Warden and the Air Corps Tactical School

Déjà Vu?

SCOTT D. WEST, Major, USAF
School of Advanced Airpower Studies

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Abstract

This study answers the following questions: Is John A. Warden III's, "The Enemy as a System" analogous to the Air Corps Tactical School's (ACTS) industrial web theory of airpower employment? If so, why (given the 50 plus years between development of these theories)? If not, what are the prime sources of divergence? The author first describes both theories using an outline from which they are compared on an "apples to apples" basis. From this analysis, similarities and differences are presented. Next, the author discusses contextual factors affecting development of both theories. A baseline is developed from which factors from both eras are compared. After linking relevant contextual factors of the 1920s–'30s and 1980s–'90s, the author explains why the theories of ACTS and Warden are more similar than different. Finally, implications are drawn from the preceding analysis to address the issue of how airpower theory should be developed.

About the Author

Maj Scott D. West was commissioned through the Reserve Officer Training Corps in 1982. He began active duty as a civil engineer and entered undergraduate pilot training in 1984. Major West completed three flying assignments culminating with duty as an F-16 instructor pilot at the United States Air Force Weapons School. Following a tour at the Pentagon in Air Force international affairs, Major West attended Air Command and Staff College and the School of Advanced Airpower Studies, Maxwell Air Force Base (AFB), Alabama. Major West is a senior pilot with more than 2,000 flying hours. He has a bachelor's degree in civil engineering from The Citadel and a master's degree in business administration from Barry University, Miami, Florida. In July 1998, Major West was assigned to Moody AFB, Georgia, as the 347th Wing's chief of safety.

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Chapter 1

Introduction

To preach the message, to insist upon proclaiming it (whether the time is right or not), to convince, reproach, and encourage, as you teach with all patience. The time will come when people will not listen to sound doctrine, but will follow their own desires and will collect for themselves more and more teachers who will tell them what they are itching to hear. They will turn away from listening to the truth and give their attention to legends.

—2 Timothy 4:2–4

In the 1930s, faculty members at the Air Corps Tactical School (ACTS) developed the industrial web theory, a concept of strategic air operations to guide the employment of American airpower. The most important enunciation of the industrial web theory came in August 1941.[1] Several key instructors had been reassigned from ACTS to the Air War Plans Division (AWPD) in Washington. The division wrote into the basic war plan—AWPD-1, "Munitions Requirements of the Army Air Force"—their "long-standing faith in precision bombing."[2] AWPD-1 planned to apply airpower "for the breakdown of the industrial and economic structure of Germany by destroying a system of objectives vital to the German war effort: primarily power, transportation, and oil industries."[3] World War II air planning would be built on the foundation of AWPD-1. Though the Pacific theater was omitted from this document, "a strategic air offensive based on precision-bombing doctrine was written into official policy."[4]

Fifty years later, in 1991, Col John A. Warden III and his Pentagon staff developed an airpower plan to defeat Iraq. Called Instant Thunder, the plan identified electricity, retail petroleum, and weapons of mass destruction as centers of gravity.[5] Colonel Warden insisted that destruction of these centers of gravity would render Iraqi leadership unable to resist United States (US) policy. Instant Thunder became part of a four-phased plan of operations for Operation Desert Storm. In 1995 Warden's theory, the basis of Instant Thunder, was published.[6] In his last active duty assignment, Colonel Warden served as commandant of the Air Command and Staff College. He remains a central, modern airpower theorist.

Airmen applied the theories developed by the ACTS faculty and Colonel Warden in World War II and the Persian Gulf War, respectively.[7] Both theories are studied and debated by airmen throughout the United States Air Force (USAF) today. Both use a systematic analysis of an enemy to attempt to achieve victory through airpower. Critics have questioned both theories because neither resulted in victory via airpower *exclusively*.[8] Yet, because both used a "system" to obtain victory through airpower, the theories appear similar despite the 50-year span between their development.

Are they similar? Were the theoretical underpinnings of airpower employment fundamentally the same in both wars? What contextual elements drove the formulation of each theory? What can airmen learn from their development to improve future theoretical development? Understanding these questions and issues is essential to understanding the foundations of American airpower doctrine.

Argumentative Roadmap

In chapter 2 of this study, I describe and compare both theories using the outline presented in figure 1. This outline does not necessarily follow the exact line of argument of each theory; rather, it is a framework designed to highlight the theoretical similarities and differences of the two theories. Beginning with the industrial web theory, each theory is analyzed from the categories of "Disagreement over Policy" through "Enemy Acceptance of US Policy." Afterward, I compare the theories on an "apples to apples" basis and show that, although the industrial web and enemy as a system theories diverge in some respects, they have more similarities than differences.

I discuss contextual factors that affected the development of both theories in chapter 3. In the final chapter, I link relevant contextual factors of the 1920s–'30s and 1980s–'90s to explain how and why the theories of the ACTS and Colonel Warden merge or diverge. Accordingly, the central question of whether the theoretical underpinnings of airpower employment were the same in World War II and the Gulf War is examined.

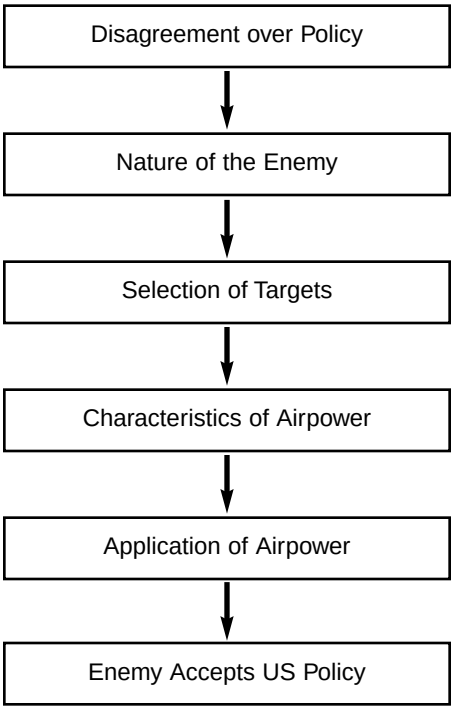


Figure 1. Core Outline

Limitations

The scope of this paper is limited to the questions delineated in the introduction. This study does not attempt to prove or disprove whether the theories in question worked in World War II or the Gulf War.[9] The focus is to describe, compare, and understand why the theories developed as they did—all of which is pertinent to the refinement of airpower theory today.

Significance

This study provides the reader with some understanding of (1) the nature of certain wars, primarily the experience of both world wars and the Gulf War, and how these conflicts drove the formulation of both theories; and (2) how the two theories are generally very similar in nature. Both prescribe a method of obtaining victory through the systematic application of airpower. The concepts of vital points or centers of gravity and airpower's unique ability to affect them remain central features of USAF doctrine today. However, given the myriad possibilities of operations other than war and the different nature of such conflicts, this study accentuates the need for a broadened understanding of airpower theory in nonconventional conflicts as well as the limitations of airpower in modern conflict.

Notes

1. Conrad C. Crane, *Bombs, Cities, and Civilians: American Airpower Strategy in World War II* (Lawrence, Kans.: University Press of Kansas, 1993), 24.
2. Michael S. Sherry, *The Rise of American Air Power: The Creation of Armageddon* (New Haven: Yale University Press, 1987), 99. Air War Plans Division (AWPD)-1, "Munitions Requirements of the Army Air Forces," 12 August 1941. AWPD-1 was the War Department's answer to President Roosevelt's request for an estimate of the national industrial capacity required to build and sustain the means to defeat Germany. Since production would be driven by the means selected, AWPD planners were able to give strategic bombardment an official "foothold" in military policy.
3. Crane, 26.
4. Ibid., 27.
5. John A. Warden III, "Success in Modern War: A Response to Robert Pape's *Bombing to Win,*" *Security Studies* 7, no. 2 (Winter 1997–98): 181.
6. John A. Warden III, "The Enemy as a System," *Airpower Journal* 9, no. 1 (Spring 1995): 40–55.
7. Airpower was applied in accordance with the theories of the ACTS and Warden, but not *exclusively;* other airpower applications (e.g., attacks of fielded forces) were utilized in World War II and the Persian Gulf War.
8. Robert A. Pape, *Bombing to Win: Airpower and Coercion in War* (New York: Cornell University Press, 1995).
9. For more opinions on the subject of effectiveness of systematic/strategic attack, see Warden, "Success in Modern War," 91–212. The format is a "point counterpoint" discussion between Pape, Warden, and Barry D. Watts, senior analyst for Northrop Grumman, maker of the B-2.

