Douhet's chapter "Aerial Warfare: General Principles" foreshadows contemporary Air Force doctrine. "[The] first principle governing its operation: *An Independent Air Force should always operate in mass*." Although the ideas sound simple, Douhet recognizes the difficulty of targeting, sequencing operations, and tying targets to objectives. Consequently, he observes, "Objectives vary considerably in war, and the choice of them depends chiefly upon the aim sought, whether the command of the air, paralyzing the enemy's army and navy, or shattering the morale of civilians behind the lines. This choice may therefore be guided by a great many considerations—military, political, social, and psychological, depending upon the conditions of the moment. . . . It will be enough to keep in mind the following basic principle, which is the same one which governs warfare on land and sea: *Inflict the greatest damage in the shortest possible time*" (emphasis in original).[26]

In other words, striking an enemy's cities would produce both physical and psychological effects. Douhet envisions a short, terrible aerial onslaught on the enemy's capital and major cities made possible by aerial dominance:

> To have command of the air means to be in a position to wield offensive power so great it defies human imagination. It means to be able to cut an enemy's army and navy off from their bases of operation and nullify their chances of winning the war. It means complete protection of one's own country, the efficient operation of one's army and navy, and peace of mind to live and work in safety. In short, it means to be in a position *to win. To be defeated* in the air, on the other hand, is finally to be defeated and to be at the mercy of the enemy, with no chance at all of defending oneself, compelled to accept whatever terms he sees fit to dictate. This is the meaning of the "command of the air" (emphasis in original).[27]

To achieve command of the air, Douhet believes in organizing a nation's air forces into an independent air force and auxiliary aviation to support land and sea forces: "*An adequate national defense cannot be assured except by an aerial force capable in case of war of conquering the command of the air.*" He calls that force an independent air force

and further states, *"National defense can be assured only by an Independent Air Force of adequate power*. . . . An Independent Air Force functioning completely independent of the army and the navy is of paramount importance. . . . It is only when we arrive at the term 'Independent Air Force' that we perceive an entity capable of fighting on the new battlefield, where neither army nor navy can take any part" (emphasis in original).[28] Thus, Douhet emphasizes that aircraft operated or controlled by the army or navy were mere auxiliaries and detracted the primary effort.

Although scholars dispute the impact of Douhet's writings upon the foundation of the United States Air Force, one significant passage appears to capture contemporary attitudes toward airpower as an innovative, revolutionary force:

> Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur. In this period of rapid transition from one form to another, those who daringly take to the new road first will enjoy the incalculable advantages of the new means of war over the old. This new character of war, emphasizing the advantages of the offensive, will surely make for swift, crushing decisions on the battlefield. Those nations who are caught unprepared for the coming war will find, when war breaks out, not only that it is too late for them to get ready for it, but that they cannot even get the drift of it. Those who are ready first not only will win quickly but will win with the fewest sacrifices and the minimum expenditure of means.[29]

Summary

From today's perspective, many of Douhet's claims exaggerate and others are simply wrong. For example, Douhet wholly ignored the potential of tactical aviation, dismissed significant challenges inherent in target selection, assumed aircraft could actually hit their targets, vastly overestimated the physical destructiveness of aerial bombardment, and vastly underestimated both the resilience of civilian will and defensive capability to defeat attacking air forces. Concerning the latter point, Douhet never considered that the same impressive aeronautical science and engineering that could produce

"battleplanes" might also produce equally impressive defensive systems—interceptors, effective antiaircraft guns, proximity fuses, radar, and others. Further, Douhet assumed that all future wars would be total wars fought between modern industrial nations with large cities and fixed targets vulnerable to aerial bombardment. Accordingly, Douhet's theory has little or no use in guerrilla wars or for conflicts involving agrarian societies that lack easily identifiable vital centers.

Giulio Douhet deserves recognition as the first major airpower theorist whose ideas still generate debate. His major points may be summarized as follows:

1. Airpower is inherently offensive and command of the air is essential for success.
2. There is no adequate defense against air attack; enemy air forces must be destroyed on the ground, preferably in a surprise attack.
3. Future wars will be total wars between entire peoples demanding destruction of vital centers essential to a state's function; in turn, air attacks should focus on destroying the enemy population's will to fight.
4. The psychological effects of aerial bombardment are greater than physical destruction; by using a combination of high-explosive, incendiary, and poison gas bombs, a panicked population would demand an end to the war.
5. Airpower constitutes a revolutionary weapon and requires air leaders commanding an independent air force to exploit its capabilities.[30]

Despite his errors, Douhet did get some key things right. Certainly, few today would deny the validity of his central premise: command of the air is crucial to success in war.[31] In the words of renowned strategic thinker Bernard Brodie, "[Douhet's] essential, correct, and enduring contribution" was to recognize that the existence of the airplane "must revolutionize the whole strategy of war."[32]

Notes

1. Hurley and Heimdahl, "The Roots of U.S. Military Aviation," 4–5; McFarland, *A Concise History of the U.S. Air Force*, 1–2; and Goldberg, *A History of the United States Air Force*, 1.

2. Dick, *Reach and Power*, 5; McFarland, *Concise History of U.S. Air Force*, 2; and Hurley and Heimdahl, "Roots of U.S. Military Aviation," 6–7.

3. Futrell, *Ideas, Concepts, Doctrine,* vol. 1: *1907–1960*, 15–16; Dick, *Reach and Power*, 7–13; Hurley and Heimdahl, "Roots of U.S. Military Aviation," 6–7; Wohl, *A Passion for Wings*, 5–30; and Goldberg, *History of the United States Air Force*, 2.

4. Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 15–16; McFarland, *Concise History of U.S. Air Force*, 2; Dick, *Reach and Power*, 7–13; and Hurley and Heimdahl, "Roots of U.S. Military Aviation," 6–7.

5. Dick, *Reach and Power,* 16–17; Hurley and Heimdahl, "Roots of U.S. Military Aviation," 12–14; History Office, *Splendid Vision, Unswerving Purpose*, 7–8; Goldberg, *A History of the United States Air Force*, 4; and Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 16–17.

6. Dick, *Reach and Power*, 19; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 16; Hurley and Heimdahl, "Roots of U.S. Military Aviation," 12–14; Cunningham, *The Logbook of Signal Corps* No. 1, 3; Shiner: "Benjamin F. Foulois: In the Beginning," 13; and Goldberg, *A History of the United States Air Force*, 4–5.

7. Dick, *Reach and Power*, 23–24; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 17–18; Hurley and Heimdahl, "Roots of U.S. Military Aviation," 13; and Goldberg, *A History of the United States Air Force*, 8.

8. See Miller, *A Preliminary to War: The 1st Aero Squadron and the Mexican Punitive Expedition of 1916*, for the most thorough account. Dick, *Reach and Power*, 28–29; Hurley and Heimdahl, "Roots of U.S. Military Aviation," 28–30; and Shiner, "Benjamin F. Foulois: In the Beginning," 13–14.

9. Kennett, *The First Air War, 1914–1918*, 23–40, 69; Wohl, *A Passion for Wings*, 203–10; and Cunningham, *Aces High*, 3–4.

10. Kennett, *First Air* War, 57–58, 60; Morrow, *The Great War in the Air: Military Aviation from 1909 to 1921*, 107–10, 220–21.

11. For an explanation of the fighter ace as "new breed of hero," see Kennett, *First Air* War, 151–74; Wohl, *Passion for Wings*, 203–50; and Cunningham, *Aces High*, 9–10.

12. Cunningham, *Aces High*, 4, 7; and Wohl, *A Passion for Wings*, 211–28.

13. Cunningham, *Aces High*, 9, 15.

14. Dick, *Reach and Power*, 41–49; Mortensen, "The Air Service in the Great War," 57–58; and Cunningham, *Aces High*, 11.

15. Dick, *Reach and Power*, 68–74; Mortensen, "The Air Service in the Great War," 64; Cunningham, *Aces High*, 11–12; and McFarland, *Concise History of U.S. Air Force*, 11.

16. Dick, *Reach and Power*, 65–68; Mortensen, "The Air Service in the Great War," 65–68; Morrow, *Great War in the Air*, 337; Hudson, *Hostile Skies: A Combat History of the American Air Service in World War I*, 52, 54–58; and Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 21–24.

17. Dick, *Reach and Power*, 74; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 27; Hudson, *Hostile Skies*, 299; and Mortensen, "The Air Service in the Great War," 69. In citing World War I figures, many of the sources differ to some extent; for consistency, I used Air Vice Marshal Ron Dick's numbers.

18. This introduction of Giulio Douhet is based upon lesson notes created by Dr. Jim Titus, whose distinguished career at the Air Force Academy and Air University

spanned nearly four decades. He based his writing upon (and included a copy of) "Air Warfare by General Gulio (*sic*) Douhet," an Air Corps Tactical School publication signed by Brig Gen Oscar Westover, 12 Dec 1933, file number U-1078, call number UG 630.D733 E5, Maxwell Air Force Base, AL: Air University Library.

19. *The Command of the Air* was first published in 1921; a revised version appeared in 1927. Douhet wrote numerous other works on airpower before his death in 1930, but few have been translated into English. See Meilinger, *Airmen and Air Theory*, 103–6, for an excellent, succinct introduction to Douhet and his significance.

20. Douhet, *Command of the Air*, 15–16.

21. Douhet, 18–19.

22. Douhet, 52–53.

23. Douhet, 19.

24. Douhet, 20.

25. Douhet, 20.

26. Douhet, 49–51.

27. Douhet, 23.

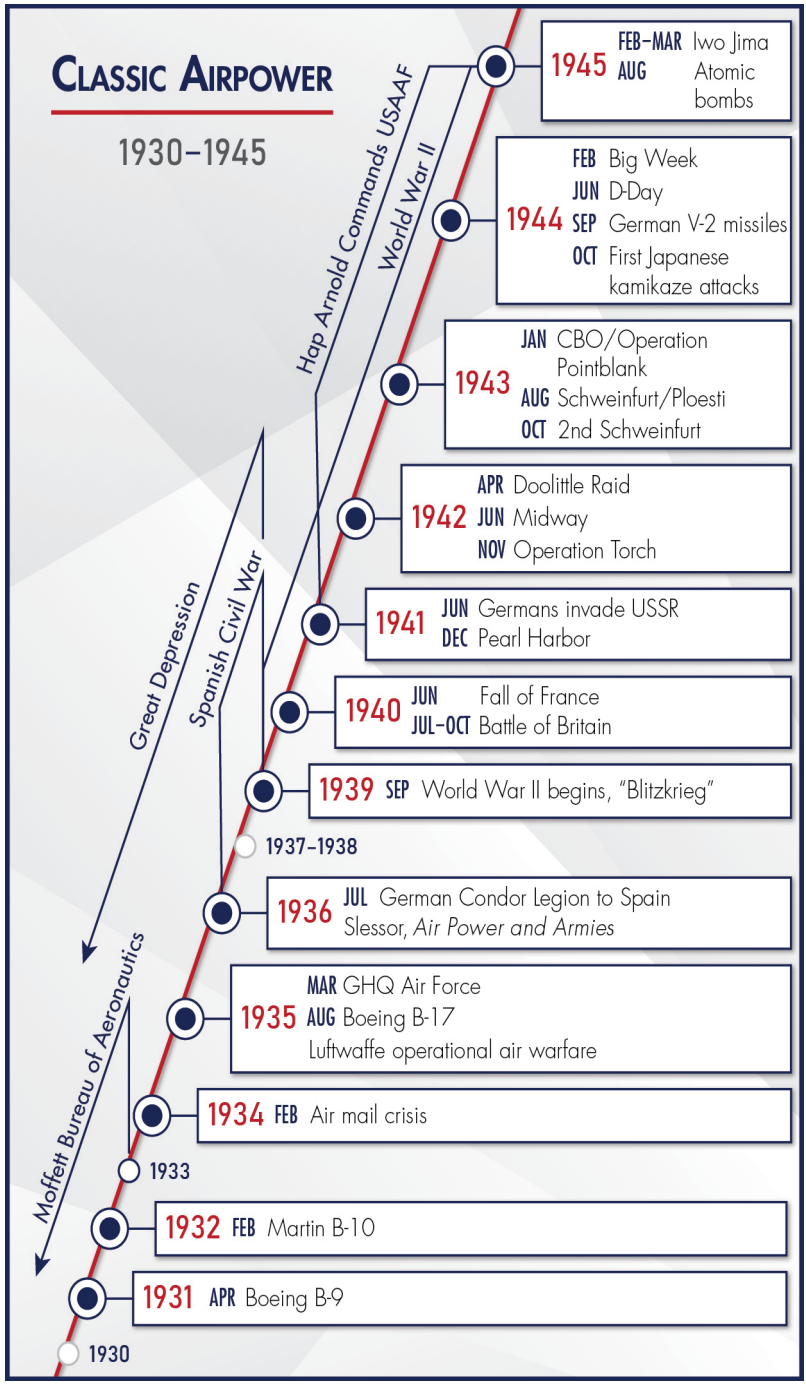
28. Douhet, 31–33.

29. Douhet, 30.

30. The best work on Giulio Douhet as airpower theorist is Meilinger, "Giulio Douhet and the Origins of Airpower Theory," 1–40; he also produced a short, useful bibliographical essay on Douhet in *Airmen and Air Theory: A Review of the Sources*, 103–6. Two additional essays on early air theory provide valuable insights: Warner, "Douhet, Mitchell, Seversky: Theories of Air Warfare," 484–503; and MacIsaac, "Voices from the Central Blue: The Air Power Theorists," 624–47. Finally, Phil Haun succinctly captures Douhet's thoughts in the introduction to *Lectures of the Air Corps Tactical School and American Strategic Bombing in World War II*, 9–11.

31. This paragraph sums up Meilinger's work mentioned in previous notes.

32. Brodie, *Strategy in the Missile Age*, 22.


CLASSIC AIRPOWER
1930–1945
Hap Arnold Commands USAAF
World War II
Great Depression
Spanish Civil War
Moffett Bureau of Aeronautics
1945 FEB–MAR Iwo Jima
AUG Atomic bombs
1944 FEB Big Week
JUN D-Day
SEP German V-2 missiles
OCT First Japanese kamikaze attacks
1943 JAN CBO/Operation Pointblank
AUG Schweinfurt/Ploesti
OCT 2nd Schweinfurt
1942 APR Doolittle Raid
JUN Midway
NOV Operation Torch
1941 JUN Germans invade USSR
DEC Pearl Harbor
1940 JUN Fall of France
JUL–OCT Battle of Britain
1939 SEP World War II begins, "Blitzkrieg"
1937–1938
1936 JUL German Condor Legion to Spain
Slessor, Air Power and Armies
1935 MAR GHQ Air Force
AUG Boeing B-17
Luftwaffe operational air warfare
1934 FEB Air mail crisis
1933
1932 FEB Martin B-10
1931 APR Boeing B-9
1930

Chapter 4

Billy Mitchell's Quest for Air Force Independence

William "Billy" Mitchell's drive for air force independence dominated airpower doctrine and public policy during the 1920s, a foundational decade for American airpower. Although Mitchell's media stunts and Congressional testimony seized headlines, Maj Gen Mason M. Patrick's quiet, behind-the-scenes political and administrative actions established a firm organizational base for later air autonomy. Bolstering both lines of effort, a series of technological advances and aerial record attempts kept military aviation in the public eye. Despite military airpower's promise, desire for normalcy, pacifism, and reduced budgets after World War I limited American airpower's growth.

Convinced of airpower's potential as the primary component of national defense and a revolutionary war-winning weapon, William "Billy" Mitchell aggressively promoted his cause. Hoping to make air forces the nation's "first line of defense," Mitchell challenged the US Navy by arguing that bombers rendered battleships obsolete. Public pressure forced a reluctant Navy to test the effect of aerial bombs upon battleship armor, featuring former German battleships surrendered after the war. Mitchell then "mobilized" Martin MB-2 bombers and formed the 1st Provisional Air Brigade at Langley Field, Virginia, to refute Navy claims that capital ships were unsinkable. On 21 July 1921 Mitchell's airmen sank the 27,000-ton battleship *Ostfriesland*. Despite a four-layer armored hull and watertight compartments, the battleship sank in just 21 minutes when struck by two 2,000-pound bombs. Ironically, although Mitchell failed to convince the War or Navy Departments of his claims, the bombing tests spurred the development of carrier-based aviation.[1]

Frustrated by what he perceived as a lack of progress, Mitchell turned up the heat in his public statements. When the Navy airship *Shenandoah* crashed on 5 September 1925, Mitchell issued a press release that charged "the incompetency, criminal negligence, and almost treasonable administration of our national defense by the Navy and War Departments." During the ensuing court-martial, Mitchell attempted to transform the trial into a public hearing on airpower. Finding him guilty of "conduct of a nature to bring discredit upon the military service," the court sentenced Mitchell to a five-year suspen-

sion from the service without pay. On 1 February 1926, he resigned from the Air Service to continue the fight for an independent Air Force as a civilian. Until his death in 1936, Billy Mitchell fought tenaciously for his vision.[2]

Stemming in part from Mitchell's court-martial and from Chief of the Air Service Maj Gen Mason M. Patrick's political acumen, the Air Corps Act of 1926 greatly improved aviation's status within the Army. The act transformed the Air Service into the Air Corps, provided for representation within the Army's General Staff, added an Assistant Secretary of War for Air, and promised expansion to a force of 1,650 officers, 15,000 enlisted men, and 1,800 serviceable aircraft within five years. Mitchell and his supporters viewed the Air Corps Act as a half-measure at best, but the act represented a realistic compromise that advanced Army aviation's organization, funding, and status. Unfortunately, fiscal worries interceded and funding never matched the goal established.[3]

Fig. 3. Maj Gen Mason Patrick (left) and Brig Gen William "Billy" Mitchell. Chief of the Air Service and later, the Army Air Corps, Mason Patrick proved an astute administrator and recognized Billy Mitchell's flair for public relations. They proved an unlikely, yet effective, team. Courtesy of Dr. Dik Daso, AFHF.

Contributing to Mitchell's frustration, congressional penny-pinching stymied technological progress. Budget cutbacks reduced the 1918 Air Service from 190,000 men to fewer than 20,000 two years later. Likewise, the $460 million allocated for military aviation in 1919 fell to $25 million in 1920. Even worse from a technology viewpoint, Congress demanded that new military aircraft use the surplus Liberty engines produced during the World War I buildup. Consequently, First World War–vintage Curtiss Jennies and Liberty DH-4 bombers remained in service until the 1930s despite technological advances in airframe and engine design.[4]

On the other hand, a concerted effort to achieve records in speed, altitude, endurance, and range spurred aviation advances in the 1920s. In September 1922, Lt James "Jimmy" Doolittle became the first man to fly across the United States in less than a day. Seven months later, Lieutenants Oakley Kelley and John Macready flew a coffin-shaped Fokker T-2 on the first nonstop transcontinental flight. Equally noteworthy, a team of Army pilots departed Seattle on 6 April 1924 in four Douglas World Cruisers, a variant of the Navy DT-2 floatplane, in an effort to fly around the world. Christened the *Chicago, Boston, Seattle,* and *New Orleans*, the open-cockpit biplanes braved weather, winds, and vast, uncharted distances. Although the *Seattle* and *Boston* were lost to a mountain crash and engine failure respectively, the remaining aircraft completed the circuit 175 days later. In 1925, Jimmy Doolittle achieved further fame by winning the Schneider Trophy, an over-water seaplane race, and established a world seaplane record at 245.71 miles per hour. Although less publicized, Doolittle would later earn respect for playing a major role in the design and testing of instruments for all-weather flying, including an accurate altimeter, directional gyro, artificial horizon, and radio aids to navigation. On 24 September 1929, Doolittle was the first pilot to take off, fly a set course, and land on instruments alone.[5]

On New Year's Day 1929, an extraordinary team of airmen destined for fame in World War II took off in an unusual Fokker C-2 featuring a large question mark on the fuselage. The question was simple: how long could they stay in the air? Using a crude air-refueling technique pioneered in 1923, Maj Carl "Tooey" Spaatz, Capt Ira Eaker, Lt Harry Halverson, Lt Elwood "Pete" Quesada, and SSgt Roy Hooe flew the *Question Mark* 150 hours and 40 minutes with 37 air-to-air refuelings. They noted that this unusual endurance test proved the unlimited range of long-distance bombers. In sum, the quest for

world records in the 1920s honed the competitive spirit of airmen, advanced aviation technology, and kept military aviation in the public limelight.[6]

Billy Mitchell and Air Force Independence

Like Giulio Douhet, William A. "Billy" Mitchell (1879–1936) began his military career before the invention of the airplane. A member of a wealthy Milwaukee family and the son of a former US senator from Wisconsin, Mitchell enlisted in the Wisconsin Volunteer Infantry at the outset of the Spanish-American War. Thanks no doubt to his father's influence, he quickly won an appointment as a second lieutenant in the Wisconsin militia. Mitchell received a regular commission in 1901 and subsequently made a name for himself as a signals officer in Alaska. He was promoted to captain at age 23—at the time, the youngest captain in the US Army. In 1912, a 32-year-old Mitchell became the youngest officer ever appointed to the Army's General Staff.[7]

As the sole Signal Corps representative on the Army's General Staff, Mitchell was drawn toward aviation. When the Army bought its first Wright flyer in 1909, it assigned the plane to the Signal Corps because airplanes were viewed primarily as a means of communication. In 1916, Mitchell learned to fly at his own expense since he was ineligible for Army flight training due to being too old (age 36) and being married. When the United States considered entry into World War I, the Army sent Mitchell to France because of his drive, language fluency, and unmatched social connections.[8]

Mitchell's early observations of French, British, and Italian aviation in World War I profoundly influenced his later views and fueled his airpower advocacy. In June 1917, Mitchell proposed organizing the air component of the American Expeditionary Force (AEF) into "tactical" and "strategical" aviation. Tactical aviation squadrons would support ground forces like the other army combat branches. In contrast, "strategical" aviation would combine bomber and pursuit (fighter) aircraft to pursue independent missions, much like the famed Confederate cavalry commander Jeb Stuart's raids in the American Civil War. Mitchell envisioned these independent missions carrying the war deep into enemy territory. In August 1917, Mitchell appointed then Capt Edgar S. Gorrell to head the Air Service's Tech-

nical Section and charged him with determining AEF aircraft requirements both in numbers and aircraft types. In this position, Gorrell produced the first American plan for what would become known as strategic bombing.[9]

Although Mitchell's recommendations planted the seed for later independent operations, his first major airpower work distilled the experiences of European air forces. In "General Principles Underlying the Use of the Air Service in the Zone of Advance, AEF," Mitchell outlined the principles of tactical aviation:

> The issue of war depends primarily on the destruction of an enemy's military forces in the field. To bring this about, all elements of a nation's military power must be employed to bring about a decision on the field of battle in the shortest time possible.
>
> An army is composed of various arms and services whose complete interdependence and working together is necessary for efficiency. No one arm alone can bring about victory.
>
> The efficiency of an army is measured by its ability to carry destruction to the enemy's forces.
>
> The efficiency of any arm is dependent on its military training, experience, and direction.[10]
>
> The Air Service of an army is one of its offensive arms. Alone it cannot bring about a decision. It therefore helps the other arms in their appointed mission. The measure of this help is its efficiency as a mission.[11]

Mitchell emerged from the war with a powerful reputation, both as America's most renowned air combat commander and as an individual difficult to work with. Mitchell's successful command of large air forces for the Battle of St. Mihiel (12–15 September 1918) and the Meuse-Argonne Offensive (26 September–11 November 1918), the largest battle in American military history, earned him the respect of AEF Commander Gen John J. Pershing and other senior American commanders. On the other hand, Mitchell also earned a reputation for being tempestuous, egotistical, and uncompromising. For example, after their first meeting in 1917, Britain's Hugh Trenchard said of

Mitchell, "If only he can break his habit of trying to convert opponents by killing them, he'll go far."[12] In fact, the petty distraction of the Billy Mitchell–Benny Foulois feud convinced Pershing to appoint his friend and West Point classmate Mason Patrick chief of the Air Service during the war, to inject professionalism, discipline, and administrative efficiency into the organization.

Although Mitchell's influence on air force independence should not be minimized, Mason Patrick injected a no-nonsense command presence that brought order to chaos and established a professional foundation for the future service. Sometimes, Patrick is portrayed as Mitchell's nemesis, but this misses a key point: by the early 1920s, Patrick agreed with Mitchell's quest but realized that the timing was premature. Like Mitchell, Patrick learned to fly at an advanced age, earning his wings at age 59. An engineer by training, Patrick proved an effective administrator, skilled organizer, and shrewd judge of character. While Mitchell gained public attention, Patrick worked within the system and gained the confidence of the Army's senior leadership and Congress. Patrick established training, logistical, maintenance, and operational infrastructure. He also expanded Air Service interaction with commercial aviation and the aviation manufacturing base. In particular, Patrick and his staff established schools for primary flight training, aircraft maintenance, aircraft development and engineering and an Air Service Tactical School that eventually became the famed Air Corps Tactical School to study airpower doctrine and employment.[13]

More a propagandist than a theorist, Mitchell in his postwar writings targeted the American public and sought to pressure Congress for an independent air force. In *Winged Defense* (1925), Mitchell opens with a declaration: "The world stands on the threshold of 'the Aeronautical Era.' During this epoch the destinies of all people will be controlled by the air."[14] In the book, Mitchell presented four major points that mirrored themes common with Douhet and Trenchard:

1. "Airpower may be defined as the ability to do something in the air" and includes civilian commercial and cultural dimensions as well as military function.
2. "Neither armies nor navies can exist unless the air is controlled over them. Air forces, on the other hand, are the only independent fighting units of the day, because neither armies nor navies

can ascend and fight twenty thousand feet above the earth's surface."

3. "No longer will the tedious and expensive processes of wearing down the enemy's land forces by continuous attacks be resorted to. The air forces will strike immediately at the enemy's manufacturing and food centers, railways, bridges, canals and harbors [vital centers]. The saving of lives, man power and expenditures will be tremendous to the winning side. The losing side will have to accept without question the dominating conditions of its adversary."
4. "Surface navies have entirely lost their mission of defending a coast because aircraft can destroy or sink any seacraft coming within their radius of operation. In fact, aircraft today are the only effective means of coast protection. . . the surface ship as an element of war is disappearing. Today the principal weapon in the sea is the submarine."[15] In other words, the independent Air Force will replace the Navy as the nation's first line of defense.

With these four points, Mitchell challenged Congress to adopt a three-part policy:

1. There should be a Department of Aeronautics charged with the complete aeronautical defense and the aeronautical development of the country.
2. There should be aeronautical personnel entirely apart from the Army and Navy.
3. There should be a Department of National Defense with subheads for the Air, Army, and Navy.[16]

Given the isolationist and antiwar atmosphere of the 1920s, Billy Mitchell couched his early airpower arguments largely in defensive terms, but frustration over his failure to secure a well-funded, independent air force prompted him to become more strident. In *Skyways: A Book on Modern Aeronautics* (1930), Mitchell both repeated his revolutionary airpower themes and upped his rhetoric with five points:

1. War is the attempt of one nation to impress its will on another nation by force after all other means of arriving at an adjustment of a dispute have failed. The attempt of one combatant,

therefore, is to so control the vital centers of the other that it will be powerless to defend itself. The vital centers consist of cities where the people live, areas where their food and supplies are produced and the transportation lines that carry these supplies from place to place. . . . The advent of air power, which can go straight to the vital centers and entirely neutralize or destroy them, has put a completely new complexion on the old system of making war. It is now realized that the hostile main army in the field is a false objective and the real objectives are the vital centers. The old theory, that victory meant the destruction of the hostile main army, is untenable. . . .

2. The result of warfare by air will be to bring about quick decisions. Superior airpower will cause such havoc, or the threat of such havoc, in the opposing country that a long, drawn-out campaign will be impossible.
3. The conceptions we have always had that wars must be waged by armies and navies must be revised, as these two branches of the military service will take a position second to that of airpower, and will act principally as aids to it. Armies will hold the land. Navies will no longer be able to remain on top of the water where they are a sure prey to aircraft, but will have to act in submarines beneath the surface.
4. What will future war hold for us? Undoubtedly an attack on the great centers of population. If a European country attacks the United States, New York, Chicago, Detroit, Pittsburgh and Washington will be the first targets. It is unnecessary that these cities be destroyed in the sense that every house be leveled with the ground. It will be sufficient to have the civilian population driven out of them so that they cannot carry on their usual vocations. A few [poison] gas bombs will do that. Picture what the dropping of a gas bomb will mean. Two thousand pounds of liquid gas smashes down in a street. None of the defending forces on the ground has even heard the airplane. It may be miles off, and may have released a gliding bomb when ten or fifteen miles away; or an air torpedo which may be fired at a range of 100 miles or more. . . . The accumulation of gas may be so great that no gas mask will protect against it. The news spreads everywhere of what has happened and just as this comes home to the people, a second bomb of the same size or

> larger hits in another place, then another and another. There is a wild and disorderly exodus from the city for the outlying fields and forests, where there are no tents or houses for the refugees. The hundreds of thousands from the great cities cannot be fed. . . . The people are helpless. There is only one alternative and that is surrender.[17]

Summary

Joining Giulio Douhet and Hugh Trenchard, William "Billy" Mitchell stands as one of the primary architects of "classic" airpower theory. More than Douhet, Mitchell's theories on airpower transform over time. During World War I, he concentrates on support for the army in the field. By 1921, Mitchell concentrates on coastal defense in an attempt to replace the Navy as America's first line of defense. As naval airpower develops, Mitchell considers aircraft carriers a poor alternative to land-based aviation, but he recognizes the value of submarines. By the end of his public career in the mid-1930s, he stridently warns of strategic air attack and sounds very much like Giulio Douhet. He joins Douhet in four important ideas:

1. Strategic bombardment will destroy the enemy's capability to fight; but like Douhet, Mitchell is vague about the concept of vital centers.
2. Air war will be short and decisive.
3. Civilian morale is weak, although he does not explicitly call for breaking enemy morale (it is more implied).
4. An independent air force is the best means to develop airpower's revolutionary potential.

Mitchell's greatest contribution was the idea (also found in Douhet and practiced by Trenchard) of an autonomous air force conducting independent operations. Like Trenchard, he claimed that bombers would win wars by destroying the enemy's ability to wage war and hence his will to fight. In contrast to the outright terror bombing advocated by Douhet, Mitchell at least tried to identify "vital centers," military and economic targets whose destruction would eliminate or greatly weaken the enemy's capacity to resist. So, while Douhet would employ "independent" airpower directly against the enemy's popula-

tion, Mitchell proposed to direct airpower against "the things" people and armies needed.

Other significant differences between Douhet and Mitchell included their views on "auxiliary" aviation (i.e., tactical airpower). Writing in an Italian context, Douhet branded tactical airpower as "worthless, superfluous and harmful."[18] In contrast, Mitchell believed that tactical airpower could play a valuable function in war. It might be noted that Mitchell's views about the need for a "balanced" air force changed over time. A comparison of Mitchell's earlier and later writings reveals a significantly increased emphasis on the primacy of strategic bombardment by 1930.

In terms of Mitchell's effectiveness as an airpower proponent, most historians have branded his incendiary methods as counterproductive and contend that other, more subdued airpower advocates (such as Mason Patrick in the 1920s and Frank Andrews in the 1930s) played a larger role in the fortunes of the fledgling air corps during the interwar period. Nevertheless, there can be no doubt that Mitchell's passionate arguments and personal flamboyance served to make him a rallying point and inspiration for many airpower proponents both in his own day and later. Arguably, Mitchell's drive, determination, combativeness, and persistence played a critical role in forming the United States Air Force. Whether today's Air Force matches his vision poses an interesting question.

Notes

1. The *Ostfriesland* bombing trial is well documented. Historian Mark Clodfelter best details the scene where five near misses intent upon damaging the *Ostfriesland's* unarmored hull allowed the two direct hits to finish the job. Clodfelter, *Beneficial Bombing: The Progressive Foundation of American Air Power, 1917–1945.* See also Dick, *Reach and Power,* 82–86; Goldberg, *History of the United States Air Force,* 29–31; Shiner, "From Air Service to Air Corps: The Era of Billy Mitchell," 93–95; Futrell, *Ideas, Concepts, Doctrine, v*ol. 1, 32–33, 37; and Hurley, *Billy Mitchell: Crusader for Air Power*, 64–68.

2. Hurley, *Billy Mitchell,* 90–109; Dick, *Reach and Power*, 89; Shiner, "From Air Service to Air Corps," 98–100; Goldberg, *History of the United States Air Force,* 31–32; and Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 46–47.

3. Goldberg, *History of the United States Air Force,* 36–37; Shiner, "The Coming of the GHQ Air Force, 1925–1935," 103–4; Futrell, *Ideas, Concepts, Doctrine,* vol. 1, 62; and Clodfelter, "Molding Airpower Convictions: Development and Legacy of William Mitchell's Strategic Thought," 105.

4. Dick, *Reach and Power,* 78; Goldberg, *History of the United States Air Force,* 29, 36; Shiner, "From Air Service to Air Corps," 78; and Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 32.

5. Shiner, "From Air Service to Air Corps," 90, 116; Dick, *Reach and Power,* 96–102; Goldberg, *History of the United States Air Force,* 34; and McFarland, *Concise History of the U.S. Air Force*, 13.

6. Dick, *Reach and Power,* 103–4; Goldberg, *History of the United States Air Force,* 37; McFarland, *Concise History of the U.S. Air Force*, 13; and Shiner, "The Coming of the GHQ Air Force," 115–16.

7. Like the introduction for Douhet, Dr. Jim Titus's biographical capsule provided the foundation for this segment. Dr. Jim Titus, "An Introduction to William 'Billy' Mitchell," MSS 200 Course Guide, 30 July 2003. Readers will benefit from Meilinger's biography of Mitchell in *Airmen and Air Theory*, 7–13, 107–8; Clodfelter, "Molding Airpower Convictions: Development and Legacy of William Mitchell's Thoughts," 79–114; and Hurley, *Billy Mitchell: Crusader for Air Power.*

8. Hurley, *Billy Mitchell*, 21–23; Clodfelter, "Molding Airpower Convictions," 83–84; and Meilinger, *Airmen and Air Theory*, 107–8.

9. Clodfelter, *Beneficial Bombing*, 16–17; Clodfelter, "Molding Airpower Convictions," 85; and Holley, *Ideas and Weapons*, 46–47. Gorrell's strategic bombing plan will be examined in greater depth in the next chapter, but see Maurer, *The U.S. Air Service in World War I*, vol. 2, 142–43.

10. In this context, "arm" refers to a "combat arm." During World War I, infantry, cavalry, and artillery were considered combat arms; the signal corps would be an example of a support arm. Mitchell is making a claim here for airpower to be considered an offensive, combat arm.

11. Mitchell, "General Principles Underlying the Use of the Air Service in the Zone of Advance, A. E. F.," in Maurer, ed., *U.S. Air Service in World War I*, 175. An esteemed early scholar of American air doctrine, Robert F. Futrell described this document as the Air Service's first formal statement of doctrine. Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 22.

12. Boyle, *Trenchard*, 299; and Baker and Cooling, "Developments and Lessons Before World War II," 12. Clodfelter cites the same idea with slightly different wording in "Molding Airpower Convictions," 80, and *Beneficial Bombing*, 39.

13. White, *Mason Patrick and the Fight for Air Service Independence*, 1–7, 133.

14. Mitchell, *Winged Defense*, 3.

15. Mitchell, xii, xv–xvi.

16. Mitchell, xix.

17. Mitchell, *Skyways: A Book on Modern Aeronautics*, 253–67.

18. Douhet, *Command of the Air*, 101.

Chapter 5

Ideas and Weapons: Technology, Theory, and Doctrine

The Air Corps Tactical School's Pursuit of Strategic Bombing

In studying the evolution of airpower thought, two terms require examination: theory and doctrine. Both terms are related, overlap, and have definitions that vary by author and time. Theory provides a broad conceptual framework that organizes our thinking. To some extent, theory simplifies the complexities of life and introduces principles and laws of behavior. Thus, good military theory makes sense out of what otherwise would be an incomprehensible mass of observations and anecdotes. Theory also challenges the status quo; it combines things we observe in new ways and, in turn, forces a fresh look at current wisdom.[1] Closely related to military theory, military doctrine seeks to capture how best to fight. Military doctrine often follows from military theory but is tempered by the fires of experience. Complementing these concepts, Maj Gen I. B. Holley Jr. wrote: "[Doctrine] reflects an official recognition of what has usually worked best from observation of numerous trials. These may be reports of actual combat operations, or they may be limited to tests, exercises, and maneuvers. Only when necessary, will doctrine consist of extrapolation beyond actual experience."[2] In sum, American airpower in the 1920s and 1930s illustrates both the importance of airpower theory (expressed by Giulio Douhet and Billy Mitchell) and the need for good airpower doctrine (sought by Mason Patrick). The rapid advance of aviation technology during the period further emphasizes the importance of theory, doctrine, and technology.

Holley, who went on to become a famed Duke University professor, examined the link between technology and doctrine in *Ideas and Weapons*.[3] He framed the problem of transforming a technological breakthrough into a useful military doctrine—in other words, how to take a technological idea and create a military capability. Holley further argued that, ideally, thinking (whether theory or doctrine) would drive technological development. Specifically, Holley raised two key points:

1. The pace of weapons development "is chiefly determined by the extent to which its mission or operational function is known or

defined." When there is vague or nonexistent doctrine, weapons development will be slow.[4]

2. "Superior arms favor victory." While essential, superior military technology will be insufficient, or squandered, unless accompanied by military doctrine capable of fully exploiting the weapon's potential.[5]

Viewing airpower through Holley's lens suggests an assertion: during the 1930s, detailed and intentional development of American strategic bombing theory at the Air Corps Tactical School (ACTS) drove the rapid technological advancement of long-range bombers (B-17 and B-29) and accurate means of delivery (the Norden bombsight). The ACTS experience links air theory, doctrine, and technology and illustrates Holley's warning about the perils of extrapolating doctrine beyond actual experience.

At a broader level, Holley's *Ideas and Weapons* analyzes America's failure in World War I to transform industrial potential into useful military power. More specifically, he examines why the US failed to employ significant numbers of American-built planes in combat. Holley argues that the root of the problem was conceptual. The US Army Signal Corps failed to think through how to employ aircraft beyond a vague image of the airplane as observation for ground forces. The Signal Corps's Aviation Section was too small and too distracted by the practical difficulties of early aviation to think long-term, whether in doctrine or strategy. In contrast, due to the inspiration of Billy Mitchell and to a lesser extent Giulio Douhet, the US Army Air Corps of the 1930s featured a robust air theory that it sought to disseminate as doctrine. Tracing the development of American strategic bombing in World War II requires examination of the influence of three sources: Britain's Hugh Trenchard's influence on Billy Mitchell, Italian concepts (Gianni Caproni and Giulio Douhet) upon Edgar Gorrell, and ACTS's attempt to turn theory into doctrine.

Blazing the Trail: Britain's Sir Hugh Trenchard and the Royal Air Force

The world's first independent air force, Britain's Royal Air Force (RAF) inspired American air enthusiasts and served as an example of what could be achieved. After a series of German zeppelin air attacks in 1915 and later multi-engined Gotha and Giant bomber raids against British cities, public outcry forced political action. The immediate response led to an advisory board chaired by Lt Gen Jan Christian Smuts that issued two reports. The first proved conventional and recommended improved antiaircraft guns, searchlights, aircraft, and defensive organization, while the second Smuts report proved revolutionary, advocating the creation of an independent air force. It included a prophetic statement: "the day may not be far off when aerial operations with their devastation of enemy lands and destruction of industrial and population centers on a vast scale may become the principal operations of war, to which the older forms of military and naval operations may become secondary and subordinate."[6]

The first commander of the RAF, Maj Gen Sir Hugh Trenchard, proved a tough, savvy example for American airmen. He seized upon public desire for retribution against German air attacks to fashion a long-range, strategic strike force as well as enhance air support for British troops in the trenches. Convinced of strategic bombing's potential for attacking important enemy industries, Trenchard envisioned a campaign against iron and coal mines, steel mills, chemical production, munitions and arms factories, aircraft and engine facilities, submarine and shipbuilding works, and gun foundries. From June 1918 until the Armistice, the nine squadrons of Trenchard's Independent Air Force (IAF) attacked German targets behind the lines. Although the limited size and capability of the IAF aircraft produced results far short of Trenchard's goals, he still believed the campaign suggested great future possibilities.[7]

When Billy Mitchell visited in May 1917, Trenchard conveyed his core beliefs that impacted later American air doctrine. Trenchard argued, "The object of war was to force an enemy to bend to one's will, accomplished by breaking either his will or capability to fight." Trenchard further conveyed his three primary beliefs on air warfare: air superiority was an essential prerequisite; airpower has a "relentless and incessant offensive" nature; and airpower's psychological ef-

fects were greater than its material impact. He also stressed that aviation should be concentrated under a single commander, aircraft detached to support army units should be minimized, and most bombardment and pursuit aircraft should be massed into an aviation strike force. Although both Trenchard and Mitchell modified their ideas somewhat in later years, Trenchard's core ideas significantly influenced Mitchell's thinking and RAF doctrine of the 1930s.[8]

Gorrell's World War I Strategic Bombing Report

On the eve of America's entry into World War I, the US Army Air Service possessed no actual combat doctrine. This reflected a lack of imagination, strict neutrality policies that limited contact with European air forces, and poor awareness of the belligerents' rapid aeronautical advances. Once the United States entered the war, the nation rushed to determine the quantity and types of aircraft required. Part of this effort resulted in the Bolling Mission, where Maj Raynal C. Bolling led a group of military and industrial representatives who interviewed French, British, and Italian air leaders and industrial manufacturers to determine the number and type of aircraft required. A 26-year-old captain, Edgar S. Gorrell, served as one of the military representatives since he was not only an experienced pilot (having flown with the 1st Aero Squadron against Pancho Villa) but also one of the nation's few credentialed aeronautical engineers.[9]

Although French and British experts influenced the Bolling Mission, Italian aircraft designer and theorist Gianni Caproni impressed Captain Gorrell. A close friend and confidant of Giulio Douhet, Caproni convinced Gorrell and other members of the Bolling Mission of strategic bombing's potential. Echoing Douhet, Caproni insisted that independent strategic bombing must be "systematic, thorough, and consistent."[10] By the end of the Bolling Mission in July 1917, Gorrell was convinced that strategic bombing promised the best means of employing aircraft to end the stalemate of trench warfare. Named by then-Col Billy Mitchell to head the Air Service Technical Section responsible for determining aircraft requirements for the American Expeditionary Forces in France, now-Major Gorrell studied the ideas behind the numbers. In trying to find the right number of bombers, Gorrell articulated a plan to use them.[11]

Fig. 4. (Left to right) Brig Gen Billy Mitchell, Eddie Rickenbacker, and Col Edgar Gorrell. While Mitchell and "Ace of Aces" Rickenbacker attracted public attention, Edgar "Nap" Gorrell wrote the Air Service's first strategic bombing doctrine. This photo appears to be from the early 1920s after Rickenbacker had returned to civilian life, while Mitchell wears the brigadier general rank as Assistant Chief of the Air Service. Courtesy of Dr. Dik Daso, AFHF.

Maj E. S. Gorrell's "Strategical Bombardment," submitted on 28 November 1917, earned later praise as the "earliest, clearest and least known" statement of American airpower.[12] The plan reasoned that German artillery munitions were "dependent upon the output of a few, specific, well-known factories" that "can be blown up, [and] the shell output will cease." Adopting Billy Mitchell's earlier terminology, Gorrell defined "strategical bomb-dropping" as targeting the commercial centers of Germany. He further explained:

> An army may be compared to a drill. The point of the drill must be strong and must stand up and bear the brunt of the much hard work with which it comes into contact; but unless the shank of the drill is strong and continually reinforcing the point, the drill will break. So with the nation in a war of these days, the army is like the point of the drill and must bear the brunt of constant conflict with foreign obstacles; but unless the nation—which represents the shank of the drill—constantly stands be-

> hind and supplies necessary aid to the point, the drill will break and the nation will fall.[13]

Thus, Gorrell's plan sought to wreck commercial centers and lines of communication as its object, to "cut off necessary supplies without which the armies in the field cannot exist."[14] As historian Mark Clodfelter noted, these ideas formed the central pillar of American strategic bombing—attacking the enemy's industrial base—later developed by the ACTS.[15]

Doctrine and Technology: ACTS Theory Drives Bomber Development

Although technological advances and occasional public relations forays continued into the 1930s, the Great Depression dominated a highly volatile decade. The technological promise of all-metal construction, monoplane design, and advanced power plants met the harsh realities of a shoestring budget forced by reduced tax revenues and a general economic malaise. Toward the latter half of the decade, powerful totalitarian states, represented by Fascist Italy, Nazi Germany, Nationalist Japan, and the Communist USSR, threatened western democracies, but powerful isolationist sentiment limited the US military response.

Within the Air Corps, leading airmen emphasized doctrinal development through the Air Corps Tactical School. ACTS instructors acutely understood the need for air doctrine (ideas of how best to fight, although more accurately termed military theory [the conceptual framework for thinking]) and sought to teach fundamental principles of air war as a foundation for an independent air force.[16] In other words, doctrine provided the intellectual and conceptual foundation for the optimum use of airpower. From doctrine evolved ideas for technological requirements, aircraft procurement, strategy, and tactics. ACTS served as the doctrinal center of military aviation from its founding in 1920 as the Air Service Field Officer School at Langley Field, Virginia. In 1922, it was renamed the Air Service Tactical School before becoming the Air Corps Tactical School in 1926. Even before the ACTS move to Maxwell Field, Alabama, in 1931, the school attracted the best and brightest airmen as its faculty, including such notables as Harold L. George, Kenneth Walker, Donald Wilson, George C. Kenney, Haywood S. Hansell, and Muir S. Fairchild. Influ-

enced by Billy Mitchell and Edgar Gorrell and to a lesser extent by Italy's Giulio Douhet and the Royal Air Force's Hugh Trenchard, the ACTS faculty developed an air war theory that emphasized long-range strategic bombardment.[17]

Fig. 5. In the 1920s and 1930s, the Air Corps Tactical School explored air theory, doctrine, and technology. Students in this ACTS class work at desks complete with aeronautical charts, rulers, compasses—apparently calculating routes of flight. Courtesy of Air University Library, Maxwell AFB, AL.

According to ACTS lectures, massed bombers would penetrate enemy defenses, bypass field armies and navies, and strike enemy vital centers, key nodes whose destruction would collapse the enemy's economy. Proper target selection would destroy both an enemy's capability and will to fight. Selective, precision bombardment assured economy of force and minimized civilian casualties. In an era before radar, airpower theorists believed effective air defense would be impossible. They looked to high altitude, speed, and internal armament for defense. Eventually, the ACTS idea became known as the "industrial web" theory, or high-altitude, precision, daylight bombardment.[18]

Coinciding with ACTS doctrine, the American aviation industry introduced a series of advanced bombers that encouraged airpower

advocates. As historian Phil Meilinger noted, the Great Depression steered aircraft manufacturers away from high-performance engines and airframes with few markets and into safe, reliable, large airframes with economical, durable, and reliable engines to serve the commercial airline industry, which also favored the attributes of bombers.[19] In 1931, the Seattle-based Boeing Airplane Company introduced the B-9, an all-metal, stressed-skin bomber with retractable landing gear, capable of 188 mph. A few months later, the Martin B-10 overshadowed the open-cockpit B-9. The B-10 also featured an all-metal, monoplane design with retractable landing gear but added enclosed cockpits, a glazed-glass gun turret, variable-pitch propellers, wing flaps, and an internal bomb bay with power-driven doors. On 19 July 1934, Col Henry H. "Hap" Arnold led a squadron of B-10s from Washington, DC, to Anchorage, Alaska, covering 4,000 miles in 25 flying hours. After conducting a photo-mapping mission of 20,000 square miles, the B-10s returned to Bolling Field without incident. Bomber theorists looked to this exploit as a validation of their ideas.[20]

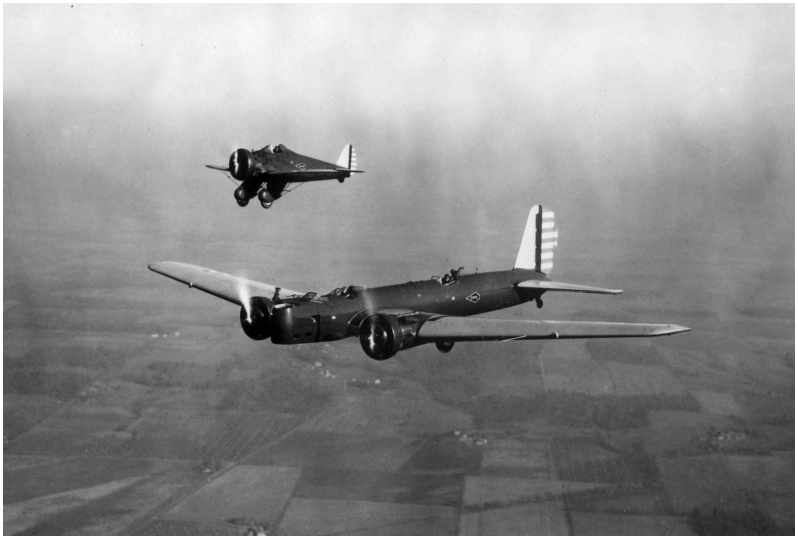


Fig. 6. In 1932, the Air Corps featured its frontline aircraft: the Boeing P-26 Peashooter fighter (background) and Boeing B-9 bomber. A close look reveals the flying scarf of the B-9's second pilot flapping in the wind stream. Courtesy of AFHF.