Chapter 2

Theory Descriptions and Comparison

The Industrial Web Theory

The experience of World War I demonstrated the need for officers trained in the employment of military aircraft. The "US Army Air Service not only lacked a coherent, working set of propositions on the proper use of military aviation but also lacked a coherent theory, strategy, and doctrine upon which airmen could base the future development of American airpower."[1] Among the 11 schools established by the War Department was the Air Service Field Officers' School at Langley Field, Virginia. It was later renamed the Air Service Tactical School (1922) and the Air Corps Tactical School (1926). In 1931 the ACTS was moved to Maxwell Field, Alabama.[2] Those who studied and taught at the ACTS were the same individuals who developed the industrial web theory prepared America for World War II and led its airmen into combat.[3]

Between the wars, airpower theory evolved through three overlapping phases culminating in development of the industrial web theory.[4] In the aftermath of World War I, airpower was envisioned as an adjunct of Army ground forces. Observation and artillery spotting were the primary missions. In the mid-1920s and throughout most of the 1930s, airpower competed with the US Navy for the mission of coastal defense. In the late 1930s, airpower emerged as an offensive force believed to be able to obtain national policy objectives through strategic bombardment of an enemy's "industrial web." Based on this theory, former ACTS instructors Lt Col Kenneth N. Walker, Lt Col Harold L. George, Maj Laurence S. Kuter, and Maj Haywood S. Hansell wrote AWPD-1.[5] The theory was never consolidated in a single document. Culled from ACTS lecture notes, course texts, and the historical records of former instructors, I describe the industrial web theory following the outline previously presented in figure 1.

Disagreement over Policy. ACTS instructors believed that disagreement over policy started war, the will and capacity of the enemy's population sustained it, and the enemy's acceptance of US policy ended it. Analogous to the famous Clausewitzian dictum that "war is nothing but the continuation of policy with other means,"[6] the staff at the ACTS believed that "the object of war is the restoration of peace on terms favorable to the national policy of [its] own people."[7] Further, 1940 lecture notes stated that "war is essentially and fundamentally a conflict of <u>will</u> . . . but where in modern war is that will to resist? Under any form of government, the will to resist, the will to fight, the will to achieve are all centered in the mass of the people—the civil mass."[8] The school also addressed the capac-

ity of a nation to wage war: "Fundamentally, the mass of the people represent the will to fight and they also provide the means to fight."[9] Accordingly, the staff believed that "we may accomplish our purpose in either of two ways: we may break down the enemy's will to fight, or we may break down his means of fighting."[10] Thus, policy—people—policy were the bookends and bones of the industrial web theory.

Nature of the Enemy. The ACTS faculty believed that a future enemy of the United States would be dependent upon its economic capacity to sustain the high tempo of modern war, but more importantly, characterized by a population whose morale could be weakened to the point of surrender. Maj Muir S. Fairchild, one of ACTS bombardment instructors, addressed the nature of the enemy—and the fragility of its popular morale—in the following 1939 lecture.

> In spite of the fact that the United States is the greatest industrial nation in the world, and in spite of the fact that every effort was made to get our great industrial machine working smoothly and efficiently in the World War, our record in that respect is not too happy. It was found that the capacity of our industries, which is frequently taxed during normal times to supply the peace-time demands, was seriously strained when it was required to take on the additional demands of the military forces. It had to speed up to the limit to keep pace with the enormous demands placed upon it. In this mere process of speeding up, all sorts of dislocations occurred . . . rapidly rising prices, food and fuel shortages, transportation congestion, labor unrest, and suffering and weakened morale among a large portion of the civilian population.[11]

Accordingly, civilian morale was believed to be fragile. The population of the enemy would not be able to endure sustained hardships as a result of economic or industrial disruptions. Furthermore, in 1939, Fairchild taught that "modern war . . . is absolutely dependent upon the capacity of the warring nation to turn out the great amount of munitions, supplies and equipment of all kinds required to equip and sustain the armed forces. [World War I] from start to finish was an economic struggle. The main battlefields were in the industrial areas and the main weapon was the blockade."[12] Accordingly, the relationship of policy—people—policy was based upon postulated weaknesses in the morale and capacity of the enemy. ACTS instructors devised a mechanism to affect morale and capacity—the systematic selection of targets.

Selection of Targets. Senior ACTS instructors believed that analysis of the enemy would reveal vulnerabilities to strategic attack.[13] In 1939 Fairchild argued that "it is a characteristic of modern civilization that the economic structure is dependent as a whole upon the integrity and continued functioning of each one of its individual elements."[14] However, most ACTS officers believed that each nation was unique, not only in the degree of vulnerability to air attack but also in the elements of its national structure most vulnerable to air attack.[15] Major Fairchild noted that targets were "not to be selected on the morning of the attack . . . Complete information concerning the targets that comprise this objective is available and should be gathered during peace . . . It is a study for the economist—the

statistician—the technical expert—rather that the soldier."[16] Thus, target selection would be a detailed, systematic process.

Although undermining enemy morale was an objective, the industrial web theory did not include direct attack of the civilian populace as a means. Some ACTS instructors believed that "direct attack of civilian populations is most repugnant to our humanitarian principles."[17] Further, "direct attack of populations gives temporary effects only and these are not necessarily cumulative . . . this attack does not directly injure the war making capacity of the nation. For these reasons, the School advocates . . . attack of the National Economic Structure . . . this method has the great virtue of reducing the capacity for war of the hostile nation and of applying pressure to the population both at the same time."[18] Thus, some faculty members argued that direct attack of civilians was not only morally wrong but also inefficient.

Characteristics of Airpower. The Army Air Corps cogently argued that the best medium to affect the vulnerable elements of the modern enemy was through the air. Therefore, ACTS officers carefully delineated the difference in objectives sought by air and surface forces: "Land and sea forces must accept intermediate objectives. Before they can accomplish the ultimate aim, they must defeat the enemy's surface forces. Air forces on the other hand are capable of immediate employment toward accomplishing the ultimate aim. They can be used directly to break down the will of the mass of the enemy people."[19]

Not only could airpower achieve national objectives more directly than could surface combatants but airpower could also do it more economically. This linkage between the means—airpower's relative efficiency and ability to directly attack selected targets of an enemy—and ends—policy acceptance via weakened will of the population—formed the core of the industrial web theory. Airpower application gave practical substance to the theory.

Application of Airpower. The ACTS's vision of the application of airpower can be broken down into four sequential steps leading to "Enemy Accepts US Policy" (fig. 2).

Primacy of the Offensive. Most of the ACTS faculty believed that bombers could get through any defense. Therefore, the offensive application of airpower held mission primacy since it would be necessary to "do unto the enemy before it did unto you." As early as 1926, the ACTS text, *Employment of Combined Air Force*, maintained that "it was futile to attempt to stop hostile aerial activity through aerial combat alone; once airborne an air attack was virtually impossible to stop. The only effective method of gaining and maintaining air superiority was to destroy hostile aircraft [on the ground]."[20] Maj Kenneth N. Walker, the ACTS's bombardment instructor from 1929 to 1934, taught that "it must be remembered by those responsible for the defense against bombardment operations, that a bombardment unit will not be stopped by the presence of a strong defense or a mere show of force. It is generally conceded, by those who are competent to judge, that an air attack once launched is most difficult to stop."[21] Accordingly, "in the

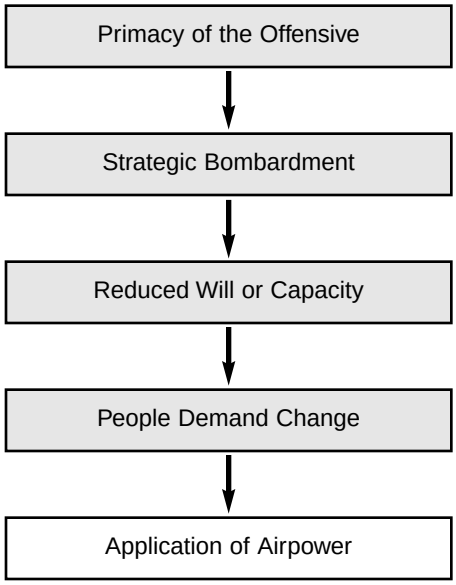


Figure 2. Air Corps Tactical School's Application of Airpower

final analysis, the most efficacious method of stopping a bombardment attack is to destroy the bombardment airplanes before they take to the air. As a bombardment unit will be upon its airdrome *at least* sixteen out of every twenty-four hours, the *best defense* would appear to be *an offensive* against the bombardment airdrome."[22] In 1940 Major Fairchild, Walker's successor, noted that "the introduction of the airplane has wrought a profound change in the means of waging war . . . No barrier can be interposed to shield the civil populace against the airplane."[23] Thus, faith and reliance on the offensive—bombardment—was sustained.[24]

Strategic Bombardment. Strategic bombardment (vice other missions—artillery spotting, close air support, reconnaissance, etc.) was a perfect fit with the school's belief in the characteristics of airpower vis-à-vis that of surface forces. Bombardment was the means of directly affecting the enemy population's will to resist. In 1941 Americans could read an authoritative view of senior officer thoughts about air strategy in *Winged Warfare*, by Generals Henry H. "Hap" Arnold and Ira C. Eaker. These senior Air Corps generals offered the standard defense of precision bombardment as the most economical way of reducing a large city to the point of surrender.[25] Given the beliefs in the frailty of enemy morale, the existence of vital points in the infrastructure of the modern enemy and airpower's sole ability to efficiently obtain national objectives, the belief in strategic bombardment was logical.

The school believed in high-altitude, daylight precision bombardment. The ACTS's 1932–33 Air Force course lecture notes stated that "the Italians are exponents of large formations at night . . . However . . . we want to transport our mass to the objective . . . when we arrive at our objective, the better the visibility, the better our chance of accomplishing our desired

destruction."[26] High-altitude attacks enabled the bomber and crew to fly above many of the surface-to-air defensive systems of the day. Daylight operations were necessary to enable precise delivery, and precision was required to hit vital points and avoid unnecessary civilian casualties.

Reduced Will or Capacity. The primary purpose of target selection was to undermine the enemy's will to resist; the backup was to reduce enemy capacity. Major Fairchild and other ACTS bombardment instructors stressed that "it is essential to analyze our particular prospective enemy in each case—arrive at a true and exact estimate of its vulnerability, and then concentrate our attack on those vulnerable elements whose destruction will have the greatest cumulative effect in two respects. First, on the morale of the civil populace, by applying pressure to them through the dislocation of their mode of living and by making life under war conditions more intolerable . . . Second, but perhaps not less important, by destroying their capacity to make war."[27]

People Demand Change. In a 1933 study, ACTS faculty member Maj Donald Wilson stated that the problem "was to select targets whose destruction would disrupt the entire fabric of an enemy's economy and thereby to discommode the civilian population in its normal day-to-day existence and to break its faith in the military establishment to such an extent that public clamor would force the government to sue for peace."[28] This belief established the requirement to identify vital points which, when properly attacked, would render the rest of the economic and industrial elements useless. The enemy would be forced to accept US policy—the ultimate aim of war.

Enemy Accepts US Policy. The ACTS faculty believed that the enemy leadership, with its civil power base diminished, would acquiesce. Thus, the circle of logic in the industrial web theory was complete: airpower could be applied as a single force to efficiently solve policy disputes.

The Enemy as a System

Unlike the ACTS's industrial web theory, which was developed by several officers over the course of the interwar years, Colonel Warden's, "The Enemy as a System," was published in a single article in 1995.[29] Based on that article and other primary sources, I describe Colonel Warden's theory and compare it to the industrial web theory following the same outline.

Disagreement over Policy. Warden argues for the subordination of military to political objectives. He states that "before one can develop or adopt a [military] concept of operations, an understanding of war and political objectives is imperative."[30] Warden writes that all military actions must be "appropriate to the desired postwar political situation."[31] Further, "war is fought to make the enemy do your will,"[32] the ultimate objective in war.

Both ACTS and Colonel Warden support the idea that politics is the central field of dispute and that war is a means to address disagreement. ACTS taught that "the object of war is the restoration of peace on terms favorable to the national policy of [its] own people."[33] Warden agrees. In

this respect, the industrial web and enemy as a system have a similar beginning in their understanding of the primacy of policy.

Nature of the Enemy. An important theory that Colonel Warden holds about the nature of the enemy is that, at the strategic level of war, the enemy state is fragile.[34] He states that "all countries look about the same at the strategic and operational levels,"[35] an implication being that the enemy of the future is somewhat predictable because it resembles any other modern industrial power.

Recalling the teachings of Carl von Clausewitz and Napoléon Bonaparte, Warden acknowledges the importance of morale in war, but believes morale was more important in past eras when the physical means of waging war were less mechanized. Today, Warden states that the "individual fighter has become a director" of systems. Without these physical systems, today's warrior is ineffective. Accordingly, Warden places emphasis on the physical element, rather than on the human element (morale), in war.[36]

To explain his views on the interdependency of the physical and morale in war, Colonel Warden uses the following formula.[37]

(Physical) x (Morale) = Outcome

Warden believes it is too difficult to predict the outcome of an effort to affect enemy morale.[38] Thus, he concentrates on the physical element and states that "if the physical side of the equation can be driven close to zero, the best morale in the world is not going to produce" victory.[39]

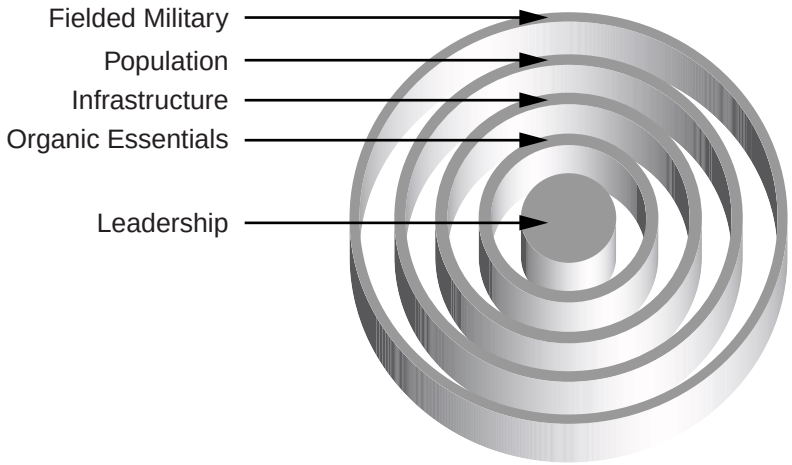
ACTS based its future enemy on the experience of World War I and cited that war's effect on the United States. World War I caused "all sorts of dislocations . . . rapidly rising prices, food and fuel shortages, transportation congestion, labor unrest, and suffering and weakened morale."[40] ACTS argued that future wars would be the same, which enemies would respond to war in the same manner as the United States. Hence, the enemy could be systematically taken down.

Both theories present similar forecasts on the nature of the enemy and future war. Both theories are based on conducting a war with a society similar to our own that contains economic vulnerabilities. In both theories, the enemy of tomorrow is seen as physically fragile at certain vital points. However, the primary "location" of the fragility presents divergence. ACTS identified the primary point of fragility at the grassroots level of the enemy—its population—while Colonel Warden identified the primary point of fragility at the treetop—its leadership. Nonetheless, in both cases, the general depiction of the enemy is one of an industrially based state whose fragile nature is vulnerable to strategic air attack. In this respect, the nature of the enemy tends to be the same.

Selection of Targets. Colonel Warden's emphasis on the physical dimension makes it necessary for the airpower planner to have a systematic approach to targeting in order to ensure an enemy's physical capacity is driven to zero. He argues that the enemy of the future can be likened

to an "inverted pyramid that rests precariously on [its] innards—[its] leadership, communications, key production, infrastructure and population."[41] He recommends that airpower planners think deductively—strategically—and envision the enemy "as a system composed of numerous subsystems."[42] Thus, it can be systematically beaten.

The Five-Ring Model,[43] depicted in figure 3, is Colonel Warden's representation of the enemy and a systematic targeting model. For Warden, the most critical ring is the inner leadership ring, "the only element of the enemy that can make concessions."[44] All actions ought to be "aimed against the mind of the enemy command or against the enemy system as a whole."[45] If the leadership element cannot be hit directly, then the task should be to apply indirect pressure sufficient to make the leadership conclude that concessions are appropriate, further action is impossible, or that it is physically unable to continue. Prioritizing the remaining rings, Warden states that organic essentials are the next most important element because when they are destroyed, "life itself becomes difficult and the state becomes incapable of employing modern weapons and must make major concessions."[46] Next, by attacking infrastructure, "the state system quickly moves to a lower energy level, and thus to a lesser ability to resist the demands of its enemy."[47] Regarding the population ring, "moral objections aside, it is difficult to attack the population directly."[48] Warden does not advocate attacks, direct or indirect, designed to affect the enemy population's morale. He argues that direct attack of civilians is "morally reprehensible," and that indirect attempts to influence the enemy morale in the past have been ineffective.[49] Finally, Colonel Warden stresses that the five-ring model represents the components of a modern enemy-state and that by attacking the entire spectrum, rather than singling out the outer ring of fielded forces, the enemy's armed forces will be isolated from leadership to become a nonentity. Accordingly, force-on-force battles are no longer necessary or even desirable.



Source: John A. Warden III, "The Enemy as a System," *Airpower Journal* 9, no. 2 (Spring 1995): 47.

Figure 3. Warden's Five-Ring Model

ACTS instructors held that systematic analysis of the enemy would reveal that states were "dependent as a whole upon the integrity and continued functioning of [vital] elements."[50] Destruction of a state's vital elements rendered remaining economic and industrial elements useless and undermined the people's will to resist—the enemy's center of gravity. Warden also argues that it is possible to systematically analyze an enemy and deduce centers of gravity. However, his attacks were "aimed against the mind of the enemy command."[51]

Although both theories sought to affect different vulnerabilities, each proposed to do this through a systematic process of target selection. The intent in each case is to get the most "bang for the buck," and each theory predicts that vital points can be identified, attacked, and sufficiently damaged to bring victory through airpower. The systematic selection of vital points—or centers of gravity—is a familiar theme in both approaches.

Characteristics of Airpower. According to Colonel Warden, airpower has emerged as the force capable of attacking the strategic and operational targets that can force an enemy to accept US policy. Warden asks, "What can be done with airpower that in the past we knew could only be done with ground or sea power or couldn't be done at all?" He answers, "Airpower has the ability to reach a conflict area faster and cheaper than other forms of power; employment of air power typically puts fewer people at risk than any other form . . . and it may provide the only way for the United States to participate at acceptable political risk."[52] Accordingly, airpower can achieve national objectives and it is the most cost-effective form of military force.

Warden writes that "airpower will destroy an enemy's strategic and operational target bases—which are very vulnerable and very difficult to make less vulnerable."[53] He states that surface forces are fragile at the operational level of war; logistical and administrative infrastructures dominate their operations and are not easily defended.

ACTS described the difference between air and surface forces in terms of objectives. "Before [land and sea forces] can accomplish the ultimate aim, they must defeat the enemy's surface forces. Air forces . . . are capable of immediate employment toward accomplishing the ultimate aim . . . to break down the will of . . . the enemy people."[54] Again, both theories offer similar ideas on the characteristics of airpower—the main one being airpower's unique ability to bypass an enemy's military forces to attack vulnerabilities directly, thus achieving strategic objectives independently of the other armed forces.