Despite the promise of doctrine and technology, Depression realities gained headlines when President Franklin D. Roosevelt cancelled

airmail contracts with civilian airlines in February 1934. Without a thorough analysis of Air Corps capabilities, Brig Gen Benny Foulois informed the president that the Air Corps would pick up the slack until contracts were renewed. Unfortunately, the Air Corps underestimated the impact of previous cuts in flying training, maintenance, and aircraft procurement. Valiant Army airmen attempted to fly day and night mail routes in open-cockpit planes with primitive instruments in one of the worst winters recorded. Over the three-month dispute, the Air Corps lost 66 aircraft and suffered 18 fatalities; these startling numbers created a public outcry. The airmail fiasco led to a Congressional investigation chaired by former Secretary of War Newton D. Baker.[21]

The 1934 Baker Board scrutinized Air Corps operations and as one of its findings recommended the creation of a single command for all combat aircraft, known as GHQ Air Force. On 1 March 1935, Brig Gen Frank Andrews assumed command of the new organization. Airmen applauded the move as a means to consolidate command, centralize doctrine, and integrate training—significant steps to service independence. Among other measures, the GHQ Air Force influenced a call for a follow-on aircraft for the Martin B-10, a bomber capable of carrying a 2,000 lb. payload 1,020 miles at a speed of 200 mph.[22]

Although the Martin and Douglas companies advanced designs, the Boeing Model 299 excited the GHQ Air Force staff. In August 1935, the four-engine aircraft flew 2,100 miles nonstop from Seattle to Dayton, Ohio, at an average speed of 232 mph. Eventually designated the B-17 "Flying Fortress," it revolutionized bombardment aviation and promised to fulfill ACTS's airpower theories. In comparison, the B-17 dwarfed the standard Air Corps fighter of the 1930s, the Boeing P-26, a chubby monoplane whose fixed landing gear and external bracing limited its top speed to 235 mph. The B-17's size, range, and 250 mph top speed ushered in a new era just as winds of war stirred in Europe.[23] Additionally, the Norden Mark XV bombsight developed by Carl L. Norden and Navy Capt Frederick I. Entwistle provided a gyro-stabilized, telescopic platform that computed the bomb release adjusted for the plane's ground speed, wind speed, altitude, and bomb ballistics. It provided greatly improved accuracy when coupled to an autopilot. Under ideal conditions, at 21,000 feet, one bomb in a load would land within 100 feet of the intended target.[24] Thus, Army Air Corps leaders viewed the

new B-17 as the instrument to achieve their ACTS-derived theories of strategic air warfare pursued by means of high-altitude, daylight, precision bombardment.

Donald Wilson's Industrial Web Theory (1934)

In March 1971, former ACTS instructor Brig Gen Donald Wilson captured the essence of the "industrial web theory" in an article based upon his 1933–1934 ACTS lectures. He explained the limited influence of Giulio Douhet and Hugh Trenchard upon ACTS thinking, credited Billy Mitchell's inspiration and overall influence, but claimed the industrial web theory as his own. The following excerpt based on his lecture notes summarizes the ACTS industrial web concept:

> In brief, the concept was: future wars of survival would be between industrial nations; continuation of the war would depend on maintaining intact a closely-knit and interdependent industrial fabric. The recently-acquired weapon of precision bombing gave us an instrument which could cause collapse of this industrial fabric by depriving the web of certain essential elements—few as three main systems such as transportation, electric power and steel manufacture would suffice. . . .
>
> Modern industrial nations are susceptible to defeat by interruption of this web, which is built to permit the dependence of one section upon many or all other sections, and further that this interruption is the primary objective of an air force. It is possible that the moral collapse brought about by the breaking of this closely-knit web will be sufficient, but closely connected therewith is the industrial fabric which is absolutely essential for modern war. To continue a war which is hopeless is worse than an undesirable peace because the latter comes soon[er] or late[r] anyway, but to continue a modern war without machinery is impossible.[25]

Summary

The 1930s emphasized the importance of theory, doctrine, and technology for American airpower development. In explaining the link between doctrine and technology, Professor I. B. Holley demonstrated that immature doctrinal thinking by the US Army Air Service in World War I slowed technological development. During World War I, Britain's Sir Hugh Trenchard profoundly influenced Billy Mitchell, and Italy's Gianni Caproni (and indirectly Giulio Douhet) convinced Edgar Gorrell of the potential of strategic bombing for overcoming trench warfare. Both Mitchell and Gorrell influenced the Air Corps Tactical School that sought to create air doctrine based primarily on theory and technological potential. In the 1930s, ACTS promoted strategic bombing as air doctrine and formed the Industrial Web Theory. The Air Corps viewed the four-engine Boeing B-17 and Norden bombsight as the technological fulfillment of their concepts. On the eve of World War II, airmen viewed High Altitude Daylight Precision Bombing as the revolutionary means for victory and the foundation for an independent air force.

Notes

1. Dr. Dorri Karolick provided this valuable perspective in her review of an early version of this work on 19 July 2005.

2. Holley, *Technology and Military Doctrine,* 1–2.

3. Yes, the same man. I. B. Holley served as an enlisted B-17 ball-turret gunner during World War II who attracted the attention of his superiors by not only redesigning the ball turret, but also by writing three books during his active service. After earning an officer's commission, Holley ascended the ranks, retiring as a major general in the Air Force reserves, and played a leading role in creating education policies and doctrine for the US Air Force. See Holley, *Technology and Military Doctrine,* vii–viii, for his remarkable biography.

4. Unfortunately, Holley creates a terminology problem with his definition of "doctrine" ("the extent to which [a weapon's] mission or operational function is known and defined"). As such Holley's use of doctrine fits definitions of both theory (the broad intellectual framework for thinking) and doctrine (more specific ideas for how best to fight) used in this text. In the case of the Air Corps Tactical School, instructors presented theory in their lectures that they hoped would translate into doctrine for the Air Corps and US Army as a whole. Holley, *Ideas and Weapons,* vii.

5. Holley, *Ideas and Weapons*, 19.

6. Meilinger, "Trenchard, Slessor, and Royal Air Force Doctrine before World War II," 43; and Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 25.

7. Meilinger, "Trenchard, Slessor," 44; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 25–26; and Holley, *Ideas and Weapons*, 138–39.

8. Meilinger, "Trenchard, Slessor," 41, 51; Hurley, *Billy Mitchell*, 25–26; and Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 20–21.

9. Gorrell earned a master's degree in aeronautical engineering at the Massachusetts Institute of Technology. Mauer, *The U.S. Air Service in World War I*. vol. 1, 4; Clodfelter, *Beneficial Bombing: The Progressive Foundation of American Air Power, 1917–1945*, 8; and Holley, *Ideas and Weapons*, 83.

10. Clodfelter, *Beneficial Bombing*, 13.

11. Airmen could rise rapidly in rank during World War I. Graduating from West Point in 1912 and a captain when America entered the war in 1917, Gorrell advanced rapidly through major and lieutenant colonel and pinned on colonel on 28 October 1918 at age 27. Mauer, *US Air Service*, vol. 1, 4.

12. Maj Gen Laurence S. Kuter, cited in Mauer, *U.S. Air Service*, vol. 2, 141.

13. Gorrell, "Strategical Bombardment," 143.

14. Gorrell, 142–43.

15. Clodfelter, *Beneficial Bombing*, 20.

16. See Haun, *Lectures of the Air Corps Tactical School and American Strategic Bombing in World War II*, for extensive commentary as well as key ACTS texts.

17. Please note that texts use both the terms theory and doctrine in describing ACTS work. Although the Air Corps Tactical School sought to create and teach air doctrine in the sense of disseminating ideas on how best to fight, the ideas lacked demonstrated experience and are better described as theory. Faber, "Interwar US Army Aviation and the Air Corps Tactical School: Incubators of American Airpower," 183–238; Greer, *The Development of Air Doctrine in the Army Air Arm 1917–1941*, 47–67; Meilinger, *Airmen and Air Theory: A Review of the Sources*, 109–13; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 62–65; and Clodfelter, *Beneficial Bombing,* 52–66.

18. Faber, "Interwar US Army Aviation and the Air Corps Tactical School," 186, 216–19; Meilinger, *Airmen and Air Theory*, 109–10; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 80; and Shiner, "The Coming of the GHQ Air Force," 113.

19. Meilinger, "The Impact of Technology and Design Choice on the Development of U.S. Fighter Aircraft," 60.

20. Dick, *Reach and Power*, 115–19; Goldberg, *A History of the United States Air Force*, 37–39; Shiner, "The Heyday of the GHQ Air Force, 1935–1939," 138–39; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 64; and Greer, *Development of Air Doctrine,* 45–46.

21. Dick, *Reach and Power*, 119–20; Shiner, "The Coming of the GHQ Air Force," 122–25, 139; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 70; Faber, "Interwar US Army Aviation and the Air Corps Tactical School," 192; Goldberg, *A History of the United States Air Force*, 38–40; Shiner, "Benjamin D. Foulois: In the Beginning," 29–31; and Copp, "Frank M. Andrews: Marshall's Airman," 50.

22. Dick, *Reach and Power*, 120–21; Shiner, "The Coming of the GHQ Air Force," 126–30; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 70–75; Goldberg, *A History of the United States Air Force*, 40–41; Greer, *Development of Air Doctrine*, 73–75; Shiner, "Benjamin D. Foulois: In the Beginning," 32–33; and Copp, "Frank M. Andrews: Marshall's Airman," 51–52.

23. Dick, *Reach and Power*, 121–24; Shiner, "The Heyday of the GHQ Air Force, 1935–1939," 144; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 81; Goldberg, *A History of the United States Air Force*, 41–42; Greer, *Development of Air Doctrine,* 46–47; Copp, "Frank M. Andrews: Marshall's Airman," 55–57; and Clodfelter, *Beneficial Bombing,* 70–71. For Boeing Model 299 transition to XB-17, YB-17, and then B-17 with corresponding technical details, see Wagner, *American Combat Airplanes*, 109.

24. Clodfelter, *Beneficial Bombing*, 71–72.

25. Wilson, "Origin of a Theory for Air Strategy," 19–20.

Chapter 6

A Means to an End

Alternatives to Strategic Bombing

At the eleventh hour of the eleventh day of the eleventh month of 1918, an armistice stilled the guns of history's bloodiest war. Reeling from the shock, carnage, and loss of the Great War, Europeans rejected the horrors of war politically through pacifism and antiwar policies. As governments struggled to rebuild and repair, financial constraints restricted attempts to maintain adequate armed forces with particular impact for modernizing air forces. For example, from 1919 to 1932 the British Cabinet's "Ten-Year Rule" advised service ministers that a major war would not occur for 10 years and to prepare budgets accordingly.[1] Thus, antiwar sentiment and strict financial limits provided the overall context for airpower development during the interwar period.

As the previous chapters indicated, a small group of international airpower visionaries considered aircraft a revolutionary weapon. Most airpower histories end here. An alternate view cast airpower as an evolutionary weapon, an important force multiplier, but a combat arm building upon the lessons of World War I. Future wars would be decided by ground warfare with sea and air playing important, but supporting, roles. A survey of the world's leading air forces during the 1920s and 1930s demonstrates the appeal of alternative views of airpower that disagreed with strategic bombing advocates.

At the end of the First World War, the French air force, or *Service Aéronautique,* emerged as the world's largest, most powerful, and most technologically advanced. Although strongly challenged by a still viable German air service until the Armistice, the French air force earned a reputation for its prowess and heroism. Unlike Douhet, Trenchard, and Mitchell, French air leaders and service culture rejected a call for independence; instead, the French air force adopted the mentality of a dependent air force, comfortable with its role as a vital support branch of the French army. Military leaders believed that unity of command and effective centralized control emerged as the primary doctrinal lessons of the Great War. To senior French commanders, the empirical evidence reinforced aviation as an extension of traditional combat arms, particularly cavalry reconnaissance

and long-range artillery.[2] The harmonious integration of the air arm into the land battle remained the goal. During the interwar years, Marshal Philippe Pétain, commander-in-chief and national hero, countered air-focused doctrine by stating, "Direct air action in the battle is illusory." Later, General Maurice Gamelin continued: "There is no such thing as aerial battle. There is only battle on the ground."[3] The creation of an independent air force threatened the harmony needed for effective combined arms.

The lack of an independent air force mentality impacted both doctrine and aircraft procurement, which in turn affected performance in World War II. French airmen embraced the legacy of World War I, proud of the fighter pilot's image as "knight of the air" and defender of ground forces.[4] For the most part, French airmen agreed with army doctrine and rejected the strategic bombing ideas of Giulio Douhet. For example, in 1932 the air service's inspector general argued that bombing civilians was immoral and could only be in retaliation; he added: "Douhet has no partisans in France."[5] Consequently, army-centric doctrine and a consensus culture led to a series of aircraft created under the Bombardement Combat Reconnaissance (BCR) program. Multi-role BCR aircraft aimed to accomplish all the missions needed by the army: bomber, fighter, reconnaissance, and observation (artillery spotting). Reflecting the need for consensus and compromise, the BCR series featured twin-engine aircraft of 10,000 to 14,000 pounds, a four- or five-man crew, three machine guns in turrets, bomb loads of 1,100 to 2,200 pounds, a top speed of 220 mph at 13,000 feet, and a radius of 850 miles.[6] Lacking a strong institutional voice and service doctrine, the French air force suffered from inadequate funding, a weak organization, and a late start to modernization before World War II.[7]

The Italian air force experience in the interwar period proved organizational independence would not serve as a panacea for air effectiveness. Despite Giulio Douhet's personal influence and airpower's appeal to Benito Mussolini's Fascist state, Italian airpower stalled as a warfighting weapon during the 1930s. Instead, airpower represented an ideal propaganda weapon merging images of modernity, progress, and technological prowess in service to the Fascist cause. During the 1920s and early 1930s, Italian airmen pioneered long-range seaplane flights including a 1925 Rome–Australia–Tokyo–Rome journey and a 1927 "four continents" flight linking Europe–Africa–South America–North America.[8]

Under Mussolini, Italy's *Regia Aeronautica* became the world's second independent air force with mixed results. The *Regia Aeronautica* consisted of four branches: an independent air force, an army cooperation contingent, a naval air service, and a colonial air force.[9] With significant limitations in raw materials, industrial base, and basic economic strength, Fascist Italy created an air superiority force-in-being adequate for a short defensive war or to serve as a deterrence force. Unfortunately for Italy, Mussolini's ambitions and alliance with Hitler committed the *Regia Aeronautica* to extended wars in Ethiopia and Spain that taxed the nation's limited resources.[10]

Italy's air campaign during the Spanish Civil War demonstrated the *Regia Aeronautica*'s doctrinal confusion. After Douhet and Italo Balbo's emphasis on strategic bombing, new air leaders, led by Giuseppe Valle and Amedeo Mecozzi, advocated tactical support for ground forces. In the 1930s, the Italian air force developed fighter-bombers and de-emphasized long-range strikes.[11] Italian air operations in Spain tried both theories. Although Valle eventually decided that ground support would be more effective, internal political pressure resulted in considerable resources devoted to strategic terror bombing, yielding poor results.[12] Consequently, on the eve of the Second World War, the *Regia Aeronautica* emerged resource depleted, doctrinally confused, and a step behind in advancing technology. An independent air force did not overcome political and resource challenges.

Often overlooked by Western airpower experts, the Soviet airpower experience offered another alternative to strategic air war theories. Like the French, Soviet leaders backed a dependent army air force dedicated to ground support, known as the Voennyo-Vozdushnye Sily or VVS, and a smaller naval air arm.[13] In contrast to the French, the Soviets considered aviation vital to future national defense and devoted large sums to its rapid advancement. Like the Italians, Soviet leadership appreciated airpower as a symbol of national progress and technical achievement. Facing significant obstacles in the construction of aircraft plants, aviation research and development, and pilot recruitment, education, and training, the Soviets still made great strides in the 1920s and 1930s.[14] Again, like the Italians, the Soviets devoted significant resources to the Spanish Civil War. Introduced to combat in 1936, the Soviet Polikarpov I-16 fighter aircraft proved superior to Italian models but inferior to Germany's latest fighter, the Messerschmitt Bf-109.[15] Combat experience verified the Soviet distrust of strategic bombing, although by 1941, the Soviet

Union still boasted the world's largest fleet of four-engine bombers. Nevertheless, when Stalin decided to withdraw the Soviet air contingent in 1938, the VVS had earned valuable combat experience and Soviet airmen had earned international respect. A later clash with Japanese airpower in the 1939 Nomonhan (or Khalkhin Gol) incident added to Soviet operational expertise. On paper, Soviet airpower represented a powerful force on the eve of World War II.[16]

Unfortunately for the Russian people, Stalin's purges in the late 1930s decimated Soviet military leadership and experience as well as political, educational, industrial, artistic, and other classes of talent. An estimated 35,000 military officers, including many Soviet Spanish Civil War veterans, died along with countless civilians. Thus, when the Germans invaded in June 1941, the VVS stood as a massive, but hollow, force. The VVS leadership void significantly hurt Soviet air efforts in the opening rounds of fighting on the Eastern Front in World War II.[17]

As important as French, Italian, and Soviet air doctrine proved as alternates to strategic air war theory, interwar German air force ideas provided the most sophisticated, comprehensive, and well-thought-out alternatives to Douhet. Worthy of a "first-class" enemy, German army and air force leaders derived an operational air warfare concept in many ways superior to British or American air doctrine despite not having an air force until the rise of Hitler. A study of Germany's air force (the famed Luftwaffe) doctrine foreshadowed today's US Air Force doctrine with emphasis on joint operations, combined arms, and working within the context of a theater campaign plan. Common ideas describing the Luftwaffe as a close air support (CAS) force, the "handmaiden" of the army, or merely "flying artillery" proved uninformed myths.[18]

Post–World War I Germany's unique geographic, political, and economic situation forced a strikingly different approach to air doctrine than that of the Western powers. Germany's central geographic location in the heart of Europe surrounded by powerful enemies merged with its political status as a defeated nation to influence strategic planning. Denied an air force by the Versailles Treaty, Germany also lacked access to financial reserves, an adequate industrial base, and virtually every resource needed by an aviation power. The drive for natural resources dominated German strategic planning, especially with the Nazi regime. It also influenced developing an air doctrine both in having to create an aircraft industry rapidly from scratch

and one needing oil, rubber, and other vital supplies. Stunted by resource, capital, and infrastructure shortfalls, German military planners applied their brains.[19]

"The vanquished learned more than the victors" is an adage shown true as the de facto German general staff seriously analyzed lessons from World War I. Although hidden from foreign observers, Germany's considerable wartime air experience was not lost. *Generaloberst* Hans von Seeckt, head of the *Truppenamt* (a camouflaged general staff), appreciated airpower's role and ensured that officers with wartime air experience were included in the assessment efforts. In general, German airmen concluded that the German air service was too defensively oriented in World War I. Despite favorable kill ratios of two- or three-to-one in aerial engagements, the Germans lost the initiative to more offensive Allied air operations. Hence, post–World War I German air studies agreed that air superiority must be the priority mission and attacking the enemy air force and its structure must be the first target. After gaining air control, deep interdiction and ground-support missions would follow. To develop air doctrine, train pilots, and build aircraft, Von Seeckt secretly negotiated to establish an air base near Lipetsk in the Soviet Union in violation of the Versailles Treaty. From 1925 to 1933, the officially nonexistent German air force tested aircraft and trained both German and Soviet pilots.[20] Additionally, German airmen carefully studied foreign air forces, including those of Britain, France, Italy, and the United States.[21]

With Hitler's Nazi government assuming power in 1933, the German air force expanded hurriedly. Acutely aware of its deficiencies and backwardness compared to Western powers, the Luftwaffe benefited from *Reichsmarshall* Herman Göring's status as Hitler's confidant and de facto second-in-command. Politically favored but woefully inadequate in administrative aptitude and attitude, Göring picked the able Gen Walther Wever as the Luftwaffe's first chief. Wever proved vital to German air doctrinal development. He continued von Seeckt's ideas and backed the Luftwaffe as an independent service, yet a complement to the army and navy. German airpower would serve overall national strategy.[22]

Reflecting Wever's beliefs, the Luftwaffe produced Regulation 16, "Conduct of Air Warfare," in 1935, which outlined the principles of what became known as operational air warfare. The doctrine integrated German general staff concepts with the studies of World War I air war. The directive's introduction stated, "From the start of the

conflict, the air forces bring the war to the enemy. Aerial assault affects the fighting power of the enemy and the foundations of the enemy people's will to resist. Because the flying forces, especially the bomber force, carry out the offensive, they give the Luftwaffe its character." Nevertheless, the air arm served the overall effort "to break down the will of the enemy" manifested in the enemy's armed forces. Therefore, "[destruction of] the enemy armed forces is . . . the primary goal in war." Accordingly, "The mission of the *Luftwaffe i*s to serve . . . by commanding the war in the air within the framework of combined operations."[23]

Relatively concise and to the point, Luftwaffe Regulation 16's articulation of operational air warfare captured key concepts consistent with earlier Prussian army tradition: mass attack on the decisive point and maintaining a strong reserve to exploit battlefield opportunity.[24] The doctrine outlined six primary missions:

1. Combat to achieve and maintain air superiority.
2. Combat to support ground troops.
3. Combat to support the navy.
4. Action to interdict enemy lines of communications and supply.
5. Strategic operations against enemy resources and sources of power (i.e., strategic bombing of industry).
6. Attacks against targets in cities.[25]

Significantly, the directive cautioned against terror raids against cities: "Unplanned side-effects can often have a disproportionate effect in the political sphere and international law."[26] Finally, operational air war emphasized targeting the enemy's center of gravity and considering war's overall framework: "The most important decisive targets will be decided under the most careful consideration of all military, political, and economic factors." Although revised in 1940, Luftwaffe Regulation 16 remained Germany's air doctrine throughout World War II.[27]

Germany's intervention in the Spanish Civil War largely confirmed Luftwaffe air doctrine and improved operational methods. In 1936, Hitler committed a force of 5,000 troops and 100 aircraft, known as the Condor Legion, to back the Nationalist cause. With little operational interference from Hitler and Göring, the legion's Luftwaffe leadership proved tactically and politically adept. German airmen

improved ground-support tactics and observed air interdiction's effectiveness against enemy transportation. Initially outclassed by Russian aircraft, the Luftwaffe replaced its biplane fighters with the advanced Messerschmitt Bf-109 to gain the air superiority called for in its doctrine. Despite the shock effect and international outcry caused by bombing the Spanish city of Guernica, Luftwaffe officers concluded the strategic bombing produced little effect on the war and that civilians proved more resilient than predicted by prewar theorists. Although "breaking the enemy's will" still formed a major plank in Nazi ideology and Luftwaffe doctrine, Spanish Civil War experience did not match expectations.[28]

By the late 1930s, Germany possessed a large, well-equipped air force well suited for an anticipated war in central Europe against its most likely enemies: Czechoslovakia, Poland, and France. It fielded a sophisticated, comprehensive, coherent air doctrine and high-quality pilots and operational leaders. Learning from Spain, the Luftwaffe advanced practical ground-support techniques and training. It also developed navigational instruments and procedures for all-weather flying and night operations and made technological strides to improve bombing accuracy. Still, the Luftwaffe suffered from rushed expansion, leadership turmoil (especially after Wever's 1936 death in an aircraft accident), and organizational growing pains. As the imminent war would demonstrate, Germany faced daunting challenges caused by an inadequate industrial base and a lack of natural, financial, and manpower resources that would doom its ambitions in the end.[29]

Bridging the Gap: Liddell Hart's Indirect Approach, Grand Strategy, and Dislocation

For many military scholars, political commentators, and policy analysts, airpower theory stops with Giulio Douhet and Billy Mitchell. At best, they regard combined-arms warfare, commonly called blitzkrieg, as primarily a means of land warfare with the air component merely serving as flying artillery. This view misses interwar European air war theories as described above as well as significant works written in English by significant British military thinkers. This chapter argues that Britain's B. H. Liddell Hart and John C. Slessor provide an interwar alternative to classic airpower theory represented by Douhet and Mitchell's independent air forces waging strategic air

warfare. Moreover, Liddell Hart provides a strategic context for airpower's role in war that would influence later air thinkers.

Building upon the classic strategic works of Clausewitz and Sun Tzu, Basil Henry Liddell Hart (known professionally as B. H. Liddell Hart) bridged the gap between historic and contemporary views of strategy. Renowned as a journalist and historian, Liddell Hart emerged as arguably the most significant British military theorist of the twentieth century. During World War I, he fought at the Battle of the Somme where he became a casualty of poison gas. During the 1920s and 1930s, Liddell Hart gained fame as the military correspondent of major London newspapers including the *Daily Telegraph* and *The Times*. A prolific author, Liddell Hart published 30 major books and articles dedicated to preventing a reoccurrence of trench warfare.[30]

An early advocate of mobility and mechanized warfare, Liddell Hart introduced the "expanding torrent," a combined-arms approach using mechanized infantry, tanks, and aircraft to penetrate enemy lines, bypass strongholds, and strike enemy command and control facilities in rear areas.[31] Liddell Hart also argued for an "indirect approach" in both strategy and tactics. On the battlefield, mechanized forces would maneuver to avoid enemy strength while strategists would use emerging land, air, and sea technologies to strike enemy flanks. In both tactics and strategy, headfirst attacks into enemy defenses would be avoided at all costs. Combining these ideas, many writers considered Liddell Hart to be the intellectual father of blitzkrieg.[32] Along the same lines, contemporary American airpower theorists John Warden and John Boyd drew inspiration from Liddell Hart's work.

Liddell Hart introduced a concept of "grand strategy" that expanded Clausewitz's earlier work. Liddell Hart examined Clausewitz's definition of strategy: "the art of the employment of battles as a means to gain the object of war. In other words, strategy forms the plan of the war, maps out the proposed campaigns which compose the war, and regulates the battles to be fought in each."[33] Then, he analyzed Helmuth von Moltke's version: "the practical adaptation of the means placed at a general's disposal to the attainment of the object in view."[34] Liddell Hart found both definitions too narrow, too military in focus. Instead, he proposed a shorter definition: "the art of distributing and applying military means to fulfill the ends of policy." He further explained, "For strategy is concerned not merely with the movement of forces—as its role is often defined—but with the effect."[35] Fighting power was only

one aspect of grand strategy, whose primary function was to coordinate and direct a nation's resources toward attaining a political object. Liddell Hart concluded, "Moreover, fighting power is but one of the instruments of grand strategy—which should take account of and apply the power of financial pressure, of diplomatic pressure, of commercial pressure, and, not least of ethical pressure, to weaken the opponent's will. A good cause is a sword as well as armor."[36]

Thus, Liddell Hart laid the foundation of today's instruments of national power often described as DIME—diplomatic, informational, military, and economic. He concluded his concept of grand strategy with an astute observation: "While the horizon of strategy is bounded by the war, grand strategy looks beyond the war to the subsequent peace. It should not only combine the various instruments, but so regulate their use as to avoid damage to the future state of peace—for its security and prosperity."[37]

Liddell Hart argued that the aim of strategy was not to annihilate the enemy but produce strategic dislocation. Ideally, "his true aim is not so much to seek battle as to seek a strategic situation so advantageous that if it does not of itself produce the decision, its continuation by a battle is sure to achieve this." Strategic dislocation consisted of two spheres: physical and psychological. In the physical sphere, Liddell Hart sought maneuvers to upset the enemy's dispositions, separate his forces, endanger his supplies, or threaten his lines of retreat. In the psychological sphere, dislocation affected the enemy's mind, especially if the maneuvers were sudden or unexpected. For emphasis, Liddell Hart quoted Thomas "Stonewall" Jackson's motto: "Mystify, mislead, and surprise." If done correctly, "*psychological dislocation fundamentally springs from this sense of being trapped*" (emphasis in original).[38]

Slessor's *Air Power and Armies* (1936): Air Superiority, Mobility, and Air-Land Coordination

Joining B. H. Liddell Hart's work on armored warfare and grand strategy, British air leader John C. Slessor offers an important alternative to 1930s strategic air war theories. In 1936, Slessor wrote *Air Power and Armies*, a valuable work examining airpower in air, naval, and land campaigns. Compared to other early airpower theorists, Slessor provides greater depth, breadth, and quality of thought. Sles-

sor's main ideas fall into three categories: airpower's role in a land campaign, the transitory nature of air superiority, and strategic concentration as the key to air strategy. Unfortunately, these ideas only scrape the surface of Slessor's thoughts on airpower, but they demonstrate that alternatives to strategic air warfare existed during the interwar period.

Unlike Giulio Douhet, Billy Mitchell, and Hugh Trenchard, who began their military lives as army officers, John C. "Jack" Slessor (1897–1979) served as an airman throughout his distinguished career.[39] Although childhood polio disqualified him from ground service, Slessor earned a commission in the Royal Flying Corps during World War I, where he saw combat in England, France, Egypt, and the Sudan. After the war he served in India and as an instructor at the British Army Staff College. During the early years of World War II, Slessor headed the RAF's Plans Division where he won recognition for his skills as a planner and thinker. He later assumed charge of RAF Coastal Command and became known as the man who beat the U-boat. He finished the war as deputy commander of the Mediterranean Allied Air Forces. After World War II, Slessor rose to five-star rank (Marshal of the RAF) and served as Chief of the Air Staff from 1950 to 1953.[40]

In contrast to Douhet's and Mitchell's emphasis on bombing vital centers in the enemy's heartland, Slessor's early writings focused on army–air force cooperation at the theater level of war. In *Air Power and Armies*, Slessor offered novel views on using airpower in support of ground operations. He strongly emphasized the critical need for rapidly winning air superiority followed by persistent attacks against enemy supply lines—called air interdiction today. He also stressed the need for careful coordination and close cooperation between air and ground forces. In calling for the ranking airman in the theater to serve both as commander of the air element and as chief air advisor to the theater commander, Slessor anticipated the modern concept of the Joint Force Air Component Commander (JFACC). In fairness to the range of ideas presented in his book, Slessor also discussed the potential of strategic bombing and aviation's role in naval war, but he stressed the inherent flexibility of airpower and the imperative of determining its right use at the right time.

In his chapter "Air Superiority: The Object," Slessor derives the primary purpose of air forces in war. Because the national object in war is to overcome the opponent's will and the army must break the

resistance of the enemy's armed forces, "[t]hus the object of an army in a land campaign is to defeat the enemy's army; that of the air force contingent in the field is to assist and cooperate with the army in the defeat of the enemy's army, and of such air forces as may be cooperating with it."[41] Efforts to secure air superiority over the battle line enable reconnaissance and artillery spotting as essential missions and direct air attack upon ground objectives. "And this leads up to the point that in a *land campaign* the primary objectives—that is to say those against which action will lead most directly to a decision—will always be *the enemy land forces*, their communications and system of supply" (emphasis in original).[42]

On the other hand, Slessor argues, this does not mean that action against enemy air forces is unimportant. On the contrary, winning air superiority is essential for initiative and to protect both air and ground forces from enemy interference. "It is thus a means to an end, an essential measure of security upon which all offensive action must be based. But air fighting in itself, the destruction of enemy air forces, will not give us a decision in a land campaign."[43]

Slessor questioned Royal Air Force doctrine's emphasis on the concept and priority of air superiority. Although an important prerequisite, air superiority too often became the sole focus of airmen. He observed: "The fact is that 'air superiority' has become something of a catchword. It is easy, and sounds convincing, to say briefly 'the job of the air force is to gain air superiority' and leave it at that." Instead, Slessor argued that this was a mistake: "Air superiority is only a means to an end and, unless it is kept in its proper place as such, is liable to lead to waste of effort and dispersion of force."[44]

On the other hand, Slessor agreed with other air theorists on airpower's unique attributes. To achieve national objectives (overcoming an opponent's will), the soldier must either occupy the enemy's country or interrupt his lines of supply or communication. In contrast, the airman strikes directly at those objectives. Within the limits of his tactical range, potentially as great as 300–400 miles, the airman "is independent of lines of communication and has no flanks." An air force can strike objectives and return to base even with an enemy astride its line of flight, provided that the enemy air force has been neutralized at the point and time of attack. Moreover, airpower's inherent mobility means "*an air force is not committed to any one course of action*. . . . It can switch, literally almost at a moment's notice, from one objective to another several hundred miles away, from the same

base" (emphasis in original).[45] Hence, Slessor recommended an organized system of inexpensive air bases and transport aircraft to provide strategic mobility, the ability to increase tactical range with a minimum of "dislocation and delay." Returning to his theme, Slessor emphasized: "But the point is that an air force *can* get to those objectives, do its job, and get back again without the preliminary total defeat of the corresponding hostile armed forces—which an army cannot" (emphasis in original).[46]

Slessor concluded his air superiority thinking with an insightful passage based on his personal experience of World War I aerial combat:

> It must then be apparent that air superiority is not a definite condition to be achieved once and for all, a stage to be passed from which the air force can proceed to other forms of activity. It is not a phase to be gone through, a necessary preliminary to be dealt with as expeditiously as possible before the real business can begin . . . . Air superiority will be gained and will have to be constantly maintained by striking directly at those objectives which are of first importance to the enemy at the time, whatever they may be; and by persisting in this line of action against opposition and in spite of casualties, assisted in varying degree by diversions in the form of direct attack on the enemy's air forces. The struggle for air superiority is part and parcel of all air operations against a first-class enemy; and though much can be done by superior organization and equipment to provide for the physical and material factors before we go to war, the essential third factor—perhaps the most important of all—the moral factor, can only be secured by an instant and unremitting *offensive* directed against the primary objective, whatever it happens to be at the time. "Air superiority is only a means to an end." But it happens that to go straight for the end is the best, in fact the only sure, way of achieving the means.[47]

In his chapter "The Selection of Objectives: Strategic Concentration," Slessor asserted that mobility is the key to concentration. He examined the principles of war as stated in British Field Service Regulations and concluded that the principles could be simplified into three: concentration, offensive action, and security. He maintained that mobility, economy of force, and cooperation essentially comprise concentration; that mobility and surprise form offensive action; and that economy of force constitutes security. He further defined the

principle of concentration as "the concentration of and employment of maximum force, moral, physical, and material, at the decisive time and place (whether that place be a strategic theater or a tactical objective)."[48] With this in mind, Slessor argued: "The whole art of air warfare is first the capacity to select the correct objective *at the time,* namely that on which attack is likely to be decisive, or to contribute most effectively to an ultimate decision; and then to concentrate against it the maximum possible force, leaving only the essential minimum elsewhere for security—and possibly to contain superior enemy detachments" (emphasis in original).[49]

Rapid concentration demands a high degree of strategic mobility. Whereas the airplane is immensely mobile within its tactical radius, Slessor recognized that careful organization, administration, training, and specialized technology are required for genuine strategic mobility. In one section, Slessor challenged the RAF of his time:

> But it is open to serious question whether our organization or administrative machinery is really founded on a sufficiently high estimate of the vital importance of mobility, or whether our training is actually fitting the Royal Air Force to be basically mobile. . . . At the same time we should recognize that such accessories as tarmac aprons, fitted workshops, huge lighted hangars, and bulk petrol installations capable of refueling whole squadrons in a few minutes, are the antithesis of true mobility however essential they may be for the one specialized purpose. And we should be very careful not to become unduly dependent upon such static luxuries. Could any selected number of squadrons of each or any class operate at full capacity and at short notice from open fields, with the aircraft picketed out, and the personnel living and working in bivouacs and [trucks]?[50]

Slessor grasped the need to plan, organize, train, and practice for strategic mobility during peacetime to be proficient in times of war. Although he did not use the phrase, in many ways Slessor foreshadowed today's US Air Force Air Expeditionary Task Force. Slessor understood that warfare requires improvisation and anticipation, especially in terms of strategic mobility. He closed the chapter with an astute summary: "And if we are not really basically mobile, then we are on dangerously wrong lines, for air strategy means concentration, and concentration depends upon mobility."[51]

Summary

In his "Theory of Strategy," British military theorist B. H. Liddell Hart introduced many fundamental concepts that form the basis of today's air, space, and cyberspace power. Students will see the link between Liddell Hart's ideas and those of Sun Tzu and Clausewitz. Additionally, later air and space theorists will draw from Liddell Hart's writing for ideas relating to grand strategy, strategic dislocation, and the indirect approach. Liddell Hart's strategic concepts include the concept of grand strategy: to coordinate and direct all the resources of a nation toward the political object of war, that is, the goal defined by fundamental policy. He defined the "instruments of grand strategy" as applying financial, diplomatic, commercial, and ethical pressure, as well as military. This concept serves as the source of DIME (diplomatic, informational, military, and economic instruments of power) used in contemporary doctrine. Air, space, and cyberspace thinkers would agree with Liddell Hart's idea that grand strategy looks beyond war to the subsequent peace. Likewise early airpower theorists paralleled Liddell Hart's concept that strategy seeks to diminish enemy resistance through movement and surprise, ideally to win without serious fighting. Contemporary thinkers John Boyd and John Warden built upon Liddell Hart's maxim: the true aim of strategy is not to seek battle, but strategic advantage—and, in turn, strategic dislocation. This directly led to the idea of strategic paralysis. Boyd and Warden also learned three other concepts from Liddell Hart: (1) Psychological dislocation stems from the sense of being trapped, (2) distract the enemy to deprive his freedom of action, and (3) adaptability governs survival in war as well as life. Unfortunately, today's doctrine often overlooks B. H. Liddell Hart, but astute students recognize that Liddell Hart forms the bridge between classic military theory and modern theories of air, space, and cyberspace power.

John C. Slessor represents a number of airpower theorists who wrote on dimensions of airpower other than strategic air war. In *Air Power and Armies*, Slessor introduced several key ideas that relate to modern airpower theory. He challenged strategic air theorists by stating three concepts: (1) In a land campaign, the object of airpower is the enemy's army; (2) air and ground commanders must coordinate their efforts; and (3) against a first-class enemy (Slessor's term for Germany), air superiority must be earned, is temporary, and is only a

means to an end. On the other hand, Slessor's discussion of strategic concentration agrees with both earlier air theory and contemporary doctrine. For example, he stated that airpower must be concentrated at the strategic level, at the right time, at the decisive target. He reinforced this theme with the idea that air strategy requires concentration and concentration depends on mobility. Equally important, Slessor did not simply write theory; he emphasized that air forces must be properly organized, trained, and equipped to achieve strategic mobility. Airmen must practice the procedures, test the equipment, and actually deploy forces long range to build the experience necessary for genuine capability. Adding to his breadth as a strategic thinker, Slessor also challenged the existing notion of the "principles of war." He believed they were overcodified and could be reduced in number to three principles: concentration, offensive action, and security. Although little known today, John C. Slessor stands as one of the greats of airpower theory; his ideas represent a flexible, mature, and creative mind worthy of examination.[52]

Notes

1. Bond, "The British Armed Forces," 101.
2. Vennesson, "Institution and Airpower," 39. See also Doughty, "French Armed Forces," 49–51.
3. Baker and Cooling, "Development and Lessons," 20.
4. Vennesson, "Institution and Airpower," 48.
5. Vennesson, 54.
6. Vennesson, 50; and Doughty, "French Armed Forces," 50.
7. Baker and Cooling, "Development and Lessons," 20; and Vennesson, "Institution and Airpower," 49.
8. Wikipedia, s.v. "Francesco de Pinedo," https://en.wikipedia.org/.
9. Baker and Cooling, "Development and Lessons," 18–19.
10. Baker and Cooling, 19–20.
11. Sullivan, "Italian Armed Forces," 177.
12. Sullivan, 195.
13. Baker and Cooling, "Development and Lessons," 26.
14. Baker and Cooling, 27.
15. Ziemke, "Soviet Armed Forces" 8, 10; and Angelucci, *Rand McNally Encyclopedia of Military Aircraft*, 217.
16. Baker and Cooling, "Development and Lessons," 27–28; Ziemke, "Soviet Armed Forces," 16–17; and Boyd, *Soviet Air Force,* 74–87.
17. Baker and Cooling, "Development and Lessons," 27; and Boyd, *Soviet Air Force*, 88–89.
18. "First-class enemy" draws from John C. Slessor's veiled reference to Germany in his writings. Three contemporary scholars (Williamson Murray, James S. Corum, and Richard R. Muller) revolutionized study of the Luftwaffe and its doctrine for English speakers. The author acknowledges their superior works in this field that

correct earlier interpretations of German air doctrine. Murray, *Luftwaffe*, 1; Corum, *Luftwaffe: Creating the Operational Air War, 5*–6; and Muller, *German Air War in Russia*, 2, 5.

19. Murray, *Luftwaffe*, xiii, 1–2; Corum and Muller, *Luftwaffe's Way of War*, 8; and Corum, *Roots of Blitzkrieg*, 155.

20. Although the Soviet-German agreement provided training grounds, officer schools, and technology to both parties, no genuine alliance resulted. Mutual suspicion and mistrust marked this marriage of convenience. Ziemke, "Soviet Armed Forces," 8.

21. Corum, *Roots of Blitzkrieg*, 159–60; Muller, *German Air War*, 4; Corum and Muller, *Luftwaffe's Way of War,* 6–7; and Muller, "Close Air Support," 155.

22. Murray, *Luftwaffe*, 9.

23. Corum and Muller, *Luftwaffe's Way of War,* 119–21.

24. Corum and Muller, 8.

25. Muller, *German Air War*, 7; and Corum, *Roots of Blitzkrieg*, 167.

26. Corum and Muller, *Luftwaffe's Way of War,* 121.

27. Corum and Muller, 9–10.

28. Corum, "*Luftwaffe and the Coalition Air War in Spain*," 71–76; Corum and Muller, *Luftwaffe's Way of War,* 10; and Murray, *Luftwaffe*, 16–17.

29. Murray, *Luftwaffe*, 16–21; Muller, *German Air War*, 12; and Corum and Muller, *Luftwaffe's Way of War,* 10–11.

30. Travers, "Liddell Hart, B. H.," 265.

31. Another British military thinker, J. F. C. Fuller, is also credited with this concept. Travers, "Liddell Hart," 265; and Danchev, "Liddell Hart, Capt Sir Basil Henry," 505–6.

32. Following World War II, some scholars listed Erwin Rommel and George S. Patton as students of Liddell Hart. This claim should be viewed carefully since many military thinkers developed similar ideas about armored warfare in the 1930s. For a readable account, see Showalter, *Patton and Rommel.*

33. Liddell Hart, *Strategy*, 333.

34. Liddell Hart refers to Helmuth von Moltke, the elder, a noted nineteenth-century military theorist. Von Moltke served as chief of staff of the Prussian Army during the Wars of German Unification (1864–1871). He should not be confused with his nephew, Helmuth von Moltke (often called "the younger"), who served as chief of the German General Staff from 1906 to 1914 and was associated with the Schlieffen Plan of World War I. Carr, "Moltke, Helmuth Karl von," 306–7; Moran, "Moltke, Helmuth von (the Younger)," 307–8; and Liddell Hart, *Strategy,* 334.

35. Liddell Hart, *Strategy,* 335.

36. Liddell Hart, 336.

37. Liddell Hart, 336.

38. Liddell Hart, 339–41.

39. Dr. Jim Titus wrote the initial draft of Slessor's biographical sketch in July 2003 for the US Air Force Academy's Department of Military and Strategic Studies instructional material; likewise, Col Phillip S. Meilinger (US Air Force, retired) served as my guide to both Trenchard and Slessor's importance; see Meilinger, "Trenchard, Slessor, and Royal Air Force Doctrine," 61–66.

40. Meilinger, *Airmen and Air Theory*, 123–24; and Wheal, Pope, and Taylor, "Slessor, Air Marshal Sir John," 439.

41. Slessor, *Air Power and Armies*, 1.

42. Slessor, 2.

43. Slessor, 3.

44. Slessor, 4.
45. Slessor, 8–9.
46. Slessor, 9.
47. Slessor, 10.
48. Slessor, 62.
49. Slessor, 82–83.
50. Slessor, 84–85.
51. Slessor, 85.
52. Meilinger, *Airmen and Air Theory*, 123–24; and Meilinger, "Trenchard, Slessor," 61–66.

Chapter 7

Dreams Fulfilled?

American Airpower in World War II's European Theater

If the First World War signaled airpower's promise as a weapon of war, the Second World War fulfilled the vision. In every aspect of aerial combat—including strategic bombardment, close air support, battlefield interdiction, air defense, antishipping and antisubmarine operations, air transport, and air assault via parachutes or gliders—airpower served as a force multiplier and a vital component of the joint, combined-arms campaign waged by the Allies. Although airpower's decisiveness is still subject to debate, air superiority proved a fundamental prerequisite for successful land, sea, or air operations.

On 1 September 1939, Adolf Hitler's Nazi regime launched a massive assault on Poland that opened the greatest war in history. Massed armor, mechanized infantry, and air attacks overwhelmed brave, but outdated, Polish defenses and spawned a new term by Western newsmen, "blitzkrieg," or "lightning war." The German air force, the Luftwaffe, employed Messerschmitt Bf-109 fighters to gain air superiority; Heinkel He-111 and Dornier Do-17 twin-engine bombers to pound Poland's capital city, Warsaw; and Junkers Ju-87 Stuka dive bombers to attack Polish ground forces and terrorize refugees. Headed by Hermann Göring, the Luftwaffe emphasized speed and concentration of forces to defeat the enemy psychologically as well as militarily.[1]

After Poland's fall and a strange lull in the action known derisively as the "Sitzkrieg," the powerful Luftwaffe again demonstrated airpower's increased effectiveness. In April 1940, German forces surprised neutral Denmark and Norway, where Luftwaffe aircraft inflicted significant losses on Britain's Royal Navy, protected inferior German naval forces, and airlifted German troops to key Norwegian airfields. A month later, Hitler's forces invaded the Netherlands and Belgium. The speed of the German advance and the ruthlessness of the Luftwaffe's terror bombing of Rotterdam shocked the West. German paratroopers and glider forces surprised and silenced Belgium's famed Eban Emael fortress, considered the strongest in Europe. When German forces turned to France, the Luftwaffe gained air superiority, masked the surprise move of German panzers (tanks)

through the Ardennes forest, and hindered Allied attempts to rally. Although in some ways auxiliary to German armored forces, Luftwaffe attacks crushed the French will to fight. In overall terms, blitzkrieg revolutionized the tempo of war and airpower proved a primary tactical and psychological component.[2]

After the defeat of France in June 1940, the victorious Luftwaffe faced Britain's Royal Air Force in the Battle of Britain, the first all-air campaign in history. On paper, *Reichsmarschall* Hermann Göring's Luftwaffe appeared to have a decisive edge with 1,131 medium bombers, 316 dive bombers, 809 single-engine fighters, 282 twin-engine fighters, and 50 long-range reconnaissance aircraft manned by experienced, successful, and confident crews. Opposing them, Air Marshal Sir Hugh Dowding's Fighter Command assembled 462 Hawker Hurricanes, a dependable, rugged aircraft suited for attacking bombers; and 279 Supermarine Spitfires, a graceful fighter equal to German Messerschmitts.[3]

Despite the apparent mismatch, a closer look revealed serious weaknesses in the German air force. Although successful in its previous campaigns, substantial losses had eroded Luftwaffe strength; in particular, the forces in France badly needed rest and refitting. Equally significant, German training, equipment, and experience proved ill-suited for a long-range strategic air campaign. Although the Messerschmitt Bf-109 was a superb fighter, its short range limited its combat time and tactical flexibility over England. The long-range Messerschmitt Me-110 proved hopelessly outclassed by RAF Spitfires and Hurricanes. On the other hand, Dowding's Fighter Command had been preparing for a German onslaught since 1937. Taking advantage of Sir Robert Watson-Watt's innovation (known in the US as "RAdio Detection And Ranging" or RADAR), the British created an effective, integrated air defense system. Dowding also utilized a breakthrough in code breaking, known as the Ultra secret, that gave British intelligence forewarning of major attacks and provided invaluable insight on the status of German maintenance and logistics.[4]

Plagued by poor intelligence, Göring and other Luftwaffe leaders committed strategic and tactical errors that led to a battle of attrition won by the RAF. Failing to appreciate the value of British radar stations, the Germans first attacked RAF airfields and then switched to a terror bombing campaign against London. Against German losses of 1,733 aircraft, the RAF lost 915 planes. By 15 September 1940, Hitler postponed indefinitely his planned invasion of Britain. In tribute

to RAF Fighter Command, Prime Minister Winston Churchill stated, "Never in the field of human conflict was so much owed by so many to so few."[5]

The fall of France in June 1940 galvanized President Franklin Delano Roosevelt's resolve to fight Nazi tyranny. Knowing the strong isolationist sentiment of many Americans, Roosevelt turned to airpower as both a deterrent and as a weapon to counter Fascism. In a well-publicized speech, the president called for American industry to build 50,000 military aircraft. Considering that in 1939 the US Army Air Corps numbered roughly 1,800 aircraft and 18,000 personnel, this figure stunned American air leaders and industrialists alike. Eventually American industry proved equal to the task, but aeronautical designs, blueprints, tools, dies, air frames, engines, not to mention factories, skilled workers, and the countless other components of an aviation industry required time to develop. By December 1940, the United States was building aircraft at a rate of only 800 aircraft per month. Fortunately, by 1942 American factories produced 47,800 aircraft; by 1943, 85,900; and by 1944 an astronomical 96,300 planes. In the grand scheme, American industrial production emerged as one of the primary keys to Allied victory in World War II.[6]

To draw additional resources for a total war, President Franklin D. Roosevelt and Congress opened two underutilized sources of talent for the armed forces. In 1940 Congress directed the US Army Air Forces to accept African Americans and provide them flight training. Likewise, on 15 May 1942, President Roosevelt established the Women's Army Auxiliary Corps, later renamed the Women's Army Corps.[7]

Although most African Americans manned segregated labor and general support units, a number entered a flight training center located at the Tuskegee Institute, a small, historically black college in rural Alabama. Under the leadership of Benjamin O. Davis Jr., the Tuskegee Airmen established a reputation for courage and professional excellence. The program trained 673 fighter pilots, 253 medium bomber pilots, and 132 navigators. These airmen formed the core of four fighter squadrons of the 332nd Fighter Group and four medium bomber squadrons of the 477th Bombardment Wing. Active in combat over Italy and Germany, the famed Red Tails destroyed 108.5 enemy aircraft.[8]

Fig. 7. Under the leadership of Benjamin O. Davis Jr., the Tuskegee Airmen earned a reputation for courage and professional excellence. This photo is from mid-1945, and an underwing fuel tank and two of the Mustang's eight .50-caliber machineguns are visible behind the pilots. Although partially blocked by the aviators, the plane appears to be named "Skipper's Darlin'." Courtesy of Dr. Dik Daso, AFHF/National Museum of the US Air Force (NMAF).

After Pearl Harbor, fears of air attacks on the continental United States prompted 6,000 women, known as "Air WACs," to be assigned to air defense centers. As air raid worries subsided, women entered

200 enlisted specialties and female officers served in 60 duty positions, including flying duty.[9]

Stemming from two groups of civilian volunteer pilots, the Women Airforce Service Pilots (WASP) earned respect for impressive wartime service. Led by Jacqueline Cochran, the WASPs flew every type of military aircraft, ferrying new, untried planes from the factory to United States Army Air Forces (USAAF) depots and operational units. Others towed targets for aerial gunner schools and served as flight instructors. By December 1944 when the program was disbanded, 1,074 female pilots flew over 60 million miles and suffered 37 fatalities. Despite their heroic performance in uniform and being subject to military discipline, the WASPs were not formally inducted into the Army Air Forces. Consequently, they lacked access to postwar military recognition, pay, education, and health benefits. Nevertheless, both the Tuskegee Airmen and WASPs pioneered social change, served their country, and established a proud legacy.[10]

Fig. 8. Over a thousand Women Airforce Service Pilots flew every type of aircraft in a variety of missions during the war. This group has completed a ferry mission and walk in front of a worn Boeing B-17 named "Pistol Packin' Mama." Courtesy of NASM.

To manage growing American airpower, a major reorganization created the USAAF that replaced the Air Corps, on 20 June 1941. Gen Henry H. "Hap" Arnold was named Chief of the USAAF and Deputy Chief of Staff to Gen George C. Marshall. At the request of the president, Arnold directed a planning document to guide force requirements and organizational structure. Assigned to the newly established Air War Plans Division of the Air Staff in August 1941, a group of ex-ACTS instructors created a doctrinal blueprint for the conduct of a strategic air campaign against the Axis known as AWPD-1. Led by Lt Col Harold "Hal" George, Maj Laurence Kuter, Maj Kenneth Walker, and Capt Haywood "Possum" Hansell created the conceptual framework for the American air effort in World War II. Reflecting 1930s ACTS doctrine, the plan argued for sufficient forces to destroy the enemy's will and capability to fight through long-range strategic bombardment. To accomplish the air war, AWPD-1 called for 239 combat groups, 26,416 combat aircraft (including 7,500 heavy bombers), 37,051 training planes, 150,000 trained aircrews, and 2.2 million personnel.[11]

American air operations in the European Theater combined strategic bombing by the Eighth and Fifteenth Air Forces and increasingly effective tactical fighters and fighter-bombers of the Ninth and Twelfth Air Forces in an attempt to fulfill AWPD-1's vision. With America's entry into the war in December 1941, the Royal Air Force attempted to persuade the USAAF to switch to night operations like those of RAF Bomber Command. Under Air Marshal Sir Arthur Harris, RAF bombing doctrine evolved to night area bombing of German cities to try to "de-house" German workers. Even though some USAAF officers observed the Battle of Britain firsthand, American leaders remained convinced that the superior range, ceiling, and defensive firepower of the Boeing B-17 would overcome German defenses. To Army Air Force leaders, night area bombing would be ineffective, inefficient, and indiscriminate with regard to civilian casualties. After a tough series of negotiations, the Casablanca Directive of January 1943 inaugurated the Combined Bomber Offensive (CBO) marked by American precision daylight bombing and British night area bombing. Eventually codenamed Operation Pointblank, the CBO threatened the Germans with "round-the-clock" bombing that would overwhelm German defenses.[12]

Flying from bases in England, the Eighth Air Force symbolized the air war against Germany. In February 1942, Brig Gen Ira C. Eaker

established the Eighth Air Force Bomber Command in preparation for the USAAF buildup. Responsible for procuring airfields, building depots, acquiring planes, and training crews, Eaker created the foundation for the fighting force when Maj Gen Carl A. "Tooey" Spaatz assumed command of the "Mighty Eighth" in June 1942. On 17 August 1942, 12 B-17Es of the 97th Bomb Group conducted the first American operational bombing mission. Although the strike against a railroad marshaling yard in Rouen, France, barely penetrated the German defenses and RAF Spitfires escorted the bombers, the mission and a series of others known as the "Freshman Raids" promised hope for the American daylight bombardment strategy.[13]

Fig. 9. During the Combined Bomber Offensive, B-17s flew in a "combat box" formation to increase defensive firepower. All total, 11 aircraft flew in very close proximity with the idea that each bomber's 10, .50-caliber machine guns could cover itself and other bombers. This photo (taken from an aircraft in the rear of the formation) is from a 13 April 1945 mission to bomb Neumünster, Germany. Courtesy of AFHF/NMAF.

Concurrent with the buildup of Eighth Air Force bombing forces in Britain, Operation Torch, the Allied invasion of North Africa on

8 November 1942 revealed the inadequacy of prewar tactical airpower doctrine, organization, training, and equipment. Disparaged by senior USAAF leaders for siphoning off scarce resources for the air campaign against Germany, Mediterranean air operations "tempered the blade" of tactical airpower by providing lessons in leadership, tactics, and combat experience. For an inexperienced Air Force, doctrine not only served to "get everyone on the same page" for coordinating actions but also taught new leaders how to fight, combining theory with experience.[14]

Fig. 10. Lt Gen Carl A. Spaatz (foreground, standing) and Gen Henry H. "Hap" Arnold (sitting in staff car). Spaatz commanded a joint, combined air campaign in the Mediterranean and later the overall strategic air campaign in the European Theater of Operations. As commander of the US Army Air Forces, Arnold both managed the vast expansion of American air forces and advocated a strategic air campaign against the Axis foes. Courtesy of Dr. Dik Daso/AFHF.

Contemporary air doctrine identified five functions critical to tactical airpower: counterair, CAS, air interdiction, tactical air reconnaissance, and tactical airlift. The North African air campaign contributed vital lessons in each area. In the eyes of Carl A. Spaatz, the senior US airman in the Mediterranean theater, the prerequisite for all functions was winning air superiority. In the initial months of the campaign (November 1942–February 1943), Spaatz struggled with building logistical infrastructure, airfields, on-the-job combat training, and air leadership issues. He proved a master of organizational skill, adept at identifying the heart of a problem and skilled at both articulating solutions and convincing superiors of their value. Spaatz wrestled with novice pilots, maintainers, and leaders against a professional, experienced foe.[15]

Operationally the USAAF's Twelfth Air Force's greatest success emerged in interdicting Axis supplies. British and American airmen exploited enemy vulnerabilities in the form of limited port and airfield facilities, constricted supply lines, inadequate shipping and transport aircraft, and high operations tempo. By the end of the North African campaign, Spaatz and American airmen joined Air Chief Marshal Sir Arthur Tedder and RAF air leaders to form a functional joint (army, navy, and air force) coalition (British, Commonwealth, Free French, and American) team while placating powerful personalities, including the mercurial George S. Patton and Bernard L. Montgomery. Moreover, the Allies exploited two important advantages: superior numbers and the breaking of German codes (the Ultra secret) that provided invaluable intelligence information.[16]

Although Mediterranean air forces never fully solved the challenges of close air support, Spaatz and other American leaders learned from the British CAS experience and issued Field Manual (FM) 100–20, *Command and Employment of Air Power* (21 July 1943), which captured hard-fought doctrinal lessons. The new doctrine recognized airpower as a flexible theater asset best commanded by a single air commander and employed as a concentrated, offensive strike force not dispersed among ground commanders. In contrast to earlier air ground-support doctrine, FM 100–20 proclaimed air forces as coequal and independent of ground forces and stated that winning air superiority was "the first prerequisite" for success in major land operations. Significantly, Spaatz both captured the lessons of North Africa and convinced General Eisenhower and other senior leaders. In

tone as well as substance, FM 100–20 served as a foundation for eventual air force independence.[17]

Three disastrous missions in the late summer and fall of 1943 demonstrated the flaws of USAAF strategic bombing theories. Eager to strike Hitler's oil supply, 177 North Africa–based Consolidated B-24 Liberators attacked oil refineries at Ploesti, Romania, on 1 August 1943. The raid required a 2,700-mile flight—with much of it low-level to avoid radar detection—accurate open-water navigation, good weather, and surprise to be successful, because Ploesti was one of the most heavily defended targets in Europe. Unfortunately, a combination of bad weather, human error, and bad luck scattered the bomber formations and resulted in a hellish nightmare for the surviving crews. As the carefully prepared plan imploded, ragged packs of bombers improvised and struck targets of opportunity at tree-top level in the face of determined fighter opposition and hundreds of antiaircraft guns. The attacking force lost 54 B-24s, 41 of them in combat. Of the 177 aircraft, only 30 emerged unscathed. Moreover, the results were disappointing. Although the strike reduced oil-refining capacity by 40 percent and knocked out some refineries for four to six months, within a few days unused facilities opened (since the complex had never operated at full capacity), largely negating the raid's impact.[18]

After finally assembling enough trained crews to strike deep into Germany, Eighth Air Force planners targeted German ball-bearing factories in an effort to destroy a vital center in the enemy's industrial web. They devised an ambitious double raid upon the Messerschmitt aircraft factory at Regensburg and the top-priority Schweinfurt ball-bearing plants. The plan called for a wave of the 3rd Air Division to fight through German fighters and hit Regensburg and then surprise the enemy by proceeding to North Africa to land. Thirty minutes later, a second bomber wave would strike Schweinfurt while German fighters were on the ground rearming and refueling. On 17 August 1943, Brig Gen Curtis E. LeMay's 3rd Air Division launched the first wave. Unfortunately, thick fog delayed the second wave and prevented fighter escorts from taking off. When the fog lifted, almost the entire German fighter force pounced upon the ill-fated 1st Air Division. Eighth Air Force staggered with the loss of 60 out of the 361 B-17s and 600 trained air crewmen, more casualties in one day than the previous six months. To make matters worse, although the Regens-

burg strike was relatively successful, the Schweinfurt ball-bearing plants required reattack.[19]

Known as "Black Thursday," the 14 October 1943 mission against Schweinfurt effectively ended the USAAF's unescorted bombing campaign. Determined to destroy the top-priority target, General Eaker ordered 291 B-17s back into the gauntlet of German fighters. This time, bombing accuracy improved significantly and the mission severely damaged the factories, but another 60 bombers were shot down, seven more were destroyed upon landing in England, and 138 B-17s suffered battle damage. The Eighth Air Force could not sustain further losses of this magnitude.[20]

Fortunately, over the winter of 1943–1944, a series of technological and production breakthroughs reversed the course of the air campaign. Before the war and during the initial campaigns, effective long-range escort fighters appeared to be a technological impossibility. To carry the fuel necessary for long-range flight, fighters required at least twin engines, but the increased size sacrificed speed and maneuverability, as shown by the ill-fated Messerschmitt Me-110 in the Battle of Britain. The long-range Lockheed P-38 Lightning offered a partial solution, but unfortunately the P-38's performance lagged at high altitudes. In mid-1943, the USAAF introduced 75-gallon and later 108-gallon drop tanks that pushed the combat radius of the Republic P-47 Thunderbolt fighter from 175 miles to 280 miles and 325 miles respectively. The extended range of P-47s proved an important step but still only a partial answer to the escort problem.[21]

The advent of the North American P-51 Mustang revolutionized the air war over Europe. Designed in only 117 days during the spring of 1940 before America's entry into the war, the North American Company intended the Mustang to supplement the RAF's Spitfire. Initially equipped with an Allison engine, the P-51's performance proved inadequate; however, when the Spitfire's Rolls-Royce Merlin engine replaced the original power plant, the results stunned Allied aviators. With a 440-mph top speed, the P-51B was faster than and could outturn and outdive the latest models of Me-109 and the new Focke-Wulf FW-190. With a basic range of 500 miles and an augmented range of 850 miles, the Mustang could even outrange a B-17 with normal payload. First introduced into Europe in December 1943, the P-51 had to wait until late February 1944 before weather permitted full flight operations. Sound engineering, ingenuity, and

luck had produced a technological marvel: a plane with a bomber's range and a fighter's performance.[22]

The P-47 and P-51 team seized air superiority from the Luftwaffe in the spring of 1944. Complementing the technological improvements, Allied factories poured out large numbers of new aircraft and stateside training bases mass-produced well-trained air crews. At the helm of the Eighth Air Force Fighter Command, Brig Gen William E. Kepner maximized his advantage by introducing new tactics. No longer would fighters be required to "stick to the bombers"; Kepner encouraged his fighters' aggressiveness and ingenuity. Numerical superiority permitted fighter sweeps and aggressive scouting; superior range allowed the strafing of German airfields and attacking targets of opportunity on the ground.[23]

Armed with new aircraft, tactics, and superior numbers, Generals Spaatz, Doolittle, and Kepner launched Operation Argument with the objective of winning air superiority and crippling Germany's aircraft industry. Between 20 and 25 February 1944, the Eighth Air Force flew 3,300 heavy bomber sorties, the Fifteenth Air Force added 500 missions from Italy, and RAF Bomber Command flew 2,750 night attacks aimed at German aircraft manufacturing plants; protecting the American daylight bombers were nearly 4,000 fighter sorties. At a cost of 226 American bombers, 114 British heavies, and 41 USAAF fighters, Operation Argument, better known as "Big Week," broke the Luftwaffe's back by destroying 355 fighters, damaging 155, and killing 400 German fighter pilots. Although the Luftwaffe eventually replaced aircraft losses, it could not replace the 2,262 experienced pilots killed in the five months preceding D-Day, the invasion of Normandy.[24]

By 6 June 1944, Allied air forces dominated the skies of Europe. On the first day of the invasion, the Allies directed 8,722 USAAF and 5,676 RAF sorties against German defenses in France. In response, the once-vaunted Luftwaffe could only send fewer than 100 sorties in opposition. In essence, American and British air forces won where the Luftwaffe had lost; Allied bombers and fighters trumped the German integrated air defense network in contrast to the Luftwaffe's experience in the Battle of Britain.[25]

The CBO devastated Germany after the Normandy invasion. Approximately 75 percent of the CBO's 1.5 million tons of bombs were dropped after June 1944. In contrast to the horrific losses experienced at Schweinfurt, Regensburg, and Ploesti in 1943, American losses fell

to acceptable rates. By 1945, some raids reported negligible losses: 1 bomber lost out of 1,094 sent to Kassel, 5 out of 1,310 at Chemnitz/Magdeburg, and 0 out of 1,219 at Nuremburg. The numerical preponderance of the Allies even crushed a German edge in fighter technology when the Luftwaffe introduced the Messerschmitt Me-262 jet fighter in July 1944. At its peak, the USAAF and RAF massed 7,904 heavy bombers in the theater and 28,000 combat planes total. By 16 April 1945, General Spaatz declared the strategic air war against Germany closed as Allied ground forces ran rampant over Germany and all significant targets were considered destroyed.[26]

The CBO constituted the longest, bloodiest, and greatest sustained air campaign in history. From 1942 to 1945, the British lost 22,000 aircraft and 79,281 airmen, and Americans lost 18,000 planes and 79,265 men killed in air action. The Allies flew 1,693,565 combat sorties and dropped 1,554,463 tons of bombs that killed an estimated 300,000 Germans, wounded 780,000, and destroyed 3,600,000 buildings, 20 percent of the nation's total. Although horrible in its destruction and lamentable in its many casualties among civilians, airpower emerged as the dominant weapon in Western Europe during World War II.[27]

Summary

The CBO waged by American daylight precision bombing and British night area raids against Germany in World War II comprised the greatest air campaign in history. Although perhaps not decisive, the Allied air assault proved vital to victory by significantly reducing German industrial production, destroying the Luftwaffe, and diverting scarce enemy resources. Despite tremendous sacrifices in a new form of attritional warfare, Allied bombing forced the Germans to convert air forces from offense to defense, matched Allied strength to enemy weakness, and denied the Axis the economic sanctuary enjoyed by the Allies. The CBO bestowed a heritage of sacrifice, valor, and success to the US Air Force. Although overshadowed by the CBO, North African and Mediterranean air operations established the foundations for combined arms, joint service, and coalition operations. FM 100–20 proved pivotal in recognizing air's contribution to land operations and that centralized control of air assets by a single

air commander optimized the concentrated, offensive airpower made possible by air superiority.

Notes

1. Three books provide excellent insights into World War II's European air war in general and the Luftwaffe in particular: Overy, *The Air War, 1939–1945*; Murray, *Luftwaffe*, which is a revised edition of his *Strategy for Defeat: The Luftwaffe, 1933–1945*; and Corum, *The Luftwaffe: Creating Operational Air War, 1918–1940*.

2. As the previous chapter mentioned, the Luftwaffe's "operational air war" doctrine was more sophisticated than the flying artillery aspect suggested by the popular term blitzkrieg. However, since most general accounts use blitzkrieg, this text will surrender and accommodate instead of arguing the point. Overy, "Air Power, Armies, and the War in the West, 1940," 1–17; Overy, *Air War*, 87–98; and Murray, *Luftwaffe,* 28–43.

3. Williamson Murray will point out that these numbers are deceptive "paper" figures of total aircraft. The number actually in commission and ready to fly was significantly less. For example, on 1 July 1940, Murray cites that only 347 of 462 Hurricanes (75 percent) and 191 of 279 Spitfires (68 percent) were in commission. Likewise, Luftwaffe in-commission rates varied from 68 to 81 percent in commission depending on type of aircraft. Murray, *Luftwaffe*, 50; and Overy, *Air War*, 98–108. See Murray, *Luftwaffe*, 43–58, for detailed tables of aircraft, in commission rates, pilot losses, and aircraft production.

4. Murray, *Luftwaffe*, 43–58; and Overy, *Air War*, 98–108. See also Overy, *The Battle of Britain: The Myth and Reality*; and Smith, "Britain, Battle of," 158–63, for good overviews of this famous air campaign.

5. Murray, *Luftwaffe*, 43–58; and Overy, *Air War*, 98–108. For the text of Winston Churchill's speech to the House of Commons, see International Churchill Society, "1940: The Finest Hour," "The Few, August 20, 1940," https://winstonchurchill.org/.

6. Dick, *Reach and Power*, 143–45, 239; Nalty, "Reaction to the War in Europe," 172, 233; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 101; Goldberg, *History of the United States Air Force*, 48, 91–93; Koppes, "USA," 1183; and Overy, *Air War*, 410.

7. Watson, "Building Air Power," 252, 253; and Mitchell, *Air Force Officers*, 304–6.

8. During his career, Benjamin O. Davis Jr. advanced to the rank of lieutenant general, and on 9 December 1998, he was promoted to full general. Dick, *Reach and Power*, 158; Watson, "Building Air Power," 252; and Mitchell, *Air Force Officers*, 324–27.

9. Watson, "Building Air Power," 253.

10. Dick, *Reach and Power*, 157–58; and Watson, "Building Air Power," 251–54.

11. Dick, *Reach and Power*, 145–47; Nalty, "Reaction to the War in Europe," 233–34; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 108–14; Goldberg, *History of the United States Air Force*, 48–49; Faber, "Interwar US Army Aviation and the Air Corps Tactical School," 224–25; Greer, *Development of Air Doctrine in the Army Air Arm*, 110, 123–26; Hansell, *Strategic Air War against Germany and Japan*, 29–41; and Clodfelter, *Beneficial Bombing*, 98–102. See also Gaston, *Planning the American Air War.*

12. Dick, *Reach and Power*, 194–95; Nalty, "Defeat of Italy and Germany," 275, 281; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 149–50; Goldberg, *History of the United States Air Force*, 57, 60; and McFarland and Newton, "American Strategic Air Offensive," 188–93.

13. Dick, *Reach and Power*, 181–83; Nalty, "Army Air Forces in Desperate Battle," 224, 227; and MacFarland and Newton, "American Strategic Air Offensive," 185, 188.

14. Air historian Richard G. Davis begins his work with a definition of temper: "to make stronger and more resilient through hardship: to put in tune with something." I copied this astute observation. Davis, "Tempering the Blade," iii, 4–16. A revised and expanded version of this study appears as Davis, *Carl A. Spaatz and the Air War in Europe*, 123–224.

15. To emphasize the USAAF's lack of experience, even though Eisenhower selected Spaatz to serve in the Mediterranean based on his aviation background, Spaatz later admitted, "I was a brand-new Air Force commander, and I had never commanded anything bigger than about a flight prior to that time." Davis, "Tempering the Blade," 18.

16. During the campaign, Allied airpower endured a number of organizational schemes and commanders. In January 1943, air forces were organized into the Allied Air Force (Maj Gen Carl A. Spaatz) with the Twelfth Air Force (Brig Gen James H. Doolittle) and the RAF's Eastern Air Command (Air Marshal William Welsh). Within a month, an Allied Air Support Command (Brig Gen Laurence A. Kuter) was added to address CAS shortcomings. Eventually, Air Chief Marshal Arthur Tedder led the Mediterranean Air Command with subordinate components: Northwest African Air Forces (Lt Gen Carl Spaatz), Malta Air Command (Air Vice Marshal Keith Park), and Middle East Command (Air Chief Marshal Sir W. Sholto Douglas). Davis, "Tempering the Blade," 68, 72, 78.

17. Davis, "Tempering the Blade," 108–20; and Davis, *Carl A. Spaatz*, 210–20. For a broader study of the Mediterranean air war's strategic and conceptual impact, see Ehlers, *The Mediterranean Air War: Airpower and Allied Victory in World War II.*

18. Dick, *Reach and Power*, 196–98; Nalty, "Defeat of Italy and Germany," 292–94; Goldberg, *History of the United States Air Force*, 64–65; MacFarland and Newton, "American Strategic Air Offensive," 197–98; Dear, "Ploesti," in *Oxford Companion to World War II*, 890; and Jablonski, *Airwar*, vol. 2, 155–72.

19. Dick, *Reach and Power*, 198, 202, 204–5; Nalty, "Defeat of Italy and Germany," 284–87; Goldberg, *History of the United States Air Force*, 65–66; MacFarland and Newton, "American Strategic Air Offensive," 197–98; Emerson, "Operation POINTBLANK: A Tale of Bombers and Fighters," 442–43, 458–59; Dear, "Schweinfurt Raids," in *Oxford Companion to World War II*, 983–84; Murray, *Luftwaffe*, 167–68; and Jablonski, *Airwar*, vol. 2, 173–83. See also Coffey, *Decision Over Schweinfurt.*

20. Dick, *Reach and Power*, 205; Nalty, "Defeat of Italy and Germany," 287; Goldberg, *History of the United States Air Force*, 66; MacFarland and Newton, "American Strategic Air Offensive," 201; Emerson, "Operation POINTBLANK," 442, 444–46; McFarland, *Concise History of the U.S. Air Force*, 27; and Jablonski, *Airwar*, vol. 2, 183–92.

21. Dick, *Reach and Power*, 210; Nalty, "Defeat of Italy and Germany," 288; Goldberg, *History of the United States Air Force*, 66; MacFarland and Newton, "American Strategic Air Offensive," 204, 208–11; Emerson, "Operation POINTBLANK," 460, 462–64; and Wagner, *American Combat Planes*, 226–37.

22. Dick, *Reach and Power*, 211–13; Nalty, "Defeat of Italy and Germany," 299–300; Goldberg, *History of the United States Air Force*, 66; MacFarland and Newton, "American Strategic Air Offensive," 210–11; Emerson, "Operation POINTBLANK," 464–67; Futrell, *Ideas, Concepts, Doctrine,* vol. 1, 153; and Wagner, *American Combat Planes*, 229–30.

23. Dick, *Reach and Power*, 213, 215; Goldberg, *History of the United States Air Force*, 66; MacFarland and Newton, "American Strategic Air Offensive," 211–12; Em-

erson, "Operation POINTBLANK," 467–68; McFarland, *Concise History*, 27; and Henry, "William E. Kepner: All the Way to Berlin," 164–72.

24. Dick, *Reach and Power*, 215, 219; Nalty, "Defeat of Italy and Germany," 300–2; Goldberg, *History of the United States Air Force*, 66; MacFarland and Phillips, "American Strategic Air Offensive," 212–16; Emerson, "Operation POINTBLANK," 446–48; Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 153–54; and Overy, *Air War*, 220.

25. Dick, *Reach and Power*, 221, 224, 226–28; Nalty, "Defeat of Italy and Germany," 308; Goldberg, *History of the United States Air Force*, 67–69; MacFarland and Newton, "American Strategic Air Offensive," 222; and Emerson, "Operation POINTBLANK," 469.

26. Dick, *Reach and Power*, 234–35, 238; Nalty, "Defeat of Italy and Germany," 317; Goldberg, *History of the United States Air Force*, 72; and MacFarland and Newton, "American Strategic Air Offensive," 232.

27. *United States Strategic Bombing Surveys: Summary Report (European War),* 5–6; and Dick, *Reach and Power*, 238.

Chapter 8

An Evolutionary Revolution?

Naval Aviation and the Pacific Air War

In contrast to Giulio Douhet's and Billy Mitchell's quests for a revolution in air warfare, the rise of naval aviation in the interwar period (1919–1941) offers an incremental, evolutionary approach with revolutionary results. Both Mitchell's determined opponent and a clever opportunist who exploited Mitchell's arguments, Rear Adm William A. Moffett deserves the title "Father of Naval Aviation"; he worked within the US Navy hierarchy to create a large, effective naval air arm largely prepared for the challenges of World War II. In other words, while Moffett deserves credit for skillfully working within the Navy's structure and congressional limitations, his effectiveness owes a debt to Mitchell's "threat" of an alternative, independent air force that pushed the Navy's conservative leadership to authorize Moffett's progressive ideas. Moffett also benefits from a confluence of political, economic, technological, and educational developments that enhanced his evolutionary approach.[1]

In an ironic way, American naval aviation benefited from pacifist, antiwar sentiments that followed World War I. The Washington Naval Conference of 1921–1922 produced a series of agreements shaped by the public's desire for peace after the cataclysm of World War I. In them, American and British diplomats hoped to avoid an Anglo-American naval race like the disastrous Anglo-German naval rivalry that contributed to the Great War. They also sought a means to both accommodate and check an ascendant Japan (and for the Americans a way to undermine a long-standing Anglo-Japanese naval alliance). Perhaps most important, leaders explored a politically astute way to reduce naval budgets for an economically exhausted Britain and a fiscally conservative United States not yet ready for the cost of great power status.[2]

The most famous of the Washington Naval Conference's naval limitations treaties, the Five-Power Treaty, imposed significant limits on the size of battleship fleets but opened the door for modern American aircraft carriers. The treaty limited the capital ships (defined as battleships and battle cruisers) for the major powers (500,000 tons for the United States and Britain, 300,000 tons for Japan, and 175,000

tons for France and Italy) and mandated a 10-year "holiday" on battleship construction. An associated agreement authorized the major powers 175,000 tons for aircraft carriers and permitted the United States to convert the USS *Lexington* and USS *Saratoga*, battle cruisers already under construction, into aircraft carriers. Thus, a political agreement halted funding for additional battleships and allowed the US Navy to build the largest, best aircraft carriers in the world.[3]

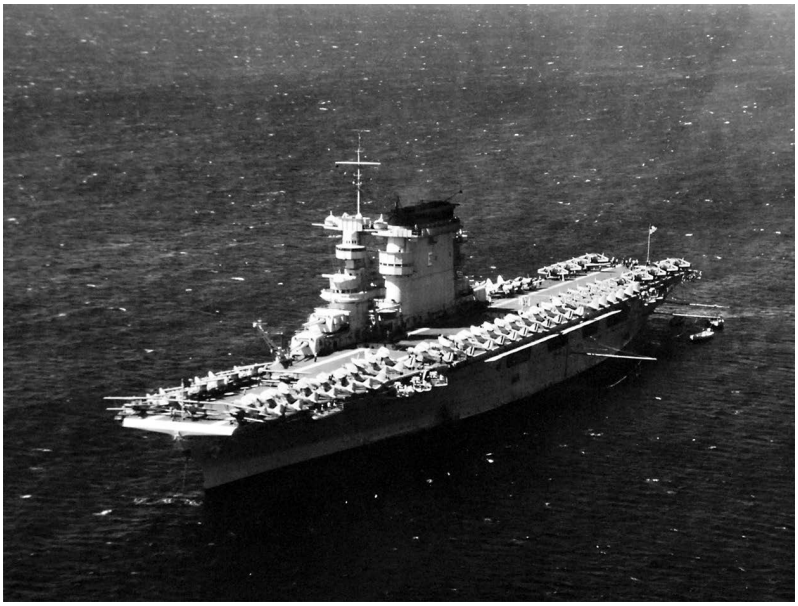


Fig. 11. When commissioned in 1927, the USS *Lexington* joined the USS *Saratoga* as the largest, best aircraft carriers in the world and provided able platforms to test concepts in naval aviation. Its decks are filled with 23 biplane fighters in the foredeck, 12 Dauntless dive bombers with folded wings mid-deck, and 10 other aircraft aft-deck. Courtesy of Naval History and Heritage Command/National Museum of the US Navy.

At roughly the same time, Billy Mitchell's celebrated 1921 *Ostfriesland* bombing tests spurred the US Navy to create the Bureau of Aeronautics, an organization that served as the focal point for naval aviation development. In July 1921, the Navy appointed William A. Moffett to lead the new organization. Well-liked and respected by the Navy's establishment for his quiet manner and organizational skill, Moffett proved tireless, inspired, and shrewd in his efforts to produce an effective fleet air arm. Moffett's service background uniquely pre-

pared him to build, manage, and promote a large organization. His leadership experience included command of sail and steam sloops, coastal monitors, riverine gunboats, ocean-going cruisers, and both predreadnought and dreadnought battleships. His traditional command experience endeared him to the conservative "Gun Club" naval establishment, yet the diversity of his career opened his mind to technological potential, having seen the transition from sail to steam, coal to oil, and coastal craft to blue-water, ocean-going vessels.

Moreover, Moffett's command of the Great Lakes Naval Training Station near Chicago during World War I honed the administrative and organizational skills needed for directing large-scale endeavors. He also developed considerable political acumen working with powerful Chicago politicians and cultivating influential congressional allies. By the mid-1920s, Moffett outmaneuvered opponents within the Navy who sought to replace him as bureau chief by using his powerful political connections to secure congressional funding in an era of tight budgets. In his three four-year appointments as Bureau of Aeronautics chief, Moffett mastered the art of the politically possible. His measured, factual, reasoned congressional testimony compared favored favorably to Mitchell's sensational, headline-grabbing claims. Furthermore, in a brilliant move, Moffett sponsored a 10-flight, hands-on observer course for Navy commanders and captains that taught the fundamentals of air navigation, radio operation, target spotting, and reporting. Not only did this spread aviation understanding, but it also created a cadre of aviation enthusiasts within the senior ranks that included such notables as Ernest J. King and William "Bull" Halsey.[4]

Contributing to Moffett's effectiveness, the US Navy focused on the strategic threat posed by a rising, militaristic Japan. Again, the Washington Naval Conference of 1921–1922 contributed by prohibiting the construction of defensive fortifications on former German Pacific island possessions gained by the US and Japan after World War I as well as US-administered territory in the Philippines. US defense planners worried about the Japanese threat to US territories and developed War Plan Orange that explored ideas to defend and, if necessary, retake them. Navy planners studied the strategic, operational, tactical, and logistical problems associated with the vast Pacific Theater. Although the core of War Plan Orange centered on a Mahanian naval battle between battleship fleets, Moffett's Naval Aeronautical Bureau promoted naval air as the eyes of the fleet.[5]

Fig. 12. Exploiting the organizational challenge posed by Billy Mitchell, Rear Adm. William A. Moffett proved a shrewd, able administrator and advocate for naval aviation and qualified to fly as a naval observer at age 53. Courtesy of US Naval Institute.

Two decades of War Plan Orange planning highlighted the geographic realities that reinforced the usefulness of naval air. First, the size of the theater eclipsed the limited range of existing land-based aircraft. To retake the Philippines, assumed to be lost to the Japanese, the Navy would have to bring its own air support via aircraft carriers. Second, the great distance from the continental United States dictated a step-by-step, incremental advance across the Pacific with islands serving as bases for fuel, water, food, and other support needs, including air bases. Finally, from 1923 to 1940, 21 major fleet exercises tested War Plan Orange concepts and allowed thinkers to probe new technological potential—not just air, but submarines and amphibious operations as well. These fleet exercises honed naval air reconnaissance and gunfire spotting and suggested the carrier's potential as a long-range strike force. For example, the 1929 Fleet Exercise IX featured an aircraft carrier attack on the Panama Canal, and in 1932, Grand Joint Exercise No. 4 caused Army defenders to protest a

Navy carrier task force surprise attack on the Hawaiian island of Oahu on an early Sunday morning.[6]

War planning and fleet exercises pushed Navy conceptual thinking, doctrinal development, technological innovation, and practical tactical adaptations. Whereas Naval War College map exercises tested decision-making and logistical awareness, by the mid-1930s realistic fleet exercises practiced radio-silent tactics, night and bad weather operations, carrier task force organization, and the nuts and bolts of flying aircraft from ships. With the Bureau of Aeronautics providing top cover, naval aviators and technical experts developed catapults to launch aircraft, arresting cables to recover them, radio-aids-to-navigation, signaling equipment, air-to-air and air-to-ship radios, scout planes for battleships, seaplanes, and ship-to-ship refueling. These small-scale yet vital innovations transformed naval aviation from theory to a war-fighting tool.[7]

On the eve of World War II, the US Navy was well prepared to meet the challenges of the Pacific War. Although doctrinally wedded to the battle line, the US Navy possessed a potent carrier strike force with modern, if not first-rate, aircraft, skilled pilots practiced in perilous carrier flight operations, a fleet train of logistical support vessels capable of sustained operations, and a cadre of air-oriented naval officers. Conceptual focus by planners and the Naval War College on War Plan Orange and numerous fleet exercises led to both sound strategy and practical solutions to the myriad problems posed by maritime war over a vast ocean. At the heart of the Navy's preparation, William A. Moffett's astute, able leadership of the Bureau of Aeronautics proved a model of effective evolutionary change. Moffett's naval air organization possessed the equipment, expertise, and imagination to meet the revolutionary challenge presented when Japanese naval air destroyed battleship row at Pearl Harbor.

Air War in the Pacific

Like World War I's Lafayette Escadrille, America's first combat experience in the Pacific Theater of World War II occurred before a declaration of war. In early 1941, Claire Lee Chennault, an ex-ACTS instructor and a prewar fighter advocate, organized the American Volunteer Group, popularly known as the "Flying Tigers," to aid Nationalist China against Japanese invaders. Famous for painted shark's

teeth on their Curtiss P-40 Warhawks, the Flying Tigers claimed an impressive 286 victories against 12 pilots lost in action before being disbanded in July 1942.[8]

On 7 December 1941, "a day which will live in infamy," Japanese naval airpower dealt a devastating blow to the US Pacific fleet at Pearl Harbor. Two waves of 350 Japanese aircraft sank or heavily damaged all eight US battleships. Overly worried over the prospect of sabotage, the US Army ground commander ordered USAAF aircraft parked in tight rows that made prime targets for Japanese aviators. To make matters worse, a few hours later, Japanese forces caught US aircraft on the ground refueling in the Philippines and destroyed B-17s and assorted fighters at Clark Air Base.[9]

As Japanese forces appeared invincible during the first six months of 1942, President Roosevelt desperately wanted an offensive strike against the Japanese home islands to boost sagging morale. On 18 April 1942, Lt Col James "Jimmy" Doolittle answered the call when 16 North American B-25 Mitchell medium bombers took off from the carrier USS *Hornet.* The aircraft dropped bombs on various targets over Tokyo, Kobe, and Nagoya before crews bailed out or crashed landed in China (although one aircraft landed undamaged near Vladivostok, where the Soviets interned the plane and crew). Even though the Doolittle Raid inflicted little damage, the gesture shocked Japanese military and naval leaders and cheered the American public. Upon his return to the United States in May 1942, Jimmy Doolittle received both the Medal of Honor and promotion to brigadier general.[10]

Naval aviation played a vital role in the Pacific War. Under the leadership of such famous leaders as Admirals Chester Nimitz, Frank Jack Fletcher, Raymond Spruance, and William "Bull" Halsey, US carrier aviation achieved fame and proved the value of naval airpower. The Battle of Coral Sea, fought 4–8 May 1942, marked the first naval battle fought entirely by air. At the epic Battle of Midway on 4 June 1942, US Navy pilots sank four Japanese carriers and turned the tide of the war in the Pacific. Although carrier-based aviation proved Billy Mitchell wrong about the value of navies in war, it demonstrated his claims of battleship obsolescence.[11]

The primary USAAF contribution to the Pacific counterattack occurred under the Fifth Air Force attached to Gen Douglas MacArthur's Southwest Pacific Theater. While Admiral Nimitz's carrier task forces struck from the Central Pacific, MacArthur's command thrust across New Guinea toward the Philippines. The Fifth Air Force suf-

fered from primitive bases, extreme conditions, second-string aircraft, a 10,000-mile supply chain, and a low priority for equipment, fuel, and personnel due to a "Europe First" strategy.

In July 1942, Maj Gen George C. Kenney assumed command of the Fifth Air Force and eventually earned praise as one of the most gifted combat commanders in Air Force history. A dynamic "people person," Kenney inspired the inventiveness and creativity of his subordinates. In a theater where range dominated employment decisions, Kenney sought the twin-engine Lockheed P-38 Lightning and backed locally developed 150-gallon drop tanks. Kenney also encouraged an ingenious subordinate, Maj Paul "Pappy" Gunn, who mounted four .50-caliber machine guns in the nose of A-20 and B-25 aircraft, creating deadly attack planes. Other Fifth Air Force innovations included attaching parachutes to fragmentation bombs and low-level "skip" bombing techniques. Fostering an aggressive, innovative fighting spirit, Kenney maximized the combat power of his resource-poor command.[12]

Even lower in priority than Kenney's Fifth Air Force, Allied forces in the China-Burma-India (CBI) Theater faced almost insurmountable logistical challenges at the end of the war's longest supply chain. Called to transport vital supplies across the mighty Himalaya mountains, Air Transport Command crews piloting C-46s and C-47s braved perilous flying conditions as they delivered 650,000 tons of supplies to Chinese and American forces. Although unheralded, flying the "Hump" was among the most hazardous military air operations of World War II and showed the potential of military airlift. Furthermore, the perilous operations demonstrated the American commitment to the Nationalist Chinese government and provided vital supplies to Chinese troops who tied down the bulk of the Imperial Japanese Army. On a tactical level, the architect of the enterprise, Brig Gen William H. Tunner, developed many of the maintenance and cargo-handling techniques that would prove their value in the Cold War's Berlin Airlift.[13]

As Allied soldiers, sailors, and marines pushed back the borders of the Japanese empire, airmen sought to destroy Japan through strategic bombardment. General Arnold and others hoped to avoid a costly land invasion of Japan and clinch victory through airpower alone. In November 1939, Air Corps leaders selected what would become the primary instrument of the campaign, the Boeing XB-29. With a pressurized crew compartment, remotely controlled guns,

and new radial engines, the B-29 promised to be a revolutionary aircraft of unprecedented size and payload capacity. The USAAF ordered 1,664 before the prototype had even flown; unfortunately, the rush to produce the plane quickly led to substantial "teething" problems. Nevertheless, by April 1944, B-29s appeared in the CBI to conduct Operation Matterhorn.[14]

At first, crews of the XX Bomber Command attempted to reproduce the high-altitude daylight precision bombing of USAAF doctrine with disappointing results. Flying from primitive bases in China with logistical staging from India, XX Bomber Command faced significant B-29 engine problems amplified by distance and weather (including encounters with 200-knot headwinds later known as the jet stream). By October 1944, B-29 operations shifted to Saipan and the new XXI Bomber Command, which significantly reduced supply lines. An ex-ACTS instructor, Brig Gen Haywood S. Hansell renewed efforts for a daylight precision bombing campaign but faced additional problems due to a lack of information on Japanese industry. Impatient with slow results, in January 1945 General Arnold replaced Hansell with Maj Gen Curtis E. LeMay, a proven combat commander from Europe.[15]

By March, LeMay drastically altered B-29 tactics. To avoid the jet stream and high-altitude engine problems, LeMay ordered low-altitude night attacks with bombers stripped of defensive machine guns; he also reduced fuel loads and increased bomb loads. Like the RAF, LeMay's B-29s relied on darkness for protection and pummeled enemy cities with incendiary bombs. From March to August 1945, American firebomb raids destroyed 66 Japanese cities and burned 178 square miles of urban landscape. Civilian casualties were severe; in one raid against Tokyo, an estimated 80,000 people perished.[16]

With a successful atomic test on 18 July 1945, the Allied powers issued an ultimatum on 26 July calling for the Japanese government to surrender or suffer "prompt and utter destruction." Specially modified B-29s of the 393rd Bombardment Squadron, a component of the 509th Composite Group, prepared to deliver the first operational atomic bomb. On 6 August 1945, Col Paul W. Tibbets piloted the *Enola Gay*, which dropped a uranium device known as "Little Boy" over Hiroshima. Nearly 5 square miles of the city were destroyed and 80,000 people died, yet no Japanese surrender appeared. Therefore, on 9 August, another B-29, *Bock's Car*, commanded by Maj Charles W. Sweeney, released a plutonium bomb known as "Fat Man" on Na-

gasaki. Partially protected by hilly terrain, the second bomb devastated 1.5 square miles, killed 35,000, and injured 60,000. Faced with a defeated army, decimated navy and air force, burned cities, a declaration of war by the Soviet Union on 8 August, and terrible atomic weapons, the Japanese government surrendered on 14 August 1945.[17]

Fig. 13. Long-range B-29s waged a devastating strategic bombing campaign against Japanese cities to avoid a costly ground invasion. This photo shows a flight of three B-29s on an early 1945 daylight raid, each dropping a string of roughly 50 bombs each; the aircraft belong to the 500th Bomb Group, 73rd Bomb Wing of the 20th Air Force flying from Isley Field, Saipan. Courtesy of AFHF.

To assess the impact of airpower, the Secretary of War established the United States Strategic Bombing Survey, composed of a blue ribbon team comprising 300 civilians, 350 officers, and 500 enlisted men to study the impact of the air war in both theaters. The survey produced over 200 detailed reports that contributed to two overall summary reports. The Pacific War summary report listed five signposts that captured vital lessons learned:

1. Control of the air was essential to the success of every major military operation. . . .

2. Control of the air was not easily achieved, and involved the coordinated application of all the resources of the nation. . . .
3. The limitations of air control deserve special mention. It was never completely possible to deny the air to the enemy. . . .
4. Given air control, there were also limitations as to the specific results which could be achieved . . . by aircraft carrying conventional high-explosive bombs. . . .
5. The experience of the Pacific war supports the findings of the Survey in Europe that heavy, sustained and accurate attack against carefully selected targets is required to produce decisive results when attacking an enemy's sustaining resources. It further supports the findings in Germany that no nation can long survive the free exploitation of air weapons over its homeland . . . .[18]

The Pacific air campaign combined efforts of Navy, Marine, and Army Air Forces in both carrier- or land-based forms. The industrial might of the United States overwhelmed valiant Japanese forces in both technology and numbers. The unique geographic circumstances and immense distances involved made aircraft the preeminent weapon but did not negate the essential contributions of land and naval forces. Finally, the advent of the atomic bomb signaled a new era of conflict where technology provided unmatched lethality and airpower emerged as a uniquely suited means of delivery.

Summary

Spurred by the threat of Billy Mitchell's independent air force removing aircraft from the US Navy, William A. Moffett proved a politically astute, innovative, adept leader who exploited technological and institutional opportunities. Known as the father of naval aviation, Moffett established a sound foundation for aircraft carriers as instruments of naval battle and power projection. He also fostered a culture of innovation marked by systematic, incremental improvements of equipment, tactics, logistical support, operational planning, and strategic awareness. To its credit, the Navy identified a clear strategic threat—Imperial Japan—and wrestled with the challenges posed by distance and geography.

Four lessons marked the Navy's preparation for World War II:

1. Senior naval leaders utilized the US Naval War College to explore broad strategic issues and think through political, geographic, and logistical challenges. Naval planners formed, tested, and revised War Plan Orange over two decades.
2. The 1921–22 Washington Naval Conferences provided an unexpected technological opportunity: converted battlecruisers USS *Lexington* and USS *Saratoga* served as test beds for practical operations and theoretical concepts.
3. Interwar naval commanders conducted regular, large-scale fleet exercises that challenged commanders, crews, equipment, and tactics under realistic, near-combat conditions.
4. With respect to naval and Marine aviation, senior leaders established a culture that inspired pragmatic innovation. Enthusiastic innovators at all levels received support from the chain of command, especially in the development of aircraft carriers.

In total, the Navy emerged from the interwar period prepared for the strategic, operational, and tactical challenges posed by the formidable Japanese armed forces.

The USAAF also faced profound challenges by geography, distance, and climate. Limited aircraft range constrained operations. Supply chain constraints and long lines of communication hampered operations based in remote locations under primitive conditions. Success required perseverance, resourcefulness, and creativity to do more with less. Gen George Kenney's Fifth Air Force in the Southwest Pacific Theater and Brig Gen William Tunner's CBI transport effort over the Hump symbolized an adaptive, can-do organizational culture.

The strategic air offensive against Japan challenged interwar ACTS industrial web theories. High-altitude daylight precision bombing failed to produce necessary results when confronted by navigational challenges, overwater flights, faulty aircraft, and the jet stream. Maj Gen Curtis E. LeMay's innovative switch to low-level, night area bombing delivered incendiaries on target at a terrible cost to Japan's cities. The August 1945 dropping of two atomic bombs forced Japanese capitulation and opened a new era of warfare. In sum, American airpower met the formidable challenges posed by World War II's Pa-

cific Theater through incremental, evolutionary innovations that yielded revolutionary results.

Notes

1. See Reynolds, "William A. Moffett," 292–303, for an outstanding biographical analysis. For a study of the incremental process of naval aviation, see Till, "Adopting the Aircraft Carrier," 191–226.

2. Millett and Maslowski, *For the Common Defense*, 382–84; and Smith, *Carrier Battles: Command Decision in Harm's Way*, 20–21.

3. Millett and Maslowski, *For the Common Defense*, 383; Muller, "Air War in the Pacific," 58; and Smith, *Carrier Battles*, 20.

4. Reynolds, "William A. Moffett," 293–94, 296, 298; and Till, "Adapting the Aircraft Carrier," 210–11.

5. Millett and Maslowski, *For the Common Defense*, 384; and Muller, "Air War in the Pacific," 57–58.

6. Muller, "Air War in the Pacific," 57–58; Reynolds, "William A. Moffett," 301; and Smith, *Carrier Battles*, 21–23.

7. Spector, "Military Effectiveness of the US Armed Forces," 89–90.

8. Dick, *Reach and Power*, 167–71; Perret, *Winged Victory: The Army Air Forces in World War II*, 153–56; and Jablonski, *Airwar*, vol. 2, 48.

9. Dick, *Reach and Power*, 159–64; Nalty, "Army Air Forces in Desperate Battle," 201–3, 209–12; Goldberg, *History of the United States Air Force*, 75–76; Dear, "Pearl Harbor, attack on," *Oxford Companion to World War II*, 870–72; Muller, "Air War in the Pacific," 60–61; and Jablonski, *Airwar*, vol. 2, 3–25.

10. Dick, *Reach and Power*, 171–77; Nalty, "Army Air Forces in Desperate Battle," 217–18; Goldberg, *History of the United States Air Force*, 77; Dear, "Doolittle Raid," *Oxford Companion to World War II*, 309; Muller, "Air War in the Pacific," 62–63; and Jablonski, *Airwar*, vol. 2, 49–72.

11. Spector, *Eagle Against the Sun*, 155–63, 166–78; Jablonski, *Airwar*, vol. 2, 73–108; and Muller, "Air War in the Pacific," 63–65.

12. Dick, *Reach and Power*, 244–52; Nalty, "Army Air Forces in Desperate Battle," 221–22; Nalty, "Victory over Japan," 330–35; Goldberg, *History of the United States Air Force*, 78–81; Muller, "Air War in the Pacific," 66–68; Spector, *Eagle Against the Sun*, 226–27; and Wolk, "George C. Kenney," 134–41.

13. Goldberg, *History of the United States Air Force*, 82–83; Nalty, "Victory over Japan," 336–39; Muller, "Air War in the Pacific," 71; Meilinger, *Airmen and Air Theory*, 65; and Dear, "Hump, the," in *Oxford Companion to World War II*, 548. For a detailed look at how the CBI aerial supply effort fit into Allied strategy, see Plating, *The Hump: America's Strategy for Keeping China in World War II.*

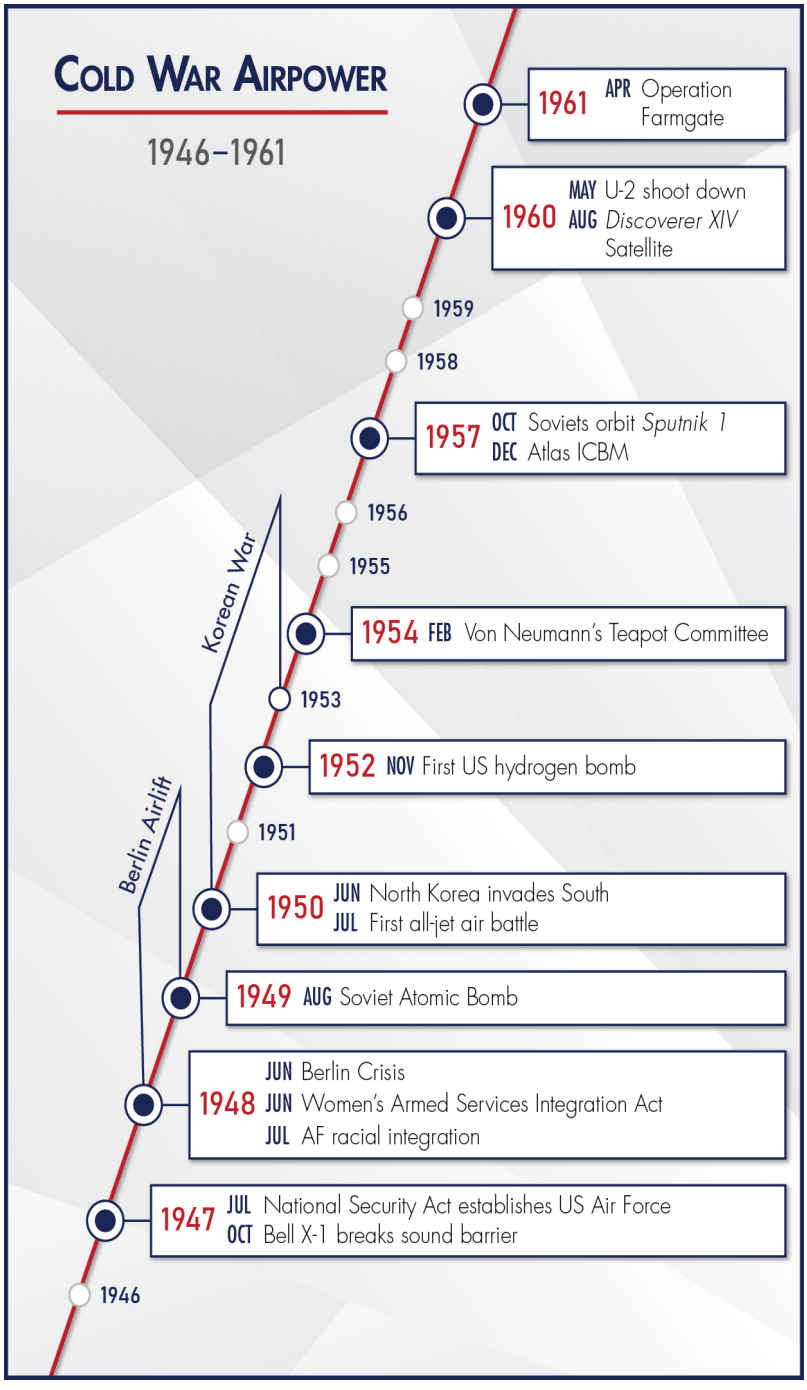
14. Dick, *Reach and Power*, 270–71; Nalty, "Victory over Japan," 341–42; Goldberg, *History of the United States Air Force*, 83–84; Muller, "Air War in the Pacific," 73–74; Coox, "Strategic Bombing in the Pacific," 273–75; Falk, "strategic air offensives," in *Oxford Companion to World War II*, 1076; and Haulman, *Hitting Home: The Air Offensive Against Japan*, 5–7.