Application of Airpower. As indicated in figure 4, the industrial web and enemy as a system theories diverge in the application of airpower. Like the ACTS's application of airpower (shown in gray), Warden's theoretical application of airpower can be broken down into four parts (shown in black).

Primacy of Air Superiority. Warden argues that the Gulf War reestablished the primacy of air superiority as the "enabler" of all other missions.

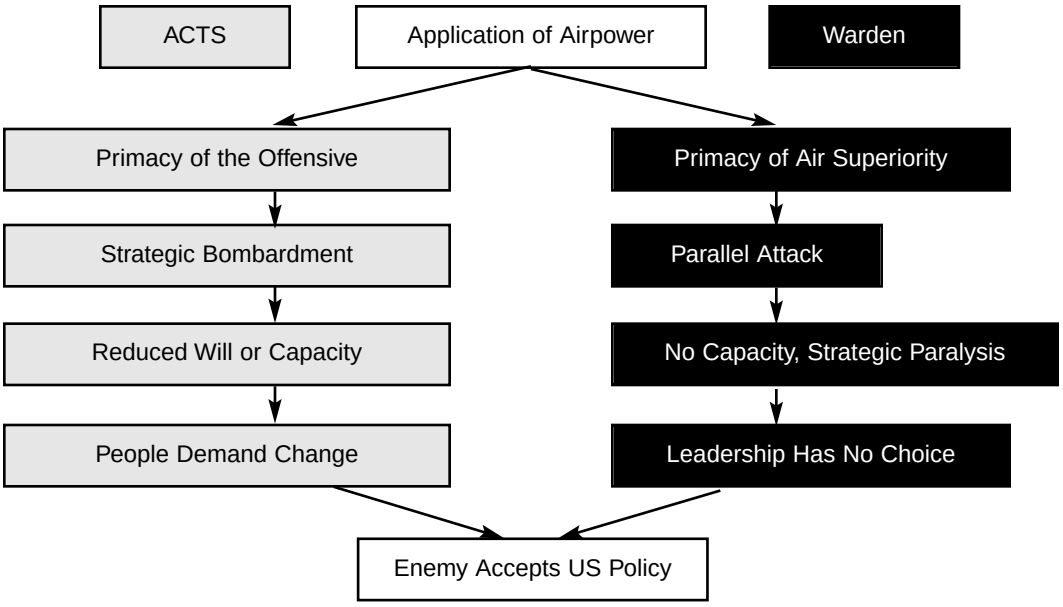


Figure 4. Divergent Applications of Airpower

Further, "winning air superiority is difficult, and one of the surest ways to fail is to . . . go for local superiority. Local air superiority is a very dangerous idea simply because it ends up requiring air defense, which is very difficult . . . and rarely successful."[55] Warden describes the fatal consequences of losing air superiority. Without it, a state "loses its ability to protect itself from air attack, it is at the mercy of its enemy and only the enemy's compassion or exhaustion can save [the state]."[56] Accordingly, "whenever possible, the offensive course should be selected—if for no other reason than that it is a positive measure that will lead to positive results. The power of the offensive notwithstanding, a variety of reasons exist why adopting the defense may be sound."[57] Thus, Colonel Warden advocates offensive and defensive (only when necessary) applications of airpower. Air superiority, which is comprised of both offensive and defensive applications, is Warden's primary mission.

Divergence between the two theories lies in the understanding of a bomber's ability to get through. Most ACTS instructors believed that bombers could not be effectively stopped and therefore advocated purely offensive objectives.[58] Warden also believes in the primacy of offense over defense but allows for the necessity of shielding friendly vulnerabilities while enabling friendly attacks to proceed unhindered by enemy defensive systems. Accordingly, the theories diverge in their understanding of defensive applications of airpower; Warden allows for it, many on the ACTS's faculty did not.

Parallel Attack. Once air superiority is established, Colonel Warden insists that parallel attack be conducted to reduce the enemy's physical

capacity to resist. Parallel attack is the rapid, simultaneous attack of the enemy's centers of gravity. It "deprives [the enemy leadership] of the ability to respond effectively, and the greater the percentage of targets hit in a single blow, the more nearly impossible his response."[59] Due to the nature of the enemy envisioned by Warden, parallel attack creates overwhelming effects since states "have a small number of vital targets at the strategic level . . . These targets tend to be small, very expensive, have few backups and are hard to repair."[60]

Precision and stealth enable parallel attack. Warden states that precision weapons "change the nature of war from one of probability to one of certainty."[61] Further, the principles of mass and surprise have been redefined by precision and stealth: "by definition, stealth achieves surprise, and precision means that a single weapon accomplishes what thousands were unlikely to accomplish in the past."[62] Technology permits parallel attack: stealth allows aircraft to "get through" and precision eliminates the requirement for mass attacks against individual targets.

Both theories advocate the offensive application of force. ACTS instructors believed that the offensive use of airpower would achieve the ultimate aim of breaking the enemy's will to resist. Bombardment was the primary means of obtaining that goal. Precision was required to hit vital points, and daylight operations were necessary to enable the precise delivery of weaponry. Warden offers more operational detail in the enemy as a system. He emphasizes the advantage of greater technological capacity in the form of stealth and precision with which one can simultaneously concentrate forces at multiple centers of gravity. Accordingly, Warden's parallel attack differs from the ACTS's strategic bombardment in the assumptions made about the technological capability to attack the enemy.

No Capacity, Strategic Paralysis. Warden's application of airpower produces "strategic paralysis," the condition experienced wherein the opposing commander has lost the physical capacity to oppose US forces. Warden believes it is possible to induce strategic paralysis via parallel attack, which the opposing leadership cannot resist.

The theories diverge on their understanding of different centers of gravity. However, both rely on the ability to affect enemy capacity. While Warden focuses on the physical capacity of the enemy leadership, ACTS instructors argued that bombardment could make an enemy comply by reducing morale or capacity.[63]

Leadership Has No Choice. With no physical means with which to respond, Warden argues that the enemy has no choice but to accept US objectives. Rapid, systematic application of force on an enemy's physical means of waging war is the operational strategy. By attacking in parallel, as opposed to serial attack, the enemy leadership is rapidly left with no policy options with which to respond. Accordingly, the divergent results of ACTS's and Warden's airpower applications are that people would demand change (of the leadership) or the leadership would have no choice, respectively.

Enemy Acceptance of US Policy. Warden concludes that "strategic warfare provides the most positive resolution of conflicts . . . 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 [US] objectives as his objectives."[64] Accordingly, the enemy as a system theory starts with policy, progresses through leadership, and ends with policy.

The ultimate aim is the same in both theories: victory—in the form of policy acceptance—through the systematic application of airpower. Both theories start and end with policy, but each runs through a different center of gravity. They are similar in core context and diverge in the application of airpower. Contextual factors explain these similarities and differences, the subject of chapter 3.

Notes

1. Peter R. Faber, "Interwar US Army Aviation and the Air Corps Tactical School: Incubators of American Airpower," in *The Paths of Heaven: The Evolution of Airpower Theory*, ed. Phillip S. Meilinger (Maxwell Air Force Base [AFB], Ala.: Air University Press, 1997), 185.
2. Robert T. Finney, *History of the Air Corps Tactical School 1920–1940* (Washington, D.C.: Center for Air Force History, 1992), v.
3. A comprehensive list of Air Corps Tactical School (ACTS) faculty and students is available in Finney, appendix 2 (faculty and staff) and 3 (students).
4. Finney, chap. 3. This chapter contains more detail on the evolution of airpower theory during this period.
5. Martha Byrd, *Kenneth N. Walker: Airpower's Untempered Crusader* (Maxwell AFB, Ala.: Air University Press, March 1997), xii.
6. Carl Von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), 69.
7. Maj Muir S. Fairchild, "The Aim in War," AF 3-L, instructor, Air Force course (Maxwell Field, Ala.: ACTS, 27 May 1940), 3.
8. Ibid., 8.
9. Ibid., 9.
10. Ibid.
11. Maj Muir S. Fairchild, "National Economic Structure," AF 9 and 10-C, instructor, Air Force course (Maxwell Field, Ala.: ACTS, 5 April 1939), 8.
12. Ibid., 6.
13. Ibid., 34.
14. Ibid., 9.
15. Ibid., 1.
16. Ibid., 10.
17. Ibid., 3.
18. Ibid., 5.
19. Fairchild, "The Aim in War," 15.
20. Finney, 64.
21. Byrd, xi.
22. Ibid., 177; and Kenneth N. Walker, "Driving Home the Bombardment Attack," *Coast Artillery Journal* 73, no. 4 (October 1930): 328–40.
23. Fairchild, "The Aim in War," 12.
24. Ibid., chap. 3. Not all ACTS instructors endorsed the notion that bombers would get through.
25. Michael S. Sherry, *The Rise of American Air Power: The Creation of Armageddon* (New Haven: Yale University Press, 1987), 93.
26. Finney, 66.

27. Maj Muir S. Fairchild, "New York Industrial Area," AF 12-C, instructor, Air Force course (Maxwell Field, Ala.: ACTS, 6 April 1939), 2.
28. Finney, 65.
29. John A. Warden III, "The Enemy as a System," *Airpower Journal* 9, no. 2 (Spring 1995): 40–55.
30. John A. Warden III, "Air Theory for the Twenty-first Century," *Challenge and Response: Anticipating US Military Security Concerns*, ed. Karl P. Magyar et al. (Maxwell AFB, Ala.: Air University Press, 1994), 313.
31. John A. Warden III, "The Transmillennial World from an American Perspective," *Global Security Concerns: Anticipating the Twenty-first Century*, ed. Karl P. Magyar et al. (Maxwell AFB, Ala.: Air University Press, 1996), 316.
32. Warden, "The Enemy as a System," 312.
33. Fairchild, "The Aim in War," 3.
34. Ibid., 327.
35. Ibid.
36. Warden, "The Enemy as a System,"42.
37. Ibid.
38. Ibid.
39. Ibid.
40. Fairchild, "National Economic Structure," 8.
41. Warden, "Air Theory for the Twenty-first Century," 327.
42. Warden, "The Enemy as a System," 42.
43. Ibid., 46.
44. Ibid., 48.
45. Ibid., 50.
46. Ibid., 49.
47. Ibid.
48. Ibid.
49. Ibid., 50.
50. Fairchild, "National Economic Structure," 9.
51. Warden, "The Enemy as a System," 50.
52. Warden, "Air Theory for the Twenty-first Century," 330.
53. Ibid., 329.
54. Fairchild, "The Aim in War," 15.
55. John A. Warden III, "Success in Modern War: A Response to Robert Pape's *Bombing to Win*," *Security Studies* 7, no. 2 (Winter 1997–98): 188 and 185.
56. Warden, "Air Theory for the Twenty-first Century," 326.
57. John A. Warden III, *The Air Campaign: Planning for Combat* (London: Brassey's, 1989), 23.
58. However, the defensive use of airpower was still discussed and taught at the ACTS. Instructor Claire L. Chennault advocated the defensive use of pursuit and argued that the bomber would not necessarily get through an effective defense.
59. Warden, "The Enemy as a System," 54.
60. Warden, "Air Theory for the Twenty-first Century," 327.
61. Ibid.
62. Ibid., 329.
63. Fairchild, "New York Industrial Area," 2.
64. Warden, "The Enemy as a System," 55.

Chapter 3

Analysis of Contextual Factors

Industrial Web Theory

The Air Corps Tactical School faced several theoretical obstacles during the interwar years: budget deficiencies, subordination of an air arm within the army, a predominantly isolationist policy within Congress, and the growth of air-related technology (fig. 5). However, no factor in the 1920s or '30s affected development of the industrial web theory more than the analysis of World War I.

War. The stalemate and casualties associated with modern, industrially based war had a profound impact at the ACTS. "In the Battle of the Somme in 1916, the British suffered 60,000 casualties in the first hour. Of this number, 21,000 were killed. During World War I, a soldier was sent 'over there' for the duration of a conflict that had no end in sight."[1]

Dr. David R. Mets states that World War I was a total, modern war. The century prior to the American and French revolutions had been one of limited wars. The tendency away from that more or less started with the nation-in-arms idea associated with the latter revolution. The war to repress Confederate rebellion was another step toward total conflict. Sherman burned Atlanta and led a scorched earth-march through the South as a legitimate act of war. By the First World War, the common perception was that nations, not just armies, fought one another. The worker in the ammunition factory was just as much an element of the national war-making structure as was any soldier or sailor—which made him a legitimate target in the eyes of international law.[2]

Airpower "offered a unique alternative to the carnage and futility of attrition warfare, as epitomized by the 'great sausage machine' of World War I."[3] Moreover, airpower could "destroy an entire nation from the inside out rather than slowly defeat it from the outside in."[4] The British had written extensively about "key targets, root industries, and bottlenecks" during World War I. In 1917 Col Edgar "Nap" Gorrell, US Army, was tasked to develop a plan for the bombing of Germany. He turned to his British colleagues for advice and relied heavily on Maj Lord Tiverton's plan of September 1917. This plan called for the systematic destruction of Germany's war-making capacity. However, it soon became evident that aviation technology was not capable of obtaining the desired material effects. Thus, the British shifted their focus to influencing the morale of the enemy by causing enough disruption and dislocation as to force the German people to reconsider their support for the war.[5]

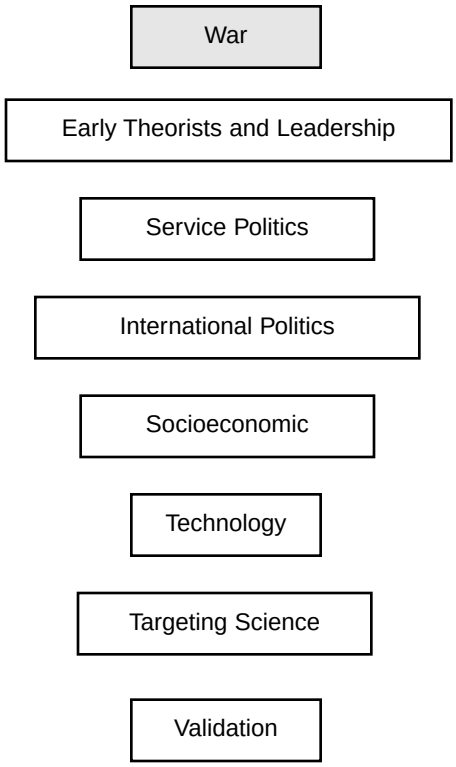


Figure 5. Air Corps Tactical School's Contextual Factors

Colonel Gorrell developed a similar plan for the US Air Service, keeping the general theme of obtaining material and morale effects based on attacks of military-industrial targets.[6] Unfortunately, the British failed to match technology to their doctrine. Furthermore, Gorrell's plan was never used due to the lack of planes and American "conservatism regarding the question of making aerial bombing an activity independent of the Army."[7]

At the conclusion of World War I, Air Service officers in Germany, led by Colonel Gorrell, surveyed bombed towns to determine whether day or night bombing had been more effective in damaging material or morale. They found both the morale of the fighting force and civilian population had been affected by bombing. However, the team criticized the British and French for inaccurate bombing and poor targeting. The policy of bombing German cities was derided based on an analysis of practical reasons, not on ethical grounds. Directly targeting the civilian morale was not viewed as a "productive means of bombing. The effect is legitimate and just as considerable when attained indirectly through the bombing of a factory."[8]

Gorrell's report ended up in the library of the ACTS and influenced development of the industrial web theory.[9] However, none of the practical limitations he identified mattered. What mattered at the ACTS was "their belief that they had come upon a theory with a kind of inherent and fundamental truth to it."[10]

The importance of air superiority was supported by the experience of World War I where airplanes were used for reconnaissance and artillery spotting. An army general could never mass the required numerical superiority at the decisive point without his enemy finding out about it. Moreover, the spotting so enhanced the accuracy of artillery fire that the new fragmenting rounds were deadly against offensive troops necessarily out in the open. So, demand for air superiority first came from ground commanders and airmen were quick to take it up.[11]

ACTS faculty members did not rest on the experience of World War I, they also analyzed the war in Europe at the start of World War II. In 1939 then-Lt Col Donald Wilson noted that "Hitler's air force had voluntarily undertaken the job of demonstrating our theories. The Luftwaffe had established control of the air by destroying the Polish air force on its airfields; it had conducted strong attacks against Poland's lines of communications; and then it had supported the invading ground armies in a blitzkrieg attack."[12] As an observer in London from May to September 1940, Col Carl A. Spaatz had a firsthand view of the Battle of Britain. Colonel Spaatz reached the conclusion that the Luftwaffe was geared to support the German army and would not prevail against the "real airpower" of the British. "'General opinion,' Spaatz noted in his diary, 'is that German fighters will not attack a well-closed-in day-bombing formation.'"[13]

However, the study of other wars shook some officers' faith in the invincibility of offensive bombardment. In 1937 lectures at the ACTS on the Spanish Civil War concluded that "bombardment operations facing hostile fighters needed pursuit protection as well as heavy defensive armament and tight defensive formations." Furthermore, "after the German blitzkrieg in Poland, Arnold stated bluntly that the Air Corps position [that fighter aircraft could not shoot down large bombers] had been proven wholly untenable." As a result, "during 1939 and 1940, other airmen began to rethink the basic concept of bomber invincibility."[14]

Nonetheless in 1941 development of AWPD-1 proceeded with the belief in the bomber's ability to get through. The Air Corps planning team asserted that "American bombers were better armed; American formations were tighter. It was still possible to believe that the bombers would get through, that they could get through in daylight to conduct precision raids, that enemy air strength could be destroyed on the ground by bombing installations and factories, that pursuit's role would be primarily defense of bases."[15] However, in anticipation of improvements in German fighter defenses, the plan (AWPD-1) "recommended that experiments be begun immediately to develop a heavily armed and armored escort fighter with long-range capacity."[16]

Early Theorists and Leadership. Brig Gen William "Billy" Mitchell had the more influence on the ACTS than any other individual. General Mitchell was among the first senior officers to advocate that bombardment aviation should become the primary arm of the air force. In 1925 Mitchell argued that air forces should target centers of production, the enemy's

physical means of waging war, instead of the enemy population. He forecast much of the ACTS's future strategic airpower theory: "As airpower can hit at a distance . . . a state will hesitate to go to war, or, having engaged in war, will make the contest much sharper, more decisive and more quickly finished."[17]