15. Dick, *Reach and Power*, 271–74; Nalty, "Victory over Japan," 342–44, 350–52; Goldberg, *History of the United States Air Force*, 84–85; Muller, "Air War in the Pacific," 74–75; Coox, "Strategic Bombing in the Pacific," 275–93; and Haulman, *Hitting Home*, 8–11. See also Hansell, *Strategic Air War against Germany and Japan.*

16. Dick, *Reach and Power*, 274–79; Nalty, "Victory over Japan," 356–59; Goldberg, *History of the United States Air Force*, 86–87; Muller, "Air War in the Pacific," 75–76; Coox, "Strategic Bombing in the Pacific," 311–26, 330–43; Spector, *Eagle Against the Sun*, 493–94, 503–5; *United States Strategic Bombing Survey: Summary Report (Pacific War)*, 83–96; Jablonski, *Airwar*, vol. 4, 160–73; and Haulman, *Hitting Home*, 18–23.

17. Dick, *Reach and Power*, 279–87; Nalty, "Victory over Japan," 360–64; Goldberg, *History of the United States Air Force, 87*; Muller, "Air War in the Pacific," 76–77; Coox, "Strategic Bombing in the Pacific," 351–60; *United States Strategic Bombing Survey: Summary Report (Pacific War)*, 96–103; Jablonski, *Airwar*, vol. 4, 207–12; and Haulman, *Hitting Home*, 32–37. Note: the sources disagree on the spelling of *Bock's Car* (Nalty and Coox) versus *Bockscar* (Dick, Mueller, Haulman); I selected the former based on Edward Jablonski's reference to the airplane being named by Capt Frederick C. Bock, who had switched planes with Major Sweeney. Jablonski, *Airwar*, vol. 4, 212.

18. *United States Strategic Bombing Survey: Summary Report (Pacific War)*, 108–10.


COLD WAR AIRPOWER
1946–1961
1961 APR Operation Farmgate
1960 MAY U-2 shoot down
AUG Discoverer XIV Satellite
1959
1958
1957 OCT Soviets orbit Sputnik 1
DEC Atlas ICBM
1956
1955
1954 FEB Von Neumann's Teapot Committee
1953
1952 NOV First US hydrogen bomb
1951
1950 JUN North Korea invades South
JUL First all-jet air battle
1949 AUG Soviet Atomic Bomb
1948 JUN Berlin Crisis
JUN Women's Armed Services Integration Act
JUL AF racial integration
1947 JUL National Security Act establishes US Air Force
OCT Bell X-1 breaks sound barrier
1946
Korean War
Berlin Airlift

Chapter 9

Peace Is Our Profession

Air Force Independence and the Korean War

With victory in World War II, the American public sought a return to normal life as rapidly as possible. Airpower and military affairs in general decreased in importance. From peak wartime strength of over 79,000 aircraft and 2,411,294 personnel, air forces dwindled to 24,000 aircraft (with only 18 percent mission ready) and just 304,000 personnel by May 1947. Nevertheless, airpower's impact on warfare led to the realization of Billy Mitchell's dream. On 26 July 1947, President Harry S. Truman signed into law the National Security Act of 1947, which provided for a separate Department of the Air Force among its provisions. On 18 September 1947, W. Stuart Symington became the first Secretary of the Air Force and officially established the United States Air Force as an independent, coequal service. Under the leadership of Gen Carl A. Spaatz as first Air Force Chief of Staff and his successor, Gen Hoyt S. Vandenberg, the Air Force clarified roles and missions and organized for a growing Cold War.[1]

The introduction of jet aircraft masked demobilization and organizational turmoil in the public's eye. Although the Bell XP-59 Aracomet first flew on 1 October 1942, the Lockheed P-80 (later redesignated F-80) entered service in December 1945 as the first operational jet fighter for the US Air Force. On 14 October 1947, Charles E. "Chuck" Yeager seized headlines as the first man to break the sound barrier. His Bell X-1 *Glamorous Glennis* reached Mach 1.06 at 43,000 feet after a successful launch from a B-29 mother ship.[2] Like the record-breaking aircraft performances of the 1920s, the jet revolution promised exciting advances in altitude, speed, range, and other measures of aerospace performance.

The Berlin Crisis awakened Americans to the harsh realities of Cold War between the United States and the Union of Soviet Socialist Republics. On 24 June 1948, the Soviets closed railroad and road corridors to the two and a half million residents of West Berlin deep within Communist East Germany. The United States Air Forces in Europe (USAFE) commander, Maj Gen Curtis E. LeMay, responded by organizing a makeshift airlift of food, medicine, and coal. With Brig Gen Joseph Smith handling day-to-day operations, USAFE C-47 and C-54 cargo

aircraft established a precise schedule of flights every three minutes, 24 hours a day. After the first month, Maj Gen William H. Tunner assumed control of an expanded effort that eventually averaged 300 American and 100 British aircraft. He applied expertise from flying the "Hump" during World War II and streamlined maintenance, logistics, training, and air traffic control procedures. On 15 April 1949, 1,398 aircraft delivered 12,941 tons of supplies, a single-day record. By May 1949 the Soviets recognized the airlift's success and lifted the blockade. Operation Vittles, as it was called, massed 277,804 flights and delivered 2,325,000 tons of supplies. More importantly, the effectiveness of this nonviolent use of airpower defused a potentially disastrous confrontation.[3]

Fig. 14. Lt Col Jackie Cochran, US Air Force Reserves and leader of the volunteer Women Airforce Service Pilots during World War II; and Col Chuck Yeager, commander of the USAF Aerospace Research Pilot School and first man to break the sound barrier, leave a Northrop T-38 Talon jet trainer at Edwards Air Force Base, California, in 1963. Courtesy of Dr. Dik Daso, AFHF.

The 1948 Berlin Crisis and the Soviet explosion of an atomic device in 1949 dramatized the US Air Force's lack of war readiness. As the new commander-in-chief, Strategic Air Command (SAC), now–Lt Gen Curtis E. LeMay emphasized rigorous training, exacting performance standards, and immediate readiness. In the late 1940s, SAC incorporated the B-50, a more powerful version of the B-29, and the massive Convair B-36 Peacemaker, the first bomber with truly intercontinental range. In the early 1950s, SAC upgraded to an all-jet bomber force with the Boeing B-47 Stratojet and the legendary Boeing B-52 Stratofortress that provided the heart of America's nuclear deterrence in the early Cold War. With the near total demobilization of the US Army, US policy makers relied on atomic weapons as the cornerstone of national security.[4]

Behind the scenes, the US Air Force increased war readiness by conducting a highly secret—but extensive—program of electronic reconnaissance along the periphery of the USSR and occasional covert overflights of Soviet territory to assess Communist air defenses. Beginning in the late 1940s and continuing through the 1960s, periodic shoot downs of Air Force and Navy reconnaissance aircraft generated diplomatic tensions and fiery press coverage of "aerial incidents" that sustained a crisis atmosphere. Nevertheless, aerial reconnaissance provided vital intelligence information needed by war planners and weapons systems developers. Until the advent of reconnaissance satellites in the 1960s, aerial reconnaissance shaped strategic doctrine and provided the best technical means to assess the Soviet threat.[5]

As the Air Force attempted to increase readiness, the armed forces continued social changes begun in World War II. On 12 June 1948, Congress passed the Women's Armed Service Integration Act that established Women in the Air Force (WAF) as a permanent part of the Air Force. Col Geraldine F. May served as the first director of the WAFs as a separate category within the service that numbered 4,300, including 300 officers. Unfortunately, US Air Force policies reflected the social conservatism of the age and barred women from combat, flying, and other "male-only" duties and mandated lieutenant colonel as the highest permanent rank for WAF officers. Although the legislation authorized women to be married and permitted children under the age of 18 if granted a waiver, Air Force policy banned waivers; pregnant WAFs were discharged from service. With weak support from senior leadership, restrictive career policies, and limited opportunities, the WAF program languished during the 1950s.[6]

Paralleling the limited advances for Air Force women, in July 1948 President Harry S. Truman's Executive Order 9981 mandated equal treatment of military personnel regardless of race, color, or national origin. Although not technically an order to integrate, Truman's action achieved the effect. By spring 1949, the Air Force integrated basic training and eliminated segregated units by 1952. Despite progress on paper, racial tensions remained, and while workplace efficiency improved, genuine social progress waited until the 1960s.[7]

On 25 June 1950, Communist North Korean forces unleashed a massive invasion of US-backed South Korea that achieved complete strategic and tactical surprise. Three days later, American B-26 bombers attacked advancing North Korean troops in the first major flare-up of the Cold War. Over the next six weeks, Far East Air Forces (FEAF) under the command of Lt Gen George E. Stratemeyer gained air superiority and assisted United Nations (UN) forces in halting the North Korean assault. The initial phase of the Korean War illustrated the dangers of unprepared peacetime forces as American Airmen struggled to relearn close air support and interdiction skills. Adding to their problems, the limited range of the jet F-80s prevented adequate "time over target" for tactical operations. Concurrently, three groups of FEAF Bomber Command B-29s conducted strategic operations to destroy the enemy's will and capacity to fight in accordance with World War II doctrinal experience. Although UN air forces controlled the skies and destroyed North Korea's industrial base, technological, political, and operational limitations frustrated hopes of decisive victory.[8]

Gen Douglas MacArthur's successful amphibious assault at Inchon and successive operations shattered the North Korean Army in September 1950, but the UN advance into North Korea led to Communist Chinese intervention. The entry of 300,000 Chinese troops in November 1950 drastically changed the war's nature. Within weeks, advanced Soviet-made MiG-15 fighters appeared. Flown by North Korean, Chinese, and Soviet pilots, the MiG-15 outclassed American F-51, F-80, and F-84 aircraft in performance. In this context, 1st Lt Russell Brown, flying an F-80C, shot down a MiG-15 in the world's first all-jet air battle on 8 November 1950. Still, the speed and altitude superiority of the enemy aircraft forced Air Force leaders to rush the North American F-86 Sabre into action. A sleek, swept-wing fighter, the F-86 equaled the MiG's speed and proved more maneuverable and stable as a gun platform. As the war settled into stalemate on the

ground, F-86s battled over "MiG Alley" where the superior training and experience of US Air Force pilots prevailed. At a cost of 76 Sabres lost to MiGs (and 142 to other causes), F-86 pilots destroyed 792 MiGs and 18 other enemy aircraft.[9]

Fig. 15. The North American F-86 Sabre battled Communist MiG-15s for air superiority over "MiG Alley" in the Korean War. The wraparound glass cockpit provided excellent visibility. Courtesy of AFHF.

In the Korean War, a new group of Air Force pilots entered the pantheon of fighter aces. Although none of the jet aces equaled Maj Richard I. Bong's 40 kills or Maj Thomas B. McGuire's 38 victories in World War II, the F-86 pilots established a remarkable 10:1 kill ratio. Capt Joseph C. McConnell, a B-24 navigator in World War II, led the pack with a score of 16, closely followed by Capt James Jabara who tallied 15 kills. Jabara also gained recognition as the world's first jet ace. Unlike the mass squadron formations often flown in the Second World War, Korean War pilots devised new tactics based on flights of only four F-86s. Nevertheless, Air Force pilots continued a successful heritage in air-to-air combat.[10]

Despite success in the air war, the Korean War frustrated American airpower. Accustomed to the heroic efforts of World War II, Air Force leaders struggled with political, technological, and resource limitations inherent in the Cold War. Worried that the conflict in Ko-

rea was a mere foreshadowing of a Soviet invasion of Europe, American policy makers limited operations in Asia to build up North Atlantic Treaty Organization (NATO) forces. Although it did not "feel" like a win, UN forces successfully repelled two Communist invasions of South Korea and American airpower secured the skies of the peninsula against enemy air attack while significantly influencing the ground war.[11]

The Korean War provided a mixed list of lessons learned. The initial phase of operations reinforced the dangers of a hollow force unready for combat. Senior leaders determined that ill-preparedness tempted the Communists to exploit war as an instrument of policy. Hence, the Korean War served as a springboard for building a permanent Cold War national security establishment. Although the war demonstrated serious deficiencies in air-ground coordination and CAS doctrine, Air Force leaders believed the war validated their faith in the primacy of strategic air warfare using atomic bombs to deter the Soviet Union. When confronted by the paradox that B-29s completely destroyed North Korean industry yet did not end the war, Airmen looked to limitations against striking the genuine sources of war-making capacity: Chinese and Soviet factories. With a relatively static war from mid-1951, air interdiction reduced, but could not halt, North Korean resupply. As long as the enemy controlled the operations tempo and pace of the ground war, air interdiction campaigns produced limited effect. Likewise, although air superiority proved vital for protecting UN forces from enemy air attack and facilitated aerial supply and medical evacuations, command of the air did not prevent enemy ground operations. In short, the Korean War convinced US Air Force leaders that limited wars drained national resources, achieved little, and should be avoided. America's best policy remained a robust, combat-ready nuclear strike force to deter Soviet aggression.[12]

Summary

The decade after World War II featured two contradictory themes: rapid technological development made possible by the new US Air Force's embrace of civilian science and industry, and the dangers of a hollow force as shown in the Korean War. Buoyed by World War II success and confident of its atomic monopoly, the Air Force explored enhanced capabilities made possible by jet aircraft, intercontinental

bombers, and improved atomic weapons. New F-80, F-84, and F-86 jet fighters and B-50, B-36, and B-47 bombers signaled dramatic advances in technology but masked the mass departure of skilled pilots, navigators, maintainers, intelligence personnel, and scores of other specialties with World War II demobilization.

The Berlin Airlift, Soviet atomic bomb, and Korean War dramatized the dangers of new Cold War realities. For example, the 1948 Berlin Airlift underscored airpower's potential for humanitarian relief and as a nonviolent means of defusing political tension. The 1949 Soviet explosion of an atomic device shocked the American public and raised the threat of atomic war. Moreover, the Korean War showed the peril of ill-preparedness and forced the USAF to relearn essential combat skills at a significant cost. Korea introduced the world to all-jet aerial combat and demonstrated the importance of superior technology plus effective training and experience. Additionally, the Korean War challenged both classic strategic bombing doctrine and its air-atomic derivative. Thus, the first decade of the Cold War presented two unsolved challenges: how to maintain a peacetime, effective fighting force and respond to a limited war (a conflict not reaching a nuclear threshold).

Notes

1. Dick, *Reach and Power*, 292–96; Wolk, "Quest for Independence," 378, 395–97; Goldberg, *History of the United States Air Force*, 105–6; and Futrell, *Ideas, Concepts, Doctrine*, vol. 1, 196.

2. Dick, *Reach and Power*, 296–303; Wagner, *American Combat Planes*, 252–53; and Goldberg, *History of the United States Air Force*, 202–3.

3. Dick, *Reach and Power*, 304–6; Trest and Watson, "Framing Air Force Missions," 426–31; Goldberg, *History of the United States Air Force*, 235–41; *Futrell, Ideas, Concepts, Doctrine*, vol. 1, 234–36; Meilinger, *Hoyt S. Vandenberg*, 95–102; and Haulman, *Wings of Hope*, 3–4.

4. Dick, *Reach and Power*, 310–12; Trest and Watson, "Framing Air Force Missions," 410–11; Goldberg, *History of the United States Air Force*, 122–23; and Moody, *Building a Strategic Air Force*, 235–39. For an in-depth assessment of the challenges of building a strategic deterrent force, see Borowski, *A Hollow Threat.*

5. Farquhar, *A Need to Know*, xv–xxi, 170–72; Hall, "Early Cold War Overflight Programs," 1–14; Farquhar, "Aerial Reconnaissance, the Press, and American Foreign Policy," 38–51; and Dick, *Reach and Power*, 364–68.

6. Mitchell, *Air Force Officers*, 309–11; and Trest and Watson, "Framing Air Force Missions," 405–6.

7. Mitchell, *Air Force Officers*, 329–31.

8. Eventually FEAF Bomber Command expanded to five B-29 groups, about 100 aircraft. Dick, *Reach and Power*, 313–19; Thompson, "Air War Over Korea," 3–13; Goldberg, *History of the United States Air Force*, 243–47; Air Force History and Mu-

seums Program, *Steadfast and Courageous*, 4–7; Thompson and Nalty, *Within Limits*, 6–8, 10; and Crane, *American Airpower Strategy in Korea*, 23–27. For the most detailed account of Korean air operations, see Futrell, *United States Air Force in Korea*, 24–55. For an in-depth analysis of F-86 vs. MiG-15 combat and evolving fighter tactics, see Hone, "Korea," 464–74.

9. Y'Blood, *MiG Alley*, 11, 13–15, 43; Dick, *Reach and Power*, 317–23; Thompson, "Air War Over Korea," 29; Goldberg, *History of the United States Air Force*, 248–50; and Thompson and Nalty, *Within Limits*, 20–34. For an extensive look at "MiG Alley" air battles, see Futrell, *United States Air Force in Korea*, 293–312.

10. Initial USAF estimates of F-86 vs. enemy aircraft claimed a 14:1 kill ratio; later studies reduced the figure to 10:1, although some studies state a 7:1 ratio as a truer figure. Y'Blood, *MiG Alley*, 44; and Cunningham, *Aces High*, 40–41.

11. Air Force History and Museums Program, *Steadfast and Courageous*, 56; and Thompson, "Air War Over Korea," 51–52.

12. Futrell, *United States Air Force in Korea*, 708–11; Thompson and Nalty, *Within Limits, 59*–60; and Thompson, "Air War over Korea," 51–52.

Chapter 10

The Influence of Nuclear Weapons on Strategy

Deterrence and Coercion

Harnessing Science and Technology: Intercontinental Ballistic Missile and Satellite Development, 1953–1962

Like in the First World War, industrial mobilization of human and natural resources played a critical role in the outcome of World War II, but many argue that the successful harnessing of science and technology played an even greater role. Notable Allied technological breakthroughs included radar and the atomic bomb. In opposition, the Germans developed jet aircraft and operational cruise and ballistic missiles, better known as V-1 and V-2 "vengeance" weapons. From September 1944 when the first German V-2 ballistic missiles became operational, the US Army Air Forces struggled to contain the threat. Standing 46 feet high, measuring 5 feet in diameter, and weighing 14 tons, the V-2 fielded a 1,650-pound ammonium nitrate/TNT warhead and ranged 200 miles. Once launched, nothing in the Allied arsenal could stop it. The V-2 menace seized USAAF Commander Hap Arnold's attention and spurred US Army interest in guided missiles.[1]

Fortunately, the German vengeance weapons arrived too late to alter the course of the war, but General Arnold recognized the importance of technology for both current and future wars. Consequently, the Army Air Forces sought scientific expertise from the best civilian academic minds. General Arnold specifically asked Dr. Theodore von Kármán, director of the California Institute of Technology's Guggenheim Aeronautical Laboratory, to explore emerging technological advances, advising him, "Do not look forward for twenty years . . . but look forward for fifty years."[2] In August 1945, von Kármán's Scientific Advisory Group (SAG) released its findings, "Where We Stand," and in December presented a 33-volume report, "Toward New Horizons." With the war's end, Arnold acted to institutionalize commitment to research and development (R&D) by naming a rising star, Maj Gen Curtis LeMay, as the USAAF chief of R&D. Under LeMay, the US-

AAF established von Kármán's Scientific Advisory Board as a formal entity and created a novel civilian think tank that eventually became the RAND (Research and Development) Corporation. Arnold's appreciation for the value of science and engineering marked the new United States Air Force as well.[3]

Von Kármán's "Toward New Horizons" acted as a catalyst for missile development. The Scientific Advisory Board recognized the immense potential of intercontinental ballistic missiles paired with atomic warheads. Along the same line, during the final days of World War II, the US Army initiated Project Paperclip, a race to prevent advanced German weapons and scientists from going to the Soviets. Paperclip "recruited" roughly 600 former German scientists with 130 rocket and missile specialists among them, including Wernher von Braun, chief V-2 developer, and Walter Dornberger, commander of the Peenemünde missile complex. Ironically, the Germans had used an earlier American rocket pioneer's research as a springboard.[4]

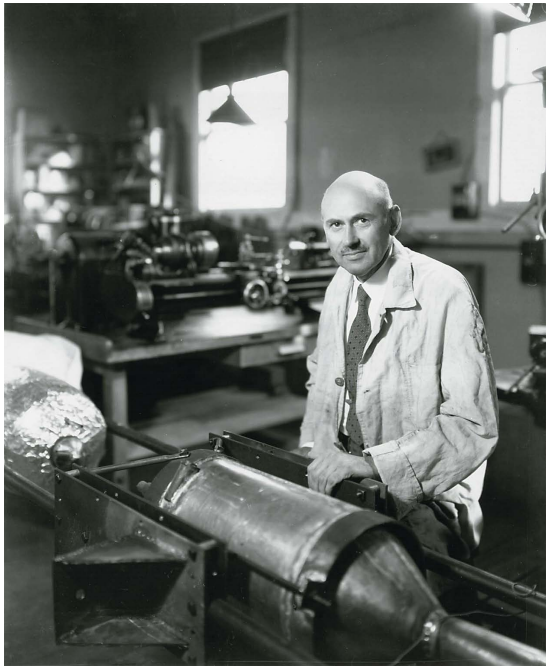


Fig. 16. A pioneer of rocket technology, Robert Goddard and his work inspired both German and American missile development. A metal lathe in the background illustrates that early pioneers had to design and build their rockets from scratch. Courtesy of NASM.

On 16 March 1926, Dr. Robert H. Goddard launched the world's first liquid-fueled rocket that failed to attract significant attention in the United States. He later published papers in the late 1920s and 1930s that explored using gyroscopes for stabilization, employing exhaust vanes for steering, and creating staged rockets for extending range. Although Goddard failed to influence American aviation, his ideas inspired some of the scientists involved in German missile development. By the end of the war, the combination of Goddard's pioneering efforts and the German wartime program suggested revolutionary potential to von Kármán and Arnold.[5]

Postwar demobilization forced budget cuts and tough decisions that tempered American intercontinental ballistic missile (ICBM) efforts. Despite an April 1946 study that called for a supersonic ICBM to carry a 5,000-pound atomic warhead with a range of 5,000 miles, von Kármán and Arnold concluded that long-range rocket technology would require a decade to mature. Instead, the newly established US Air Force placed air-to-air and air-to-surface missiles as top priority and short-range cruise missiles as second. For the near future, long-range B-36 bombers would serve as the primary delivery means for atomic bombs. Nevertheless, von Kármán advocated an orderly, sequential guided-missile development program using the German single-manager organization as a model.[6]

Greatly increased Cold War tensions galvanized the new Eisenhower administration to alter the ICBM development timeline. Three external events—the 1949 Soviet atomic detonation, the 1950 Korean War, and a 1953 Soviet test of a hydrogen (fusion) device—increased fears of a nuclear Pearl Harbor. President Eisenhower directed the Air Force to review missile development and organization, approved Trevor Gardner as special assistant for R&D for the Secretary of the Air Force, and chartered a select committee of scientists and engineers chaired by Princeton University's Dr. John von Neumann. In February 1954, von Neumann's "Teapot Committee" recommended a crash program to build an operational ICBM in eight years. With this recommendation, Trevor Gardner pushed the bureaucracy, first convincing the Air Force to make the Atlas ICBM program its top R&D priority and then securing the president's approval for ICBM development as the top national priority the following year.[7]

Armed with the Teapot Committee's scientific rationale, Gardner's top cover within the Air Force, and President Eisenhower's statement of national priority, Air Force Brig Gen Bernard A. Schriever pro-

vided the focused leadership and stellar organizational talent to bring the Atlas ICBM to fruition. Schriever skillfully exploited his unique command authority to control all aspects of ICBM systems acquisition and procurement. He streamlined the budget, development, and approval process and established a parallel developmental structure that allowed two independent teams to tackle technical challenges. In other words, each Atlas component had a backup team exploring a different design. By the late 1950s, Schriever's autonomous Western Development Division coordinated an industrial project of enormous scale featuring nearly 2,000 contractors working all phases of the ICBM project.[8]

Fig. 17. An astute manager and administrator, Bernard A. Schriever spearheaded the development of the Atlas and Titan ICBMs. Courtesy of AFHF/NMAF.

Designated Weapon System (WS)-107A, the Atlas "intercontinental ballistic rocket" represented a technological marvel. Initial designs called for a stainless steel, monocoque airframe (pressurized to provide structural stability) 100 feet long, 12 feet in diameter, weighing 440,000 pounds and powered by a liquid-fueled rocket engine. The rocket was aimed to deliver a 3,000-pound atomic warhead a distance

of 5,000 nautical miles within 1,500 feet of a target. The US detonation of the first hydrogen (fusion) nuclear device on 1 November 1952 eased challenging technical hurdles. Professor von Neumann's Teapot Committee showed that new hydrogen bombs could be significantly lighter (1,500 pounds) yet exponentially more powerful, easing guidance requirements to a less stringent 3-mile accuracy. In turn, this meant the missile weight could be cut nearly in half and would require proportionately less thrust.[9]

The Soviet launch of the world's first satellite, *Sputnik*, on 4 October 1957 overshadowed American ICBM progress and dramatized the political nature of nuclear weapons. Contrasting the well--publicized, earlier failures of the first three Thor intermediate-range ballistic missile launches and the first two Atlas ICBMs, *Sputnik*'s success convinced the public of Soviet scientific superiority and fed worries of a "missile gap." American voters pressured politicians who in turn demanded the US "beat the Russians." *Sputnik*'s timing coincided with, and reversed, an Eisenhower decision to reduce missile expenses. Unknown to the public, the CIA's highly classified U-2 spy plane showed Soviet bomber and ICBM programs to be significantly less advanced than generally perceived. The *Sputnik* uproar pushed Schriever to secure the funding to complete both Atlas and Titan ICBM programs. On 17 December 1957, the fifty-fourth anniversary of the Wright brothers' first powered flight, the US Air Force successfully launched Atlas.[10]

A battle between short-term necessity and long-term potential marked the development of both American ICBMs and space-based satellites. Paralleling the initial decision to fund jet-engine-powered cruise missiles instead of the more complex rocket-powered ballistic missiles, in 1954 another Eisenhower-sponsored study group, the Technological Capabilities Panel (TCP) headed by Dr. James Killian and Edwin Land, backed a high-flying reconnaissance aircraft over a space-based reconnaissance satellite. Beginning in 1956, the revolutionary U-2 reconnaissance aircraft provided overflights of Soviet territory that provided valuable intelligence of Soviet air and space capabilities, but at an acknowledged political risk. A RAND study recommended the development of a strategic reconnaissance satellite. Logically, the Air Force tapped General Schriever's Western Development Division to head the effort. As a result, the WS-117L, Advanced Reconnaissance System, entered Schriever's managerial domain in 1956.[11]

While scientists and engineers worked on the technological hurdles of space satellites, Secretary of the Air Force Donald A. Quarles examined the novel political-legal dimension. He proposed launching a peaceful Earth-study satellite in conjunction with the 1957–1958 International Geophysical Year. Quarles convinced President Eisenhower of the need to establish a "freedom of space" principle in international law similar to the long recognized "freedom of the seas." Peaceful, internationally sanctioned space flight would gain the right of unimpeded overflight of terrestrial regions. This rationale also persuaded President Eisenhower to create a civilian space agency, the National Aeronautics and Space Agency, overriding earlier military space programs. Ironically, *Sputnik*'s successful orbits established precedence in international law that matched Quarles's intent. Because the Soviet satellite had already overflown the airspace of other sovereign nations, US satellites need not fear Soviet protests of their flight paths. By the time of the 18 August 1960 launch of *Discoverer XIV*, questions of the legality of space-based reconnaissance were moot. Adding to the prestige and political statement associated with America's first satellite, *Discoverer* included secret Corona military photo-reconnaissance capability. This proved fortuitous since the 1 May 1960 Soviet shoot down of the U-2 and capture of pilot Francis Gary Powers showed the vulnerability of high-altitude reconnaissance aircraft.[12]

The Air Force role in the development of ICBMs and military reconnaissance satellites served as a case study of successful military technical innovation. Under the extraordinary leadership of Gen Bernard A. Schriever, the Atlas ICBM went from theoretical concept to operational weapon in six years. Its "backup," the solid-fueled Titan ICBM, successfully launched in 1960 and entered operational alert status in April 1962. Additionally, the secret Corona space reconnaissance system proved not just viable, but vital in reducing Cold War tensions by providing factual information on Soviet nuclear capabilities. Sometimes hysterical speculation could be disarmed by cold fact. At the time of the 1962 Cuban Missile Crisis, the United States fielded a 4-to-1 advantage in ICBMs and more than 8-to-1 advantage in total nuclear weapons delivery capability when B-47 and B-52 bombers were added. Equally important, the Soviets knew of the disparity; the crash program to develop US Air Force ICBMs and reconnaissance satellites had succeeded in providing the United States a true deterrent force.[13]

An Atomic Clausewitz? Bernard Brodie's Theory for a New Era

For 40 years, Bernard Brodie served as arguably the most significant American strategic thinker. He has been described as an "American Clausewitz" and ranked among the "immortals of strategic theory."[14] Born in 1910 and earning his doctorate at the University of Chicago in 1932, Brodie joined the Navy as a lieutenant in December 1942 where he served as a special assistant to the Secretary of the Navy, a technical expert to the US delegation establishing the United Nations, and a member of the State Department's Office of Special Political Affairs. After World War II, Brodie joined Yale University's Department of International Relations where he authored "The Atomic Bomb and American Strategy" in the fall of 1945, the first published article to address the strategic impact of atomic weapons. A revised version of the article, "War in the Atomic Age" and its companion "Implications for Military Policy" (both published in 1946 as chapters of *The Absolute Weapon*) gained renown as landmarks of American nuclear strategic thought.[15] In these articles, Brodie articulated important strategic themes relating to "war as policy" and "the nature and character of war." He served as a bridge between classical theorists (especially Clausewitz), the theories of strategic bombing (Douhet), and contemporary air, space, and cyberspace theory. Additionally, Brodie represented a civilian takeover of strategic thought with the advent of atomic weapons. Bernard Brodie was only one of many significant civilian nuclear theorists, including Thomas Schelling, Herman Kahn, Albert Wohlstetter, Henry Kissinger, and others. Until John Warden, US Air Force officers did not contribute significant air and space power theory by publishing books and introducing ideas into national debate. With this void, Brodie and strategic intellectuals provided the nation's conceptual foundation.

Bernard Brodie's "War in the Atomic Age" (1946)

In "War in the Atomic Age," Brodie introduced concepts that formed the cornerstone of American strategic theory during the atomic era. At the heart of Brodie's article was a fundamental idea: there is no winner of an atomic war. Furthermore, with the Japanese attack on Pearl Harbor providing context, Brodie warned, "It has, for

example, been stated over and over again that the atomic bomb is *par excellence* the weapon of aggression, that it weights the scales overwhelmingly in favor of surprise attack. That if true would indicate that world peace is even more precarious than it was before, despite the greater horrors of war. But is it inevitably true?"[16]

In exploring the latter question, Brodie advanced a series of conclusions concerning the character of the atomic bomb that also suggested changes in the character of war:

1. The power of the present bomb is such that any city in the world can be effectively destroyed by one to ten bombs. . . .
2. No adequate defense against the bomb exists, and the possibilities of its existence in the future are exceedingly remote. . . .
3. The atomic bomb not only places an extraordinary military premium upon the development of new types of carriers but also greatly extends the destructive range of existing carriers. [By "new types of carriers," Brodie meant the development of long-range missiles like the German V-2 while "existing carriers" referred to manned bombers.]
4. Superiority in air forces, though a more effective safeguard in itself than superiority in naval or land forces, nevertheless fails to guarantee security. [With this passage, Brodie questioned Douhet's concept of command of the air.]
5. Superiority in numbers of bombs is not in itself a guarantee of strategic superiority in atomic bomb warfare.[17]

Thus, Brodie's "War in the Atomic Age" established the baseline of American nuclear strategy for decades to come.

In his 1946 chapter "Implications for Military Policy," Brodie continued his thoughts on the nature of atomic war and established the essence of nuclear deterrence theory. Brodie described how advances in aircraft and atomic weapons concentrated the time span of strategic bombing, enhancing its effects. He quoted Professor J. Robert Oppenheimer:

> The pattern of the use of atomic weapons was set at Hiroshima. They are weapons of aggression, of surprise, and of terror. If they are ever used again it may well be by the thousands, or perhaps by the tens of thousands; their method of delivery may well be different, and may reflect new possibilities of intercep-

> tion, and the strategy of their use may well be different from what it was against an essentially defeated enemy. But it is a weapon for aggressors, and the elements of surprise and of terror are as intrinsic to it as are the fissionable nuclei.[18]

Yet, Brodie observed that the truth of Oppenheimer's claim depended upon the assumption that the attacker does not fear retaliation. If the defender retained some capability to strike back, to inflict catastrophic damage upon the attacker, then fears of surprise attack could be mitigated:

> If the aggressor state must fear retaliation, it will know that even if it is the victor it will suffer a degree of physical destruction incomparably greater than that suffered by any defeated nation of history, incomparably greater, that is, than that suffered by Germany in the recent war. Under those circumstances no victory, even if guaranteed in advance—which it never is—would be worth the price. The threat of retaliation does not have to be 100 percent certain; it is sufficient if there is a good chance of it, or if there is belief that there is a good chance of it. The prediction is more important than the fact.[19]

Consequently, although the atomic bomb logically might favor aggression, its destructive properties could inhibit an aggressive strike. As long as a nation retained some degree of retaliatory capability, an aggressor could be deterred. The scale of atomic destruction outweighed the potential benefits of aggression.

Brodie concluded his thoughts on nuclear deterrence with an astute observation that soon marked American nuclear policy: "Thus, the first and most vital step in any American security program for the age of atomic bombs is to take measures to guarantee to ourselves in case of attack the possibility of retaliation in kind. . . . Thus far the chief purpose of our military establishment has been to win wars. From now on its chief purpose must be to avert them. It can have almost no other useful purpose."[20]

The Diplomacy of Violence: Thomas Schelling's Coercion Theory

Joining Bernard Brodie's concept of nuclear deterrence, Thomas C. Schelling added what became known as coercion theory to complete

the foundation of American strategic theory during the Cold War. Although primarily an economist, Schelling wrote on a broad range of issues including military strategy, arms control, nuclear proliferation, terrorism, organized crime, tobacco, and drug policy, among others.[21] His best-known book, *The Strategy of Conflict*, emerged a classic across the social sciences and introduced economic thinking into political science, sociology, and international relations.[22] Schelling's theories emphasized looking at matters from the perspective of the other side. His core principle stressed that by understanding your adversary's perspective you will improve your comprehension of the situation and come out better yourself.[23]

Born in 1921, Schelling began military and strategic studies as a graduate student during World War II. In the early postwar years, Schelling worked with the Marshall Plan, the US Bureau of Budget, the White House, and the Executive Office of the President during the Eisenhower Administration.[24] In addition to his numerous works on game theory and behavior, Schelling's three books on strategic thought (*The Strategy of Conflict*, *Strategy and Arms Control*, and *Arms and Influence*) proved foundational to modern strategic thinking. His works pioneered the relationship of diplomacy and bargaining, brute force, and coercion during the nuclear era. Renowned for insightful, flexible, and innovative approaches to intellectual challenges, Professor Schelling received the 2005 Nobel Prize for Economics; he contributed to biological and nuclear proliferation issues until his death in 2016.

Agreeing with Brodie's premise that atomic wars were unwinnable, Schelling emphasized the importance of diplomacy and bargaining: "The bargaining can be polite or rude, entail threats as well as offers, assume a status quo or ignore all rights and privileges, and assume mistrust rather than trust. But whether polite or impolite, constructive or aggressive, respectful or vicious, whether it occurs among friends or antagonists and whether or not there is a basis for trust and goodwill, there must be some common interest, if only in the avoidance of mutual damage, and an awareness of the need to make the other party prefer an outcome acceptable to oneself."[25]

Schelling tied bargaining to strategy. Traditionally, superior military powers secured strategic objectives through brute force, often punishing or hurting the vanquished after victory. With nuclear weapons, countries could hurt or destroy their enemy without first achieving victory. Nuclear weapons changed the equation. Now,

Schelling argued, belligerents must achieve objectives through coercion: "To be coercive, violence has to be anticipated. And it has to be avoidable by accommodation. The power to hurt is bargaining power. To exploit it is diplomacy—vicious diplomacy, but diplomacy."[26]

Schelling contrasted brute force with coercion by observing, "Brute force succeeds when it is used, whereas the power to hurt is most successful when held in reserve. It is the *threat* of damage, or of more damage to come, that can make someone yield or comply. It is *latent* violence that can influence someone's choice" (emphasis in original).[27]

The altered relationship of brute force and coercion necessarily altered the American approach to strategy in the nuclear era. Previously, the central aim of American strategy was to seek out and destroy the enemy's armed forces, and often military victory served as an alternative to bargaining—not as a process of bargaining. With nuclear weapons, American strategy required coercion versus brute force.

Although not directly stated, Schelling implied a change in the nature of war with nuclear weapons, not just a change in the character of war. In other words, the essence of war changed, not simply the means of fighting it. Three passages supported this contention:

> War appears to be, or threatens to be, not so much a contest of strength as one of endurance, nerve, obstinacy, and pain. It appears to be, and threatens to be, not so much a contest of military strength as a bargaining process—dirty, extortionate, and often quite reluctant bargaining on one side or both—nevertheless a bargaining process.[28]

> So nuclear weapons do make a difference, marking an epoch in warfare. The difference is not just in the amount of destruction that can be accomplished but in the role of destruction and in the decision process. Nuclear weapons can change the speed of events, the control of events, the sequence of events, the relation of victor to vanquished, and the relation of homeland to fighting front. Deterrence rests today on the threat of pain and extinction, not just on the threat of military defeat.[29]

> To concentrate on the enemy's military installations while deliberately holding in reserve a massive capacity for destroying

his cities, for exterminating his people and eliminating his society, on condition that the enemy observe similar restraint with respect to one's own society, is not the "conventional approach."[30]

Summary

Bernard Brodie and Thomas Schelling bridged the gap between classic military theory, early theories of strategic air war, and contemporary nuclear deterrence theory by establishing fundamental concepts that influence American thinking about nuclear weapons. At the core of Brodie's "War in the Atomic Age" was the idea that no one "wins" a nuclear war. Hence, deterrence became the dominant concept of nuclear strategy, and the chief purpose of a military establishment must be to avert (or deter) war.

Other ideas followed: protecting the retaliatory force was the essential requirement for deterrence, superiority in numbers of nuclear weapons or the means of delivering them meant nothing as long as each side has reason to fear the nuclear capability of the other, and the "shadow" of the atomic bomb was so great as to create a wholly novel form of war. Brodie stated that the idea of deterrence was as old as physical force, but with the atomic bomb, the consequence of deterrence's failure was intolerable. Building upon Brodie's deterrence ideas, Thomas Schelling established nuclear coercion theory. Although related to classic military theory, coercion theory differed by focusing on diplomacy, bargaining, and the limited use of force to achieve ends. Coercion theory built upon the concept of grand strategy by emphasizing the instruments of national power more than the application of military power to achieve national ends. Coercion theory was based upon this idea: "The power to hurt is bargaining power. To exploit it is diplomacy."[31] Schelling argued that it was the threat of violence that can make someone yield or comply. War was no longer a contest of strength but of endurance, obstinacy, nerve, and pain. Thus, governments could no longer anticipate wars that might bring political benefits with little cost. In other words, Brodie and Schelling argued that in the atomic age, wars were no longer instruments of policy. Although Brodie and Schelling pioneered nuclear strategy, their concepts of deterrence and coercion remain the heart of today's nuclear enterprise.

Notes

1. The V-2's ammonium nitrate/TNT explosive was known as amatol. Neufeld, *Ballistic Missiles*, 17, 36, 41. Dr. Steven A. Pomeroy explains the relative strengths and weaknesses of cruise vs. ballistic missiles, pointing out that rockets used for ballistic missile engines attained far greater speeds than air-breathing jet engines used for early cruise missiles. For intercontinental range, rockets required massive amounts of fuel and oxidizer, and early systems only provided guidance during the initial phase of flight. Early guidance systems proved inaccurate, unreliable, and heavy, hence the USAAF prudently chose a more proven, less risky technology for the late 1940s. Pomeroy, *An Untaken Road*, 36; Moody, Neufeld, and Hall, "Emergence of the Strategic Air Command," 82; and McNeill, *Pursuit of Power*, 356–57.

2. Schriever, "Military Space Activities," 12.

3. The postwar reorganization changed von Kármán's Scientific Advisory Group (SAG) to the Scientific Advisory Board (SAB). Neufeld, *Ballistic Missiles*, 24, 39; Schriever, "Military Space Activities," 12; Pomeroy, *Untaken Road*, 32–35; and Spires, *Beyond Horizons*, 8–11. For a book-length, in-depth study of the von Kármán-Arnold partnership and the text of "Where We Stand," see Daso, *Architects of American Air Superiority.*

4. Neufeld, *Ballistic Missiles*, 36, 39, 43.

5. Neufeld, 34–36, 39, 43; Pomeroy, *Untaken Road*, 34–35, 37; and Spires, *Beyond Horizons*, 6, 17.

6. Neufeld, *Ballistic Missiles*, 24, 27, 36; Moody, Neufeld, and Hall, "Emergence of the Strategic Air Command," 82; and Spires, *Beyond Horizons*, 10–11, 18.

7. Although treated by the press and public as the detonation of operational atomic bombs, both the 1949 and 1953 Soviet atomic tests merely demonstrated their capability. Both the fission and fusion devices required further development to produce workable bombs. Neufeld, *Ballistic Missiles,* 3, 93–94, 241; Pomeroy, *Untaken Road*, 45; Schriever, "Military Space Activities," 12; Neufeld, *Bernard A. Schriever, 10;* and Spires, *Beyond Horizons*, 31–33. On a quirkier note, although officially labeled the Strategic Missile Evaluation Committee, von Neumann and his colleagues' love for tea led to the Teapot Committee designation. Moody, Neufeld, and Hall, "Emergence of the Strategic Air Command," 83–84. For the text of the Teapot Report, see Neufeld, *Ballistic Missiles*, 249–65.

8. Neufeld, *Ballistic Missiles*, 242–43; Pomeroy, *Untaken Road*, 44–48; Schriever, "Military Space Activities," 15; Spires, "Air Force and Military Space Missions," 35; and Moody, Neufeld, and Hall, "Emergence of the Strategic Air Command," 83–84.

9. Neufeld, *Ballistic Missiles* 78, 98; Pomeroy, *Untaken Road*, 32, 46; and Neufeld, *Schriever, 8*–10.

10. The Titan solid-fueled ICBM resulted from General Schriever's parallel development scheme. Neufeld, *Ballistic Missiles,* 4; Pomeroy, *Untaken Road*, 60; Meilinger, *Significant Milestones in Air Force History*, 47–48; and Hall, "Civil-Military Relations," 27.

11. Like the earlier cruise versus ballistic missile decision, the Killian Committee (as the TCP was commonly known) acknowledged satellite reconnaissance potential but backed the high-flying aircraft as the fastest means to answer a critical, immediate need. Schriever, "Military Space Activities," 12–13; Hall, "Civil-Military Relations," 23; Spires, "Air Force and Military Space Missions," 37; Moody, Neufeld, and Hall, "Emergence of the Strategic Air Command," 85–86; and Spires, *Beyond Horizons*, 34–35, 37–39.

12. Hall, "Civil-Military Relations," 23, 25; National Museum of the United States Air Force, "Discoverer XIV"; Moody and Trest, "Containing Communism," 158; and Spires, *Beyond Horizons*, 41.

13. The US Air Force fielded five Atlas and 48 Titan ICBMs on alert with 625 nuclear-armed B-47 and B-52 bombers that faced six Soviet R-7 (NATO designation SS-6) and 32 R-16 (SS-7) ICBMs and roughly 165 Tupolev Tu-95 (Bear) and Miyasishchev Mya-4 (Bison B) bombers, a decided US advantage made even more impressive when additional US forces were fully mobilized. By 4 November 1962, US strategic nuclear forces fielded 182 missiles and approximately 1,300 bombers with 3,500 fully generated nuclear weapons yielding 6,300 megatons versus 300 Soviet nuclear warheads with indeterminate yield. Norris, "The Cuban Missile Crisis"; and Pomeroy, *Untaken Road*, 99.

14. Gray, *Modern Strategy*, 88.

15. Shortly before his death, Brodie published an article that tackled his critics and, in the process, summarized what he considered important in his earlier works. Brodie, "Development of Nuclear Strategy," 66.

16. Brodie, "War in the Atomic Age," 22–23.

17. Brodie, 21–69.

18. J. Robert Oppenheimer (1904–1967) was a pioneering American theoretical physicist known as "the Father of the Atomic Bomb." Brodie, "Implications for Military Policy," 73.

19. Brodie, 74.

20. Brodie, 76.

21. RAND, "Nobel Committee Honors Former RAND Economist Thomas Schelling."

22. Zeckhauser, "Distinguished Fellow: Reflections on Thomas Schelling," 154.

23. Zeckhauser, 155.

24. RAND, "Nobel Committee Honors Former RAND Economist Thomas Schelling." The original source was "Thomas C. Schelling, C.V.," University of Maryland School of Public Policy, Faculty and Staff, but that article is no longer active at the site.

25. Schelling, *Arms and Influence*, 1.

26. Schelling, 2.

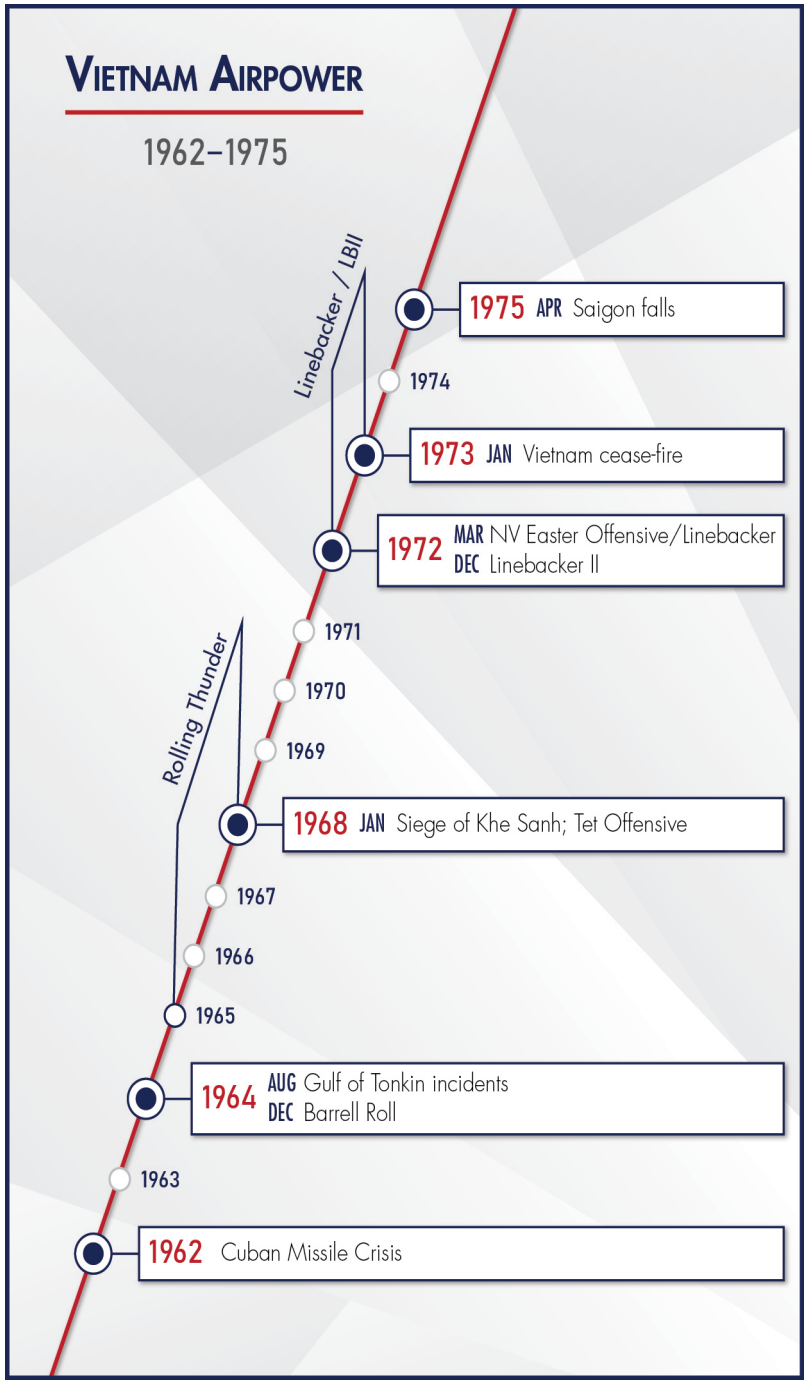
27. Schelling, 3.

28. Schelling, 7.

29. Schelling, 23.

30. Schelling, 25–26.

31. Schelling, 2.


VIETNAM AIRPOWER
1962–1975
Linebacker / LBII
Rolling Thunder
1975 APR Saigon falls
1974
1973 JAN Vietnam cease-fire
1972 MAR NV Easter Offensive/Linebacker
DEC Linebacker II
1971
1970
1969
1968 JAN Siege of Khe Sanh; Tet Offensive
1967
1966
1965
1964 AUG Gulf of Tonkin incidents
DEC Barrell Roll
1963
1962 Cuban Missile Crisis

Chapter 11

Airpower in Irregular Warfare

After nine years where the US Air Force emphasized building America's strategic nuclear forces, "national wars of liberation" backed by the Soviet Union confronted the administration of President John F. Kennedy. In response to increased Communist efforts in Laos and South Vietnam, in April 1961, President Kennedy ordered Operation Farmgate, the covert deployment of the 4400th Combat Crew Training Squadron (nicknamed "Jungle Jim") to train the South Vietnamese Air Force. Flying old North American T-28 Trojans, Douglas A-26 Invaders, and Douglas A-1E Skyraiders, American pilots launched attack missions under the guise of "combat training." After the Gulf of Tonkin Incident on 2–4 August 1964, where North Vietnamese torpedo boats allegedly attacked the USS *Maddox* and USS *C. Turner Joy*, President Lyndon B. Johnson lifted the shroud of secrecy and ordered an orchestrated air attack as a show of force. By December 1964, North American F-100 Super Sabres, McDonnell RF-101 Voodoos, and Republic F-105 Thunderchiefs, with Boeing KC-135 Stratotanker support, conducted Operation Barrel Roll attacking Communist forces in Laos.[1]

Faced with a deteriorating political and military situation in South Vietnam, President Johnson decided upon Operation Rolling Thunder as a sign of American support to South Vietnam and a signal of US resolve. Beginning on 2 March 1965, Rolling Thunder was "a program of measured and limited air action against selected military targets in North Vietnam remaining south of the 19th Parallel." Closely managed by the White House, Rolling Thunder sought to apply military power as a political instrument to influence North Vietnamese will. Unfortunately, the United States underestimated the enemy's resiliency and determination. Air Force leaders chafed at stringent rules of engagement that negated the speed, surprise, and flexibility of massed airpower, and periodic bombing pauses, intended to signal American intentions, allowed enemy recovery. During 1965, North Vietnamese air defenses, including Soviet-made SA-2 surface-to-air missiles (SAM), multiplied; eventually Hanoi established an advanced radar-controlled air defense system that combined SAMs, antiaircraft artillery (AAA), and Soviet-produced MiG-17 and MiG-21 interceptors. Consequently, US losses mounted without any visible progress from

the air campaign. By the fall of 1968, Air Force tactical aircraft had flown 166,000 sorties over North Vietnam, and Navy attack aircraft had added a further 144,500 missions. In the process, the enemy downed 526 Air Force aircraft, with SAMs accounting for 54, MiGs destroying 42, and AAA claiming the remainder. Personnel losses were equally heavy; of the 745 Air Force crewmen shot down over North Vietnam, 145 were rescued, 255 were confirmed killed, 222 became prisoners, and 123 were classified missing-in-action. In retrospect, many consider Operation Rolling Thunder the most ineffective air campaign in US Air Force history due to its disregard for air doctrine, questionable targeting, high losses, and lackluster results.[2]

Complementing the operations over North Vietnam, the air war over South Vietnam demonstrated the full spectrum of airpower. US Air Force aircraft and helicopters provided valuable close air support, interdiction, reconnaissance, airlift, tanker support, and search and rescue roles. Air Force resources ranged from single-piloted Cessna O-1 Bird Dogs, used by forward air controllers to mark enemy targets, to mammoth B-52Ds modified to drop as many as twenty-seven 750 lb. bombs or eighty-four 500 lb. bombs for Arc Light interdiction missions. Vintage World War II aircraft like AC-47 "Puff the Magic Dragon" gunships joined the state-of-the-art General Dynamics F-111 with its sophisticated swing-wing design and advanced terrain-following radar. While the US Army carried the brunt of the ground war, Air Force support proved invaluable. Nevertheless, difficulties in command and control, aircraft suitability, air-ground coordination, and contrasting political and military objectives plagued the South Vietnamese air war.[3]

The siege of Khe Sanh in January 1968 displayed the impressive potential of US Air Force CAS. With 6,000 US Marines surrounded by 20,000 North Vietnamese troops protected by hilly, covered terrain, Gen William W. Momyer responded with massive firepower in the form of Operation Niagara. A flight of three B-52 "Buffs" struck the enemy every 90 minutes for most of the 77-day siege. Successfully preventing the enemy from overrunning the base, American aircraft dropped 100,000 tons of bombs, two-thirds of them from B-52s. By the end of the siege, Air Force, Navy, and Marine Corps aircraft flew 24,000 tactical sorties; Air Force transports landed 4,300 tons of supplies and 2,700 reinforcements at the Khe Sanh airstrip and dropped 8,000 tons of supplies by parachute.[4]

Fig. 18. Although designed as a strategic deterrence force, B-52 bombers played an important role in Vietnam, either in Arc Light sorties in South Vietnam or Linebacker II attacks against targets in the north. Courtesy of AFHF.

After President Johnson's 1968 bombing halt, newly elected President Richard M. Nixon carried out the American public's mandate and began a phased withdrawal from the frustrating conflict. From a peak of 536,000 US troops in 1968, American personnel numbered less than 100,000 by 1972 with only 100 combat aircraft in Vietnam and 300 total in theater. Still, when the North Vietnamese launched the Easter Offensive on 30 March 1972, Nixon resolved to achieve "Peace with Honor."[5] With additional US ground troops a political impossibility, Nixon resorted to Operation Linebacker to blunt the Communist attack.[6]

In contrast to Rolling Thunder, Nixon resisted the urge to micromanage military forces and significantly reduced the restrictions placed on war fighting. Resolved to not reintroduce American ground troops, he significantly increased air resources with a focused, limited mission against conventional targets. Additionally, new television- and laser-guided "smart" bombs dramatically increased strike accuracy. For example, on 13 May 1972, 16 McDonnell-Douglas F-4 Phantoms hit the Than Hoa bridge with 24 smart bombs and wrecked a target that had eluded American Airmen for years. From April to

October 1972, Air Force and Navy aircraft dropped 155,548 tons of bombs on North Vietnamese troops often arrayed in conventional units with tanks, trucks, and defined troop concentrations. Linebacker also provided the first aces of the war. On 28 August 1972, Capt Steve Ritchie shot down his fifth MiG-21. Within weeks, two F-4 Weapons Systems Officers joined the ranks of aces: Capt Charles DeBellevue with six kills and Capt Jeffrey S. Feinstein with five. When North Vietnamese negotiators signaled acceptance of specific peace conditions, Nixon terminated the air campaign.[7]

Fig. 19. McDonnell-Douglas F-4 Phantoms being refueled by a Boeing KC-135 enroute to striking targets in North Vietnam. Each Phantom is carrying two external fuel tanks, four Mark 82 bombs, and three AIM-9 Sidewinder air-to-air missiles. Courtesy of AFHF.

In December 1972, North Vietnamese intransigence over the final peace agreement prompted President Nixon to initiate Operation Linebacker II, an intense 11-day air campaign to pressure enemy compliance. From 18 to 29 December, American aircraft pounded military and industrial targets in North Vietnam. For the first time, the White House authorized B-52 strikes in the Hanoi vicinity. In less than two weeks, 729 B-52 sorties dropped 15,000 tons of bombs, and fighter-bombers added another 5,000 tons. Despite the loss of 26 air-

craft, including 15 B-52s, airpower broke the impasse. Peace talks resumed 8 January 1973, and a comprehensive cease-fire was signed on 23 January 1973.[8]

Although many airmen perceived Linebacker II as evidence of what airpower could do if unshackled from political constraints and micromanagement, historian Mark Clodfelter astutely critiqued this view. He compared Rolling Thunder and Linebacker II and formed three important analytical observations:

1. Before the 1968 Tet Offensive, the Viet Cong (the largely South Vietnamese Communist movement) waged primarily a guerrilla war augmented by significant, but limited, numbers of North Vietnamese regular troops.
2. The Johnson Administration sought a broad positive political objective—to achieve an independent, stable, non-Communist South Vietnam.
3. President Lyndon Johnson faced an equally important negative political constraint—avoiding direct Soviet or Chinese Communist involvement in fighting that might escalate to World War III.[9]

In contrast, President Richard Nixon faced a different context for Linebacker campaigns:

1. After the Tet Offensive that largely destroyed the Viet Cong, the 1972 Easter Offensive featured a high-intensity conventional assault with targets and supply lines more suited to airpower capabilities.
2. The Nixon Administration sought a narrow, relatively simple, positive political objective—to withdraw American troops without an imminent Communist takeover.
3. A series of Nixon-Kissinger political maneuvers resulted in Soviet-American détente, and opening Sino-American diplomatic relations largely ended fears of World War III—in other words, cancelled the previous negative political constraint.[10]

Thus, drastic changes in political context greatly enhanced airpower's effectiveness as a political instrument in the latter stage of the American war in Vietnam. Nevertheless, the success of Linebacker II did not mean a similar approach would have succeeded seven years ear-

lier. The Eleven-Day War or Christmas Bombings did not validate Cold War airpower doctrine applied to irregular war.[11]

In Vietnam, airpower demonstrated its versatility and wide-ranging impact—and its limitations. The US Air Force did not "win" in Vietnam, despite an impressive showing. Faced with a blended guerrilla and conventional campaign, American and South Vietnamese airmen applied virtually every form of airpower over a range of military operations with disappointing results. Although the Air Force flew over 5.25 million sorties over Southeast Asia, dropped 6 million tons of bombs, and suffered 2,251 aircraft losses, North Vietnamese forces conquered South Vietnam in April 1975. Air forces, despite their power, failed to prevent the collapse of South Vietnam's and America's will to fight.[12]

Airpower in Irregular Warfare: A Didactic Digest Driving Doctrine

In a 2015 *Wall Street Journal* article, "Why Air Power Alone Won't Beat ISIS," military analyst Max Boot presented a clear thesis expressed in his title: anti-ISIS coalition airpower efforts will fail if not combined with ground forces.[13] His article described early airpower theories and their limitations confronting irregular warfare.[14] He looked at the airpower doctrine devoted to strategic air war for an industrial age but neglected more contemporary thinking. His critique appeared on the mark and was largely unchallenged by many contemporary airmen, but Boot's article missed an even more important question given public opposition to committing ground forces in Syria and Iraq: What can airpower do to confront the Islamic State? Or stated more generally, what can air forces do to counter irregular warfare?

A survey of the relatively limited contemporary literature devoted to airpower and irregular warfare revealed a focus on kinetic effects (bombing and targets) and overlooked the political nature of irregular war. For contemporary airmen confronting irregular warfare, three ideas expressed by Prussian theorist Carl von Clausewitz set the stage:

War is an instrument of politics.

> The first, the supreme, the most far-reaching act of judgment that the statesman and commander have to discern and agree upon is the kind of war they are facing.
>
> Everything in strategy is very simple, but that does not mean that everything is very easy. Great strength of character, clarity, and firmness of mind are needed to follow through and not be distracted by thousands of diversions.[15]

With these thoughts in mind, Airmen should consider the following thesis: In irregular war, airpower is, first and foremost, an instrument of politics. No matter how spectacular airpower's technological potential appears, Airmen must remember that airpower is simply a means to achieve a political end.

At its core, irregular warfare is conceptual, a battle of ideas. Considering the 1916 Arab Revolt, T. E. Lawrence observed the difficulty posed for a conventional army confronting an idea: "How would the Turks defend . . . [against] an influence, a thing invulnerable, intangible, without front or back, drifting about like a gas?"[16] Writing of the Chinese Revolution (1927–1949), Mao Zedong talked of winning the people's hearts and minds and described a process of using an ideologically trained army to not only fight but also persuade the people through word (propaganda, education, and indoctrination) and deed (moral example, civic actions, and coercion). Along the same lines, contemporary Australian counterinsurgency expert David Kilcullen defined counterinsurgency as "a competition with the insurgent for the right and the ability to win the hearts, minds and acquiescence of the population."[17] For success, the counterinsurgent must use combat power carefully, indeed even sparingly; misapplied firepower "creates blood feuds, homeless people, and societal disruption that fuels and perpetuates the insurgency. The most beneficial actions are often local politics, civic action, and beat-cop behaviors. For your side to win, the people do not have to like you, but they must respect you and accept that your actions benefit them, trust your integrity and your ability to deliver on promises, particularly regarding their security. In this battlefield, popular perceptions and rumor are more influential than the facts and more powerful than a hundred tanks."[18]

The difficulty of irregular warfare lies not in theory, but in practice. "Winning hearts and minds" seems intuitively obvious but proves exceedingly hard to do. How do you convince a population of

your righteous view when you do not speak the language or know the culture? Irregular war theory evokes Sun Tzu's famous line: "Know the enemy and know yourself; in a hundred battles, you will never be defeated."[19] This certainly is a wise observation, but how can you know your enemy in a single short deployment? Thus, the Airman's conundrum is to use airpower as an instrument to advance the overall political objective without damaging the cause through excessive force.

Irregular warfare poses a particularly tough challenge for airpower and Airmen. Fortunately, two excellent sources influence current doctrinal thinking: Col Dennis M. Drew's "Air Theory, Air Force, and Low Intensity Conflict: A Short Journey to Confusion" and James S. Corum and Wray R. Johnson's *Airpower in Small Wars: Fighting Insurgents and Terrorists*.[20] Drew's 1997 chapter ably critiqued the shortcomings of the first 50 years of US Air Force doctrinal thinking (or lack thereof) regarding irregular war, while Corum and Johnson presented a history of airpower in small wars through a series of twentieth-century case studies. Both sources link classic irregular warfare theory with useful ideas made possible by airpower.

Drew asserted that the US Air Force "has not effectively accounted for the realities" of irregular war in its theory of airpower and instead preferred to think of it as "little more than a small version of conventional war."[21] He succinctly presented five differences between insurgencies and conventional wars that proved vexing to airpower's application:

1. Time. Classic insurgencies were protracted struggles intended to frustrate the Western concept of short, decisive wars.
2. Dual military and political strategy. Irregular warfare featured both a military and a civilian political strategy intended to harass and frustrate a government by showing its inability to cope. After wearing down the government's resources and morale, the insurgents harnessed the masses to overwhelm government forces in a conventional campaign (i.e., Airmen cannot directly influence a government's policies, and when airpower is called for in direct combat, it is too late).
3. Insurgents used guerrilla tactics to negate superior government firepower by blending insurgents into the civilian population (i.e., deny airpower targets).

4. Insurgent/guerrilla logistics were largely immune from classic airpower interdiction and strategic attack (i.e., too small, too dispersed, too blended into the populace for attack).
5. The center of gravity was the same for both the government and the insurgents: the people. "Putting fire and steel on target" may backfire by alienating this center of gravity.[22]

Professor Drew cautioned that US Airmen tended to be "doers" rather than "thinkers" and valued technology and mental toughness over devotion to academic study and conceptual inquiry. During the first five decades of Air Force doctrinal development, well-reasoned thinking on the application of airpower appeared occasionally, but basic Air Force doctrine was "unaffected at best and contradictory at worst" in its treatment of irregular war.[23] In essence, Drew's article challenged a generation of Air Force leaders to do better.

Seeking to fill an intellectual void and create a textbook for teaching airpower's role in irregular war, James S. Corum and Wray Johnson argued that airpower was an indispensable tool for militaries confronting terrorists, guerrillas, insurgents, or other irregular forces. They emphasized that all forms of aviation comprised airpower, including army, navy, and air force aircraft, plus civilian, police, unmanned, space, and other nontraditional aviation sources. Presenting a series of in-depth airpower case studies ranging from the 1916 Mexican punitive expedition against Pancho Villa to Israeli air strikes against Hezbollah in the early 2000s, Corum and Johnson concluded with 11 general lessons:

1. A comprehensive strategy is essential. Military, political, economic, social, and other resources must be coordinated to attain a political goal.
2. The support role of airpower (e.g., intelligence, surveillance, and reconnaissance [ISR]; transport; medical evacuation; supply; etc.) is usually the most important and effective mission in a guerrilla war.
3. The ground attack role of airpower becomes more important when the war becomes conventional.
4. Bombing civilians is ineffective and counterproductive (i.e., campaigns to punish backfire!).

5. There is an important role for the high-tech aspect of airpower in small wars (i.e., smart bombs, space, cyber, and remotely piloted aircraft [RPA]).
6. There is an important role for the low-tech aspect of airpower in small wars (i.e., simple, old aircraft can still do the job and may be more cost-effective).
7. Effective joint operations are essential for the effective use of airpower.
8. Small wars are intelligence intensive.
9. Airpower provides the flexibility and initiative that are normally the advantage of the guerrilla.
10. Small wars are long wars.
11. The United States and its allies must put more effort into small wars training (i.e., small or irregular wars are not simply smaller versions of conventional war; similarly, building host-nation airpower capacity is an effective force multiplier).[24]

The airpower-oriented writings of Drew, Corum, and Johnson complemented the important 2006 *Counterinsurgency* manual (Army FM 3–24/Marine Corps MCWP 3–33.5) signed by Lt Gens David H. Petraeus and James N. Mattis. In the first new counterinsurgency (COIN) manual in 20 years, a celebrated writing team captured classic ideas of how to defeat insurgency through protecting the population: "The government normally has an initial advantage in resources; however, that edge is counterbalanced by the requirement to maintain order and protect the population and critical resources. Insurgents succeed by sowing chaos and disorder anywhere; the government fails unless it maintains a degree of order everywhere."[25]

Counterinsurgency's "Appendix E: Airpower in Counterinsurgency" recognized airpower's asymmetric advantage and echoes Drew, Corum, and Johnson. The appendix emphasized airpower's supporting role in most counterinsurgencies. It acknowledged airpower's importance in direct strike, intelligence collection, transport, helicopter troop lift, CAS, reconnaissance, surveillance, and the need to develop a host-nation's airpower capability. Still, with the manual's population-protection emphasis, the appendix cautioned, "precision air attacks can be of enormous value in COIN operations: however, commanders [must] exercise exceptional care. Bombing, even with

the most precise weapons, can cause unintended civilian casualties. Effective leaders weigh the benefits of every air strike against its risks. An air strike can cause collateral damage that turns the people against the host-nation government and provides insurgents with a major propaganda victory."[26]

Insightfully and conceptually sound, FM 3–24's airpower annex represented an important step forward in doctrinal thinking regarding airpower and irregular war. Furthermore, it demonstrated the value of applying academic thought to warfighting challenges.

Despite the doctrinal advance, Air Force Maj Gen Charles J. Dunlap Jr. in 2008 claimed the Army–Marine Corps Counterinsurgency manual failed to go far enough. In *Shortchanging the Joint Fight: An Airman's Assessment of FM 3–24 and the Case for Developing Truly Joint Doctrine*, Dunlap acknowledged the manual's skillful statement of classic, population-centric COIN doctrine but critiqued the document's failure to exploit contemporary airpower's potential made possible by advanced technology. More important, Dunlap argued, "the value of an Airman's contribution to the counterinsurgency . . . is not limited to airpower capabilities" but "equally—or more—important is the Airman's unique *way of thinking*" (emphasis in original). He urged a joint doctrine, including an air-minded perspective, to fight unconventional war.[27]

In a cogent argument, Dunlap proposed changes to FM 3–24's troop-heavy, close-engagement approach. Airpower represented an asymmetric advantage for the United States. He advocated replacing American boots on the ground, more likely to stir local resentment of foreign occupiers, with technology-enhanced capabilities of air, space, and cyberspace.[28] Dunlap reasoned that under present conditions, "masses of ground forces, especially American troops, simply is not *sustainable* strategy" (emphasis in original).[29] Public aversion to US casualties and long-term, costly employment of US ground troops weakened FM 3–24's case. Instead of "clear-hold-build," airpower could provide an alternative "hold-build-populate," where airpower could help create safe havens—abandoned areas that could be rehabilitated, protected, and repopulated.[30] In essence, Dunlap fused FM 3–24 COIN theories with contemporary precision, high-technology capabilities, and thinking: "the challenge for military strategists is to devise *pragmatic* options within the resources realistically available to political leaders" (emphasis in original).[31]

Appearing at roughly the same time as Dunlap's study, noted airpower theorist Phillip S. Meilinger critiqued the boots-on-the-ground approach of American COIN doctrine. Even with the relative success of the 2007–2008 surge in Iraq, Meilinger considered the presence of thousands of American ground troops dangerous and deadly for both US forces and Iraq's civilian population. Instead, he suggested that the US objectively study the Royal Air Force's "air control" operations in the Middle East during the 1920s and 1930s and also the airpower, Special Operations Forces (SOF), and indigenous ground forces that succeeded in Bosnia, Kosovo, Afghanistan (2001–2002), and Iraq (2003).[32] In essence, Meilinger reinforced Dunlap's argument and called for a joint, air-centric COIN to build on American strengths and avoid political weaknesses. In other words, precision airpower + SOF + ISR + indigenous troops provided the equation for success.[33]

In "Preparing for Irregular Warfare: The Future Ain't What It Used to Be," published in 2009, retired Col John Jogerst lauded the US Air Force's superb tactical capabilities; however, he proclaimed these skills irrelevant strategically. In COIN, "the critical capability involves building the partner nation's airpower—an essential distinction."[34] In a war for political legitimacy, the US Air Force must understand the difference between "doing COIN (the job of the local authorities) and enabling COIN (the role of external actors)," including the US.[35] Agreeing with FM 3–24, Jogerst emphasized assisting the host nation by enhancing its local presence and enabling small unit tactical prowess through "immediate, precise, and scalable firepower."[36] But unlike Dunlap or Meilinger, Jogerst emphasized foreign internal defense (FID), building partner capability, and training host-nation air forces to do the job themselves.[37]

Jogerst proposed creating a permanent US Air Force irregular warfare (IW) wing staffed by COIN experts to avoid the usual American tendency to provide overwhelming force independent of local control. Since IW and COIN are inherently political wars, host nations must be trained to function independently and reinforce the government's legitimacy.[38] Hence, a US Air Force IW wing would provide a long-term, sustainable organization with a COIN group to teach airpower employment and provide initial capability and an FID group to develop host-nation capability. Additionally, Jogerst stressed that the wing must prepare a small number of personnel with inten-

sive cultural and language skills to build useful personal relationships with the partner nations.[39]

Although not specifically oriented for irregular warfare, another work from a different source exemplified Dunlap's argument for novel, air-minded thinking. Dr. Sanu Kainikara's *The Bolt From the Blue: Air Power in the Cycle of Strategies* (2013) presented broad, fresh, air-minded perspectives useful for irregular warfare at the conceptual, strategic level. A former Indian Air Force wing commander and current air theorist at Australia's Air Power Development Centre, Dr. Kainikara argued that airpower planners must reject the concept of a linear end state.[40] Instead, airpower represented an instrument in a cycle of strategies that included influence and shape, deterrence, coercion, and punishment. In other words, the spectrum of violence was not a line, as often depicted with humanitarian assistance on one end and total war on the other, but a circle (or cycle) with war termination immediately linked to postconflict stabilization. In this, Kainikara evoked Clausewitz's famous aphorism, "in war the result is never final."[41] Just as classic insurgency theory often talked of stages of guerrilla or irregular war, Kainikara suggested applying counterinsurgency air strategies as a cyclical process.

Kainikara emphasized the correct calculation of ends and means and airpower's inherent flexibility. For example, in the strategy of influence and shape, Kainikara described distinct airpower contributions as a means to monitor, assist, intervene, police, and stabilize to avoid conflict.[42] Highlighting airpower's strategic contribution, Kainikara explored airpower's ability to apply nonlethal force by monitoring, providing physical assistance and intervention through airlift, and active policing and stabilization through ISR. Like Dunlap, Kainikara articulated four airpower advantages applicable to irregular war:

1. It carries comparatively low operational risk with respect to one's own casualties.
2. Since operational risk is low, it is easier to obtain political support for action.
3. Airpower is scalable—relatively easy to ramp up (or down) the intensity and tempo of operations.
4. Air responds rapidly to evolving threats.[43]

Consequently, Western policy makers may be unable to resist applying limited airpower even when airpower alone may not win an

irregular war. The need to "do something" will trump military planners' understanding of airpower's limits in fighting insurgencies.

Summary

Challenged by Dennis Drew and historically analyzed by James Corum and Wray Johnson, thinking on airpower's role in irregular warfare significantly advanced over the past decade. Charles Dunlap, Phillip Meilinger, John Jogerst, and Sanu Kainikara conceptualized the air instrument as a tool in the fight against contemporary, irregular wars. As Meilinger and others articulated, airpower combined with advanced ISR and SOF generates unparalleled precision strike and greatly enhances local forces. Likewise, Jogerst gets it right with his emphasis on FID, the need to build host-nation capacity. More recently, operations in Afghanistan, Iraq, and Syria demonstrated the value of airborne ISR in providing persistent overwatch for ground operations, convoy protection, and guarding forward outposts. Despite airpower's important technological contribution, Airmen must resist the lure of technological determinism. Technology is vital and should not be minimized but does not provide a silver bullet.

Context matters, history matters, and the political ends must be understood and acceptable to the populations involved. Airmen must not forget that COIN and irregular warfare are inherently political. Therefore, two additional observations from T. E. Lawrence complement the ideas of air theorists and should not be ignored:

> Rebellion must have an unassailable base, something guarded not merely from attack, but from the fear of it . . . . It must have a sophisticated alien enemy, in the form of a disciplined army of occupation too small [for the territory]. It must have a friendly population, not actively friendly, but sympathetic to the point of not betraying the rebel movements to the enemy. Rebellions can be made by 2 percent active in a striking force, and 98 percent passively sympathetic.
>
> In 50 words: Granted mobility, security (in the form of denying targets to the enemy), time, and doctrine (the idea to convert every subject to friendliness), victory will rest with the insurgents, for the algebraical factors are in the end decisive, and

> against them perfections of means and spirit struggle quite in vain.[44]

Lawrence's ideas provide a blueprint to the insurgent (achieve mobility, security, time, and doctrine; create an unassailable base) as well as to the counterinsurgent (deny these elements to the enemy). Airmen must contribute to the battle for ideas for irregular war through creative thinking—how to employ the many distinctive, force-multiplying attributes of airpower to the comprehensive political strategy. As examined, contemporary air theorists provide many of the tactical, operational, and strategic ideas needed to enhance local forces and avoid large numbers of American boots on the ground. Still, Airmen must recognize a caution: used in political isolation or without strategic thought, airpower simply illustrates the truth of Lawrence's 50 words: "for the algebraic factors are in the end decisive, and against them perfections of means and spirit struggle quite in vain."

Notes

1. For a good survey of early Air Force involvement in Vietnam, see Schlight, "War in Southeast Asia," 241–94; Futrell, *United States Air Force in Southeast Asia*, 79–84, 227–35, 256; Schlight, *A War Too Long*, 6, 16, 19; Dick, *Reach and Power*, 376–83; and McFarland, *Concise History of the U.S. Air Force,* 59. USS *C. Turner Joy* is now primarily referred to as USS *Turner Joy*. The Gulf of Tonkin incidents aroused considerable controversy during the Vietnam War with many claiming the incidents were manufactured. Most historians agree that the attack of 2 August 1964 was real and that confusion surrounds the incident of 4 August whereby North Vietnamese shadowing operations might have been interpreted as an attack. Professor John F. Guilmartin observed that the North Vietnamese chose the latter date to celebrate "Navy Day," suggesting that a second attack was intended. Guilmartin, *America in Vietnam*, 86.

2. Schlight, "War in Southeast Asia," 281–88; Dick, *Reach and Power*, 383–94; McFarland, *Concise History of the U.S. Air Force*, 61–62; Schlight, *War Too Long*, 45–53; Guilmartin, *America in Vietnam*, 95, 106–18; Thompson, "Operations Over North Vietnam, 1965–1973," 108–17; and Hone, "Southeast Asia," 513–46. For a sharp critique of the conceptual thinking, target selection, and execution of Rolling Thunder, see Clodfelter, *Limits of Air Power*, 73–115.

3. Schlight, "War in Southeast Asia," 259, 263–68; Dick, *Reach and Power*, 394–97; McFarland, *Concise History of the U.S. Air Force*, 63; Schlight, *War Too Long*, 30–31; and Guilmartin, *America in Vietnam*, 95.

4. Schlight, "War in Southeast Asia," 278; Dick, *Reach and Power*, 398–99; McFarland, *Concise History of the U.S. Air Force*, 65; Schlight, *War Too Long*, 41–42; Schlight, *War in South Vietnam*, 277–88; and Guilmartin, *America in Vietnam*, 138, 146–47.

5. Richard M. Nixon, "Address to the Nation Announcing an Agreement on Ending the War in Vietnam," 23 January 1973, https://millercenter.org/.

6. Schlight, "Vietnamization and Withdrawal," 317–24; Dick, *Reach and Power*, 412–15; McFarland, *Concise History of the U.S. Air Force*, 66; Schlight, *War Too Long*, 87–97; Thompson, "Operations Over North Vietnam," 117–23; Clodfelter, *Limits of Air Power*, 151–76 (particularly good for linking political objectives, strategy, and operations); and Guilmartin, *America in Vietnam*, 177–85.

7. Schlight, "Vietnamization and Withdrawal," 320–21; Dick, *Reach and Power*, 414–15; McFarland, *Concise History of the U.S. Air Force*, 66; Schlight, *War Too Long*, 90–93; Thompson, "Operations Over North Vietnam," 120–22; Clodfelter, *Limits of Air Power*, 172–73; Guilmartin, *America in Vietnam*, 182; and Hone, "Strategic Bombardment Constrained," 510–12.

8. Schlight, "Vietnamization and Withdrawal," 325–28; Dick, *Reach and Power*, 415–17; McFarland, *Concise History of the U.S. Air Force*, 66–68; Schlight, *War Too Long*, 97–100; Thompson, "Operations Over North Vietnam," 124–26; Clodfelter, *Limits of Air Power*, 177–202; Guilmartin, *America in Vietnam*, 186; and Hone, "Strategic Bombardment Constrained," 514–16.

9. Clodfelter describes "positive" political objectives as those "attainable only by *applying* military power," while negative political goals are those "achievable only by *limiting* military force" (emphasis in original). Clodfelter, *Limits of Air Power,* xi, 204–5.

10. Clodfelter, 204–5.

11. Clodfelter, 205–6.

12. Schlight, "Vietnamization and Withdrawal," 331; Dick, *Reach and Power*, 417; McFarland, *Concise History of the U.S. Air Force*, 69; and Schlight, *War Too Long*, 103.

13. Boot, "Why Air Power Alone Won't Beat ISIS," A15.

14. Although specialists will debate the nuances and differences between terms, this book will use irregular warfare, small wars, guerrilla war, and counterinsurgency interchangeably. Additionally, it substitutes "irregular warfare" for "low intensity conflict" (LIC) for Dennis Drew's observations. For astute commentary on the problem of terminology in irregular warfare/counterinsurgency/small wars, see Gray, "Irregular Warfare: One Nature, Many Characters," 37.

15. These famous passages have been paraphrased. Clausewitz, *On War*, 87, 88, 178.

16. Better known as Lawrence of Arabia, T. E. Lawrence produced a number of insightful writings on guerrilla warfare of which *The Seven Pillars of Wisdom* is the most famous, but his short "The Science of Guerrilla Warfare" and "Twenty-Seven Articles" are valuable for succinct insights. Lawrence, "The Science of Guerrilla Warfare." See also T. E. Lawrence, " Articles," The Arab Bulletin, 20 August 1917, reprinted on *The World War I Document Archive*, last modified 7 July 2009, http://wwi.lib.byu.edu/.

17. Kilcullen, "Twenty-Eight Articles," 134.

18. Kilcullen, 134.

19. As famous as this line is, carefully consider the rest of the quote: "When you are ignorant of the enemy but know yourself, your chances of winning or losing are equal. If ignorant both of your enemy and of yourself, you are sure to be defeated in every battle." Hanzhang, *Sun Tzu's Art of War*, 36.

20. Drew, "Air Theory," 321–47; and Corum and Johnson, *Airpower in Small Wars*.

21. Drew, "Air Theory," 321.

22. Paraphrased from Drew, 323–25.

23. Drew, 347.

24. Corum and Johnson, *Airpower in Small Wars*, 425–37.

25. Headquarters Department of the Army and Headquarters Marine Corps Combat Development Command, Department of the Navy, Headquarters United States Marine Corps, FM 3–24 and Marine Corps Warfighting Publication No. 3–30.5, *Counterinsurgency*, 1–2. Although the manual has both Army and Marine Corps numerical designations, this book will simply refer to it as FM 3–24. In *The Gamble: General Petraeus* and the *American Military Adventure in Iraq*, Thomas E. Ricks described the writing of FM 3–24 as an intellectual, policy, and leadership tour de force. Ricks detailed Petraeus's role in assembling a diverse team of practitioners and academics, both military and civilian, to produce a groundbreaking, insightful, focused attack on the challenge of counterinsurgency. FM 3–24 featured the writings of David Galula, Charles Calwell, David Kilcullen, Roger Trinquier, and others in addition to famed guerrilla-warfare classics, including Sun Tzu, T. E. Lawrence, and Mao Zedong. The field manual's annotated bibliography is impressive and worth professional study.

26. FM 3–24/MCWP No. 3-30.5, *Counterinsurgency, E-1.*

27. Dunlap, *Shortchanging the Joint Fight*, 7–8. Note: General Dunlap's observations made an impact; the current counterinsurgency manual is now a joint publication: JP 3–24, *Counterinsurgency.*

28. Dunlap, *Shortchanging the Joint Fight*, 13.

29. Dunlap, 33.

30. Dunlap, 43.

31. Dunlap, 64.

32. Meilinger, "Counterinsurgency From Above," 39. Another well-written article reinforced the precision airpower + SOF theme: Patterson, "Long-Term Counterinsurgency Strategy," 118–31.

33. Phillip S. Meilinger, email message to author, 12 May 2016.

34. Jogerst, "Preparing for Irregular Warfare," 68.

35. Jogerst, 68.

36. Jogerst, 72.

37. Jogerst, 75.

38. Jogerst, 74.

39. Jogerst, 76.

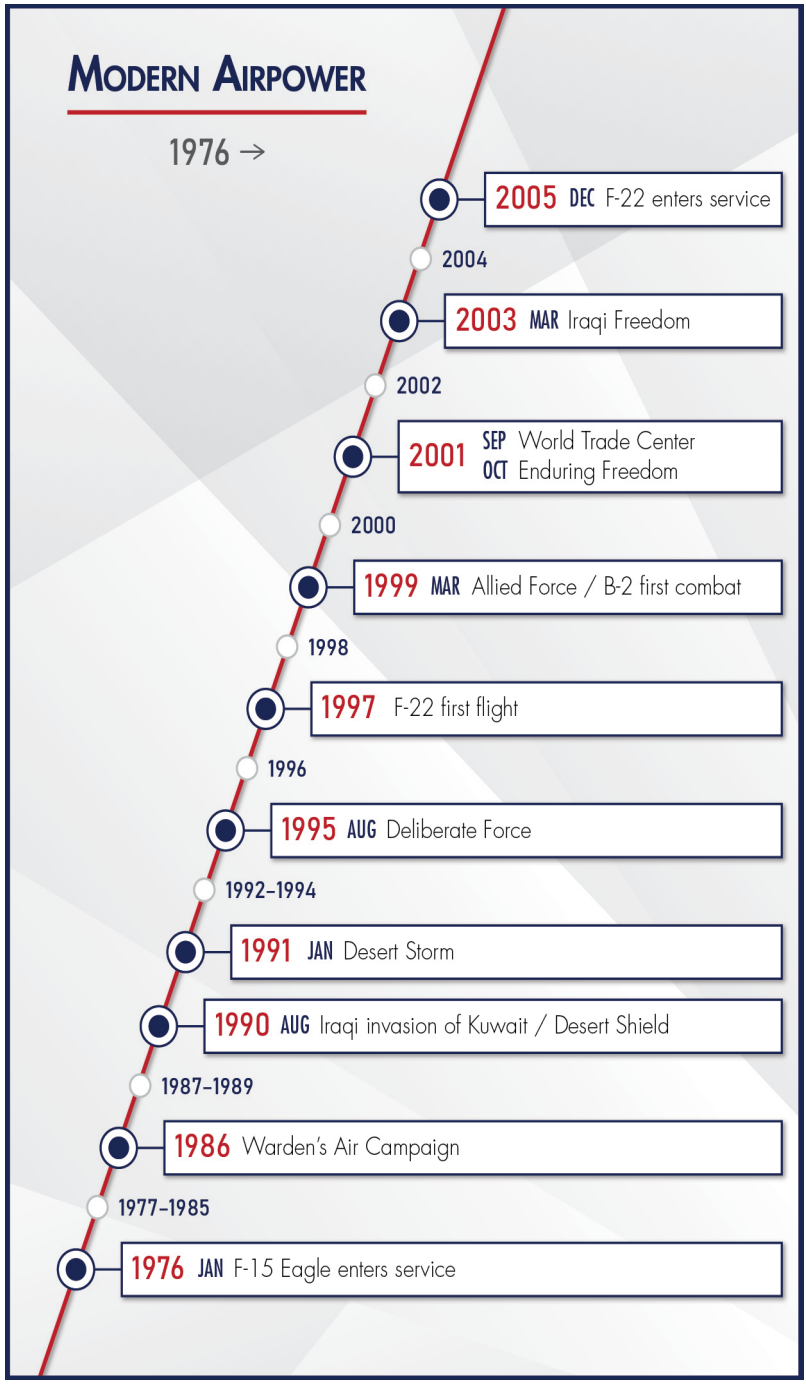
40. Referring to JP 5–0, which outlines an operational design process envisioning an initial state, identifying friendly centers of gravity, tangible "lines of effort" for focus, intermediate objectives for measured progress, identified enemy centers of gravity, to achieve a desired end state linking military and political objectives. JP 5–0, *Joint Operations Planning.*

41. Clausewitz, *On War, 80.*

42. Kainikara, *Bolt From the Blue, 35.*

43. Paraphrased from Kainikara, 74–75.

44. Lawrence described the "algebraic" factor as those things that could be measured: size of territory, number of troops, population size, miles of roads and railroads, noting that in Arabia, the Turks simply did not have enough troops for the land mass. Lawrence, "Science of Guerrilla Warfare," n.p.


MODERN AIRPOWER
1976 →
2005 DEC F-22 enters service
2004
2003 MAR Iraqi Freedom
2002
2001 SEP World Trade Center
OCT Enduring Freedom
2000
1999 MAR Allied Force / B-2 first combat
1998
1997 F-22 first flight
1996
1995 AUG Deliberate Force
1992–1994
1991 JAN Desert Storm
1990 AUG Iraqi invasion of Kuwait / Desert Shield
1987–1989
1986 Warden's Air Campaign
1977–1985
1976 JAN F-15 Eagle enters service

Chapter 12

The Quest for Strategic Paralysis

On 2 August 1990, Iraqi dictator Saddam Hussein directed over 100,000 troops to invade oil-rich Kuwait, claiming it as Iraq's nineteenth province. Immediate international condemnation followed, and on 6 August 1990 the UN authorized an economic embargo. The same day, President George H. W. Bush announced Operation Desert Shield, the deployment of US air and ground units to defend Saudi Arabia and Persian Gulf states. Within 18 hours of the order, US Air Force Military Airlift Command (MAC) C-141 and C-5 transports delivered elements of the Army's 82nd Airborne Division and the Air Force's 1st Tactical Fighter Wing (whose 48 F-15Cs flew direct).[1]

Operation Desert Shield eclipsed the Berlin Airlift as the greatest air deployment in history. From 7 August to 8 November 1990, MAC transport planes concentrated on delivering defensive forces, and the second phase (9 November to January 1991) brought material for a counteroffensive. The "air bridge" spanned over 7,000 miles and included 20,500 strategic airlift missions. Desert Shield validated Air Force large-capacity, heavy transports: the Lockheed C-5A Galaxy and the Lockheed C-141A Starlifter. In total, the "heavies" carried 534,000 passengers and 542,000 tons of cargo during the Gulf War.[2]

When US Central Command theater commander Gen H. Norman Schwarzkopf asked for a conceptual air plan, Col John Warden, the Air Staff's deputy director for Warfighting Concepts, assembled a select planning group known as Checkmate. The resulting plan, Instant Thunder, called for a stand-alone air offensive designed to destroy Iraqi centers of gravity by attacking 84 high-priority targets in a week. Lt Gen Charles A. "Chuck" Horner, Joint Force Air Component Commander, rejected the "airpower alone" thesis and formed his own Special Planning Group, known as The Black Hole, to refine the Air Staff plan. By 25 August 1990, Horner's Black Hole rolled Instant Thunder into a sophisticated four-phase air campaign that targeted the enemy's strategic centers, air defense network, and ground combat forces. Central to success, coalition air forces had to neutralize Iraq's integrated air defense network that included an estimated 690 combat aircraft, 17,000 SAMs, and 9,000 AAA guns.[3]

At 0239 local time, 17 January 1991, three Air Force Special Operations MH-53J PAVE LOW helicopters led nine Army Apaches on

the first strike mission of Operation Desert Storm. Within hours, the world watched live television coverage of Iraqi skies filled with AAA fire, but with no apparent effect. Lockheed F-117A Nighthawks struck high-risk, heavily defended targets with unprecedented precision and total impunity. Under General Horner's command, 2,700 aircraft from 14 countries and services implemented the finely honed master air attack plan. The coalition effort overwhelmed the formidable Iraqi air defense system with speed, surprise, precision, and mass. Adding to the F-117's stealthy effectiveness, a flight of seven B-52Gs flew nonstop from Barksdale AFB, Louisiana, to strike Iraqi power stations and communications facilities with air-launched cruise missiles. With a round-trip duration of 35 hours, the 14,000-mile raid was the longest combat mission in history and proof of the US Air Force's claimed "Global Reach."[4]

The first week of Desert Storm emphasized gaining air supremacy and destroying the enemy's command and control system. Capt John K. Kelk, flying an F-15C, scored the first air-to-air kill by downing an Iraqi MiG-29. All total, coalition aircraft shot down 41 Iraqi aircraft with Capt Thomas N. Dietz and Lt Robert W. Hehemann each credited with three kills. Additionally, allied air forces destroyed 375 of the enemy's 594 hardened aircraft bunkers on the ground. Faced with coalition air dominance, 148 Iraqi aircraft fled to neighboring Iran, preferring internment to destruction.[5]

With air supremacy achieved, the air campaign prepared the battlefield by isolating Iraqi ground units, interdicting supplies, and systematically reducing enemy combat power. Fairchild Republic A-10 Thunderbolt IIs (better known as Warthogs) and two-seat, air-to-ground F-15Es introduced a new term, "tank plinking," as they destroyed the enemy's vaunted armored forces. Additionally, General Dynamics F-111F Aardvarks earned notoriety for dropping 4,600 of the 8,000 precision-guided munitions (PGM). Accompanying most strike packages, EF-111A electronic warfare aircraft provided vital tactical jamming, while RC-135 Rivet Joint, E-8 Joint Surveillance Target Attack Radar System (STARS), and E-3 Airborne Warning And Control System (AWACS) aircraft added unmatched intelligence and command and control. Perhaps the most spectacular element against ground forces, venerable B-52s shattered Iraqi army morale by massive bomb drops upon the enemy's deployed forces. When one Iraqi commander asserted that he surrendered because of the B-52 strikes, his interrogator pointed out that his position had never been

attacked by the Buff: "That is true, but I saw one that *had* been attacked" (emphasis in original).[6]

Not all aspects of the air campaign were successful. Early in the campaign, Saddam Hussein ordered the launching of modified Soviet Scud missiles against Israel, Saudi Arabia, and the Persian Gulf states. On 18 January 1991, US Air Force A-10s, F-16s, and F-15Es with Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) pods commenced the "Great Scud Hunt." Despite 2,767 sorties (22 percent of the strategic air phase), air patrols did not destroy a significant number of the missiles. Skillful Iraqi camouflage, decoys, and employment tactics frustrated the effort. The enemy launched 88 Scuds, including one that struck a US Army Reserve unit at Dhahran that killed 28 soldiers and wounded 98. Nevertheless, most Scuds were launched in the first two weeks of fighting, and the anti-Scud effort reduced the political impact of the weapon.[7]

The Desert Storm air campaign demonstrated airpower's dominance on a modern, conventional battlefield. Over the course of the 44-day air campaign, the coalition flew 118,661 sorties, of which the US Air Force flew 60 percent. Desert Storm also showed the revolutionary impact of PGMs upon modern war. Although PGMs accounted for only 8 percent of the 88,500 tons of bombs dropped, they achieved 80 percent of the known targets destroyed. Moreover, battle damage assessments showed that in some cases, a single F-117 with two laser-guided bombs achieved the same target destruction as 108 World War II B-17s dropping 648 bombs. While coalition ground forces applied the final blow to Iraqi military forces with General Schwartzkopf's famous "Hail Mary" outflanking maneuver, airpower set the stage for victory. As the *Gulf War Air Power Survey* stated, "It was not the number of Iraqi tanks or artillery pieces destroyed, or the number of Iraqi soldiers killed that mattered. It was the effectiveness of the air campaign in breaking apart the organizational structure and cohesion of enemy military forces and in reaching the *mind* of the Iraqi soldier that counted" (emphasis in original).[8]

Airpower's Quest for Strategic Paralysis

In previous chapters, we saw how Giulio Douhet and Billy Mitchell established the foundational concepts for classic airpower theory, emphasizing airpower's offensive nature, flexibility, range, speed, and

revolutionary impact upon warfare, among other ideas. Their ideas stressed the bypassing of fielded forces and striking the enemy's vital centers directly to destroy both the will and the capacity to wage war. World War II's many air campaigns, especially the Combined Bomber Offensive in the European Theater and the B-29 bombing campaign against Japan's cities, emphasized the tremendous impact of what was called at the time strategic bombardment or strategic air warfare. Nuclear weapons dominated Cold War strategic theory, altering the operational focus of strategic air war to the need for deterrence and coercion since the consequences of atomic war were simply too devastating for its use as a rational instrument of power. Moreover, air campaigns over Korea, Vietnam, and the Arab-Israeli wars suggested both limits to strategic bombing's effectiveness and its inapplicability to limited war. Hence, aspects of air theory needed rethinking.

Col John Boyd energized airpower thinking and symbolized a new breed of out-of-the-box thinkers. A Korean War fighter pilot and pioneer of the Air Force Weapons School, John Boyd studied F-86 versus MiG-15 fighter tactics and observed that the F-86's hydraulically operated flight controls provided a significant advantage over the MiG-15. He used this realization to influence the design and procurement of both the F-15 and F-16, stressing the need for "fast transient maneuvers."[9] Later in his career, Boyd broadened his observations to both operational and strategic levels, emphasizing the need to think and act more quickly than the opponent. His extensive briefing, entitled "Patterns of Conflict" or "A Discourse on Winning and Losing," assumed near legendary status within the US armed forces in the 1970s and '80s.[10] Unfortunately, Boyd never published his theories. Instead, other sources published copies of the brief and scholars interpreted his work.[11] One scholar, David Fadok, astutely linked Sun Tzu and B. H. Liddell Hart with John Boyd and John Warden in a "quest for strategic paralysis."[12]

Col John Boyd's "Patterns of Conflict" represented a living document and tool for thinking. He engaged his audience in a conceptual forum, and no two presentations were the same. Boyd proposed a fourfold mission with the intent of revealing the character of conflict, survival, and conquest:

To make manifest the nature of moral-mental-physical conflict

To discern a pattern for successful operations

To help generalize tactics and strategy

To find a basis for grand strategy[13]

Early in the brief, Boyd proposed an idea linked to "fast transient" maneuver (the ability to accelerate, decelerate, climb, dive, and turn rapidly): "in order to win, we should operate at a faster tempo or rhythm than our adversaries—or, better yet, get inside adversary's observation-orientation-decision-action time cycle or loop."[14] In air-to-air combat, pilots must first see the enemy (observe), maneuver to a position of advantage (orient), decide whether to engage (decide), and act. Thus, Boyd's fast transient maneuver ideas morphed into the famed Observe-Orient-Decide-Act (OODA) loop. He explained:

- Why? Such activity will make us appear ambiguous (unpredictable) [and] thereby generate confusion and disorder among our adversaries—since our adversaries will be unable to generate mental images or pictures that agree with the menacing as well as faster transient rhythm or patterns they are competing against. . . .
- [The central idea is to] simultaneously compress [our] own time and stretch-out adversary time to generate a favorable mismatch in time/ability to shape and adapt to change.
- [Thus, the goal is to] collapse [an] adversary's system into confusion and disorder causing him to over and under react to activity that appears simultaneously menacing as well as ambiguous, chaotic, or misleading.[15]

In surveying a variety of wide-ranging, but selective, examples from history, Boyd observed successful patterns of response that may be summarized:

- He who is willing and able to take the initiative to exploit variety, rapidity, and harmony—as the basis to create as well as adapt to the more indistinct—more irregular—quicker changes of rhythm and pattern, yet shape the focus and direction of effort—survives and dominates.

or contrariwise

- He who is unwilling to take the initiative to exploit variety, rapidity, and harmony . . . goes under or survives to be dominated.[16]

Boyd readily admitted to drawing ideas from Clausewitz, Sun Tzu, and B. H. Liddell Hart and urged his audience to think deeply and read widely. Thus, more than the mere ramblings of an eccentric colonel, John Boyd inspired, influenced, and inculcated thinking throughout the US Air Force and military services in general.

If Boyd's airpower thinking was heavily influenced by his experience flying fighters in the Korean War, Air Force Col John Warden's Vietnam combat experience shaped his airpower concepts. To Warden and many of his fellow Airmen, Vietnam air campaigns, especially Operation Rolling Thunder, represented a misapplication of airpower. Graduated, limited, and diluted application of air assets against inappropriate targets failed to exploit the inherent strengths of the air weapon. Hence, as a student at the National War College in 1986, Colonel Warden revamped airpower's use as a strategic instrument by focusing upon enemy leadership.[17] Later, assigned to the Air Staff at the Pentagon, Warden headed the team responsible for producing an air attack plan, called Instant Thunder, in response to Saddam Hussein's 1990 invasion of Kuwait. In this capacity, Warden aimed to produce strategic paralysis by targeting enemy leadership through his five-ring and parallel attack (often called parallel warfare) theories as described in the next paragraph. He called for attacking the enemy's command and control network as a priority with simultaneous, overwhelming air attacks to achieve synergistic effects. After the Gulf War, Warden gained acclaim and doctrinal influence within the US armed forces, but his intellectualism, confidence, and outspoken manner also led to disputes with senior Air Force leaders. Arguably one of the best-known Airmen of his generation, John Warden never achieved the rank of general.