World War I molded the thinking of General Mitchell who "borrowed his ideas largely from an international community of airmen which he joined during World War I."[18] By experiencing German attacks firsthand, Mitchell learned to respect the "effects which bombardment could have on material and morale."[19] Mitchell's writings were also influenced by Colonel Gorrell's 1917 plan which stated that "the object of strategic bombing is to drop aerial bombs upon the commercial centers and the lines of communications in order to cut off the necessary supplies without which the armies in the field cannot exist." Such aerial operations should "shatter the morale of the workmen."[20]

Several ACTS faculty members served under Mitchell and carried his ideas into the development of airpower theory. At the conclusion of World War I, Maj Thomas Milling, a protégé and former chief of staff of General Mitchell in Europe, was directed to set up the ACTS's forerunner, the Air Service Field Officers' School. Milling recruited Maj William Sherman as his assistant, another disciple of Mitchell, who had served under the general in the American Expeditionary Force (AEF).[21] In 1932 then-Lieutenant Walker, who was one of General Mitchell's several very capable aides, became instructor in bombardment aviation at ACTS. Capt Robert Olds, another of Mitchell's aides, became responsible for extensive courses of bomber instruction.[22] Together, these officers and others developed Mitchell's ideas into what would become the industrial web theory.

During the 1920s, the individual most closely associated with the emerging theory of strategic bombardment was the Italian general and air minister, Giulio Douhet. Douhet envisioned future conflicts as total war characterized by massive aerial offensives against which he saw no defense. He forecast that wars would end quickly because civilian morale would collapse in the face of bombardment.[23] In 1929 Maj Walter H. Frank, assistant commandant of the ACTS, noted that "Douhet . . . says that 'now that aviation has entered the ranks as a means of carrying on war, more than ever war is going to be a question of give and take.' [This] emphasizes the fact that the air force is principally an offensive weapon rather than a defensive one."[24] Many of Douhet's ideas found favor at the ACTS, but his advocacy of mass night bombing did not meet the ACTS's vision of precision bombardment of pinpoint targets in daylight.[25] Nonetheless, his emphasis on the offensive was a mainstay of the industrial web theory.

Service Politics. Throughout the post–World War I period there was constant disagreement between airmen and the War Department general staff on the proper employment of airpower. The general staff position was that "the airplane was simply a valuable adjunct to ground armies and that its

principle function would be to assist ground forces. Airmen . . . were convinced that warfare in the future would be increasingly dependent upon airpower which they regarded as a major independent striking arm."[26] However, as the Air Corps served as a subordinate arm of the Army, "early manuals of the ACTS closely followed the ideas expressed in the statements of air leaders in Washington."[27] The first school texts, issued in 1921, were primarily concerned with the contribution aviation could make to the ground campaign.[28] The main emphasis was on the "human element in war and the morale and psychological effect of airpower on surface troops."[29] In April 1928 Lt Col C. C. Culver, the ACTS commandant, forwarded "The Doctrine of the Air Force" to Washington. It followed the letter of the law set forth in War Department Training Regulation 440-15, and concluded: "In the final analysis, the army is the principal component of the nation's militia, both the air and naval forces being used to further its interest. . . . The Air component . . . always supports the ground forces, no matter how decisive its . . . operations may be, or how indirect its support."[30] In 1938 when ACTS commandant Brig Gen Henry C. Pratt suggested that ACTS texts were accepted throughout the Air Corps as the guiding doctrine of tactical units, he was reminded by the Army adjutant general of a contrary view: official doctrine only appeared in field service regulations, manuals, and training regulations. Further, as late as 1940, when Air Corps Field Manual (FM) 1-5, *Employment of Aviation of the Army*, appeared the closest the general staff came to conceding the airman's views was the approved statement that bombardment was undertaken to "nullify the enemy's war effort or to defeat important elements of the hostile military forces."[31]

Service battles with the Navy affected the development of airpower theory. One of Mitchell's main themes prior to his 1925 courts-martial was that airpower could defend both coasts more effectively and at much lower costs than could navies.[32] The MacArthur Pratt agreement of 1931 that divided land-based and naval aviation between the Army and Navy "gave the Army an officially sanctioned, defensive use for long-range bombers: defenders of the American coastline. The need to hit a ship at sea put a premium on precision capability."[33]

In 1933 ACTS bombardment instructor Major Walker articulated airpower's capability in the guise of defense: "Successful invasion of the United States by an armed enemy is impossible in the face of an adequate force of bombardment airplanes."[34] Accordingly, "*The bombardment airplane in the hands of the United States is a purely defensive weapon*. It is impractical to construct bombardment airplanes capable of spanning the ocean and returning."[35] That same year, ACTS instructor then-Major Wilson was busy trying to identify centers of gravity in the American industrial infrastructure and wrote to the Office of the Assistant Secretary of War requesting industrial information on the northeastern United States. In his request, he asked for "information that would help him plan an air defense of industry."[36] Hosting a congressional group at Maxwell

Field in 1939, Col M. F. Harmon, ACTS assistant commandant, stated that ACTS "endeavors to develop the best strategic and tactical use of the Army Air Corps in the broad spectrum of national defense when acting alone, with the armed forces in the field and with the Navy afloat."[37]

Such was the service politics of the interwar era; the offensive, strategic application of aviation was unacceptable to the senior army and navy leadership. Although little of this political correctness affected the core offensive assertions of the industrial web theory, the defensive presentation of airpower's potential, in concert with austere financial constraints of the 1930s, delayed procurement of hardware with which to test and validate the ACTS's industrial web theory.

International Politics. At the height of the Munich crisis, airpower emerged as the means of waging war as well as a diplomatic deterrent. William Bullitt, ambassador to France, wrote to President Franklin D. Roosevelt in September 1938 that "if you have enough airplanes, you don't have to go to Berchtesgaden."[38] The French and British governments had just appeased Adolf Hitler's demands for Czechoslovakia based on their understanding of Germany's bombing campaign in Spain and its perceived threat to do the same to Paris and London. In light of these events, President Roosevelt announced that "airplanes—not ground forces—were the implements of war that would influence Hitler's actions."[39]

Roosevelt saw two ways in which airpower could play a role in the conflict in Europe. First, he believed that strategic bombing could help force a quick German surrender. He argued that "this kind of war would cost less money, would mean comparatively few casualties and would be more likely to succeed than a traditional war by land and sea."[40] Further, Roosevelt believed that the mere terror of bombing, not its actual application, would work a quick victory. The president settled on the "round number of ten thousand planes for the American air force and a capacity to produce another ten thousand each year."[41] He wisely defined the buildup in terms of hemisphere defense: "a fleet of several thousand long-range bombers capable of intercepting an attack on America by sea or air."[42] General Arnold later described Roosevelt's remarks as the Magna Carta of the Air Force.[43]

At the Air Corps Tactical School, Colonel Wilson anticipated "future Munichs for which the United States should prepare by acquiring long-range bombers . . . What could be better than a force so strong that actual conflict is thereby avoided? The key to airpower's utility was not its use but the very irrationality of threatening to use it."[44] Airpower could coerce without deploying large armies which drained national resources.[45] Thus, in the late 1930s, airpower's inherently offensive nature emerged in the form of a deterrent role—and garnered support for significant funding.

Socioeconomic. In the 1920s sociocultural factors limited aviation to commercial applications and national defense.[46] Post–World War I public opinion precluded overt identification of the morale of a civilian population as a direct target. Many believed war to be immoral and a strong paci-

fist lobby in Congress limited funds for military expenditures. The notion of bombing an enemy population directly, à la Douhet, was politically unacceptable. Accordingly, the Air Service supported aeronautical development until such time that commercial air transportation could be established.

The Air Mail Act of 1925 and Air Commerce Act of 1926 took the military out of commercial aviation and initiated a five-year military aircraft buildup that was to result in the fielding of 1,800 serviceable airplanes.[47] Since the primary role of aviation was observation, the Air Corps was not permitted to purchase any bombers in the initial phase of the buildup. Unfortunately, the United States entered an economic depression in the early 1930s that delayed completion of the five-year plan. At the buildup's conclusion in 1933, instead of 1,800 aircraft, the Air Corps had "only 1,619 planes of which 442 were either obsolescent or nonstandard."[48] During the depression, careful thought had to go into the development of technology before awarding a contract for aircraft purchase. The final product was often obsolete by the time it hit the field because aeronautical advances and new ideas for tactical employment had created demand for an improved version.[49] Thus, economic realities curtailed opportunities to match theory to practice throughout most of the 1930s.