John Warden's 1995 *Airpower Journal* article, "The Enemy as a System," called for deductive, strategic thinking versus inductive, tactical thought. He argued, "We must focus on the totality of our enemy, then on our objectives, and next on what must happen to the enemy before our objectives become his objectives. When all of this is done rigorously, we can begin to think about how we are going to produce the desired effect on the enemy—the weapons, the delivery systems, and other means we will use."[18] Warden also contended that technology altered the traditional relationship between morale and the physical: "The advent of airpower and accurate weapons has made it possible to destroy the physical side of the enemy. This is not to say that morale, friction, and fog have all disappeared. It is to say, however,

that we can now put them in a distinct category, separate from the physical. As a consequence, we can think broadly about war in the form of an equation: (Physical) x (Morale) = Outcome."[19] In other words, Warden believed military planners must consider the enemy as a strategic entity and as a system composed of subsystems. Before operations, military and political leaders must focus on objectives: "At the strategic level, we attain our objectives by causing such changes to one or more parts of the enemy's physical system that the enemy decides to adopt our objectives, or we make it physically impossible for him to oppose us. The latter we call *strategic paralysis.* Which parts of the enemy system we attack (with a variety of weapons ranging from explosives to nonlethal computer viruses) will depend on what our objectives are, how much the enemy wants to resist us, how capable he is, and how much effort we are physically, morally, and politically capable of exercising" (emphasis in original).[20]

To simplify his analysis, Warden proposed "The Five-Ring Model" drawing analogies to the human body. At the center, the brain served as the body's strategic center, the organ responsible for making it a strategic entity providing leadership and direction. Vital organs, like the heart, lungs, and liver, necessary for converting food and air into energy constituted the second ring. Without organic essentials, the brain could not perform its strategic function. Next, an infrastructure of bones, blood vessels, and muscles provided the body's third ring, responsible for mobility and movement. Warden then listed the millions of cells that populate the body carrying nutrients and sustaining the whole of it. Finally, the fifth ring consisted of the body's defenses, white blood cells and other elements that protect the other rings. In total, the system consisted of four basic components: central leadership or direction, organic essentials, infrastructure, and population, protected by a fifth.[21]

In explaining his model, Warden emphasized the need for conceptual, strategic thinking and repeated his theme of the enemy as a system: "Strategic war is war to force the enemy state or organization to do what you want it to do. In the extreme, it may even be war to destroy the state or organization. It is, however, the *whole system* that is our target, not its military forces. If we address the system properly, its military forces will be left as a useless appendage, no longer supported by its leadership, organic essentials, infrastructure, or population" (emphasis in original).[22]

He admitted that despite the model's simplicity, it would be difficult to execute. Each ring possessed more than one center of gravity with varying degrees of vulnerability. Nevertheless, Warden stressed the importance of striking the enemy's command ring as a priority, the key to strategic functioning and the first place to attack. He added a nuance missed by later critics:

> The most critical ring is the command ring because it is the enemy command structure . . . which is the only element of the enemy that can make concessions, that can make the very complex decisions that are necessary to keep a country on a particular course, or that can direct a country at war. . . . Capturing or killing the state's leader has frequently been decisive. In modern times, however, it has become more difficult—but not impossible—to capture or kill the command element. At the same time, command communications have become more important than ever, and these are vulnerable to attack.[23]

He also noted the difficulty of attacking an enemy's population ring directly; in addition to moral concerns, "There are too many targets, and, in many cases, especially in a police state, the population may be willing to suffer grievously before it will turn on its own government."[24] Warden also acknowledged that the model might be "somewhat diminished" in guerrilla or irregular warfare, where the people may be motivated to fight for extended periods of time against an invader.[25]

Warden finished his argument in "The Enemy as a System" with a concept of parallel attack made possible by technological advances in precision, range, speed, and lethality. In the past armies fought sequentially because a commander had to concentrate resources to prevail against a single vulnerability of the enemy. Now, technology permitted the "the near simultaneous attack on every strategic- and operational-level vulnerability of the enemy. This parallel process of war, as opposed to the old serial form, makes very real what Clausewitz called the ideal form of war, the striking of blows everywhere at the same time."[26] Warden stressed airpower's role in strategic warfare and the need to understand the enemy's objectives. He also emphasized thinking deductively, from big to small, focusing on enemy systems consisting of subsystems, and in turn, avoiding the urge to concentrate on the tools of war—enemy weapons. Instead, Warden clinched his argument with the following reflection: "Fighting is not the essence of war, nor even a desirable part of it. The real essence is

doing what is necessary to make the enemy accept our objectives as his objectives."[27]

Summary

John Warden joined John Boyd as air theorists who bridged classical airpower theory with modern doctrinal ideas. While both aimed to achieve strategic paralysis through air war, Boyd emphasized the mind of the enemy, while Warden sought to destroy his leadership structure. John Warden's five-ring model appealed to military leaders as a simple, coherent, conceptual template, but the model assumed a centralized state with a defined or authoritarian leader. Likewise, parallel attack, or parallel warfare, assumed both command of the air and overwhelming numbers. It did not account for an enemy of near equal or superior strength. Like earlier airpower theorists, Warden lacked precision with some terms. For example, Warden used "centers of gravity" (COG) like Mitchell used "vital centers"—but not like Clausewitz's concept of a single "center of gravity." Despite flaws in some aspects of their respective theories, both John Warden and John Boyd joined classic airpower theorists (represented by Douhet, Mitchell, and ACTS) in envisioning airpower's strategic effect. They modified, but did not challenge, airpower as an inherently strategic entity. Therefore, airpower theorists bridged the gap between past and present and laid the foundation for today's effects-based operations.

Notes

1. Dick, *Reach and Power*, 490–91; Olsen, "Operation Desert Storm, 1991," 177–80; Davis, "Strategic Bombardment in the Gulf War," 536–39; McFarland, *Concise History of the U.S. Air Force*, 75; Y'Blood, "From the Deserts to the Mountains," 441–48; and Keaney and Cohen, *Revolution in Warfare?*, 1–4. Dr. Eliot Cohen served as the director and Dr. Thomas Keaney acted as the chief of the summary report for the Gulf War Air Power Survey commissioned by the US Air Force to review all aspects of air warfare in the conflict, similar to the World War II Strategic Bombing Survey. *Revolution in Warfare?* represents a commercial, edited version of the Gulf War Air Power Survey Summary Report.

2. Dick, *Reach and Power*, 491; Olsen, "Operation Desert Storm," 179–80; McFarland, *Concise History of the U.S. Air Force*, 75; and Y'Blood, "From the Deserts to the Mountains," 448–52.

3. Dick, *Reach and Power*, 493–94; Olsen, "Operation Desert Storm," 181–82; Davis, "Strategic Bombardment in the Gulf War," 540–47; McFarland, *Concise History of the U.S. Air Force*, 78–79; Y'Blood, "From the Deserts to the Mountains," 455–56; and Keaney and Cohen, *Revolution in Warfare?*, 22–44. Three in-depth studies examine

the Desert Storm air campaign planning process and its relationship to airpower theory and organizational politics: Reynolds, *Heart of the Storm*; Mann, *Thunder and Lightning*; and Martin, *Victory From Above*.

4. Dick, *Reach and Power*, 494–96; Olsen, "Operation Desert Storm," 184; Davis, "Strategic Bombardment in the Gulf War," 561–70; McFarland, *Concise History of the U.S. Air Force*, 75, 78; and Y'Blood, "From the Deserts to the Mountains," 458–61.

5. Y'Blood, "From the Deserts to the Mountains," 464, 467–68. Ron Dick states the first air-to-air kill went to Capt. Steve Tate of the 1st Tactical Fighter Wing; *Reach and Power*, 496.

6. Y'Blood, "From the Deserts to the Mountains," 462; Dick, *Reach and Power*, 499, 502; Davis, "Strategic Bombardment in the Gulf War," 571–75; and Olsen, "Operation Desert Storm," 193–95.

7. Dick, *Reach and Power*, 496–97; Olsen, "Operation Desert Storm," 187; Davis, "Strategic Bombardment in the Gulf War," 578–81; McFarland, *Concise History of the U.S. Air Force*, 80; Y'Blood, "From the Deserts to the Mountains," 469–71; and Keaney and Cohen, *Revolution in Warfare?*, 78, 107–8. An excellent analysis of the Great Scud Hunt can be found in Hallion, *Storm Over Iraq: Air Power and the Gulf War*, 177–88.

8. Y'Blood, "From the Deserts to the Mountains," 484–86; and Dick, *Reach and Power*, 507. Davis, "Strategic Bombardment in the Gulf War," 575, 589–613, provides a detailed analysis of the strategic air campaign; and Keaney and Cohen, *Revolution in Warfare?*, present an insightful final chapter: "What Does Desert Storm Tell Us about the Future of Air Power?"

9. Meilinger, *Airmen and Air Theory*, 141–43; Fadok, "John Boyd and John Warden," 363; and Hammond, *The Mind of War*, 91–98.

10. On 2 February 1978, Colonel Boyd presented "Warp XII: Patterns of Conflict" to a class at the US Air Force Academy with the author in attendance. Accused of being a pack rat by his beloved wife, the author still has a copy of the overhead projector slides. For academic year 2005–2006, Air University's School of Advanced Air and Space Studies published Boyd's "A Discourse on Winning and Losing" dated August 1987 as a course reader. Likewise, in January 2007, Chet Richards and Chuck Spinney edited Boyd's "Patterns of Conflict" as a PowerPoint presentation based on a 1986 version, http://www.projectwhitehorse.com/. In 2018, Grant Hammond edited and published a similar 1986 version with Air University Press, https://www.airuniversity.af.edu/. The latter three versions are almost identical and differ from the 1978 version primarily in length and treatment of guerrilla war. Boyd limits his ideas to blitzkrieg/maneuver warfare in the early versions.

11. Fadok, "John Boyd and John Warden," 357–98; and Meilinger, *Airmen and Air Theory*, 141–43.

12. Similar to Liddell Hart's strategic dislocation, Fadok defines strategic paralysis: "a military option with physical, mental, and moral dimensions that intends to disable rather than destroy the enemy. It seeks maximum possible political effect or benefit with minimum necessary military effort or cost. Further, it aims at rapid decision through a maneuver battle directed against an adversary's physical and mental capability to sustain and control his war effort in order to diminish his moral will to resist." Fadok, "John Boyd and John Warden," 361.

13. Boyd, "Patterns of Conflict."

14. Boyd, "Patterns of Conflict," slide 5.

15. Boyd, slides 5, 7.

16. Boyd, slide 174.

17. For a short, but incisive, account of both John Boyd and John Warden's contributions to airpower theory, see Meilinger, *Airmen and Air Theory*, 141–44.
18. Warden, "The Enemy as a System," 42.
19. Warden, 43.
20. Warden, 43.
21. Warden, 49–51.
22. Warden, 47.
23. Later versions of the article will call this the leadership ring. Warden, 49.
24. Warden, 50.
25. Warden, 53.
26. Warden, 54.
27. Warden, 55.

Chapter 13

Airpower and Coercion Theory

The breakup of Yugoslavia after the collapse of Communism proved to be the North Atlantic Treaty Organization's greatest challenge in the 1990s. The Balkans' bloody history of strife, tangled politics, and ethnic hatred plagued hopes for peaceful coexistence. In 1992–1995 a barbaric civil war in Bosnia-Herzegovina challenged the UN and NATO to halt a humanitarian crisis that eventually resulted in resolutions authorizing air operations. In October 1992 the UN sanctioned NATO to conduct Operation Sky Monitor, enforcing a ban on flight operations for all warring factions including Bosnian Serbs, Bosniak Muslims, and Croatians. Sky Monitor involved no combat operations and hoped to encourage peace by "observe and report, but don't engage" rules of engagement (ROE) that failed miserably.[1] Confronted by increasingly bellicose and brutal ground operations by Bosnian Serb forces, which included ethnic cleansing, intentionally using murder, rape, and pillage as instruments of political terror with the intent of forcing Bosniak Muslims and Croatians to flee their homes, the UN activated Operation Deny Flight on 31 March 1993.

Operation Deny Flight intended to prevent Bosnian Serb air operations from assisting the ground campaign. It established a no-fly zone, maintained a NATO air presence, and theoretically provided on-call air support for UN peacekeeping ground forces in designated "safe areas" to protect civilians. Unfortunately, deep UN and NATO political divisions and a general reluctance to become involved in a Balkan civil war led to a "dual-key" procedure requiring both UN and NATO leadership to authorize force. In other words, all 16 NATO member states and the UN Secretary General must "turn their keys simultaneously" for action.[2] In 1993, no approvals to drop bombs were issued and in 1994–1995, only a small number of authorizations that proved too little, too late to stem the tide of violence. According to Richard Holbrooke, the principal American negotiator, the dual-key procedure was an "unmitigated disaster."[3] Along the same lines, one respected analyst concluded, "Operation DENY FLIGHT was little more than a costly exercise converting jet fuel to noise."[4]

The Bosnian Serb capture of Srebrenica on 6 July 1995 forced a change in policy; not only did Serb forces brush aside a lightly armed

Dutch UN battalion (taking 30 hostage) and threaten to kill civilians in the UN safe area, but journalists reported that Bosnian Serb paramilitary forces also murdered thousands of Muslim men in the city.[5] Shamed and frustrated, NATO enabled Lt Gen Michael A. Ryan to prepare a still limited, but more punitive, aerial response.

Although technically a part of Deny Flight, Operation Deliberate Force demonstrated airpower as a coercive force even with "the most restrictive general ROEs in the history of warfare."[6] As commander of Allied Air Forces, NATO Southern Command (AIRSOUTH), Ryan assembled 220 fighter and 70 support aircraft from the US Air Force, Navy, Marines, and eight NATO countries (Great Britain, France, Italy, Germany, the Netherlands, Spain, Turkey, and Greece). Deliberate Force targeted 48 specific military sites intended to restore the UN safe areas, remove Bosnian Serb heavy weapons, and reopen besieged Sarajevo for relief supplies by air and land routes. From 30 August to 14 September 1995, NATO forces delivered 1,026 weapons on 338 specific desired mean points of impact (DMPI). Convinced that "every bomb was a political bomb," General Ryan personally approved every DMPI that struck command and control sites, SAM and AAA emplacements, and supporting radar and communications nodes.[7] After 12 days of air attack, Operation Deliberate Force achieved its assigned objectives with no civilians reported killed and only a small number of Bosnian Serb casualties. With 69 percent of the weapons employed either laser-guided or electro-optical guided bombs (versus 8 percent in Desert Storm), some analysts described Deliberate Force as the first true precision-guided air war. Along the same lines, the most comprehensive assessment concluded: "airpower delivered what it promised in DELIBERATE FORCE. It was a decisive element in bringing a new period of peace to Bosnia—quickly, cleanly, and at minimal cost in blood and treasure to the intervening states and, indeed, to the Bosnian Serbs . . . . Airpower not only was the lead arm of American involvement in the region but also was almost certainly the only politically viable offensive arm available . . . to end in a controllable way an ugly war of indeterminate cause and uncertain future."[8]

Operation Allied Force

Despite the Bosnian experience, militant Serbian nationalism and strongman Slobodan Milošević's continued policy of ethnic cleansing

created a crisis in Kosovo, a Serbian province largely inhabited by ethnic Albanians in 1998–1999. At the same time, Albanian separatists in the Kosovo Liberation Army (KLA) fanned the flames of violence. After the breakdown of diplomatic talks between the two sides, NATO worried about the prospect of a genocidal civil war and destabilization throughout the Balkans. As NATO debated intervention in early 1999, President Milošević unleashed a ruthless offensive designed to crush the KLA and drive ethnic Albanians out of Kosovo. Faced with a massive humanitarian crisis, NATO turned to airpower to influence events.[9]

The NATO air campaign against Serbia represented another attempt to use airpower as a political instrument. Optimistic policy makers looked to NATO's successful two-week Operation Deliberate Force in 1995 that brought relative peace to Bosnia. On 24 March 1999, President Bill Clinton commenced Operation Allied Force and announced three primary objectives:

Demonstrate NATO's opposition to aggression.

Deter President Milošević from escalating attacks on civilians.

Damage Serbia's capability to wage war against Kosovo.

Unfortunately, Milošević and Serbian forces presented US and NATO forces with a tough, savvy opponent with a demonstrated capacity for skilled propaganda and calculated ruthlessness. The ensuing 78-day campaign would be fought against both the Serbian military and global public opinion.[10]

From 24 March to 9 June 1999, NATO air forces walked a political tightrope. Flying over 38,000 sorties, 13 of NATO's 19 nations attempted to pressure President Milošević by degrading Serbian fielded forces in Kosovo and striking a limited number of high-value targets important to his regime within Serbia. NATO sought both to avoid collateral damage and civilian casualties and to maintain popular support for intervention at home. Significantly, NATO policy makers failed to reach political consensus on either the extent of military means to be used or the ultimate political ends to be achieved. The campaign emphasized applying the minimum force necessary to coerce the enemy. Initially, 214 strike aircraft followed a limited, phased air campaign against 51 air defense sites and 40 targets of influence. After weeks of caution and frustration, NATO expanded the scale of the air campaign. Eventually, 563 US Air Force aircraft and 13,850 American Airmen joined the effort as Allied Force approached the scale of a major theater war.[11]

Operationally, Allied Force achieved mixed results. On the plus side, NATO aircraft dominated the skies, inflicting significant damage and preventing Serbian regular forces from massing effective land power. Precision weapons proved their worth on the battlefield and in striking key coercion targets. Adding to the effort, the Northrop Grumman B-2 Spirit flew its first combat missions, eventually delivering 650 Joint Direct Attack Munitions in 49 thirty-hour sorties from Whiteman AFB, Missouri. Unfortunately, airpower failed to prevent dispersed Serbian irregular and paramilitary units from terrorizing the Kosovar Albanian population. Additionally, the enemy's effective camouflage and use of dummy vehicles diluted battlefield effects. Also, despite a concerted effort to avoid civilian casualties, at least 20 major collateral damage incidents occurred, including the accidental bombing of the Chinese embassy in Belgrade on 7 May 1999. The Serbian foe proved adept in manipulating the information war. For example, on 27 March 1999, Serb air defenses shot down a USAF F-117 stealth aircraft. Valiant US Air Force Combat Search and Rescue personnel recovered the pilot in an impressive display of courage and airmanship, but Serbian television exploited images of the downed aircraft to undermine NATO efforts.[12] Of even greater impact, Serbian media immediately broadcast grisly scenes of civilian carnage to a global audience.

By June 1999, NATO airpower accomplished its initial political and military objectives, ended Serbian atrocities, stabilized Kosovo, and undermined the Milošević regime. Although complex political constraints, abysmal flying weather, and a Serbian-manufactured refugee crisis hampered progress, air- and space power triumphed when Milošević agreed to withdraw his forces and accept a joint NATO-UN Kosovo Peacekeeping Force to occupy the province. At the cost of two downed aircraft and no combat casualties, NATO achieved its stated objectives. Nevertheless, critics pointed out that while NATO's military losses of the campaign were slight, Kosovar and Serbian noncombatants suffered significantly. NATO airpower failed to prevent Serbian ethnic cleansing efforts that killed hundreds of Kosovar Albanians and brought misery to hundreds of thousands, and while NATO air attacks attempted to minimize Serbian noncombatant casualties, approximately 500 Serbian civilians were killed.[13]

In retrospect, the 1999 air campaign against Serbia reinforced historical lessons on employing aerospace power. Despite limitations, air and space forces proved operationally precise, effective, and rapid

when viewed in historical context. In many ways, a limited air campaign represented the only means available to coerce an implacable foe. Nevertheless, the experience demonstrated that there are costs, risks, and frustrations to gradual air campaigns. Assessments of Operation Allied Force concluded that air and ground commanders must agree on the enemy's COG, that micromanagement of the targeting process limited military effectiveness, and that coalition politics trumped military effectiveness. In other words, airpower did not provide a silver bullet to solve long-term historical and political problems; policy makers failed to understand the limits of applied military force. Airpower capabilities did not substitute for well-thought strategy. The Operation Allied Force experience also reinforced the importance of popular support for military efforts; the battle for public opinion in all forms of media forms a vital battleground for future conflicts. In a limited conflict, public perceptions rank as important as actual military achievement.[14]

Hammer and Anvil: Airpower's True Worth

Operation Allied Force's perceived limitations rallied critics of airpower's strategic paralysis theory. Arguably the most influential critic, political scientist Dr. Robert Pape, challenged John Warden's ideas. In *Bombing to Win: Air Power and Coercion in Warfare* (1996), Pape asked the question: can airpower alone persuade states to alter their behavior? He challenged what he considered "accepted wisdom" by arguing against coercion campaigns that targeted civilians by either conventional or nuclear means. Instead, Pape asserted that threats against an opponent's military vulnerabilities would succeed by making it infeasible for the enemy to achieve political objectives. He called for policy makers to resist the siren's call of quick, inexpensive airpower solutions to complex problems.[15] Although Pape's coercion theories drew from Schelling, Liddell Hart, and other established theorists, he framed his arguments in political science methodology and coined terms that gained widespread usage. Pape defined coercion as "efforts to change behavior of a state by manipulating costs and benefits." While both deterrence and coercion aimed at the opponent's "calculus for decision-making," deterrence sought to maintain the status quo and coercion attempted to alter behavior through force.[16]

Bombing to Win identified three types of coercion: punishment (threats to civilians), denial (threat of military failure), and risk (a form of punishment that slowly raised the probability of civilian damage). Pape explained that punishment threatened to inflict costs heavier than any potential gains, while denial threatened military defeat where the opponent gained nothing but still suffered significant cost. Like Schelling, Pape differentiated between brute force, or traditional military victory, and coercion, aimed at altering behavior through threat or limited destruction. The primary difference centered on the extent of force: brute force imposed costs after crushing an opponent's means to resist, while coercion (whether punishment or denial) influenced the enemy's mind, changing behavior when the enemy still possessed a means to resist.[17] Along the same lines, risk differed from punishment primarily in the element of timing; a risk strategy threatened civilian punishment gradually. After a series of selected case studies, Pape concluded that coercion by punishment rarely worked and that when coercion succeeded it was through denial. In other words, campaigns to break civilians fail, while coercive campaigns targeting military means *might* work. Sometimes, coercive denial campaigns must escalate to inflict military defeat (or morph into brute force, to echo Schelling).[18] Significantly, Pape's ideas and terminology captured airpower theory and sparked intellectual debate. Pape argued that airpower alone cannot force states to change their behavior. He rejected what he called "decapitation theory" and the strategic emphasis of John Warden and other recent air theorists.

In a 2004 *Foreign Affairs* article, "The True Worth of Air Power," Robert Pape asserted that airpower advocates identified the "wrong revolution" in their claims of an air-centric revolution in military affairs (RMA).[19] He critiqued the belief that wars could be won by selectively targeting enemy leaders, communication systems, and major economic systems. He labeled such ideas as "decapitation theory": "Decapitating the enemy has a seductive logic. It exploits the United States' advantage in precision air power; it promises to win wars in just days, with few casualties among friendly forces and enemy civilians; and it delays committing large numbers of ground troops until they can be welcomed as liberators rather than as conquerors. But decapitation strategies have never been effective, and the advent of precision air weaponry has not made them any more so."[20]

Pape conceded that precision technology greatly increased bombing accuracy, but he viewed the benefit as primarily tactical, not stra-

tegic. He maintained that improved accuracy did not empower air operations to succeed on their own. Precision weapons did not constitute a strategic RMA:

> Yet greater accuracy has not enabled air operations alone to win major wars any more than they did before the precision age. Independent air operations have rarely been decisive. From World War I until the 1980s, they were most effective in support of ground power, serving as the "hammer" to ground power's "anvil," with the anvil usually doing most of the work. Thanks to precision weapons, air power has become a far more effective complement to ground power; the hammer now does much more work for the anvil.
>
> Precision air weapons have fundamentally changed military power, but they have not brought about the revolution often proclaimed by many air power advocates. Despite precision bombing, enemy decapitation has not become "the new American way of war." Rather, precision weaponry has revolutionized contemporary warfare by multiplying the effectiveness of using air and ground power together. The United States, in other words, still wins its wars the old-fashioned way. But with new precision air weapons, it now does so better than ever.[21]

Pape explained that decapitation strategies failed for three reasons: "First, killing leaders and accurately attacking communications networks depends more on military intelligence than on precision in combat. Without precise intelligence, precise weapons may precisely destroy targets that are not in use. Second, there are generally so few leadership targets that they can be destroyed even without precision weapons. Third, even successful hits may not translate into coercive success. Determining which ones will is a problem of political forecasting—and an uncommonly difficult one. No current theory can predict whether air power alone can force regimes to change or assure that they will change in the right direction."[22]

Writing in 2004, Pape supported his claims by arguing that the United States won five major wars in roughly a decade—Kuwait and Iraq (1991), Bosnia (1995), Kosovo (1999), Afghanistan (2001), and Iraq again (2003)—not by decapitating the enemy but by greatly enhancing friendly ground power. Improved bombing accuracy meant a more potent hammer and anvil strategy: "Attacking the enemy si-

multaneously by air and on the ground puts the enemy army in a quandary. If the enemy concentrates its ground forces in large numbers to form thick and overlapping fields of fire, they become vulnerable to air raids. But if it disperses them to avoid air strikes, opposing ground forces can defeat them in detail, mopping them up with few losses."[23]

Pape capped his argument with a simple conclusion: precision weapons greatly enhanced airpower's support for ground campaigns, even allowing it to become the military's main force, with ground power serving as support in some circumstances. In other words, combined arms warfare remains the most effective use of airpower. Precision weapons do not guarantee successful coercion strategies, primarily because of the lack of inadequate targeting intelligence. Precision airpower advocates "have it exactly backwards": "There has been a precision revolution, but not the one touted by air power's advocates. The real revolution has not turned leadership targeting into a winning strategy; it has multiplied the combined effectiveness of air and ground power against enemy forces on the battlefield."[24]

Coercion Theory Refined

Complementing Robert Pape's "hammer and anvil" ideas, Daniel Byman, Matthew Waxman, and Eric Larson refined the coercion theory proposed by Thomas Schelling in the 1960s. Whereas Schelling was primarily interested in coercion within the realm of nuclear weapons and deterrence, Byman, Waxman, and Larson represented the prestigious RAND Corporation and wrote from the perspective of the 1990s. Like Robert Pape, the RAND team offered a corrective to a perceived Warden strategic paralysis orthodoxy. Additionally, Byman, Waxman, and Larson dealt with the immediate post–Cold War world. Not only did they not worry about nuclear issues as a primary theme, but their perspective also reflected a decade where the United States did not anticipate a "near peer competitor."[25]

Byman, Waxman, and Larson's *Air Power as a Coercive Instrument* refined coercion theory and built upon earlier works.[26] To review, B. H. Liddell Hart introduced the term "grand strategy" and the concept of the instruments of power (currently described by DIME—diplomatic, informational, military, and economic). Reflecting on the impact of the atomic bomb, Bernard Brodie emphasized a new purpose for the mili-

tary instrument: deterrence, rather than traditional war fighting. Likewise, Thomas Schelling explored the "diplomacy of violence" and coercion theory as an alternative to traditional military brute force. Both Brodie and Schelling stressed that nuclear weapons fundamentally influenced the nature and character of war. Consequently, post–World War II nuclear theorists argued that Clausewitz and other classical theorists were obsolete. By the end of the Cold War, policy makers perceived a reduced threat of nuclear war and strategic thinkers renewed study of conventional warfare. Like Robert Pape, Byman, Waxman, and Larson transformed coercion theory from its original nuclear emphasis to contemporary precision air warfare for specific, limited political objectives. In their chapter, "How to Think About Coercion," they adopted Pape's paradigm and further clarified his terminology:

> Coercion is the use of threatened force, including the limited use of actual force to back up the threat, to induce an adversary to behave differently than it otherwise would. Coercion is typically broken down into two subcategories: compellence and deterrence. Compellence involves attempts to reverse an action that has already occurred or to otherwise overturn the status quo, such as evicting an aggressor from territory it has just conquered or convincing a proliferating state to abandon its existing nuclear weapons programs. Deterrence, on the other hand, involves preventing an action that has not yet materialized from occurring in the first place. Deterrence would include dissuading an aggressor from trying to conquer a neighboring state or convincing a country that desires nuclear weapons not to seek them.[27]

Like Schelling and Pape, Byman, Waxman, and Larson emphasized that "coercion is not destruction. Although partially destroying an adversary's means of resistance may be necessary to increase the effect and credibility of coercive threats, coercion succeeds when the adversary gives in while it still has the power to resist."[28] Thus, successful coercion is not war fighting; the adversary must still have the capacity to fight but choose not to do so.

Air Power as a Coercive Instrument acknowledged that the line between compellence and deterrence and brute force and coercion is blurred and difficult to discern. Nevertheless, the authors stressed the enormous difference between inducing surrender at the beginning of a conflict and that gained only after a destructive campaign. Thus,

today's war fighter should master coercion theory and focus on the use of threatened force to manipulate an adversary's choices.[29]

In attempting to comprehend the reasons for successful airpower coercion, Byman, Waxman, and Larson analyzed the recent historical record seeking insight into coercion theory in general and the strengths and weaknesses of airpower. They recognized that successful air coercion needed favorable operational conditions—that is, air superiority or uncontested air space—as well as an adversary strategy vulnerable to air attack. In other words, aerial coercion required an enemy strategy presenting identifiable targets, usually with fielded forces and supply lines. The RAND authors identified three enabling factors common to success:

Escalation Dominance—The ability to escalate credibly against the adversary—that is, to threaten imposition of a greater and greater price of defiance—allows a coercer to manipulate the level of costs the adversary associates with behavior.

Threatening to Defeat an Adversary's Strategy—Coercion is more effective when it renders impotent an adversary's strategy for winning or, in coercive terms, gaining the desired benefits.

Magnifying Third-Party Threats—Successful coercive operations can magnify an external threat by reducing the ability of the adversary to defend against the third party. In such cases, the adversary fears not only the immediate punishment imposed but also further losses at the hands of the third party.[30]

Likewise, Byman, Waxman, and Larson described three challenges, or inhibiting factors, to a successful coercion campaign.

Intelligence—A lack of plentiful, accurate, and timely intelligence on the situation and enemy order of battle and assessments on an enemy's determination, creativity, and resilience threatens success.

Credibility—An adversary doubts the coercer's willpower or capacity to sustain/escalate a coercion campaign; the coercer's reputation matters.

> Feasibility—The coercer may lack the means or capacity for the strategy; the adversary may weigh the coerced behavior as a direct threat to its survival; some regimes cannot be coerced.[31]

Finally, the authors offered ideas to clarify Pape's punishment, risk, and denial concepts: "'Punishment strategies' have tried to increase direct costs by threatening to inflict pain on an adversary's population or economy; 'risk strategies' have focused on increasing the probability that the adversary will suffer costs by gradually ratcheting up the pain; and 'denial strategies' have tried to lower the probability of benefits by making it less likely an adversary will achieve territorial or political goals."[32]

Building upon Schelling and Pape, the RAND study refined terminology, concepts, and offered pragmatic considerations for those contemplating an airpower coercion strategy.

Summary

Robert Pape directly challenged the strategic-level emphasis of John Boyd and John Warden. He viewed his ideas as a corrective to airpower independence advocates as far back as Douhet. In sum, Pape argued that "decapitation" does not work, airpower has rarely been decisive, and precision weapons have revolutionized air-ground cooperation and effectiveness but not warfare itself. Airpower now constitutes the hammer to ground power's anvil. In many ways, the logic of Pape rings true; however, his critics point out that Pape's "historical" support is selective, speculative at best, and flat-out wrong at worst. Additionally, although Pape's thesis may well be right, he ignores ever-present political realities that may not permit the "hammer and anvil" option. Nevertheless, Robert Pape's controversial ideas enrich the debate and enhance the thinking behind contemporary airpower theory.

Daniel Byman, Matthew Waxman, and Eric Larson transformed coercion theory from a nuclear emphasis to a conventional one that applied to the 1990s, utilizing airpower and precision-guided munitions. In their context, airpower emerged as a coercive instrument and continued Schelling's focus on diplomacy, bargaining, and the limited use of force to achieve political ends. More specifically, they refined a definition of coercion including two subcategories: compellence and deterrence. They acknowledged that deterrence and com-

pellence blur in practice and that coercion and brute force blur in practice as well. Generally, three factors (enablers) marked successful coercions: escalation dominance, threatening to defeat an enemy's strategy, and magnifying third-party threats. Additionally, three challenges (inhibitors) undermined success in coercion: gaps in intelligence, credibility, and feasibility. Byman, Waxman, and Larson's *Air Power as a Coercive Instrument* played a significant role in contemporary airpower theory. It offered a way to employ limited force for limited political objectives without committing ground troops. Moreover, advances in precision weapons promise reduced collateral damage. Consequently, airpower becomes a choice instrument of policy for modern leaders. Of course, a study of classic military theorists suggests that there are always unintended consequences and fog, and friction will detract from attaining desired results.

Notes

1. Owen, *DELIBERATE FORCE: A Case Study in Effective Air Campaigning*, 466; Owen, "Operation DELIBERATE FORCE, 1995," 202; and *Air Force Historical Support Division*, "1992–NATO Operation Sky Monitor."

2. In 1993, NATO consisted of Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Turkey, the United Kingdom, and the United States. Owen, "Operation DELIBERATE FORCE," 206–7.

3. Owen, "Operation DELIBERATE FORCE," 209.

4. Lambeth, *Transformation of American Air Power*, 179.

5. Owen, "Operation DELIBERATE FORCE," 211. For further detail, see Torkelson, "No Fly, Don't Fight & Win," 22.

6. Owen, "Operation DELIBERATE FORCE," 214–15.

7. Owen, *DELIBERATE FORCE: A Case Study*, 485.

8. Owen, 515.

9. Cordesman, *Lessons and Non-Lessons of the Air and Missile Campaign in Kosovo*, 5–16; Lambeth, *Transformation of American Air Power*, xiii, 1, 181–82; Grant, *Kosovo Campaign*, 2–4, 8–10; and Department of Defense (DOD), "Report to Congress: Kosovo/Operation ALLIED FORCE After-Action Report." For a detailed look at the complex political background behind Kosovo and Operation Allied Force, see Nation, *War in the Balkans, 1991–2002*, 223–45.

10. In the cover message to Congress by Secretary of Defense William S. Cohen and Chairman of the Joint Chiefs of Staff Henry H. Shelton, a fourth objective is mentioned: ensure NATO's credibility. DOD, "Kosovo/Operation ALLIED FORCE After-Action Report," 1; United States Air Forces in Europe (USAFE), "The Air War over Serbia," 5; Grant, *Kosovo Campaign*, 8; Cordesman, *Lessons and Non-Lessons*, 18; Lambeth, *NATO's Air War for Kosovo*, 13–14; Nation, *War in the Balkans*, 246; and Hammond, "Myths of the Air War Over Serbia," 78–81.

11. In March 1999, the Czech Republic, Hungary, and Poland joined NATO, raising the number of member states to 19. Lambeth, *Transformation of American Air*

Power, 182–86; Cordesman, *Lessons and Non-Lessons*, 21–32; Nation, *War in the Balkans*, 251–53; and Grant, *Kosovo Campaign*, 10–11, 16–20.

12. Lambeth, *NATO's Air War*, 223-224; Grant, *Kosovo Campaign*, 23–26; and Nation, *War in the Balkans*, 248.

13. Initial assessments of the air war were more optimistic than later accounts. USAFE, "Air War over Serbia," 59–60; Grant, *Kosovo Campaign*, 23–26; Lambeth, *Transformation of American Air Power*, 194–95; Cordesman, *Lessons and Non-Lessons*, 51–55; Nation, *War in the Balkans*, 251–54, 260–65; and Hammond, "Myths of the Air War Over Serbia," 78–86.

14. Hammond, "Myths of the Air War," 78–86; Lambeth, *NATO's Air War*, 245–50; Lambeth, *Transformation of American Air Power*, 223–32; Cordesman, *Lessons and Non-Lessons*, 357–359; USAFE, "Air War over Serbia," 33–49; and Nation, 260–63.

15. Pape, *Bombing to Win*, 1–3, 12.

16. Pape, 4. See also Meilinger, *Airmen and Air Theory*, 144–45, for a succinct, astute summary of Pape's theories.

17. Pape, *Bombing to Win*, 7, 13; and Meilinger, *Airmen and Air Theory*, 144–45.

18. Pape, *Bombing to Win*, 15.

19. Pape, "True Worth of Air Power," 116–30.

20. Pape, 116.

21. Pape, 117.

22. Pape, 118.

23. Pape, 119.

24. Pape, 128, 130.

25. The influential RAND Corporation represents a prestigious civilian think tank that studies many military strategic issues. In the late 1940s, the Air Force established RAND (Research and Analysis Division) as an alternative center for military, strategic, and other forms of research. Senior Air Force leaders sought an independent, largely civilian line of thought free from military bureaucracy and interservice or interdepartmental disputes. Over the years, RAND established a reputation for innovative, impartial, high-quality research, especially in areas involving mathematical and quantitative methods. In the 1980s, the RAND Corporation was established separate from the US government. Although RAND continues to work on government contracts, it represents a diversified, independent research center.

26. Byman, Waxman, and Larson, *Air Power as a Coercive Instrument*. See Meilinger's *Airmen and Air Theory*, 146–47, for a valuable synopsis.

27. Byman, Waxman, and Larson, *Air Power as a Coercive Instrument*, 10.

28. Byman, Waxman, and Larson, 10–15.

29. Byman, Waxman, and Larson, 13, 15.

30. Byman, Waxman, and Larson, 29–30, 37, 39.

31. Summarized from Byman, Waxman, Larson, 29, 43, 45, 49–51.

32. Watts, "Ignoring Reality," 129–30; and Byman, Waxman, and Larson, *Air Power as a Coercive Instrument*, 16.

Chapter 14

Putting It all Together

Airpower's Intellectual Challenge

"Man's flight through life is sustained by the power of his knowledge." These words, written by Austin "Dusty" Miller and found on the Eagle and Fledglings statue at the United States Air Force Academy, provide an appropriate epilogue to this introduction of American airpower. This conclusion builds upon our overview of the US Air Force mission's evolution, the machines and technology associated with flight, and more importantly, the men and women responsible for the United States Air Force. At the heart of the book is an idea: that aviation transformed both civil society and warfare. Airpower revolutionized war by adding a third dimension to land and sea operations and added unmatched speed, range, mobility, and flexibility to both combat and support activities. The airplane also dramatically changed society by opening new horizons of knowledge and shattering previous barriers of time and distance. By surveying aviation from the Wright brothers to the present, readers surveyed America's proud air heritage, the rationale for current Air Force operations and traditions, and airpower's role in our nation's defense. Furthermore, understanding the past enhances appreciation for four pillars of Air Force service: honor, personal integrity, character, and patriotism. Knowing the sacrifice, courage, and inspiration of previous generations of Airmen provides perspective and builds confidence for today's challenges.

Two important theoretical works highlight airpower as strategic instrument, a flexible tool for the policy maker. Col Phillip S. Meilinger's *10 Propositions Regarding Airpower*, published in 1995, captured ideas from the first century of airpower theory and application. The propositions intended to summarize lessons and prompt thinking. Two decades later, strategic theorist Colin S. Gray published *Airpower for Strategic Effect* with a similar purpose, building upon and critiquing Meilinger's earlier work. Gray's book presented an essay regarding airpower's role in strategy, lessons from airpower's application in war, and his 27 "Dicta," formal statements that sought to expand and correct the 10 propositions. Gray believed that earlier airpower theory strayed from universal strategic theory. By examining

both works, readers may discern similarities, differences, and nuances that add depth to understanding.

Meilinger's *10 Propositions Regarding Airpower* deserves to rank as a classic text for its clarity, impact, and succinct insight. A transport pilot, PhD historian who taught at the Air Force Academy in the 1980s, and air strategist who worked with Col John Warden in the planning of the Desert Storm air campaign, Meilinger served as dean of the School of Advanced Airpower Studies (SAAS) in its formative stage. A prolific author, Meilinger challenged and mentored a generation of airpower theorists. The *10 Propositions* captures the thinking of Airmen after the impressive air performance of the 1991 Persian Gulf War. Students will find some of the propositions to be common sense; others are more challenging and controversial. Like John Boyd and John Warden, Meilinger wrote as an officer serving on active duty who had thought deeply about important issues and who possessed the intellectual talent and fortitude to publish his thoughts.

Phillip S. Meilinger's Ten Propositions Regarding Air Power

1. Whoever controls the air generally controls the surface.

According to Meilinger, whether referred to as command of the air, air superiority, or air supremacy, airpower must neutralize an enemy's air force as a prerequisite for successful air, land, or sea operations. A possible exception may be irregular or unconventional war. Meilinger observes that ground commanders often equate proximity with protection and seek to tether air forces to specific ground units or geographic locations—a misguided notion. He pointed out, "An aggressive doctrine has been very effective for the United States: American troops have not had to fight without air superiority since 1942; the last American ground soldier killed by air attack was in 1953; and our army has never had to fire a surface-to-air missile at an enemy aircraft—they have never been allowed to get that close."[1] Nevertheless, Meilinger agreed with John C. Slessor that air superiority is only a means to an end, not an end in itself. Meilinger closes with this idea, "In reality, the attainment of air superiority has not yet brought a country to its knees. Therefore, the proposition remains

that air superiority is a necessary but insufficient factor in victory. It is the essential first step."[2]

2. Airpower is an inherently strategic force.

Drawing upon the classic ideas of Douhet, Trenchard, and Mitchell and contemporary thoughts of John Warden, Meilinger asserts airpower's strategic value: "War and peace are decided, organized, planned, supplied, and commanded at the strategic level of war. Political and military leaders located in major cities direct the efforts of their industry, natural resources and populations to raise and equip military forces."[3] Whether called vital centers or COGs, airpower can bypass fielded forces and achieve strategic-level effects. This requires a different perspective: "In essence, air war requires broad, strategic thinking. The air commander must view war in totality, not in a sequential or circumscribed fashion."[4] Finally, nonlethal airlift or other humanitarian operations also provide policy makers an important instrument of soft power. Thus, "strategic air power is growing, not decreasing, in importance in our national security structure."[5]

3. Airpower is primarily an offensive weapon.

Meilinger observes that classic military theory considers the defensive as the stronger form of war where armies can dig in, fortify, take advantage of rugged terrain, and operate on interior lines in familiar territory. The farther an attacker advances, the more vulnerable his supply lines become. On the other hand, airpower's ability to exploit the sky's immensity largely negates a defender's advantages. Certainly, radar and other modern defensive measures must be accounted for, but advanced technology and tactics (stealth, electronic countermeasures, terrain masking, and others) still confer a decided advantage to the attacker. Meilinger concludes, "It is virtually impossible to stop an air attack completely—some planes will get through."[6] For example, he cites that even with the USAAF's disastrous losses in the 1943 Schweinfurt raids, 85 percent of Eighth Air Force bombers struck their targets.[7] In sum, Meilinger closes, "the speed, range and flexibility of air power grant it ubiquity, and this in turn imbues it with an offensive capability. Because success in war is generally attained while on the offensive, the adage, 'the best defense is a good offense,' is almost always true in air war."[8]

4. In essence, airpower is targeting, targeting is intelligence, and intelligence is analyzing the effects of air operations.

Meilinger believes that military intelligence specifically tailored to targeting is the key to airpower. Planners must identify the proper targets to strike or influence—the essence of air strategy. Traditional military intelligence focuses on tactical concerns—troop numbers, location, routes of advance—but strategic air warfare demands different, more specialized information. Early air theorists realized this but proved "frustratingly vague" on strategic intelligence. Meilinger laments, "Air power's ability to affect targets has always exceeded its ability to identify them . . . . Intelligence is essential to targeting; moreover, intelligence specifically geared to air war is required."[9]

5. Airpower produces physical and psychological shock by dominating the fourth dimension: time.

In discussing the role of time in war, Meilinger differentiates between timing (synchronizing the actions of multiple units to achieve maximum effect) and time as duration. By utilizing speed to compress time, airpower produces shock. He explains the physical and psychological components of shock as factors of force, space, and time. Physical shock results when irresistible force collides with an object in a confined area instantaneously. Psychological shock occurs when physical shock overwhelms an individual's or unit's ability to cope and is linked to the tempo of combat operations. Meilinger argues that airpower's speed and ubiquity combine to produce its psychological effects. He contrasts the slow, static rates of ground advance (approximately three miles a day when studying the last four centuries) with airpower's speed and range of movement (depending on aircraft, rates exceeding 700 mph over hundreds of miles).[10] Meilinger concludes, "This conquest of time by air power provides surprise, and surprise in turn affects the mind, causing confusion and disorientation."[11] Nuclear weapons best demonstrate this proposition. Yet, on the other hand, irregular warfare may stymie airpower's attempt to telescope time. Meilinger cites Vietnam's Operation Rolling Thunder where the North Vietnamese intentional, protracted guerrilla campaign negated US airpower's advantage in speed and time. In this sense, airpower is ill-suited for irregular war.[12]

6. Airpower can conduct parallel operations at all levels of war, simultaneously.

Inspired by John Warden, Phillip Meilinger explains, "Parallel operations occur when different campaigns, against different targets, and at different levels of war, are conducted simultaneously. Unlike surface forces that must generally fight sequentially and win the tactical battle before they can move on to operational or strategic objectives, air forces can fight separate campaigns at different levels of war."[13] For example, during Desert Storm, coalition aircraft attacked strategic (nuclear research facilities, oil refineries, and airfields), operational (rail yards and bridges), and tactical (troops and equipment) targets simultaneously. Furthermore, airpower's speed and range enabled strikes across the enemy's entire country, resulting in the strategic paralysis envisioned by Liddell Hart, Boyd, and Warden.[14]

7. Precision air weapons have redefined the meaning of mass.

Meilinger contends that while mass has long been considered a fundamental principle of war, precision-guided munitions reduce its importance. Technological advances impart previously unimagined accuracy resulting in increased lethality to targets, reduced civilian casualties and collateral damage, and smaller, more efficient weapons that in turn simplify supply. He also warns, "Because precision is possible, it will be expected. Air warfare has thus become highly politicized. Air commanders must be extremely careful to minimize civilian casualties and collateral damage. All bombs are becoming political bombs, and air commanders must be aware of this emerging constraint."[15]

8. Airpower's unique characteristics necessitate that it be centrally controlled by airmen.

In the following anecdote, Phillip Meilinger expresses a cherished tenet of air doctrine. "General Carl Spaatz once commented in exasperation that soldiers and sailors spoke solemnly about the years of experience that went into training a surface commander, thus making it impossible for outsiders to understand their arcane calling. Yet, they all felt capable of running an air force."[16] Meilinger believes that the story of American airpower justifies an Airman's centralized control of air assets. He asserts that the unique skills, knowledge, per-

spective, and experience of flying personnel reinforce an air commander's control of relatively scarce air resources. In a joint force, Meilinger supports the Joint Force Air Component Commander concept where the senior Airman commands air forces and presents an air perspective to the overall theater commander. He cites Gen Charles Horner in Desert Storm as the ideal, facilitating "synergies gained from diverse air forces working together as a team with one commander to focus their efforts."[17] Ironically for the USAF, the same arguments led to the creation of the United States Space Force on 19 December 2019.

9. Technology and airpower are integrally and synergistically related.

Meilinger argues that while Army service culture focuses on the infantryman and his rifle, airpower must and should emphasize technology. Airpower exists because of the aspirations, thinking, and perseverance of early pioneers who pushed technological bounds. Contemporary Airmen depend on advances in "aerodynamics, electronics, metallurgy, and computer technology."[18] Consequently, airpower benefits from a synergistic relationship with technology different from surface forces.

10. Airpower includes not only military assets but also an aerospace industry and commercial aviation.

In his final proposition, Meilinger echoes Hap Arnold's drive to instill "airmindedness" in the American people and former Secretary of the Air Force Donald B. Rice's description of the United States as an "aerospace" nation. Along the same lines, Meilinger highlights the connection between American popular culture and aviation. Why? He explains that the vast size of the United States and the need to link Alaska and Hawaii demand "rapid, reliable, and cost-effective" transportation.[19] For over a century, aviation filled this need and successful commercial and government investment contributed to the US aviation infrastructure. Equally important, crossover between civilian and military personnel established a foundation of skilled talent necessary for security, industry, and commerce. Meilinger respects the vision of early air theorists who proclaimed America's destiny in air and space. He summarizes the tenth proposition with a thought: "In a very real sense, air power is a state of mind."[20]

Colin S. Gray's Airpower for Strategic Effect

"Airpower is and has long been the sharpest of America's swords, as well as a highly versatile set of tools for the support of national strategy—both grand and of course military."[21] With this statement, strategic theorist Colin S. Gray began his chapter "Airpower: A Contested Narrative" and expressed the central message of *Airpower for Strategic Effect*. In revisiting airpower theory, Gray seeks "a better strategic understanding of airpower to improve the practice of airpower."[22] He further insists that "strategic theory has as its sole purpose the improvement of strategic practice. Such theory is not an end to itself."[23]

Like B. H. Liddell Hart's critique of Clausewitz and earlier strategic writers as too narrowly military in their view of strategy, Gray faults Meilinger and earlier air theorists as too narrowly focused on airpower. Gray modifies Billy Mitchell's definition of airpower from "the ability to do something in or through the air" to "airpower may be defined as the ability to do something *strategically useful* in the air."[24] In exploring his "contested narrative," Gray declares five airpower truths:

- In the grand duel of competition, conflict, war, and warfare, the military behavior in every geographical environment by ever belligerent forces makes a net contribution to a competition in strategic effect . . . .
- There are no great, universal, and eternal truths about the relative strategic value of airpower, or land power, or sea power, and so forth. Truth is situational; it varies with contexts.
- Often it will not be obvious, even to truly objective assessors, just what the relative strategic value will prove to be of land power as contrasted with airpower, let alone space power, or to muddy the waters further, nuclear deterrence or even coercive nuclear employment . . . .
- Airpower may be anything that flies or any capability to accomplish militarily worthwhile tasks in the air, but much of airpower's value has to lie in the importance of what it can do from, as opposed to in, the air. Is airpower actually sea power when it is deployed at sea . . . ?
- Modern warfare inalienably is conducted as a whole . . . . The measure of true complementarity, real jointness, let alone seam-

> less integration, always leaves more or less to be desired, but it is an undeniable fact that boundaries among the geographies of warfare are as clear geophysically as they are fuzzy and even scrambled tactically, operationally, and strategically.[25]

As the previous passages indicate, Gray loves words and word play. He cannot resist the clever passage or repeating variations of a theme. In examining airpower theory in general, Gray contends that airpower's meaning yesterday, today, and tomorrow is "neither mysterious nor controversial."[26] Airpower has "a single nature whose character is ever changing and changeable."[27] He reminds the reader: "Airpower theory educates for action; it does not provide the ammunition."[28] He critiques previous air theories as "both logically unsound and empirically fragile."[29] With advances in technology, experience, and operational history, Gray believes a general theory of airpower is now possible since—unlike airpower strategies, operations, and tactics—it is not "hostage to particular technical or other judgments."[30] Then, he presents his general theory in the form of 27 dicta, explaining that a *dictum* is a formal pronouncement, seriously considered and evidenced, but carries less baggage than *principle* or *law* (his emphasis).[31] Since many of Gray's dicta overlap or repeat ideas already mentioned, the following presents a selective list:

> D1: Airpower theory is subordinate to the general theory of strategy . . . . No matter how revolutionary airpower is or appears to be in its nature, character, and consequences, it has not, will not, and indeed cannot revolutionize the nature of strategy, war, or statecraft . . . .[32]

> D2: Airpower theory helps educate airpower strategists; it is theory for practice . . . . Fighting power most essentially is the compounded product of three principal elements: material, intellectual/conceptual, and moral. Airpower theory alone cannot deliver superior airpower, but it can help ensure that the air agent of policy is employed in ways that are strategically intelligent . . . .[33]

> D3: Airpower theory educates those who write airpower doctrine and serves as a filter against dangerous viruses. Theory is not doctrine. The purpose of theory is to instruct . . . .[34]

D4: Airpower is the ability to do something strategically useful in the air . . . .[35]

D9: Airpower has persisting characteristic strengths and limitations . . . .