After Munich in 1938, Roosevelt's policy "squared with the dominant prejudices and priorities of Americans: alarm over fascist aggression, aversion to military expeditions abroad, desire to preserve American isolation, and faith in aviation as a benign technology."[50] As German aggression in Europe unfolded, "precision-bombing doctrine, attacking factories instead of women and children, offered a way for the Air Corps to be decisive in war without appearing immoral."[51]

Technology. With the appearance of the B-9 and B-10 bombers in the early thirties—aircraft that were nearly equal in speed and range performance to pursuit aircraft—ACTS instructors came to endorse the concept of the bomber's invincibility. The bombardment course text of 1931 maintained that bomber defense was, in part, based on "the mutually supporting fire of machine guns of airplanes flown in close formation. As the speed of bombardment aircraft approached that of pursuit, the difficulty of interception . . . would be increased."[52] The ACTS's beliefs seemed plausible at the time. However, instructors admitted that "because of a lack of experience much of their instruction was pure theory."[53]

ACTS instructors wrestled with the issue of defending a bomber on its way to a target. If an escort plane were built with the range, speed, and ceiling to accompany a bomber to a target, sacrifices would have to made in terms of maneuverability and agility that negated the aircraft's ability to engage enemy defenders. Given limited funds, it seemed prudent to spend more on bombers than to attempt to build an escort plane that could not engage enemy fighters on equal terms.[54]

With the introduction of the XB-17 in 1935, the ACTS's "invincible bomber" belief was cemented.[55] In terms of range and destructive capac-

ity, no aircraft had yet existed to test their ideas until the XB-17 was developed. Although the B-17 would require forward basing in order to strike the interior of an enemy nation, its range, payload, service ceiling, and rate of climb exceeded that of all previous bombers. Indeed, it was faster than most pursuit aircraft of the day. When the Norden Mark XV bombsight was successfully tested in 1935, the ACTS believed that it finally had its capability to hit pinpoint targets, from high altitude and in daylight.[56]

The ACTS's faith in bombers is not surprising. Radar was unknown in the mid-1930s, and visual lookout was the only means of providing tactical warning of an impending attack. Fuel-limited fighters, with little loiter time, would be cocked for alert on the ground. After receiving scramble orders, they would take off, climb to altitude, and accelerate to close within gun range. Throughout the intercept, the fighter-pilot had to obtain a tallyho based on information that was minutes old. Given a bomber's high altitude and airspeed, its advantage of tactical surprise and (perhaps) poor weather/visibility, it was logical to believe that a majority of bombers would get through the air defense systems of the day.[57]

However, the invincibility of the bomber was challenged within the faculty. In 1933 ACTS conducted exercises at Fort Knox, Louisville, Kentucky, to determine whether a "warning net" could detect ingressing bombers and provide enough information for pursuit aircraft to intercept them before the bombers reached their target.

> The test net was set up in three concentric arcs, with observation/listening posts six miles apart radiating from Fort Knox. The area was radially divided into twelve sectors for clarity in reporting. Each of the sixty-nine posts, which together covered some 16,000 square miles, was equipped with a telephone; three radio posts supplemented these. The signal corps staffed the posts and reported to the pursuit group's operations office. When hostile bombers were spotted by posts in the outer arc, the alerted pursuit planes took off. As subsequent reports confirmed the enemy's course, the fighters deployed for interception.[58]

In the final report, the warning net "functioned satisfactorily and efficiently."[59] A majority of the bombers were intercepted. ACTS instructor Major Chennault thought the conclusion was obvious: bombers were vulnerable to pursuit that had an intelligence system. Furthermore, he urged that the net procedures be improved and studied as part of the pursuit course at ACTS.

However, after the Pacific Coast exercises in May 1933, the Air Corps headquarters concluded that the best defense was an effective offense, and that meant bombers would attack the enemy air force on the ground.[60] The "Pacific Coast maneuvers [which Chennault charged with being rigged in favor of the bomber] indicated to many that available pursuit aircraft were no match for the bombers, the test having been between the P-26—the Air Corps's earliest and already outmoded standard all-metal monoplane fighter—and the B-12—the Air Corps's most modern bomber."[61] The P-26, a low-wing monoplane flown as an experimental aircraft in 1931, was fast for the era and more were ordered. However, the

B-12 bomber was also developed. The B-12's top speed rivaled that of the P-26, which rendered the latter obsolete before it was procured.[62]

As a result, the pursuit course at the ACTS was changed in emphasis from offensive to defensive roles. In 1935 Gen Oscar M. Westover directed the Air Corps Board to determine whether the Air Corps had a requirement for an interceptor aircraft. In 1937 the board concluded that the most efficient way to stop an enemy offensive was to attack enemy bases, but noted that friendly defenses would also be necessary and recommended the development of an interceptor with a cannon and at least 20 percent greater speed than the proposed bomber planes. This finding laid the groundwork for eventual production of the P-38 and P-40.[63]

The ACTS's bombardment doctrine called for long-range strikes into the enemy territory. The faculty was divided over whether heavily armed, fast bombers could make it through or whether they required close escort. In the latter case, they gave serious attention to the creation of a "special support" plane: a multiseater pursuit aircraft suitable for the escort role.[64] Chennault fought against this concept and argued that in its conceived "close" role, the special support plane would be as vulnerable as the bomber. He insisted that operating in close proximity to the bombers limited the effectiveness of fighters since they would respond defensively and hence lose the initiative. Chennault continued to argue for defensive pursuit aviation coupled with an intelligence warning system.[65] Meanwhile, focused on the budget, the War Department was interested in a multiplace fighter that could fill the roles of interceptor, bomber, observation, and attack plane. The end product, the XFM-1 Bell Aircuda, was a failure. Thus, inadequate funding and lagging technological development of fighters directly affected the belief that the bomber would get through.

Targeting Science. By 1930 the primacy of bombardment was established at the Air Corps Tactical School.[66] However, bombardment was primarily limited to targets whose destruction would impede military operations. This began to change in 1933 with the work of then-Major Wilson. "From his experience as a civilian with the American railroad, Wilson was aware that the destruction of a few vital links would disrupt an entire railroad system . . . It was discovered that the lack of a particular highly specialized spring, manufactured by one particular firm and essential to the functioning of the controllable-pitch propellers nullified, to all intents and purposes, a very large portion of the aircraft production in the United States . . . items of similar criticality for basic industries were sought."[67] Between 1935 and 1940, ACTS instructors surveyed American industry with the object of determining vulnerabilities of industrial systems in general. It was assumed that the industrial structure of any great power would mirror that of the United States. ACTS texts in 1935 noted that "interlaced social, economic, political, and military divisions made up a national structure and that dislocation in one of these divisions would produce sympathetic disturbances . . . in the others."[68]

The issue of whether a strategic campaign should be initiated against the hostile air force or the hostile nation's economy was not resolved until 1939. By then ACTS instructors assumed that the United States would fight in a coalition in which forward bases would be provided for carrying out a strategic campaign. Like Douhet, ACTS instructors believed that friendly nations would have to suffer initially from enemy air attacks, but friendly attacks against the industrial capacity of the enemy would meet two objectives: the destruction of the enemy's morale, national infrastructure, and military capability. These attacks would render enemy armed forces impotent.[69]

Validation. In 1929 ACTS adopted its motto: *Proficimus Mor Irrententi* (We Make Progress Unhindered by Custom).[70] The school was "more concerned with the promise than with the limited record, with tomorrow than with yesterday."[71] Given the era's economic climate and the Air Corps' subordination to the Army, it is understandable why airmen were unable to adequately test their theories prior to World War II.

Indeed, they tried to test some of these theories. In 1932 the school recommended the creation of a composite test group in order to demonstrate the tactics and techniques promulgated in school texts. However, neither the equipment nor personnel were available.[72] General Headquarters (GHQ) Air Force was established in 1935 that "had the responsibility, among others, of furnishing combat units for demonstration purposes."[73] However, GHQ Air Force was under no obligation to demonstrate the latest school-developed tactics and techniques. In addition, Air Corps field commanders had differing views on the use of airpower.

In 1939 as the United States began to mobilize in reaction to the conflict in Europe and funds for aircraft, personnel, and training became available, General Arnold "called for a study to determine the advisability of organizing three demonstration squadrons—one each of attack, pursuit, and bombardment—at Maxwell."[74] The War Department ordered the creation of the 23d Composite Group in September 1939. However, before this group could begin operations, the school suspended classes in June 1940. The 23d Group was only available for a brief period of time and had to support not only ACTS but also other service schools, maneuvers, tactical exercises, and national air races.[75] Unfortunately, ACTS and the Air Corps had little time to validate their theories.[76] The result was that the United States entered World War II with a good bomber, the B-17, but without suitable aircraft or doctrine for the other major missions of airpower.[77]

The Enemy as a System

Colonel Warden faced fewer, but similar obstacles in developing his theory. Colonel Warden had the advantage of writing after the ACTS's theory was tested in war. Unlike the ACTS's context in which the limited experience of World War I was the primary foundation of the theory, Colonel Warden's theory was primarily shaped by two factors: war and technology (fig. 6).