What uniquely can airpower do?

- Directly assault physical centers of gravity regardless of their location, attack the enemy inside to outside from his center to his periphery
- Project force rapidly and globally
- Observe "over the hill" from altitude (. . . shared with space power)
- Transport people, modest levels of equipment, and supplies rapidly and globally
- Insert and sustain small, isolated expeditions, raids, and even garrisons

What can airpower do well?

- Protect friendly land and sea forces and other assets from enemy airpower
- Deter and be the decisive strategic agent for high-level and mid-level regular and conventional conflicts
- Compensate effectively for (some) deficiencies in friendly land and sea forces
- Deny or seriously impede enemy access to particular land and sea areas
- Deny enemy ability to seize, hold, and exploit objectives

What does airpower tend to do poorly?

- "Occupy" to control territory from the air alone
- Send clear diplomatic messages
- Close with and grip the enemy continuously
- Apply heavy and potentially decisive pressure for conclusive strategic effect in (largely) irregular conflicts

- Discriminate with thorough reliability between friend and foe, guilty and innocent

What is airpower unable to do?

- Cost-effectively transport very heavy or bulky cargo
- Seize and hold contested territorial objectives
- Accept, process, and police an enemy's surrender[36]

D11: Control of the air is the fundamental enabler for all of airpower's many contributions to strategic effect . . . .[37]

D16: All airpower has strategic value in every kind of conflict. Airpower universally and ubiquitously is strategically useful . . . .[38]

D21: Strategy for airpower is not all about targeting—Douhet was wrong . . . . Given that the dropping and firing of ordnance is how aircraft fight, of course targeting is of high importance. The problem is not with targeting. Rather is the error in confusing targeting with its effect(s) and in conflating those effects with the whole narrative of warfare and war itself.[39]

Encountering this list essentially verbatim, readers will determine whether Gray's writing style resonates, or repels. To many, reading Gray is an acquired taste or perhaps the opposite of clarity. To others, Gray will present nuggets of true gold buried under the mass of words. Like Clausewitz, Colin Gray forces a reader to think and wrestle with meaning and nuance.

The Nature and Character of War and Airpower

Both Colin Gray and Phillip Meilinger draw attention to a concept—the nature and character of war—that is helpful for comprehending the subject's breadth and depth. Although some writers use "the nature and character of war" as a single descriptive phrase, many will find it useful to think of them as separate entities. The "nature of war" refers to those elements that are timeless and unchanging, whereas "the character of war" describes those features that do change and transform over time.[40] More specifically, the nature of war includes four attributes discussed by Carl von Clausewitz: war as a political instrument, war as a clash of wills, war as violence, and war

tempered by fog, friction, and chance.[41] In other words, the nature of war features the relationship of war and politics; the emotions of war—hatred, enmity, bravery, cowardice, panic, to name a few; chance, uncertainty, and chaos; and other elements described as fog and friction. On the other hand, the character of war refers to those elements that do change over time: history, geographic location, technology, societal values and structure, ideologies and attitudes, military organizations and traditions, political alliances, leaders, personalities, and others. Some would describe them as the elements of a society's strategic culture.[42] For airpower, technological change dominates the character of war. The history of air warfare links technological superiority to operational success, recognizing that technological superiority does not necessarily guarantee success. Both Meilinger and Gray emphasize the importance of effective leadership, theory, doctrine, training, logistics, maintenance, and motivation.

Meilinger's 10 propositions examine the nature of airpower. He proposes the concepts to stimulate thought and debate. His ideas distill a century of airpower theory and practice and serve as a stage for discourse. Although similar in some ways, Gray's *Airpower for Strategic Effect* focuses on the nature of war and strategy; Meilinger focuses on airpower's role within that context. Gray misinterprets Meilinger's intent—propositions are not dogma. The central issue lies in Meilinger's contention that airpower is inherently strategic and inherently offensive. Students should read both works to assess each author's full merits. In sum, both works seek the same educational goal and, in many ways, complement one another. Meilinger opens the debate about airpower's nature, and Gray broadens the scope to address how airpower fits into strategy.

Recap

To bring matters full circle, a modern, transformational United States Air Force recognizes the truth behind Giulio Douhet's famous assertion: "Victory smiles upon those who anticipate the changes in the character of war; not upon those who wait to adapt themselves after the changes occur."[43] Yet, does the US Air Force fully recognize the nature of airpower and its relationship with strategy and war overall? This text attempts to provide sufficient context, theory, and doctrine to address this question. Its thesis, or central message, is

simple: airpower is a strategic tool for policy makers but does not replace the need for sound, comprehensive strategy. Airpower is not a silver bullet that will magically solve problems; it is an instrument of strategy. Modern warfare requires effective joint operations, the cooperation and integration of land, sea, air, space, and cyberspace, for success. However, Airmen must comprehend the potential and limits of airpower and be able to articulate its contribution to joint planning. Today's Airman must appreciate Air Force heritage and the evolution of contemporary doctrine. Finally, *Kick the Tires and Light the Fires* hopes to spark further thinking and build Air Force identity.

Notes

1. Meilinger, *10 Propositions Regarding Air Power*, 4–5.
2. Meilinger, 7.
3. Meilinger, 8.
4. Meilinger, 12.
5. Meilinger, 13.
6. Meilinger, 16.
7. Meilinger, 16.
8. Meilinger, 19.
9. Meilinger, 21–23.
10. Meilinger, 31, citing in turn Helmhold, *Rates of Advance*, 1–3, 4–9.
11. Meilinger, *10 Propositions Regarding Air Power*, 31.
12. Meilinger, 33.
13. Meilinger, 35.
14. Meilinger, 37.
15. Meilinger, 46.
16. Meilinger, 49–50.
17. Meilinger, 55.
18. Meilinger, 57.
19. Meilinger, 62.
20. Meilinger, 66.
21. Gray, *Airpower for Strategic Effect*, 1.
22. Gray, 2.
23. Gray, 2.
24. Gray, 9.
25. Gray, 15–16.
26. Gray, 267.
27. Gray, 269.
28. Gray, 269.
29. Gray, 267.
30. Gray, 267.
31. Gray, 270.
32. Gray, 275.
33. Gray, 275.
34. Gray, 276.
35. Gray, 276.

36. Gray, 280–81.
37. Gray, 283.
38. Gray, 288.
39. Gray, 294.
40. Gray, *Modern Strategy*, 1–15.
41. Clausewitz, *On War*, 101, 104, 119.
42. See Gray's chapter "Strategic Culture as Context" in *Modern Strategy*, 129–51.
43. Douhet, *Command of the Air*, 30.

Appendix 1
Biographies and Concepts

air superiority. A key concept of aerial warfare and, depending on the theorist, a prerequisite for command of the air. Italian air marshal Giulio Douhet argued that destroying the enemy air force on the ground in a surprise attack is the best means to achieve command of the air. During World War I, Billy Mitchell argued that fighters must achieve air superiority through air-to-air battle. Britain's Sir Hugh Trenchard also advocated air superiority as a priority air mission for the RAF and a prerequisite for an independent air force strategic bombing campaign. The Luftwaffe's operational air war also emphasized the need to first seize air superiority as part of a joint campaign. Perhaps most astute, the RAF's John C. Slessor explained that air superiority is simply a means to an end. It is important and vital, but not an end of itself. Air superiority must work into a joint theater campaign plan, an instrument only. However, air superiority against a first-class enemy must not be assumed; it must be earned through peacetime investment in equipment and training and wartime blood and skill in combat. Significantly, the USAF has not fought against a superior air force since 1942 and assumes air superiority. Today, USAF air superiority must not be taken for granted, and investments in resources—both monetary and human—are essential for ensuring this vital prerequisite for modern warfare.

Allied Force, Operation (1999). In the spring of 1999, Serbian dictator Slobodan Milošević conducted a brutal ethnic cleansing campaign against the Kosovar Albanians, mostly Muslim inhabitants of Kosovo, a province of Serbia. NATO responded with Operation Allied Force, a precision air campaign to coerce Milošević to comply. President Bill Clinton announced three objectives: (1) demonstrate NATO resolve; (2) deter Serbian ethnic cleansing; and (3) reduce Serbian military capability. The 78-day air campaign represented an example of using airpower as a coercive instrument. Robert Pape cited the campaign as ineffective for its inability to decapitate enemy leadership, and Daniel Byman, Matthew Waxman, and Eric Larson claimed it as a moderate success for aerial coercion. The campaign was waged by a risk-averse NATO coalition that feared both ground commitment and escalation into a wider war. On the positive side, NATO aircraft dominated the skies, inflicting significant damage and preventing Serbian regular forces from massing effective land power,

and precision weapons proved their worth on the battlefield in striking key coercion targets. On the negative side, Milošević brutalized thousands of civilians, used the world press skillfully, and exploited collateral damage effectively. Allied Force reinforced the significance of clear political objectives and airpower as a coercive instrument but also showed the frustrations of coalition warfare, the limits of airpower against a determined enemy, and that coercion campaigns may not be simple or quick. Although NATO achieved its objectives at the cost of only two aircraft and no combat casualties, Allied Force did not live up to the promise of Boyd, Warden, Byman, Waxman, and Larson; it achieved a victory, but it seemed like a defeat. Allied Force's significance is mixed; to critics it showed the limits of air coercion theory, but in comparison to more recent campaigns in Iraq and Afghanistan, it looks like a resounding success.

Battle of Britain (August–September 1940). The first all-air military campaign pitting the German Luftwaffe against Britain's Royal Air Force Fighter Command. The Luftwaffe appeared to have a three-to-one numerical edge with aircraft manned by experienced, confident crews. However, the RAF Hawker Hurricane and Supermarine Spitfire fighter aircraft proved up to the challenge. The air battle revealed serious weaknesses in the German air force: Previous European air campaigns had eroded Luftwaffe strength. German training, equipment, and experience proved ill-suited for a long-range strategic air campaign. Although Germany's Messerschmitt Bf-109 was a superb fighter, its short range limited its endurance and tactical flexibility. German air intelligence proved woefully inadequate. On the other hand, the RAF's Fighter Command featured an effective, integrated air defense system that utilized both radar and signals intelligence known as the ULTRA secret, a codebreaking system that provided attack warning and insight on German maintenance and logistics. Additionally, Luftwaffe chief Herman Göring committed strategic and tactical errors that squandered German advantages and led to a battle of attrition won by the RAF. Against German losses of 1,733 aircraft, the RAF lost 915 planes. By 15 September 1940, Hitler postponed indefinitely his planned invasion of Britain. In tribute to RAF Fighter Command, Prime Minister Winston Churchill stated, "Never in the field of human conflict was so much owed by so many to so few."[1]

Boyd, John (1927–1997). American Air Force colonel, fighter pilot, and eclectic airpower theorist who introduced contemporary re-

visions to the classic ideas of Giulio Douhet, Billy Mitchell, and Hugh Trenchard. From his Korean War fighter pilot experience flying F-86s against MiG-15s, Boyd developed the idea of "fast, transient maneuver" that expanded from tactics to operations and strategy. Boyd influenced the design of both the F-15 and F-16, emphasizing maneuverability and rapid acceleration and deceleration. His goal was to achieve strategic paralysis, not destroying the enemy, but stunning or paralyzing him. He introduced the OODA loop (observe, orient, decide, and act) based on defeating the mind of the opponent by rapid, unpredictable maneuvers that would confuse and paralyze the opponent by observing, orienting to fire, deciding to act, and acting (firing) more rapidly than the enemy. Boyd published little but spread his ideas in presentations known as a "Discourse on Winning and Losing," first at the USAF Fighter Weapons School and later in nearly a thousand seminars to a wide range of audiences. The simplicity and versatility of his ideas resound, but Boyd tended to mirror his opponent and assumed an enemy with modern, high-tech culture and values. Significantly, Boyd influenced both contemporary Air Force doctrine and thinking and provided the backbone of today's US Marine Corps operational doctrine.

Brodie, Bernard (1910–1978). Described as an "American Clausewitz," Bernard Brodie is an American strategic thinker best known for his work on nuclear deterrence theory. In the fall of 1945, he wrote "War in the Atomic Age," the first work on the atomic bomb's effect on warfare when published the following year. Brodie articulated several ideas still foundational in today's nuclear theory: The atomic bomb is par excellence the weapon of aggression. It favors surprise attack. Superiority in number of nuclear weapons does not guarantee safety; even one bomb can provide a deterrent effect. No adequate defense against atomic bombs exists. Any city can be destroyed by atomic bombs. Air superiority or even command of the air does not guarantee strategic superiority. Other powers will gain nuclear weapons (in his original writing, the Soviet Union would gain the bomb in five to 10 years). Finally, he implied that there is no winner in a nuclear war. Significantly, he asserted that atomic/nuclear weapons have changed both the character and nature of war. Up until the advent of these weapons, the primary purpose of military organizations has been to win wars; from now on, it must be to avert them. Hence, maintaining a sufficient nuclear deterrent retaliation force is the primary military mission. To a great or lesser extent, Brodie influenced

all later nuclear theorists and shaped American attitudes toward nuclear warfare.

Clausewitz, Carl von (1780–1831). Prussian soldier and strategic thinker who struggled to capture insights from 20 years of personal experience fighting in the Napoleonic Wars (1795–1815). Clausewitz forms one of the pillars for classic strategic thought, along with Thucydides, Sun Tzu, and a handful of others. His book *On War* (1832) was never finished and can be contradictory and perplexing in its complexity. It is written in a dialectical style: his thesis is called "absolute war" or "war in theory" where in ideal form, war is total with no logical limit to the application of force and where the two antagonists will escalate to extremes. In contrast, the antithesis is called "war in reality," or war in the real world, where political objectives, chance, uncertainty, and other factors described as "fog and friction" will always limit the violence of war. This is called the dual nature of war and key to understanding *On War.* Another of his key insights relates to the relationship between war and the state called the paradoxical trinity. Clausewitz created a triangular relationship, or trinity, consisting of passion (primordial violence, hatred, and enmity), chance and probability (the scope where creativity, courage, and talent roam), and reason (politics and policy). These three relationships are often simplified to be people (passion), commander and army (chance and probability), and government (politics and policy). Clausewitz emphasized that success in war rests upon balance of the three elements, "like an object suspended between three magnets." Another key idea is the relationship between war and policy. War is merely a continuation of politics/policy by other means. The military objective and operations must be subordinate to the political objective. War is simply politics/policy with the addition of violence. There are many additional insights in *On War* with fog and friction and military genius being among the most important. Clausewitz defined the fog of war as the realms of uncertainty, chance and probability, and the friction of war as those elements that make even the simplest thing difficult. Clausewitz further described war as the realms of danger, physical exertion, and suffering. Others will describe the two as one interrelated, amorphous "fog and friction" that reduces even the best trained personnel or planned operation into achieving only moderate results. Military genius is the harmonious combination of what we would call leadership traits today: courage (both physical and moral) being the first requirement, intelligence—a strong mind

more than a brilliant one, determination, staunchness (the ability to withstand a great blow), endurance (the ability to withstand incessant, daily small blows and obstacles), strength of character, and an intuitive grasp of the important that Clausewitz called *coup d'oeil.* In a balanced total, the military genius of a commander allows him to impose his will and inspire his troops to overcome the many obstacles imposed by war's fog and friction. In sum, Clausewitz provides essential concepts for comprehending war, war's relationship to the state, and war's relationship to policy/politics.

coercion. Although rarely mentioned, military theorist Carl von Clausewitz stated that the object of war is to compel the enemy to do your will. American economist and strategic theorist Thomas Schelling is credited with being the father of modern coercion theory. In an age of nuclear weapons where war could potentially end civilization, Schelling argued that war's purpose is no longer victory but rather to threaten the enemy with the use of force, latent violence, in an act of bargaining. His book *Arms and Influence* contrasts brute force (traditional warfare) with coercion (the diplomacy of violence or the threat of nuclear war). He assumed that belligerents share common ground in any dispute, even if it is simply survival in the nuclear age. He asserts that "the power to hurt is bargaining power"; the threat of damage is more important than the actual damage itself—latent violence can influence your adversary. RAND corporation theorists Daniel Byman, Matthew Waxman, and Eric Larson's *Air Power as a Coercive Instrument* (1999) modified Schelling slightly, defining coercion as the use of threatened force, to include a limited use of actual force, to force an enemy to act differently than it would otherwise. They divided it into deterrence (preventing an action from occurring) and compellence (reverse an action that has already occurred). They argued that airpower serves as a coercive instrument for policy makers. Likewise, airpower theorist Robert Pape revised coercion to mean "efforts to change behavior in a state by manipulating costs and benefits." Pape divided coercion into three types: "punishment" (threats to civilians), "denial" (threat of military failure), and "risk" (a form of punishment that slowly raises the probability of civilian damage). Significantly, airpower as an instrument of coercion strongly appeals to modern policy makers for promising a precision strategic tool with minimal footprint and entanglement associated with large land forces. On the other hand, coercion theory assumes a rational actor for an adversary and shared cultural values.

Combined Bomber Offensive (1943–1945). The Casablanca Directive of January 1943 inaugurated the Combined Bomber Offensive (CBO), marked by American precision daylight bombing and British night area bombing in history's greatest air campaign, eventually codenamed Operation Pointblank. American air leaders, spearheaded by Generals Carl Spaatz, Ira Eaker, and James Doolittle, attempted to implement the Air Corps Tactical School's strategic air war theory with unescorted Boeing B-17 and Consolidated B-24 bombers. After costly missions against Schweinfurt and Ploesti in the fall of 1943, air leaders sought long-range escort fighters eventually provided by Republic P-47 Thunderbolts and North American P-51s. Breaking the back of the Luftwaffe during Operation Argument (also known as Big Week) in February 1944, Allied air forces established air superiority. The CBO was the longest and bloodiest air campaign in history; the British lost 22,000 aircraft and 79,281 airmen, and the US lost 18,000 planes and 79,265 men killed in air action. The Allies flew 1,693,565 combat sorties and dropped 1,554,463 tons of bombs that killed an estimated 300,000 Germans, wounded 780,000, and destroyed 3,600,000 buildings, 20 percent of the nation's total. Although horrible in its destruction and lamentable in its civilian casualties, the CBO proved vital to Allied victory by significantly reducing German industrial production, by destroying the Luftwaffe, and by diverting scarce enemy resources.

deterrence. An age-old strategic concept where a superior force could induce behavior based on superior strength. In the nuclear age, Bernard Brodie's "War in the Atomic Age" (1946) argued that the terror and devastation of atomic weapons made nuclear deterrence, avoiding war, the prime function of military establishments. Societies could no longer wage total war, and, hence, safeguarding a nuclear retaliation, or deterrent, force became the primary mission. Thomas Schelling's *Arms and Influence* (1966) largely agreed with coercion, the threat or latent force, being the primary instrument to compel an adversary's behavior. Deterrence is simply the threat of force to prevent an action. Robert Pape (1996) defines deterrence as efforts to maintain the status quo, in contrast to coercion, which sought to alter behavior through force. Daniel Byman, Matthew Waxman, and Eric Larson's *Air Power as a Coercive Instrument* (1999) divided coercion into deterrence (preventing an action from occurring) and compellence (reverse an action that has already occurred). Significantly, deterrence formed the key component of American nuclear strategy

from 1945 to the present; it constitutes the most important mission for contemporary armed forces. Moreover, airpower forms arguably the most important coercive instrument, both nuclear and conventional, for policy makers.

Douhet, Giulio (1869–1930). Italian army officer who served in World War I and became the first theorist to write about airpower. His most famous book, *Command of the Air* (1921), proposed many of the classic concepts of airpower, including airpower is inherently offensive, command of the air is the key to successful war, there is no adequate defense from air attack, surprise attack is effective in destroying an enemy's air force on the ground, and the psychological impact of air attack is more important than the physical. He argued that a combination of high explosives, incendiaries, and poison gas (the weapons effects of the atomic bomb) would destroy an enemy population's will to fight and force governmental surrender. Douhet failed to define "vital centers," underestimated civilian resolve, and did not anticipate advances in aerial defense, especially radar. He assumed future wars would be total wars like World War I. Significantly, Douhet inspired debate about airpower as a revolutionary war-winning weapon. His ideas remain influential today, especially when thinking of nuclear war. Douhet influenced contemporary Air Force doctrine, although key aspects are challenged on joint service and moral grounds.

fog and friction. A concept introduced by Carl von Clausewitz in *On War* (1832) that describes the nature of war. Some will define the fog of war as the realms of uncertainty, chance and probability, and the friction of war as those elements that make even the simplest thing difficult. Clausewitz will further describe war as the realms of danger, physical exertion, and suffering. Others will describe the two as one interrelated, amorphous "fog and friction" that causes even the best-planned operation to achieve only mediocre results. The significance of fog and friction stands as one of the two factors (along with policy/politics) that separates war in reality from absolute or theoretical war. It also serves as one of the sides of the paradoxical trinity where the creative spirit is free to roam when manipulated by the commander with military genius.

hammer and anvil. A traditional military tactic usually describing the infantry as the "anvil" to tie an enemy force down and the cavalry as the "hammer" to outflank or envelope to destroy. In "The True Worth of Airpower" (2004), Robert Pape applied the idea to modern

airpower. He argued that from World War I until the 1980s, airpower served as the hammer to ground power's anvil, but the anvil did most of the work. With the advent of precision-guided weapons, airpower is still the hammer, but the hammer does the work of destroying enemy forces. He argues that wars are still won the old-fashioned way, but with precision-guided weapons, it does so better than ever. Hammer and anvil is a significant tactic both as an essential concept in military theory and as an example of the evolution of airpower theory. It focuses attention on the nature of revolutions in military affairs.

Industrial Web Theory. A theory developed at the Air Corps Tactical School (1922–1940) that captured an American version of strategic air war. Sometimes called HAPDB (high-altitude, precision, daylight bombing), the Industrial Web Theory called for the destruction of the enemy's war-making capability by directly attacking vital centers—key nodes of the enemy's industrial web since modern economies are interconnected. Destroy the vital centers and the economic web collapses. Although claimed by Donald Wilson, other Air Corps Tactical School (ACTS) instructors also contributed to the theory (including Harold George, Muir Fairchild, Laurence Kuter, and Haywood Hansell). They were inspired not so much by Giulio Douhet's command of the air theories as by Hugh Trenchard's RAF independent air force operations of World War I and Billy Mitchell's advocacy of air force independence. The Industrial Web Theory helped drive technological development, specifically the Boeing B-17 Flying Fortress and the Norden Bomb site, although it can be argued that the technology also favored the theory. Although a theory, ACTS treated the Industrial Web Theory as doctrine and a strategy for the World War II air war. Its significance is clear: the Industrial Web Theory was the foundation of World War II's Combined Bomber Offensive and in turn the justification for an independent US Air Force.

Instant Thunder, Operation (1990). After Saddam Hussein invaded Kuwait in 1990, US Central Command (CENTCOM) theater commander Gen H. Norman Schwarzkopf asked HQ USAF for a conceptual air plan. Col John Warden, the Air Staff's deputy director for Warfighting Concepts, assembled a select planning group known as "Checkmate." The resulting plan, Instant Thunder, called for a "stand-alone" air offensive designed to destroy Iraqi "centers of gravity" by attacking 84 high-priority targets in a week. Warden intentionally evoked the strategic bombing theories of the ACTS. Lt Gen Charles A. "Chuck" Horner, Joint Force Air Component Commander,

rejected the "air power alone" thesis and formed his own Special Planning Group, known as "The Black Hole," to refine the Air Staff plan. By 25 August 1990, Horner's Black Hole rolled Instant Thunder into a sophisticated four-phase air campaign that targeted the enemy's strategic centers, air defense network, and ground combat forces. Central to success, coalition air forces had to neutralize Iraq's integrated air defense network that included an estimated 690 combat aircraft, 17,000 surface-to-air missiles (SAM), and 9,000 antiaircraft artillery (AAA) guns. Instant Thunder formed the core of the initial air attack phase and executed Warden's Five Ring theory by focusing on Iraqi command and control. It also intentionally incorporated Warden's ideas of parallel warfare to overwhelm the Iraqi air defenses and achieve strategic paralysis. Significantly, Instant Thunder was designed to be the exact opposite of Vietnam's Rolling Thunder's graduated response and ineffectual signaling. In sum, Instant Thunder was considered the essence of the most successful air campaign in history, and the overall Desert Storm air campaign demonstrated airpower's dominance on a modern, conventional battlefield.

Liddell Hart, B. H. (Basil Henry) (1895–1970). Arguably the most significant British military theorist of the twentieth century, who bridged the gap between classical and modern strategy. A WWI poison gas casualty, Liddell Hart served as the chief military correspondent for *The London Times* in the 1920s and 1930s, the most widely read newspaper in the world. He is famous for the "expanding torrent" (combined arms of tanks, mechanized infantry, and aircraft that is the foundation for blitzkrieg); the indirect approach (avoid trench warfare by avoiding enemy strength in frontal attacks and attack weakness); and the idea of grand strategy (strategy is more than military, it combines diplomatic, financial, commercial, economic, and ethical instruments of power—roots of today's DIME). Liddell Hart acknowledged and popularized Sun Tzu's ideas in the West. Like Sun Tzu, he introduced the idea of psychological dislocation (the idea of being trapped). In terms of significance, Liddell Hart influenced modern ideas of effects-based strategy and inspired the contemporary American airpower ideas of John Boyd and John Warden.

Linebacker, Operation (1972). American airpower campaign in reaction to the North Vietnamese Easter Offensive of March 1972 where main force North Vietnamese army divisions launched a conventional invasion of South Vietnam in hopes of replicating Mao's Phase III of protracted war. The North Vietnamese Army (NVA) fea-

tured Soviet tanks and vehicles in its vanguard that initially overwhelmed the Army of the Republic of Vietnam (ARVN) defenders but in turn provided POL (petroleum, oil, and lubricants) targets and a conventional supply line that would prove vulnerable to American airpower. Linebacker occurred when US forces were drawing down from a peak of 536,000 US troops in 1968; American personnel numbered fewer than 100,000 by 1972 with only 100 combat aircraft in Vietnam and 300 total in theater. Still, President Nixon resolved to achieve "Peace with Honor." With additional US ground troops a political impossibility, Nixon resorted to Operation Linebacker to blunt the Communist attack. USAF and US Navy aircraft pummeled NVA ground forces using new technologies: early precision-guided munitions in Maverick TV-guided bombs. Linebacker succeeded in halting the offensive, and North Vietnam returned to the Paris peace talks. The significance of Linebacker is subtle. On the surface, it contrasts an effective, focused air campaign against conventional targets vs. the gradual ineffectiveness of Rolling Thunder. A deeper look reveals that Rolling Thunder suffered from broad, yet vague, political objectives while Linebacker was more focused, simpler, and easier to achieve since the US was committed to pulling troops out; the issue was the kind of American withdrawal. President Nixon would not abide by American "loss of face."

Linebacker II, Operation (December 1972). Faced with North Vietnamese intransigence over a final agreement to withdraw American troops, in December 1972 President Nixon initiated Linebacker II, an intense 11-day air campaign to pressure enemy compliance. From 18 to 29 December, American aircraft pounded military and industrial targets in North Vietnam. For the first time, the White House authorized B-52 strikes in the vicinity of Hanoi and mined Haiphong harbor. In fewer than two weeks, B-52s dropped 15,000 tons of bombs and fighter-bombers added another 5,000 tons. Despite the loss of 26 aircraft, including 15 B-52s, airpower broke the impasse. Peace talks resumed 8 January 1973 and both parties signed a comprehensive cease-fire on 23 January 1973. Linebacker II is significant for two reasons of varying accuracy: (1) Many airmen perceived Linebacker II as evidence of what airpower could do if unshackled from political constraints and micromanagement, in contrast to Rolling Thunder. Advocates of this view overlook Linebacker II's narrow political objective—return North Vietnam to peace talks, thus ending American involvement without an immi-

nent Communist takeover; (2) additionally, Linebacker II served as an example of a successful aerial coercion campaign reminiscent of Daniel Byman, Eric Larson, and Matthew Waxman, as stated in their *Airpower as a Coercive Instrument.* It suggests airpower's potential to coerce an opponent given a defined, attainable political objective; overwhelming means to employ; and political leadership willing to endure significant international and domestic political condemnation. Linebacker II is far more nuanced than most acknowledge. The success of Linebacker II did not mean a similar approach would have succeeded seven years earlier. The "Eleven-day War" or "Christmas Bombings" did not validate Cold War airpower doctrine applied to irregular war.

Mahan, Alfred Thayer (1840–1914). American naval officer who served in the American Civil War (1861–1865) and dominated naval strategy until his death in 1914. Known as "The Father of Sea Power," Alfred Thayer Mahan not only established the precepts of naval strategy and the core concepts that would define naval warfare but also profoundly influenced later air- and space power theories. In his book *The Influence of Seapower Upon History 1660–1783* (1890), Alfred Thayer Mahan argues that sea power is the key to world power as shown by history. He believes command of the sea can be attained through decisive battles won by the main battle fleet and that commerce raiding (*guerre de course*) is the weaker form of naval war. In his "Elements of Sea Power," Mahan describes command of the sea as production, shipping, and colonies and markets. In addition he lists the elements of sea power as (1) geographical position, (2) physical conformation, (3) extent of territory, (4) number of population, (5) character of the people, and (6) character of the government. His significance is threefold: First, he is the most famous and impactful American strategic thinker. Second, Mahan inspired Americans who wanted the United States to become a world power. Third, Mahan's ideas form a baseline for air and space theory.

military genius. A phrase used by Carl von Clausewitz in *On War* (1832) that captures the elements needed by a commander to overcome fog and friction. Clausewitz describes war as having four realms: danger, exertion, uncertainty, and chance. Military genius is the harmonious combination of what we would call leadership traits today: courage (both physical and moral) being the first requirement; intelligence, a strong mind more than a brilliant one; determination; staunchness, the ability to withstand a great blow; endurance, the

ability to withstand incessant, daily small blows and obstacles; strength of character; and an intuitive grasp of the important that Clausewitz called *coup d'oeil.* In a balanced total, the military genius of a commander allows him to impose his will and inspire his troops to overcome the many obstacles imposed by war's fog and friction; this is the significance of the term.

Mitchell, William "Billy" (1879–1936). Charismatic and temperamental American Army officer, son of a US senator, whose drive for air force independence dominated 1920s defense policy. Joining Giulio Douhet and Hugh Trenchard, William "Billy" Mitchell stands as one of the primary architects of "classic" airpower theory and strategic air warfare. More than Douhet, Mitchell's theories on airpower transformed over time. During World War I, he concentrated on support for the army in the field. By 1921, Mitchell concentrated on coastal defense in an attempt to replace the Navy as America's first line of defense. He considered aircraft carriers a poor alternative to land-based aviation but recognized the value of submarines. By the end of his public career in the mid-1930s, he stridently warned of strategic air attack and sounded very much like Giulio Douhet. He joined Douhet in four important ideas: (1) strategic bombardment will destroy the enemy's capability to fight (but like Douhet, Mitchell was vague about the concept of vital centers); (2) air war will be short and decisive; (3) civilian morale is weak, although he does not explicitly call for breaking enemy morale (it is more implied); and (4) an independent air force is the best means to develop airpower's revolutionary potential. Mitchell's greatest contribution was the idea (also found in Douhet and practiced by Trenchard) of an autonomous air force conducting independent operations. Like Trenchard, he claimed that bombers would win wars by destroying the enemy's ability to wage war and hence his will to fight. In contrast to the outright terror bombing advocated by Douhet, Mitchell at least tried to identify "vital centers," military and economic targets whose destruction would eliminate or greatly weaken the enemy's capacity to resist. So, while Douhet would employ "independent" airpower directly against the enemy's population, Mitchell proposed to direct airpower against "the things" people and armies needed.

operational air war. Initiated by the German Luftwaffe (in secret during the 1920s as part of the Treaty of Rapallo with the Soviets), operational air war is the most sophisticated, comprehensive alternative to strategic air war theory. Unlike earlier assumptions, the Luft-

waffe was not simply flying artillery or totally devoted to ground support; its doctrine was broad and encompassed strategic bombing, air interdiction, air superiority, and close air support in concert with the overall campaign plan. The Luftwaffe was offensively oriented in reaction to its perceived defensive orientation of World War I. It articulated its ideas in Regulation 16, "Conduct of Air Warfare," credited to General Walther Wever: take the war to the enemy by attacking enemy airfields, break enemy morale, and destroy the enemy's armed forces. The doctrine featured air superiority, close air support, naval operations, interdiction, strategic attack against industry, and attacks on cities. Note the doctrine's flexibility and that it did call for terror/morale attacks against enemy cities, but not as a top priority. The flow of missions depended on the overall campaign plan and proved flexible. The significance of operational air war lies in an alternate way of thinking in some ways more traditional than strategic air war and, ironically, now closer to modern USAF doctrine.

Pape, Robert (1960–). Contemporary American political scientist and strategic thinker whose book *Bombing to Win: Air Power and Coercion in Warfare* (1996) countered the theories of John Warden. He labeled (and to some extent mischaracterizes) Warden's Five Rings as "decapitation theory" and then announced that decapitation rarely works. He argued against coercion campaigns targeting civilian will or capability and instead argued for targeting military vulnerabilities. Pape questioned whether airpower alone could force states to alter their behavior and hence opposes Daniel Byman, Matthew Waxman, and Eric Larson's *Airpower as a Coercive Instrument*. Pape drew from Thomas Schelling and B. H. Liddell Hart but divided coercion into three types: punishment (threats to civilians), denial (threat of military failure), and risk (a form of punishment that slowly raises the probability of civilian damage). In "The True Worth of Airpower" (2004), Pape asserted that airpower advocates identified the "wrong revolution" in an air-centric revolution in military affairs. Precision-guided weapons have revolutionized war—by making traditional combined arms warfare more viable. He reasserted the hammer and anvil theory: from World War I until the 1980s, airpower served as the hammer to ground power's anvil, but the anvil did most of the work. With the advent of precision guided weapons, airpower is still the hammer, but the hammer does the work of destroying enemy forces. He argued that wars are still won the old-fashioned way, but with precision-guided weapons, it does so better than ever.

paradoxical trinity. A key concept of Carl von Clausewitz's book *On War* (1832) that describes the relationship of war and the state. Clausewitz creates a triangular relationship, or trinity, consisting of passion (primordial violence, hatred, and enmity), chance and probability (the scope where creativity, courage, and talent roam), and reason (politics and policy). These three relationships are often simplified to be people (passion), commander and army (chance and probability), and government (politics and policy), but this misses the subtleties of the trinity. Clausewitz emphasizes that success in war rests upon balance of the three elements, "like an object suspended between three magnets." The significance of the paradoxical trinity lies primarily in it being a conceptual tool to understand better the complex interactions within a state at war. Like war, the trinity implies complexity where all events affect others. Nothing is ever simple nor easy.

relationship between policy, strategy, and doctrine. Current Air Force doctrine (found in Air Force Basic Doctrine [AFBD, 2021] or the Air Force Doctrine Pamphlet [2022]) defines policy as guidance that is directive or instructive, stating what is to be accomplished. At the national level, it might be expressed in the National Security Strategy or National Military Strategy; at an operational or tactical level, it might be expressed in rules of engagement. AFBD defines strategy as how operations should be accomplished to achieve national policy objectives, a continuous process of matching ends, ways, and means with acceptable levels of risk. Finally, AFBD defines doctrine as considerations on how to accomplish military goals and objectives, a storehouse of experience, authoritative but not directive. The relationship parallels Clausewitz's paradoxical trinity: all elements must be in balance for success. In AFBD's view, policy drives strategy, which in turn is bounded by doctrine, the statement of what is possible. Sun Tzu would observe that policy is the realm of the sovereign and war is a matter of vital importance to the state, a matter of life and death. Thucydides would argue that rational policy will be tempered by the emotions and passions of the people and is subject to the whims of the *demos* (public). Clausewitz, of course, will emphasize (1) that war is politics or policy by other means, (2) that war is an instrument of policy, and (3) that military objectives must be subordinate to the political objectives as defined in policy. Thus, AFBD tries to capture the insights of classical strategy, in particular Clausewitz; this is one of the significant points. The second is that in seeking clarity and defini-

tion—a function of doctrine—AFBD downplays Clausewitz's emphasis on fog and friction, the role of chance, probability, and uncertainty (another side of the paradoxical trinity) where rational policy and strategy may be overwhelmed by the uncontrollable.

relationship between war and the state. Classic military theory explores the relationship between war and the state in a variety of ways. The Athenian Greek Thucydides (c. 460–400 BC) wrote the *History of the Peloponnesian War*, in which he emphasized three ideas important to understanding war and the state: (1) war consists of both rational and irrational elements; (2) in matters of importance and stress, the irrational (emotional) trumps the rational; and (3) a society's ethical and moral standards suffer from war. Additionally, in the "Debate at Sparta," Thucydides stated the three reasons nations go to war: fear (security), honor, and self-interest. In the same debate, Thucydides had the Spartan King Archidamus mention that war is a matter of money (or economics) as much as battle; Archidamus will stress caution and not let emotions lead to wrong decisions. Wars begin "the wrong way round" with action coming first, and only after suffering do belligerents begin to think. Writing at roughly the same time, Sun Tzu wrote that war is of vital importance to the state, a matter of life and death. He devoted considerable attention to "estimates" before a war that reinforce the importance of "know yourself, know your enemy" and in a hundred battles never suffer defeat; know yourself and don't know your enemy, your odds are roughly fifty-fifty; and don't know your enemy, and don't know yourself, and you will suffer defeat. Thus, rational calculations before entering hostilities are essential. Sun Tzu is famous for saying that deception is the key to victory, that no nation benefits from a prolonged war, and that one must respect the situation, one may know how to win, but not necessarily be able to do so. A speedy victory is the goal. To achieve this, a state should attack the enemy's strategy, alliances, army, and as a last resort, cities. The epitome is to win without fighting through adroit maneuver for advantage. Finally, complementing the other two theorists, Carl von Clausewitz presented a nuanced relationship between war and the state. He reminded us that war is an instrument of policy/politics; that the political objective is paramount and the military objective and operations must be subordinate. He used the paradoxical trinity, a triangular relationship consisting of passion (primordial violence, hatred, and enmity), chance and probability (the scope where creativity, courage, and talent roam), and reason (politics and policy).

These three relationships are often simplified to be people (passion), commander and army (chance and probability) and government (politics and policy), but this misses the subtleties of the trinity. Clausewitz emphasized that success in war rests upon balance of the three elements, "like an object suspended between three magnets." The point with Clausewitz is that military theory is not a checklist but rather a means to educate the mind of the commander. The significance of classic military theory coincides with this observation. The relationship between war and the state is varied, nuanced, complicated—and subject to human flaws, emotions, and miscalculations. Each theorist provides a separate lens to view the problem. Wars have a common nature, but each character is unique. Beware the call to action without comprehending the costs and consequences. Wars change societies.

Rolling Thunder, Operation (March 1965–November 1968). Faced with a deteriorating political and military situation in South Vietnam, President Johnson decided upon Operation Rolling Thunder as a sign of American support to South Vietnam and a signal of US resolve. Rolling Thunder sought limited air action against selected military targets in North Vietnam remaining south of the nineteenth parallel. Closely managed by the White House, Rolling Thunder applied military power as a political instrument to influence North Vietnamese will. Unfortunately, the United States underestimated the enemy's resiliency and determination. Air Force leaders chafed at stringent rules of engagement that negated the speed, surprise, and flexibility of massed airpower; and periodic "bombing pauses," intended to signal American intentions, allowed enemy recovery. During 1965, North Vietnamese air defenses, including Soviet-made SA-2 surface-to-air missiles (SAM), multiplied; eventually Hanoi established an advanced radar-controlled air defense system that combined SAMs, antiaircraft artillery (AAA), and Soviet-produced MiG-17 and MiG-21 interceptors. Consequently, US losses mounted without any visible progress from the air campaign. By the fall of 1968, Air Force tactical aircraft had flown 166,000 sorties over North Vietnam and Navy attack aircraft had added a further 144,500 missions. In the process, the enemy downed 526 Air Force aircraft with heavy personnel losses. In retrospect, many consider Operation Rolling Thunder the most ineffective air campaign in USAF history due to its disregard for air doctrine, questionable targeting, high losses, and lackluster results. It also showed the limits of coercion theory

where US efforts to signal resolve were interpreted by the North Vietnamese as weakness and lack of will.

Schelling, Thomas (1921–2016). Joining Bernard Brodie as one of the giants of contemporary American strategic thought, economist Thomas Schelling is best known for his work on game theory, but in strategy he contributed the core of coercion theory. His book *Arms and Influence* (1966) contrasts brute force (traditional warfare) with coercion (the diplomacy of violence or the threat of nuclear war). He assumes that belligerents share common ground in any dispute, even if it is simply survival in the nuclear age. Diplomacy is thus bargaining, and modern war in the nuclear age is therefore diplomacy with violence. He asserts that "the power to hurt is bargaining power"; the threat of damage is more important than the actual damage itself—latent violence can influence your adversary. Like Clausewitz, he argued that the purpose of war is to compel the enemy to do your will. Coercion is thus bargaining through threat of force, to include limited use of force; but in the atomic age, civilization cannot afford absolute war. Unlike the past, atomic weapons mean that an adversary can punish an enemy without first achieving victory. Hence, war is not a contest of strength but of endurance, nerve, obstinacy, and pain. Like Brodie, he emphasizes deterrence, which rests upon the threat of pain and extinction and the importance of preserving a nuclear deterrent force. Schelling is significant for adding key ideas to nuclear deterrence theory and also for forming the foundations for using airpower as a coercive instrument later developed by Robert Pape, Daniel Byman, Matthew Waxman, and Eric Larson.

Slessor, John C. (1897–1979). British air theorist and leader of RAF Coastal Command during World War II where he was credited with defeating the U-boat campaign. In 1936, Slessor wrote *Airpower and Armies*, considered the best, most comprehensive interwar airpower theory. Although he wrote about strategic bombing and airpower in naval campaigns, he is best known for his ideas of using airpower in coordination with land forces. He emphasized that in a land campaign, defeating the enemy army was the priority and air superiority was only a means to an end. It may be a prerequisite and was important, but air superiority was simply an instrument in the overall campaign. Based on WWI, he stressed that air superiority must be earned and prepared for against a first-class enemy by spending the required money on equipment and training in times of peace. Likewise, he called for establishing a joint staff, where the air com-

mander would be the chief advisor to the theater commander, foreshadowing the Joint Force Air Component Commander of today. He wrote many modern ideas, but his ideas on strategic concentration and mobility resound. The key principle of war is concentration of force at the right place and right time, but to do that you need strategic mobility. To be mobile, you need proper doctrine, equipment, training, and practice. Although not widely known today, Slessor's ideas are significant because they form the foundation for modern airpower theory. He was ahead of his time.

strategic air war. A fundamental concept of airpower as a revolutionary, war-winning weapon. In short, strategic air war (or strategic bombing) calls for bypassing the enemy's fielded forces and striking directly at his vital centers (later called centers of gravity). Italian air marshal Giulio Douhet is credited with being the first theorist associated with strategic bombing when as a product of command of the air, he called for destroying the enemy's vital centers (loosely defined as the enemy's capital and population centers) in his book *Command of the Air* (1921). The RAF's Sir Hugh Trenchard also advocated strategic air warfare in response to German air attacks on London with zeppelins in 1915 and Gotha bombers in 1917. Trenchard sought to attack enemy morale and war-fighting capacity with his Independent Air Force in 1918. Its small size and limited capacity yielded few results, but Trenchard believed in its promise. He influenced Billy Mitchell, who by the 1930s became a strident advocate of Douhet's ideas, warning of German surprise attacks on New York and Japanese attacks on Pearl Harbor. The key to Douhet's ideas was the assumed weakness of civilian populations and vulnerability to terror and panic, based upon the initial reaction of Londoners to the first German raids. Douhet, Mitchell, and Trenchard assumed the bomber would always get through and air defenses would be minimal (writing before the advent of radar). Inspired by Col Edgar Gorrell, who wrote the first US Army Air Service strategic bombing doctrine, the Air Corps Tactical School (1922–1940) developed the tactics, doctrine, theory, and strategy of strategic air war. Donald Wilson claimed credit, but Harold George, Laurence Kuter, Muir Fairchild, and Haywood Hansell also contributed to the Industrial Web Theory: instead of targeting enemy morale and civilians, strategic bombers should target the enemy's war-making capability by striking vital centers and key industries, the destruction of which would collapse the enemy's industrial web (since modern factories are dependent on parts and

resources from other sources in an intricate web). The significance of strategic bombing is at least twofold: it is key to winning a war without extended land warfare, and it is the rationale for an independent air force. Both the Combined Bomber Offensive and the strategic bombing of Japan during World War II were attempts to implement strategic air war. The relatively positive assessment of the United States Strategic Bombing Survey combined with the visual imagery of destroyed German and Japanese cities contributed the strategic air war being the focus of the new US Air Force established in 1947.

strategic paralysis. A relatively modern strategic concept initially inspired by B. H. Liddell Hart's idea of strategic dislocation, where an adversary would be stunned or paralyzed by the expanding torrent of armor, air, and mechanized infantry, the roots of blitzkrieg. Col John Boyd's "Discourse on Winning and Losing" in the 1970s–1990s revised the idea: aim to stun or paralyze the enemy through "fast transient maneuvers." Control time through the OODA loop by processing through the observe, orient, decide, and act cycle more rapidly than the enemy can react. Hence, strategic paralysis seeks to confuse, disorient, and render the enemy ineffective versus killing or destroying the enemy's military forces. Boyd targets the mind of the enemy. John Warden also sought strategic paralysis in his Five Rings theory proposed in his 1986 book *The Air Campaign*, but he did it through targeting enemy leadership by destroying key communications nodes. Paralyze enemy forces by denying them cohesive command and control. The significance of the concept is both conceptual, forming key elements of current Air Force and Marine doctrine, and experiential, with the 1991 Persian Gulf War, Operation Desert Storm, as the epitome of success.

Sun Tzu. Ancient Chinese philosopher and security advisor who may have lived in the Warring States period (c. 500 BC), or who may not be a historical figure but could instead refer to a compilation of strategic wisdom, that is, the *Sun Tzu.* Although many western scholars disagree, the People's Republic of China (PRC) argues that he is a real person and national hero. We have no way of knowing, but many find his personage useful for comprehension. Sun Tzu's *Art of War* is the greatest book of the Eastern military tradition and filled with insights and quotable affirmations. The most famous pearls of wisdom include: all warfare is based on deception; a speedy (or swift) victory is the main object of war; and "there has never been a prolonged war which benefited a country." Sun Tzu's ideal is also noteworthy: "To

subdue the enemy without fighting is the supreme excellence." He outlines a strategic sequence that emphasizes the importance of moves before hostilities commence: attack the enemy's strategy, alliances, army, and last, his cities. Sun Tzu's most famous quote is abbreviated: Know yourself and know your enemy (and in a hundred battles never suffer defeat). But, the expanded quote is also important: Know yourself, don't know your enemy and your odds of victory are fifty-fifty; and don't know your enemy and don't know yourself, and you will be defeated. Sun Tzu's significance lies in his book being simple, easy to read, and capable of a variety of levels of interpretation and insight. It is a classic and like Clausewitz not subject to being used as a checklist, but for informing the mind. Moreover, Sun Tzu's ideas strongly influence many of the later theorists of air, space, and cyberspace power. John Warden and John Boyd sought his insights and clarity, for example.

Thucydides. Athenian Greek soldier, statesman, and strategic thinker (c. 460–400 BC) who wrote *The History of the Peloponnesian War*, arguably one of the two best books examining warfare and strategy in the Western tradition. Thucydides emphasized three themes in his wide-ranging work: war consists of both rational and irrational elements; in matters of importance and stress, the irrational usually wins out over the rational; and the first casualties of war are the ethical standards and morality of the belligerents. In "The Debate at Sparta," Thucydides articulated the reasons nations go to war: security (or fear, depending on translation), honor, and self-interest. He also observed that the longer a war lasts, the more things tend to depend on accidents. Through both the Spartan king Archidamus and Athenian leader Pericles, Thucydides presented the first articulation of strategy and strategic thought in the Western world. Finally, in "Pericles' Funeral Oration," Thucydides outlined core concepts of Western strategic culture: freedom, honor, democracy, bravery, and civic obligation. Thucydides and his masterpiece *The History of the Peloponnesian War* are significant for providing the foundation for modern strategic thinking and inspiration for many later Western strategists.

Trenchard, Hugh (1873–1956). British airman, the first commander of the RAF in 1918, Maj Gen Sir Hugh Trenchard proved a tough, savvy example for American air leaders. He seized upon public desire for retribution against German air attacks on London in 1915–1917 to fashion a long-range, strategic strike force as well as

enhancing air support for British troops in the trenches. Convinced of strategic bombing's potential for attacking important enemy industries, Trenchard envisioned a campaign against mines, factories, and supply centers. In 1918 Trenchard's Independent Air Force (IAF) waged strategic air warfare, although with limited results. Trenchard conveyed his core beliefs to Billy Mitchell, which impacted later American air doctrine. He argued that the object of war was to bend an enemy to one's will by either breaking his will or destroying his capability to fight. Trenchard further conveyed his three primary beliefs on air warfare: air superiority is an essential prerequisite; airpower has a "relentless and incessant offensive" nature; and airpower's psychological effects are greater than its material impact. He also stressed that aviation should be concentrated under a single commander, aircraft detached to support army units should be minimized, and most bombardment and pursuit aircraft should be massed into an aviation strike force. His significance rests in commanding the world's first air force, significantly shaping Mitchell's ideas and inspiring American airpower doctrine, and forming the core of strategic air war theory.

Notes

1. For the text of Winston Churchill's speech to the House of Commons, see International Churchill Society, "1940: The Finest Hour," "The Few, August 20, 1940," https://winstonchurchill.org/.

Appendix 2
Excerpts from Key Documents

The documents in this appendix represent some of the most important policy statements relating to American airpower. Each document reproduces an edited, abridged text, verbatim in wording but condensed for brevity.

Memorandum by the Combined Chiefs of Staff

The Bomber Offensive From the United Kingdom [Casablanca Directive]

21 January 1943

[This document established the Combined Bomber Offensive of World War II's European Theater of Operations. Note the influence of interwar strategic bombing theory and the relative order of targets.]

Directive to the appropriate British and U.S. Air Force Commanders, to govern the operation of the British and U.S. Bomber Commands in the United Kingdom . . .

1. Your primary object will be the progressive destruction and dislocation of the German military, industrial and economic system, and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened.
2. Within that general concept, your primary objectives, subject to the exigencies of weather and of tactical feasibility, will for the present be in the following order of priority:

   a. German submarine construction yards.

   b. The German aircraft industry.

   c. Transportation.

   d. Oil plants.

   e. Other targets in the enemy war industry.

The above order of priority may be varied from time to time according to the developments in the strategical situation. Moreover, other objectives of great importance either from the political or military point of view must be attacked. Examples of these are:

1. Submarine operating bases on the Biscay coast. . . .
2. Berlin, should be attacked when conditions are suitable for the attainment of specially valuable results unfavorable to the morale of the enemy or favorable to that of Russia.
3. . . . objectives in Northern Italy in connection with amphibious operations in the Mediterranean theater.
4. . . . objectives of great but fleeting importance . . . important units of the German Fleet in harbor or at sea.
5. You should take every opportunity to attack Germany by day, to destroy objectives that are unsuitable for night attack, to sustain continuous pressure on German morale, to impose heavy losses on the German day fighter force, and to contain German fighter strength away from the Russian and Mediterranean theaters of war.
6. When the Allied armies reenter the Continent, you will afford them all possible support in the manner most effective.
7. In attacking objectives in occupied territories, you will conform to such instructions . . . for political reasons by His Majesty's Government through the British Chiefs of Staff.[1]

War Department Field Manual FM 100-20: Command and Employment of Air Power (21 July 1943)

[Known as airpower's declaration of independence to airpower historians, FM 100-20 attempted to correct the overcontrol and micromanaging of air resources by ground commanders. Notice core ideas that remain foundational to current Air Force doctrine: the assertion of air forces as coequal to ground forces, air superiority as a prerequisite, and centralized command/decentralized execution, among others.]

1. RELATIONSHIP OF FORCES — LAND POWER AND AIR POWER ARE CO-EQUAL AND INTERDEPENDENT FORCES; NEITHER IS AN AUXILIARY OF THE OTHER.
2. DOCTRINE OF EMPLOYMENT — Air superiority is the requirement for the success of any major land operation. Air forces may be properly and profitably employed against enemy sea power, land power, and air power, however, land forces operating without air superiority must take such extensive security measures against hostile air attack that their mobility and ability to defeat the enemy land forces are greatly reduced. Therefore, air forces must be employed primarily against the enemy's air forces until air superiority is obtained. In this way only can destructive and demoralizing air attacks against land forces be minimized and the inherent mobility of modern land and air forces be exploited to the fullest.
3. COMMAND OF AIR POWER — The inherent flexibility of air power is its greatest asset. This flexibility makes it possible to employ the whole weight of the available air power against selected areas in turn; such concentrated use of the air striking force is a battle winning factor of the first importance. Control of available air power must be centralized and command must be exercised through the air force commander if this inherent flexibility and ability to deliver a decisive blow are to be fully exploited. Therefore, the command of air and ground forces in a theater of operations will be vested in the superior commander charged with the actual conduct of operations in the theater, who will exercise command of air forces through the air commander and command of ground

forces through the ground commander. The superior commander will not attach Army Air Forces to units of the ground forces under his command except when such ground force units are operating independently or are isolated by distance or lack of communication.[2]

The United States Strategic Bombing Survey Summary Report

(European War)

[To assess the impact of airpower, the Secretary of War established the United States Strategic Bombing Survey (USSBS), composed of a blue-ribbon team composed of 300 civilians, 350 officers, and 500 enlisted men to study the impact of the air war in both theaters. Deployed immediately to liberated Axis territory, the survey team produced more than 200 detailed reports derived from captured enemy records and extensive interviews. The individual reports contributed to two overall summary reports for both Europe and the Pacific.]

Conclusion

. . . Allied air power was decisive in the war in Western Europe. Hindsight inevitably suggests that it might have been employed differently or better in some respects. Nevertheless, it was decisive. In the air, its victory was complete. At sea, its contribution, combined with naval power, brought an end to the enemy's greatest naval threat—the U-boat; on land, it helped turn the tide overwhelmingly in favor of allied ground forces. Its power and superiority made possible the success of the invasion. It brought the economy which sustained the enemy's armed forces to virtual collapse, although the full effects of this collapse had not reached the enemy's front lines when they were overrun by Allied forces. It brought home to the German people the full impact of modern war with all its horror and suffering. Its imprint on the German nation will be lasting.

Some Signposts

1. The German experience suggests that even a first class military power—rugged and resilient as Germany was—cannot live long under full-scale and free exploitation of air weapons over the heart of its territory. . . .
2. The significance of full domination of the air over the enemy—both over its armed forces and over its sustaining economy—must be emphasized. . . .

3. As the air offensive gained in tempo, the Germans were unable to prevent the decline and eventual collapse of their economy. Nevertheless, the recuperative and defensive powers of Germany were immense; the speed and ingenuity with which they rebuilt and maintained essential war industries in operation clearly surpassed Allied expectations. . . .
4. The mental reaction of the German people to air attack is significant. Under ruthless Nazi control they showed surprising resistance to the terror and hardships of repeated air attack, to the destruction of their homes and belongings . . . . The power of a police state over its people cannot be underestimated.
5. The importance of careful selection of targets for air attack is emphasized by the German experience. The Germans were far more concerned over attacks on one or more of their basic industries and services—their oil, chemical, or steel industries or their power or transportation network—than they were over attacks on their armament industry or the city areas. . . .
6. The German experience showed that, whatever the target system, no indispensable industry was permanently put out of commission by a single attack. Persistent reattack was necessary.
7. In the field of strategic intelligence, there was an important need for further and more accurate information, especially before and during the early phases of the war. . . .
8. Among the most significant of the other factors which contributed to the success of the air effort was the extraordinary progress during the war of Allied research, development, and production. . . . It was fortunate that the leaders of the German Air Force relied too heavily on their initial advantage. For this reason they failed to develop, in time, weapons, such as their jet-propelled planes, that might have substantially improved their position. . . .
9. The achievements of Allied air power were attained only with difficulty and great cost in men, material and effort. Its success depended on the courage, fortitude, and gallant action of the officers and men . . . . It depended also on a superiority in leadership, ability, and basic strength.[3]

Excerpts from Executive Order 9877, Functions of the Armed Forces

Section IV, Functions of the United States Air Force

[Issued the same day (26 July 1947) as the National Security Act of 1947 that established the postwar national security framework and created the United States Air Force, Executive Order 9877 spelled out the details implementing the act and defined the initial functions of the services.]

The United States Air Force includes all military aviation forces, both combat and service, not otherwise specifically assigned. It is organized, trained, and equipped primarily for prompt and sustained air offensive and defensive operations. . . .

The specific functions of the United States Air Force are:

1. To organize, train and equip air forces for:

    a. Air operations including joint operations.

    b. Gaining and maintaining general air supremacy.

    c. Establishing local air superiority where and as required.

    d. The strategic air force of the United States and strategic air reconnaissance.

    e. Air lift and support for airborne operations.

    f. Air support to land forces and naval forces, including support of occupation forces.

    g. Air transport for the armed forces, except as provided by the Navy . . .

2. To develop weapons, tactics, technique, organization and equipment of Air Force combat and service elements, coordinating with the Army and Navy on all aspects of joint concern, including those which pertain to amphibious and airborne operations.

3. To provide, . . . such missions and detachments for service in foreign countries as may be required to support the national policies and interests of the United States.

4. To provide the means for coordination of air defense among all services.

5. To assist the Army and Navy in accomplishment of their missions . . .[4]

Notes

1. CCS 166/1, Combined Chiefs of Staff memorandum, "The Bomber Offensive From the United Kingdom" [Casablanca], 21 January 1943, in *Foreign Relations of the United States: The Conferences at Washington*, 1941–1943, and *Casablanca*, 1943 (Washington, DC: Government Printing Office, 1968), 781–82. See also Phil Haun, *Lectures of the Air Corps Tactical School* (Lexington: University of Kentucky Press, 2019), 265–66.

2. War Department, Field Manual FM 100–20, *Command and Employment of Air Power* (Washington, DC: US GPO, 1943). The original text had all three opening paragraphs of "Doctrine of Command and Employment" in all capital letters and contained occasional misspellings that have been corrected for readability.

3. *The United States Strategic Bombing Surveys (European War) (Pacific War)* (30 September 1945; repr., Maxwell AFB, AL: Air University Press, 1987; page references are to the 1987 edition), 37–40.

4. "Executive Order 9877, 26 July 1947," in *The United States Air Force Basic Documents on Roles and Missions*, ed. Richard I. Wolfe (Washington, DC: Office of Air Force History, 1987), 61, 85, 89–90.

Abbreviations

ACTS	Air Corps Tactical School
AEF	American Expeditionary Force
AFB	Air Force Base
AFBD	Air Force Basic Doctrine
AFHF	Air Force Historical Foundation
ARVN	Army of the Republic of Vietnam
BCR	Bombardement Combat Reconnaissance
CAS	close air support
CBI	China-Burma-India
CBO	Combined Bomber Offensive
COG	centers of gravity
COIN	counterinsurgency
DMPI	desired mean points of impact
DOD	Department of Defense
FDLP	Federal Depository Library Program
FEAF	Far East Air Forces
FID	foreign internal defense
GHQ	general headquarters
IAF	Independent Air Force
ICBM	intercontinental ballistic missiles
ISR	intelligence, surveillance, and reconnaissance
IW	irregular warfare
JFACC	Joint Force Air Component Commander
KLA	Kosovo Liberation Army
LANTIRN	Low-Altitude Navigation and Targeting Infrared for Night
NASM	National Air and Space Museum
NATO	North Atlantic Treaty Organization
NVA	North Vietnamese Army
OODA	observe, orient, decide, and act
PGM	precision-guided munitions
PRC	People's Republic of China
R&D	research and development
RAF	Royal Air Force

RMA	revolution in military affairs
ROE	rules of engagement
SAC	Strategic Air Command
SAG	Scientific Advisory Group
SAM	surface-to-air missiles
SOF	Special Operations Forces
TCP	Technological Capabilities Panel
UN	United Nations
US	United States
USAAF	United States Army Air Forces
USAF	United States Air Force
USAFE	United States Air Forces in Europe
VVS	Voennyo-Vozdushnye Sily (Soviet air force)
WAF	Women in the Air Force
WASP	Women Airforce Service Pilots

Bibliography

Air Force Doctrine Publication (AFDP) 1. *The Air Force*, 10 March 2021. https://www.doctrine.af.mil/.

Air Force Historical Support Division. "1992–NATO Operation Sky Monitor." Accessed 8 April 2023. https://www.afhistory.af.mil/.

Air Force History and Museums Program. *Steadfast and Courageous: FEAF Bomber Command and the Air War in Korea 1950–1953*. Washington, DC: Air Force History and Museums Program, 2000.

Air Force Manual (AFMAN) 1–1. Vol 2, *Basic Aerospace Doctrine of the United States Air Force*, 1 March 1992.

Ames, Roger T., trans. *Sun-Tzu: The Art of Warfare*. New York: Ballantine, 1993.

Angelucci, Enzo. *Rand McNally Encyclopedia of Military Aircraft, 1914 to Present*. New York: Crescent Books, 1990.

Arquilla, John, and David Ronfeldt. "Cyberwar Is Coming!" *Comparative Strategy* 12 (April–June 1993): 141–65. https://doi.org/10.1080/01495939308402915.

Baker, Leonard, and B. F. Cooling. "Development and Lessons before World War II." In Cooling, *Case Studies in the Achievement of Air Superiority*, 1–63.

Bauman, Paul E., ed. *The Officer's Companion to Military History*. New York: Houghton Mifflin, 1999.

Bond, Brian, and Williamson Murray. "The British Armed Forces, 1918–1939." In Millett and Murray, *Military Effectiveness*, vol. 2, 98–130.

Boot, Max. "Why Air Power Alone Won't Beat ISIS." *Wall Street Journal*, 9 December 2015.

Borowski, Harry R. *A Hollow Threat: Strategic Air Power and Containment Before Korea*. Westport, CT: Greenwood Press, 1982.

Boyd, Alexander. *The Soviet Air Force Since 1918*. London: Macdonald and Jane's, 1977.

Boyd, John R. *A Discourse on Winning and Losing*. Edited by Grant T. Hammond. Maxwell AFB, AL: Air University Press, 2018. https://www.airuniversity.af.edu/.

Boyle, Andrew. *Trenchard*. London: Collins, 1962.

Brodie, Bernard. "The Development of Nuclear Strategy." *International Security* 2, no. 4 (Spring 1978): 65–83.

_____. "Implications for Military Policy." In Brodie, *Absolute Weapon*, 70–107.

_____. *Strategy in the Missile Age*. Princeton, NJ: Princeton University Press, 1965.

_____. "War in the Atomic Age." In Brodie, *Absolute Weapon*, 21–69.

Brodie, Bernard, ed. *The Absolute Weapon: Atomic Power and World Order*. New York: Harcourt, Brace, 1946.

Builder, Carl H. *The Masks of War: American Military Styles in Strategy and Analysis*. Baltimore: Johns Hopkins, 1989.

Byman, Daniel L., Matthew C. Waxman, and Eric Larson. *Air Power as a Coercive Instrument*. Project Air Force. Santa Monica, CA: RAND, 1999. https://www.rand.org/.

Carr, Caleb. "Moltke, Helmuth Karl von." In Bauman, *The Officer's Companion to Military History*, 306–7.

Chun, Clayton K. S. *War, Military Theory, and Strategy: An Introduction*. Boston: Houghton Mifflin, 2002.

Clausewitz, Carl von. *On War*, edited and trans. Michael Howard and Peter Paret. Princeton, NJ: Princeton University Press, 1984.

Clodfelter, Mark. *Beneficial Bombing: The Progressive Foundation of American Air Power, 1917–1945*. Lincoln: University of Nebraska Press, 2010.

_____. *The Limits of Air Power: The American Bombing of North Vietnam*. New York: Free Press, 1989.

———. "Molding Airpower Convictions: Development and Legacy of William Mitchell's Strategic Thought." In Meilinger, *Paths of Heaven*, 79–114.

Coffey, Thomas M. *Decision Over Schweinfurt: The U.S. 8th Air Force Battle for Daylight Bombing*. New York: David McKay, 1977.

Cooling, Benjamin Franklin, ed. *Case Studies in the Achievement of Air Superiority*. Washington, DC: Air Force History and Museums Program, 1994.

Coox, Alvin D. "Strategic Bombing in the Pacific." In Hall, *Case Studies in Strategic Bombardment*, 253–382.

Copp, DeWitt S. "Frank M. Andrews: Marshall's Airman." In Frisbee, *Makers of the United States Air Force*, 43–72.

Corbett, Julian S. *Some Principles of Maritime Strategy*. London: Longmans, Green, 1911. Reprint, Uckfield, England: Naval & Military Press, n.d.

Cordesman, Anthony H. *The Lessons and Non-Lessons of the Air and Missile Campaign in Kosovo*. Westport, CT: Praeger, 2001.

Corum, James S. "The Luftwaffe and the Coalition Air War in Spain, 1936–1939." In Gooch, *Airpower: Theory and Practice*, 68–91.

_____. *The Luftwaffe: Creating the Operational Air War 1918–1940*. Lawrence: University Press of Kansas, 1997.

_____. *The Roots of Blitzkrieg: Hans von Seeckt and German Military Reform*. Lawrence: University Press of Kansas, 1992.

Corum, James S., and Wray R. Johnson. *Airpower in Small Wars: Fighting Insurgents and Terrorists*. Lawrence: University of Kansas Press, 2003.

Corum, James S., and Richard R. Muller. *The Luftwaffe's Way of War: German Air Force Doctrine 1911–1945*. Baltimore: Nautical & Aviation Publishing, 1998.

Crane, Conrad C. *American Airpower Strategy in Korea, 1950–1953*. Lawrence: University Press of Kansas, 2000.

Crowl, Philip A. "Alfred Thayer Mahan: The Naval Historian." In Paret, *Makers of Modern Strategy*, 444–79.

Cunningham, Meghan, ed. *The Logbook of Signal Corps No. 1: The U.S. Army's First Airplane*. Washington, DC: Air Force History and Museums Program, 2004.

Cunningham, Robert E. *Aces High*. St. Louis, MO: General Dynamics, 1977.

Curtis E. LeMay Center for Doctrine Development and Education. "Policy, Strategy, and Doctrine." In *Air Force Basic Doctrine*, vol. 1, 12–13; last reviewed 27 February 2015.

Danchev, Alex. "Liddell Hart, Capt Sir Basil Henry." In *The Oxford Companion to Military History*, edited by Richard Holmes, 505–6. Oxford: Oxford University Press, 2001.

Daso, Dik. *Architects of American Air Superiority: General Hap Arnold and Dr. Theodore von Kármán*. Maxwell AFB, AL: Air University Press, 1997.

Davis, Richard G. *Carl A. Spaatz and the Air War in Europe*. Washington, DC: Center for Air Force History, 1993.

_____. "Strategic Bombardment in the Gulf War." In Hall, *Case Studies in Strategic Bombardment*, 527–622.

_____. "Tempering the Blade: General Carl Spaatz and American Tactical Air Power in North Africa, November 8, 1942—May 14, 1943." Air Staff Historical Study. Washington, DC: Office of Air Force History, 1989.

Dear, I. C. B., ed. *The Oxford Companion to World War II*. Oxford: Oxford University Press, 1995.

Department of the Army. FM 3–24, *Counterinsurgency*. Washington, DC: Headquarters Department of the Army, December 2006.

Department of Defense. "Report to Congress: Kosovo/Operation ALLIED FORCE, After-Action Report." 31 January 2000, 1–13.

de Seversky, Alexander P. *Victory Through Air Power*. New York: Simon & Schuster, 1942.

Dick, Ron. *Reach and Power: The Heritage of the United States Air Force in Pictures and Artifacts*. Washington, DC: Air Force History and Museums Program, 1997.

Doughty, Robert A. "The French Armed Forces, 1918–1940." In Millett and Murray, *Military Effectiveness*, vol. 2, 39–69.

Douhet, Giulio. *The Command of the Air*, translated by Dino Ferrari. New York: Coward-McCann, 1942. Reprint, Washington, DC: Office of Air Force History, 1983. Page references are to the 1983 edition.

Drew, Dennis M. "Air Theory, Air Force, and Low Intensity Conflict: A Short Journey to Confusion." In Meilinger, *Paths of Heaven*, 321–98.

_____. "Insurgency and Counterinsurgency: American Military Dilemmas and Doctrine." CADRE paper. Maxwell AFB, AL: Air University Press, 1988.

Dunlap, Maj Gen Charles J., Jr. *Shortchanging the Joint Fight: An Airman's Assessment of FM 3–24 and the Case for Developing Truly Joint Doctrine*. Maxwell AFB, AL: Air University Press, 2008. https://www.airuniversity.af.edu/.

Earle, Edward Mead, ed. *Makers of Modern Strategy: Military Thought from Machiavelli to Hitler.* Princeton, NJ: Princeton University Press, 1971.

Ehlers, Robert S. *The Mediterranean Air War: Airpower and Allied Victory in World War II*. Lawrence: University of Kansas, 2015.

Emerson, William R. "Operation POINTBLANK: A Tale of Bombers and Fighters." In *The Harmon Memorial Lectures in Military History, 1959–1987*, edited by Harry R. Borowski, 441–72. Washington, DC: Office of Air Force History, 1988.

"Executive Order 9877, 26 July 1947." In *The United States Air Force Basic Documents on Roles and Missions*, edited by Richard I. Wolfe. Washington, DC: Office of Air Force History, 1987.

Faber, Peter R. "Interwar US Army Aviation and the Air Corps Tactical School: Incubators of American Airpower." In Meilinger, *Paths of Heaven*, 183–238.

Fadok, Maj David S. "John Boyd and John Warden: Airpower's Quest for Strategic Paralysis." In Meilinger, *Paths of Heaven*, 357–98.

Farquhar, John T. "Aerial Reconnaissance, the Press, and American Foreign Policy, 1950–54." *Air Power History* 62, no. 4 (Winter 2015): 38–51.

_____. *A Need to Know: The Role of Air Force Reconnaissance in War Planning, 1945–1953*. Maxwell AFB, AL: Air University Press, 2004. https://www.airuniversity.af.edu/.

Frisbee, John L., ed. *Makers of the United States Air Force*. Washington, DC: Office of Air Force History, 1987.

Fuller, J. F. C. *Machine Warfare*. Washington, DC: Infantry Journal Press, 1943.

Futrell, Robert Frank. *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force*. Vol. 1, *1907–1960*. Maxwell AFB, AL: Air University Press, 1989. https://www.airuniversity.af.edu/.

_____. *The United States Air Force in Korea*. Reprint, Washington, DC: Air Force History and Museums Program, 2000.

_____. *The United States Air Force in Southeast Asia: The Advisory Years To 1965*. Washington, DC: Office of Air Force History, 1981.

Gaston, James C. *Planning the American Air War: Four Men and Nine Days in 1941: An Inside Narrative*. Washington, DC: National Defense University Press, 1982.

Goldberg, Alfred, ed. *A History of the United States Air Force, 1907–1957*. Princeton, NJ: D. Van Nostrand, 1957.

Gooch, John, ed. *Airpower: Theory and Practice*. London: Frank Cass, 1995.

Gorrell, Maj Edgar S. "Strategical Bombardment." In Maurer, *The U.S. Air Service in World War I*, vol. 2, 141–58.

Grant, Rebecca. *Kosovo Campaign: Aerospace Power Made It Work*. Arlington, VA: Air Force Association, 1999.

Gray, Colin S. *Airpower for Strategic Effect*. Maxwell AFB, AL: Air University Press, 2012. https://www.airuniversity.af.edu/.

_____. "Irregular Warfare: One Nature, Many Characters." *Strategic Studies Quarterly* 1, no. 2 (Winter 2007): 35–57. https://www.airuniversity.af.edu/.

_____. *Modern Strategy*. Oxford, UK: Oxford University Press, 1999.

Greer, Thomas H. *The Development of Air Doctrine in the Army Air Arm 1917–1941*. Washington, DC: Office of Air Force History, 1955. Reprint, 1985. Page references are to the 1985 edition.

Guilmartin, John F., Jr. *America in Vietnam: The Fifteen Year War*. New York: Military Press, 1991.

Hall, R. Cargill. "Civil-Military Relations in America's Early Space Program." In Hall and Neufeld, *The U.S. Air Force in Space*, 19–32.

_____. "Early Cold War Overflight Programs: An Introduction." In Hall and Laurie, *Early Cold War Overflights 1950–1956*, 1–14.

Hall, R. Cargill, ed. *Case Studies in Strategic Bombardment*. Washington, DC: Air Force History and Museums Program, 1998.

Hall, R. Cargill, and Clayton D. Laurie, eds. *Early Cold War Overflights 1950–1956: Symposium Proceedings*. Vol. 1, *Memoirs*. Washington, DC: Office of the Historian, National Reconnaissance Office, 2003.

Hall, R. Cargill, and Jacob Neufeld, eds. *The U.S. Air Force in Space: 1945 to the Twenty-first Century*. Proceedings of the Air Force Historical Foundation, Andrews AFB, Maryland, 21–22 September 1995. Washington, DC: USAF History and Museums Program, 1998. https://media.defense.gov/.

Hallion, Richard P. *Storm Over Iraq: Air Power and the Gulf War*. Washington, DC: Smithsonian Institution Press, 1992.

Hammond, Grant T. *The Mind of War: John Boyd and American Security*. Washington, DC: Smithsonian Books, 2001.

_____. "Myths of the Air War Over Serbia: Some 'Lessons' Not to Learn." *Aerospace Power Journal* 14, no.4 (Winter 2000): 78–81.

Handel, Michael I. *Masters of War: Classical Strategic Thought*. 3rd rev. ed. London: Frank Cass, 2001.

Hansell, Haywood S., Jr. *The Strategic Air War against Germany and Japan*. Washington, DC: Office of Air Force History, 1986.

Hanzhang, General Tao. *Sun Tzu's Art of War: The Modern Chinese Interpretation*. Translated by Yuan Shibing. New York: Sterling Publishing, 2007.

Haulman, Daniel L. *Hitting Home: The Air Offensive Against Japan*. Washington, DC: Air Force History and Museums Program, 1999.

_____. *Wings of Hope: The U.S. Air Force and Humanitarian Air Operations*. Rev. ed. Washington, DC: Air Force History and Museums Program, 2007.

Haun, Phil. *Lectures of the Air Corps Tactical School and American Strategic Bombing in World War II*. Lexington: University of Kentucky Press, 2019.

Headquarters Department of the Army and Headquarters Marine Corps Combat Development Command, Department of the Navy, Headquarters United States Marine Corps. FM 3–24 and Marine Corps Warfighting Publication No. 3–30.5, *Counterinsurgency*. Washington, DC: Headquarters Department of the Army and Headquarters Marine Corps Combat Development Command, Department of the Navy, Headquarters United States Marine Corps, 15 December 2006.

Helmhold, Robert L. *Rates of Advance in Historical Land Operations*. Bethesda, MD: US Army Concepts and Analysis Agency, June 1990.

Henry, Paul F. "William E. Kepner: All the Way to Berlin." In Frisbee, *Makers of the United States Air Force*, 151–76.

History Office, Aeronautical Systems Center, Air Force Materiel Command. *Splendid Vision, Unswerving Purpose: Developing Air Power for the United States Air Force During the First Century of Powered Flight*. Wright Patterson AFB, OH: Air Force History and Museums Program, 2002.

Holley, I. B., Jr. *Ideas and Weapons*. New York: Yale University Press, 1953. Reprint, Washington, DC: Air Force History and Museums Program, 1997. Page references are to the 1997 edition.

_____. *Technology and Military Doctrine: Essays on a Challenging Relationship*. Maxwell AFB, AL: Air University Press, 2004. https://www.airuniversity.af.edu/.

Hone, Thomas C. "Korea." In Cooling, *Case Studies in the Achievement of Air Superiority*, 453–504.

———. "Southeast Asia." In Cooling, *Case Studies in the Achievement of Air Superiority*, 513–46.

———. "Strategic Bombardment Constrained: Korea and Vietnam." In Hall, *Case Studies in Strategic Bombardment*, 510–12.

Howard, Michael. *Clausewitz*. Oxford: Oxford University Press, 1983.

Hudson, James J. *Hostile Skies: A Combat History of the American Air Service in World War I*. Syracuse, NY: Syracuse University Press, 1996.

Hurley, Alfred F. *Billy Mitchell: Crusader for Air Power*. Bloomington: Indiana University Press, 1975.

Hurley, Alfred F., and William C. Heimdahl. "The Roots of U.S. Military Aviation." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 3–34.

Jablonski, Edward. *Airwar: An Illustrated History of Air Power in the Second World War*. Vol. 2. Garden City, NY: Doubleday, 1979.

Jogerst, John D. "Preparing for Irregular Warfare: The Future Ain't What It Used to Be." *Air and Space Power Journal* 23, no. 4 (Winter 2009): 68–79.

Joint Publication (JP) 1. *Doctrine of the Armed Forces of the United States*, 25 March 2013, Incorporating Change 1, 12 July 2017. https://irp.fas.org/.

JP 1-02. *DOD Dictionary of Military and Associated Terms*, 21 January 2021.

JP 3-0. *Doctrine for Joint Operations*, 10 September 2001.

JP 3-24. *Counterinsurgency*, 22 November 2013. http://www.dtic.mil/.

JP 5-0. *Joint Operations Planning*, 16 June 2017. https://www.jcs.mil/.

Kainikara, Sanu. *The Bolt From the Blue: Air Power in the Cycle of Strategies*. Canberra, Australia: Air Power Development Centre, 2013.

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

Kennett, Lee. *The First Air War, 1914–1918*. New York: Free Press, 1991.

Kilcullen, David. "Twenty-Eight Articles: Fundamentals of Company-Level Counterinsurgency." *Military Review*, special edition (October 2006): 134–39. https://www.proquest.com/.

Koppes, Clayton. "USA." In Dear, *Oxford Companion to World War II*, 1177–1206.

Lambeth, Benjamin S. *NATO's Air War for Kosovo: A Strategic and Operational Assessment*. Santa Monica, CA: RAND, 2001.

———. *The Transformation of American Air Power*. Ithaca, NY: Cornell University Press, 2000.

Lawrence, T. E. "The Science of Guerilla Warfare." *Encyclopedia Britannica*, 14th ed. (1929; added to website 2 November 2014). https://www.britannica.com/.

Liddell Hart, B. H. *Strategy*. 2nd rev. ed. New York: Frederick A. Praeger, 1967.

Lykke, Arthur F., Jr. "Defining Military Strategy = E + W + M." *Military Review* 69, no. 5 (May 1989): 2–8.

MacIsaac, David. "Voices from the Central Blue: The Air Power Theorists." In Paret, *Makers of Modern Strategy*, 624–74.

Mahan, Alfred Thayer. *Influence of Sea Power Upon History 1660–1783*. 13th ed. Boston: Little, Brown, 1918.

Mann, Edward C., III. *Thunder and Lightning: Desert Storm and the Airpower Debates*. Maxwell AFB, AL: Air University Press, 1995.

Martin, Jerome V. *Victory From Above: Air Power Theory and the Conduct of Operations Desert Shield and Desert Storm*. Research report no. AU-ARI-92-8. Maxwell AFB, AL: Air University Press, 1994. https://apps.dtic.mil/.

Mauer, Mauer, ed. *The U.S. Air Service in World War I*. Vol. 1, *The Final Report and A Tactical History*. Washington, DC: Office of Air Force History, 1978.

_____. *The U.S. Air Service in World War I*. Vol. 2, *Early Concepts in Military Aviation*. Washington, DC: Office of Air Force History, 1978.

McFarland, Stephen L. *A Concise History of the U.S. Air Force*. Washington, DC: Air Force History and Museums Program, 1997.

McFarland, Stephen L., and Wesley Phillips Newton. "The American Strategic Air Offensive Against Germany in World War II." In Hall, *Case Studies in Strategic Bombardment*, 183–252.

McNeill, William H. *The Pursuit of Power: Technology, Armed Force, and Society since A.D. 1000*. Chicago: University of Chicago Press, 1982.

Meilinger, Phillip S. *10 Propositions Regarding Air Power*. Washington, DC: Air Force History and Museums Program, 1995.

_____. *Airmen and Air Theory: A Review of the Sources*. Maxwell AFB, AL: Air University Press, 2001.

_____. "Counterinsurgency From Above." *Air Force Magazine* 91, no. 7, July 2008. https://www.airandspaceforces.com/.

_____. email message to author, 12 May 2016.

_____. "Giulio Douhet and the Origins of Airpower Theory." In Meilinger, *Paths of Heaven*, 1–40.

_____. *Hoyt S. Vandenberg: The Life of a General*. Bloomington: Indiana University Press, 1989.

_____. "The Impact of Technology and Design Choice on the Development of U.S. Fighter Aircraft." *American Aviation Historical Society Journal* 36 (Spring 1991): 60–69.

_____. *Significant Milestones in Air Force History*. Washington, DC: Air Force History and Museums Program, 2003.

_____. "Trenchard, Slessor, and Royal Air Force Doctrine before World War II." In Meilinger, *Paths of Heaven*, 41–78.

Meilinger, Phillip S., ed. *The Paths of Heaven: The Evolution of Airpower Theory*. Maxwell AFB, AL: Air University Press, 1997. https://www.airuniversity.af.edu/.

Miller, Roger G. *A Preliminary to War: The 1st Aero Squadron and the Mexican Punitive Expedition of 1916*. Washington, DC: Air Force History and Museums Program, 2003.

Millett, Allan R., and Peter Maslowski. *For the Common Defense: A Military History of the United States of America*. Rev. ed. New York: Free Press, 1994.

Millett, Allan R., and Williamson Murray, eds. *Military Effectiveness*. Vol. 2, *The Interwar Period*. Boston: Allen & Unwin, 1988.

Mitchell, Vance O. *Air Force Officers: Personnel Policy Development, 1944–1974*. Washington, DC: Air Force History and Museums Program, 1996.

Mitchell, William. "General Principles, 30 April 1918." In Maurer, *The U.S. Air Service in World War I*, vol. 2, 175–76.

_____. *Our Air Force: The Keystone of National Defense*. New York: Dutton, 1921.

_____. *Skyways: A Book on Modern Aeronautics*. Philadelphia: J. B. Lippincott, 1930.

_____. *Winged Defense: The Development and Possibilities of Modern Air Power—Economic and Military*. New York: G. P. Putnam's Sons, 1925. Reprint, Mineola, NY: Dover Publications, 2006. Page references are to the 2006 edition.

Moody, Walter S. *Building a Strategic Air Force*. Washington, DC: Air Force History and Museums Program, 1995.

Moody, Walton S., Jacob Neufeld, and R. Cargill Hall. "The Emergence of the Strategic Air Command." In Nalty, *Winged Shield, Winged Sword,* vol. 2, 53–96.

Moody, Walton S., and Warren A. Trest. "Containing Communism." In Nalty, *Winged Shield, Winged Sword*, vol. 2, 129–60.

Moran, Daniel. "Moltke, Helmuth von (the Younger)." In Bauman, *Officer's Companion to Military History*, 307–8.

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

Mortensen, Daniel R. "The Air Service in the Great War." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 35–70.

Muller, Richard R. "The Air War in the Pacific, 1941–1945." In Olsen, *A History of Air Warfare*, 53–79.

———."Close Air Support: The German, British, and American Experiences, 1918–1941." In Murray and Millett, *Military Innovation in the Interwar Period*, 144–90.

_____. *The German Air War in Russia*. Baltimore: Nautical & Aviation Publishing, 1992.

Murray, Williamson. *Luftwaffe*. Rev. ed. Baltimore: Nautical & Aviation Publishing, 1985.

_____. "Why Air Forces Do Not Understand Strategy." *MHQ: The Quarterly Journal of Military History* 1, no. 3 (Spring 1989): 34–35.

Murray, Williamson, and Mark Grimsley. "Introduction: On Strategy." In *The Making of Strategy: Rulers, States, and War*, edited by Williamson Murray, MacGregor Knox, and A. Bernstein, 1–23. Cambridge: Cambridge University Press, 1994.

Murray, Williamson, and Allan R. Millett, eds. *Military Innovation in the Interwar Period*. Cambridge: Cambridge University Press, 1996.

Nalty, Bernard C. "The Army Air Forces in Desperate Battle." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 201–30.

_____. "The Defeat of Italy and Germany" In Nalty, *Winged Shield, Winged Sword*, vol. 1, 269–326.

_____. "Reaction to the War in Europe." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 165–200.

_____. "Victory over Japan." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 327–68.

Nalty, Bernard C., ed. *Winged Shield, Winged Sword: A History of the United States Air Force*. Vol. 1, *1907–1950*. Washington, DC: Air Force History and Museums Program, 1997.

———. *Winged Shield, Winged Sword: A History of the United States Air Force*. Vol. 2, *1950–1997*. Washington, DC: Air Force History and Museums Program, 1997.

Nation, R. Craig. *War in the Balkans, 1991–2002*. Carlisle, PA: Strategic Studies Institute, US Army War College, 2003.

National Museum of the United States Air Force. "Discoverer XIV." Accessed 25 August 2016. https://www.nationalmuseum.af.mil/.

Neufeld, Jacob. *Ballistic Missiles in the United States Air Force 1945–1960*. Washington, DC: Office of Air Force History, 1990.

_____. *Bernard A. Schriever: Challenging the Unknown*. Washington, DC: Office of Air Force History, 2005.

Norris, Robert S. "The Cuban Missile Crisis: A Nuclear Order of Battle, October/November 1962." Woodrow Wilson Center Conference Presentation, 24 October 2012. Washington, DC: Wilson Center, 2012. https://www.wilsoncenter.org/.

O'Connell, Robert L. *Of Arms and Men: A History of War, Weapons, and Aggression*. New York: Oxford University Press, 1989.

Olsen, John Andreas. "Operation Desert Storm, 1991." In Olsen, *A History of Air Warfare*, 177–200.

Olsen, John Andreas, ed. *A History of Air Warfare*. Washington, DC: Potomac Books, 2010.

Overy, R. J. "Air Power, Armies, and the War in the West, 1940." In *Harmon Memorial Lectures in Military History, 1988–2017*, edited by Mark E. Groteluesche, 335–54. Maxwell AFB, AL: Air University Press, 2020.

_____. *The Air War, 1939–1945*. New York: Stein and Day, 1981.

_____. *The Battle of Britain: The Myth and Reality*. New York: W. W. Norton, 2000.

Owen, Robert C. "Operation Deliberate Force, 1995." In Olsen, *A History of Air Warfare*, 201–24.

Owen, Robert C., ed. *Deliberate Force: A Case Study in Effective Air Campaigning*. Final Report of the Air University Balkans Air Campaign Study. Maxwell AFB, AL: Air University Press, 2000. https://www.airuniversity.af.edu/.

Pape, Robert A. *Bombing to Win: Air Power and Coercion in War*. Ithaca, NY: Cornell University Press, 1996.

_____. "The True Worth of Air Power." *Foreign Affairs* 83, no. 2 (March–April 2004): 116–30.

Paret, Peter. "Clausewitz." In Paret, *Makers of Modern Strategy*, 186–216.

Paret, Peter, ed. *Makers of Modern Strategy: From Machiavelli to the Nuclear Age*. Princeton, NJ: Princeton University Press, 1986.

Patterson, John James, VI. "A Long-Term Counterinsurgency Strategy." *Parameters* 40, no. 3 (Autumn 2010): 118–31.

Perret, Geoffrey. *Winged Victory: The Army Air Forces in World War II*. New York: Random House, 1993.

Plating, John D. *The Hump: America's Strategy for Keeping China in World War II*. College Station: Texas A&M University Press, 2011.

Pomeroy, Steven A. *An Untaken Road: Strategy, Technology, and the Hidden History of America's Mobile ICBMs*. Annapolis, MD: Naval Institute Press, 2016.

RAND. "Nobel Committee Honors Former RAND Economist Thomas Schelling." RAND.org, 11 October 2005. https://www.rand.org/.

Reynolds, Clark G. "William A. Moffett: Steward of the Air Revolution." In *Quarterdeck and Bridge: Two Centuries of American Na-*

val Leaders, edited by James C. Bradford. Annapolis, MD: Naval Institute Press, 1994.

Reynolds, Richard T. *Heart of the Storm: The Genesis of the Air Campaign Against Iraq*. Maxwell AFB, AL: Air University Press, 1995. https://www.airuniversity.af.edu/.

Rice, Donald B. "Global Reach, Global Power: The Evolving Air Force Contribution to National Security." Washington, DC: US Air Force white paper. December 1992.

Ricks, Thomas E. *The Gamble: General Petraeus and the American Military Adventure in Iraq*. New York: Penguin Press, 2009.

Schelling, Thomas C. *Arms and Influence*. New Haven, CT: Yale University Press, 1966.

Schlight, John. "Vietnamization and Withdrawal, 1968–1975." In Nalty, *Winged Shield, Winged Sword*, vol. 2, 295–336.

_____. "The War in Southeast Asia, 1961–1968." In Nalty, *Winged Shield, Winged Sword*, vol. 2, 241–94.

_____. *The War in South Vietnam: The Years of the Offensive, 1965–1968*. Washington, DC: Office of Air Force History, 1988.

_____. *A War Too Long: The History of the USAF in Southeast Asia*. Washington, DC: Air Force History and Museums Program, 1996.

Schriever, Bernard A. "Military Space Activities: Recollections and Observations." In Hall and Neufeld, *The U.S. Air Force in Space*, 11–18.

Shiner, John F. "Benjamin D. Foulois: In the Beginning." In Frisbee, *Makers of the United States Air Force*, 11–42.

———. "The Coming of the GHQ Air Force, 1925–1935." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 101–34.

_____. "From Air Service to Air Corps: The Era of Billy Mitchell." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 71–100.

———. "The Heyday of the GHQ Air Force, 1935–1939." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 135–62.

Showalter, Dennis E. *Patton and Rommel: Men of War in the Twentieth Century*. New York: Berkley Caliber, 2005.

Slessor, J. C. *Air Power and Armies*. London: Humphrey Milford, Oxford University Press, 1936.

Smith, Douglas V. *Carrier Battles: Command Decision in Harm's Way*. Annapolis, MD: Naval Institute Press, 2006.

Smith, Malcolm. "Britain, Battle of." In Dear, *The Oxford Companion to World War II*, 158–63.

Spector, Ronald. *Eagle Against the Sun: The American War with Japan*. New York: Free Press, 1985.

_____. "Military Effectiveness of the US Armed Forces, 1919–1939." In Millett and Murray, *Military Effectiveness*, vol. 2, 70–97.

Spires, David N. "The Air Force and Military Space Missions: The Critical Years, 1957–1961." In Hall and Neufeld, *U.S. Air Force in Space 1945 to the Twenty-first Century*, 33–45.

_____. *Beyond Horizons: A Half Century of Air Force Space Leadership*. Rev. ed. Washington, DC: Air Force Space Command, 1998.

Sprout, Margaret Tuttle. "Mahan: Evangelist of Sea Power." In Earle, *Makers of Modern Strategy*, 415–45.

Strassler, Robert B. ed. *The Landmark Thucydides: A Comprehensive Guide to the Peloponnesian War.* New York: Simon & Schuster, 1996.

Sullivan, Brian R. "The Italian Armed Forces, 1918–1940." In Millett and Murray, *Military Effectiveness*, vol. 2, 169–217.

Sullivan, Gen Gordon R., and Lt Col James M. Dubik. "Land Warfare in the 21st Century." Carlisle Barracks, PA: Strategic Studies Institute, February 1993.

Sun Tzu. *The Art of War*. Translated by Samuel B. Griffith. London: Oxford University Press, 1977.

Sun Tzu. *The Art of War*. Translated by Ralph D. Sawyer. Boulder, CO: Westview Press, 1994.

Sunzi. *Sunzi Speaks: The Art of War*. Adapted by Tsai Chih Chung, translated by Brian Bruya. New York: Doubleday, Anchor, 1994.

Tedder, Arthur (Air Chief Marshal of the Royal Air Force). *Air Power in War*. London: Hodder and Stoughton, 1948.

Thompson, Wayne. "The Air War Over Korea." In Nalty, *Winged Shield, Winged Sword*, vol. 2, 3–52.

———. "Operations Over North Vietnam, 1965–1973." In Olsen, *A History of Air Warfare*, 107–26.

Thompson, Wayne, and Bernard C. Nalty. *Within Limits: The U.S. Air Force and the Korean War*. Washington, DC: Air Force History and Museums Program, 1996.

Thucydides. *History of the Peloponnesian War*. Translated by Rex Warner. New York: Penguin Classics, 1954.

Till, Geoffrey. "Adopting the Aircraft Carrier: The British, American, and Japanese Case Studies." In Murray and Millett, *Military Innovation in the Interwar Period*, 191–226.

Torkelson, Thomas. "No Fly, Don't Fight & Win: How Modern No-Fly Zones Achieve Strategic Effect & Inform Coercive Airpower Theory." PhD diss., School for Advanced Air and Space Studies, Air University, 2018.

Travers, Tim. "Liddell Hart, B. H." In Bauman, *Officer's Companion to Military History*, 265.

Trest, Warren A., and George M. Watson Jr. "Framing Air Force Missions." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 399–436.

United States Air Forces in Europe Studies and Analysis Directorate. "The Air War over Serbia: Aerospace Power in Operation Allied Force." Initial Report, March 2000.

United States Strategic Bombing Surveys (European War) (Pacific War), originally published 30 September 1945. Reprint, Maxwell AFB, AL: Air University Press, 1987. Page references are to the 1987 edition.

Vennesson, Pascal. "Institution and Airpower: The Making of the French Air Force." In Gooch, *Airpower: Theory and Practice*, 36–67.

Wagner, Ray. *American Combat Planes*. Rev. ed. Garden City, NY: Doubleday, 1968.

War Department. Field Manual FM 100–20, *Command and Employment of Air Power*, *21 July 1943*. Washington, DC: US GPO, 1943. https://www.ibiblio.org/.

Warden, John A., III. "The Enemy as a System." *Airpower Journal* 9, no. 1 (Spring 1995): 40–55. https://www.airuniversity.af.edu/.

Warner, Edward. "Douhet, Mitchell, Seversky: Theories of Air Warfare." In Paret, *Makers of Modern Strategy*, 484–503.

Watson, George M., Jr. "Building Air Power." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 231–68.

Watts, Barry. "Ignoring Reality: Problems of Theory and Evidence in Security Studies." *Security Studies* 7, no. 2 (Winter 1997/1998): 116–71.

Wheal, Elizabeth-Anne, Stephen Pope, and James Taylor. "Slessor, Air Marshal Sir John." In *A Dictionary of the Second World War*, by Elizabeth-Anne Wheal, Stephen Pope, and James Taylor. New York: Peter Bedrick Books, 1990.

White, Robert P. *Mason Patrick and the Fight for Air Service Independence*. Washington, DC: Smithsonian Institution Press, 2001.

Wilson, Donald. "Origin of a Theory for Air Strategy." *Aerospace Historian* 18, no. 1 (Spring 1971): 19–25.

Wohl, Robert. *A Passion for Wings: Aviation and the Western Imagination, 1908–1918*. New Haven, CT: Yale University Press, 1994.

_____. "Republic of the Air." *Wilson Quarterly* 17 (Spring 1993): 106–17. https://archive.wilsonquarterly.com/.

Wolfe, Richard I., ed. *The United States Air Force Basic Documents on Roles and Missions.* Washington, DC: Office of Air Force History, 1987.

Wolk, Herman S. "George C. Kenney: The Great Innovator." In Frisbee, *Makers of the United States Air Force*, 127–50.

———. "The Quest for Independence." In Nalty, *Winged Shield, Winged Sword*, vol. 1, 371–98.

Wylie, J. C. *Military Strategy: A General Theory of Power Control*. New Brunswick, NJ: Rutgers University Press, 1967.

Y'Blood, William T. "From the Deserts to the Mountains." In Nalty, *Winged Shield, Winged Sword*, vol. 2, 441–512.

_____. *MiG Alley: The Fight for Superiority*. Washington, DC: Air Force History and Museums Program, 2000.

Zeckhauser, Richard. "Distinguished Fellow: Reflections on Thomas Schelling." *Journal of Economic Perspectives* 3 (Spring 1989): 153–64.

Ziemke, Earl F. "The Soviet Armed Forces in the Interwar Period." In Millett and Murray, *Military Effectiveness*, vol. 2, 1–38.

Index

Kick the Tires and Light the Fires: Foundations of American Airpower introduces American airpower studies and explores the foundations of today's United States Air Force, building Air Force identity through an overview of Air Force heritage and an explanation of the concepts behind current theory and doctrine.

Balancing brevity with thoroughness and introducing the people, events, technology, and ideas associated with American airpower, *Kick the Tires and Light the Fires* recognizes domestic and international contributions, acknowledging not only the US Army Air Service, Air Corps, Air Forces, and the US Navy's Aeronautical Bureau but also the influence of British, French, Italian, German, and Soviet air forces and international air theorists.

From the groundbreaking feats of the Wright brothers to the cutting-edge drone warfare of today, Kick the Tires and Light the Fires *delves into the dynamic interplay between theoretical frameworks and real-world action in the realm of airpower. Expertly penned by John T. Farquhar, this compelling work uncovers the foundational influences of airpower, seamlessly connecting classical military and naval strategies to contemporary applications. Focusing on the evolution of the United States Air Force, Farquhar masterfully illuminates the pivotal figures, transformative events, trailblazing technology, and visionary ideas that have elevated airpower as an indispensable component of modern military strategy. An insightful and captivating exploration,* Kick the Tires and Light the Fires *is an indispensable read for both airpower professionals and enthusiasts alike.*

- Dr. Edward Kaplan, Dean, School of Strategic Landpower, US Army War College

John Farquhar details how airpower theory relates to military theory in a simple way that enhances understanding essential for a joint all-domain perspective. This work is an excellent starting point to understand the basic thinking that underpins modern military and airpower strategy and operational art. More importantly, it is a clear and succinct primer that can stimulate fresh thinking and analysis while drawing useful connections for the novice and a great refresher for the more experienced practitioner as well.

- John Terino, PhD, Associate Professor of Airpower, Air Command and Staff College

Dr. Farquhar has written an outstanding history of US airpower that covers conventional, unconventional, and nuclear operations from its beginnings through the war over Serbia in 1999. Taking both a historical and social science viewpoint, he details the theory, doctrine, technology, and leadership of the air arms—both Air Force and Navy—and does so with an honest, straightforward, and engaging style. This should be a basic text for cadets, Airmen, and junior officers.

- Phillip S. Meilinger, Col, USAF, retired, PhD

Kick the Tires and Light the Fires *is a brilliant survey of the theory and thinking behind America's development of air power. "Airpower is an instrument of strategy," says author John Farquhar, and he plays this "instrument" beautifully. Its breadth of scope is breathtaking, laying out the path of power from early military thinkers to contemporary theorists. Anyone concerned with how airpower fits into today's complex strategic dynamic should grab a copy and keep it handy.* Kick the Tires *will become a standard textbook for all air-minded strategists, from undergraduate cadets to commanders at the war colleges.*

- Dr. James Tucci, Professor of Strategy and Security Studies, School of Advanced Air and Space Studies

AUP
AIR UNIVERSITY PRESS

9 781585 663231