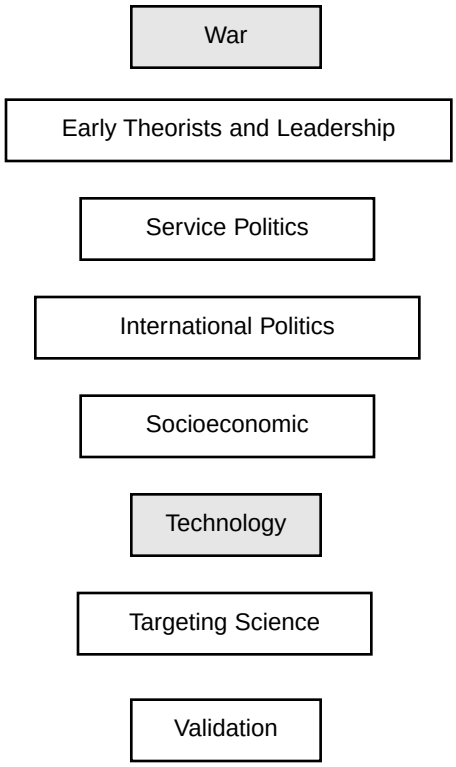


Figure 6. Warden's Contextual Factors

War. Just as World War I shaped the "nature of the enemy" for instructors at ACTS, the same type of war, industrially based, conventional war, shaped Colonel Warden's enemy as a system. Warden uses many historical analogies to express his ideas noting that World War I-style "attrition warfare belongs to another age, and the days when wars could be won by sheer bravery and perseverance are gone."[78] The war most often referenced in his 1989 book, *The Air Campaign: Planning for Combat,* is World War II. His 1995 article, "The Enemy as a System," references many conflicts, but his defense of it in his 1997 article, "Success in Modern War: A Response to Robert Pape's *Bombing to Win,*" relies almost exclusively on the Gulf War. These two wars, World War II and the Gulf War, were conducted against a conventionally armed adversary—a familiar enemy.

The World War II experience shaped Warden's opinion on the primacy of air superiority. One example used is the Pacific theater: "MacArthur gradually came to the conclusion that his operations had to have as their primary goal the attainment of air superiority . . . He believed that winning air superiority was the key to positioning himself for [an Army] assault [on Japan] . . . From 1943 to the eve of the invasion of Japan, and with only one exception, MacArthur use his ground forces primarily to seize bases from which air forces could extend the bomb line . . . General [George C.] Kenney's goal was to find and destroy enemy aircraft on the ground."[79]

The Gulf War cemented his beliefs on the subordination of military operations to policy and the systematic nature of an enemy: "General [Norman H.] Schwarzkopf [CENTCOM commander during the Gulf War] well understood the real purpose of the war against Iraq. The proposals [in the form of Instant Thunder] we put to him on 8 August 1990 flowed from a very specific view of the peace that should follow a war with Iraq, and from an understanding that attainment of our objectives depended on our recognition that Iraq was and is a complex system. The plan we put forward was to attack Iraq in order to change Iraq so that it would be compatible with the envisioned postwar peace."[80]

Early Theorists and Leadership. Warden builds on the importance of the ACTS's strategic bombardment by discussing the German response to it in World War II. "The Germans put an enormous amount of resources into building and manning antiaircraft guns and they withdrew dangerously large numbers of fighters from the tactical fronts. The strategic base of Germany was so important that Hitler and his high command recognized that they had to defend it regardless of the cost . . . Albert Spear recognized in 1943 that strategic bombing would doom his country . . . This shows that government and military leaders understand the importance of a secure strategic base."[81] Accordingly, Warden merged the ACTS's strategic bombardment with current technology to build his operational concept of parallel attack.

Service Politics. Like the officers at ACTS, Warden fought interservice battles. Regarding the US plan of military operations in the Gulf War and the issue of surface versus airpower options, Warden writes that "the direct solution called for application of standard Army AirLand Battle doctrine which would have meant air and artillery attacks to soften the Iraqi army in Kuwait. It would have been difficult for the President of the United States to secure political support for an operation which would have led to a high number of casualties."[82] When he first briefed General Schwarzkopf, Warden's plan was fully endorsed by the Army general. However, his plan was resisted within the Air Force. Gen Robert D. Russ, commander of Tactical Air Command, did not want to have "someone picking targets in Washington, like they did in Vietnam."[83] Schwarzkopf's joint force air component commander, Lt Gen Charles A. Horner, USAF, did not endorse his plan. As with AWPD-1, Warden's Instant Thunder became part of a general strategy that called for ground combat, the opposite of what Warden and ACTS's instructors sought. Nonetheless, in arguing that airpower is a more efficient form of military operations, Warden holds with the ACTS tradition.

International Politics. Warden writes that "our political leaders and our citizenry will insist that we hit only what we are shooting at and that we shoot the right thing."[84] Warden states that "in World War II, the United States and her Allies imposed widespread destruction and civilian casualties on Japan and Germany; prior to the Gulf War, a new political climate meant that a proposal to impose similar damage on Iraq would have

met with overwhelming opposition from American and coalition political leaders."[85] Warden insists that airpower's technological capabilities address concerns of coalition partners by reducing collateral damage.

Socioeconomic. Since stealth reduces exposure to enemy defenses and precision reduces the number of sorties required to achieve effects, Warden emphasizes technology as a means to address sociocultural factors, particularly public aversion to casualties. Like his predecessors at ACTS, Warden believes that airpower has reduced the cost of war and that "military operations must be conducted so as to give reasonable probability of accomplishing desired political goals at an acceptable price."[86] Warden references both World Wars:

> Many commentators . . . have talked about the losses suffered by airmen participating in the strategic air campaign against Germany in the Second World War. They were heavy in absolute terms, but in total they equaled only one or two particularly bad days on the Western front during the First World War . . . Were the losses suffered by airmen taking part in the strategic campaign in the Second World War worthwhile? One salient fact stands out: the Western Allies defeated Germany at a fraction of the cost of fighting to a stalemate from 1914 to 1918. Was not the strategic attack on the German core homeland the single most important difference?[87]

Technology. Technological advances in stealth and precision support Colonel Warden's operational strategy of parallel attack. He states that in the Gulf War "for the first time in the history of nonnuclear warfare, we had the concepts, aircraft and weapons to make parallel attack possible. With the new technologies, we were able to think about attacking Iraq as a system, in parallel instead of in the serial fashion, which old era weapons would have dictated."[88] Conversely, "when the United States began its daylight operations against Germany, it could only put relatively small numbers of bombers in the air at any time and, [for technological reasons], could only attack one target. The result was a serial attack to which the Germans responded by repairing damage and improving their defense schemes."[89]

Targeting Science. Analysis of the Gulf War supported Warden's belief that any enemy can be analyzed to reveal centers of gravity. Tying theory to practice, Warden writes that in the Gulf War "our plan to produce this postwar peace began with an analysis of the Five Rings system we had developed and debated in the Air Staff during the two years prior to the Iraqi invasion of Kuwait. The underlying assumption of this approach is that all organizations are put together in about the same way." Thus, Instant Thunder contained a systematic targeting plan for parallel attack of Iraqi centers of gravity.

Validation. Ultimately, Warden argues that the Gulf War validated his enemy as a system theory.[90] He notes that "it is important to understand that the Five Rings and the table of Iraqi centers of gravity are describing a system . . . We had an information system which allowed us to coordinate operations . . . stealth aircraft which penetrated by themselves . . . [and] bombs which had a very high probability of hitting that against

which they were aimed."[91] As with most of the faculty at ACTS, the experience and analysis of war against a conventional adversary, was used to justify Warden's theory.

Notes

1. David R. Mets, "The Air Campaign: Theory or Throwback? Colonel John Warden and the Classical Airpower Theorists," draft (Maxwell AFB, Ala.: School of Advanced Airpower Studies [SAAS], August 1997), 1.
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6. Ibid., 106.
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11. Martha Byrd, *Kenneth N. Walker: Airpower's Untempered Crusader* (Maxwell AFB, Ala.: Air University Press, March 1997), xxii.
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18. David C. MacIsaac, "Voices from the Central Blue: The Air Power Theorists," in *Makers of Modern Strategy from Machiavelli to the Nuclear Age*, ed. Peter Paret (Princeton, N.J.: Princeton University Press, 1986), 631.
19. Robert T. Finney, *History of the ACTS 1920–1940* (Washington, D.C.: Office of Air Force History, 1992), 4.
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21. Faber, 213.
22. Finney, 57.
23. Martha Byrd, *Chennault: Giving Wings to the Tiger* (Tuscaloosa, Ala.: University of Alabama Press, 1987), 38.
24. Futrell, 64.
25. Finney, 58.
26. Ibid., 55.
27. Futrell, 62.
28. Finney, 20.
29. Ibid.
30. Futrell, 62–63.
31. Finney, 70.
32. Byrd, *Kenneth N. Walker*, xxi.
33. Biddle, 111.
34. Kenneth N. Walker, "Bombardment Aviation: Bulwark of National Defense," *U.S. Air Services*, August 1933, 179.
35. Ibid., 189.
36. Biddle, 112.

37. Martha Byrd, "Short Talk by Colonel M. F. Harmon, Assistant Commandant, on the Occasion of the Visit of the Congressional Party to Maxwell Field" (Maxwell Field, Ala.: ACTS, 10 November 1939), 3.

38. Michael S. Sherry, *The Rise of American Air Power: The Creation of Armageddon* (New Haven: Yale University Press, 1987), 76.

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40. Sherry, 78–79.

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43. Futrell, 91.

44. Sherry, 88.

45. Ibid., 89.

46. Finney, 56.

47. Futrell, 61–62.

48. Ibid., 67.

49. Ibid., 80.

50. Sherry, 82.

51. Crane, 19.

52. Finney, 67.

53. Ibid.

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57. The Battle of Britain may have turned out much differently had radar not been available to provide tactical warning and intercept information.

58. Martha Byrd, *Chennault*, 46.

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60. Ibid.

61. Finney, 76–77.

62. Martha Byrd, "The Pursuit Airplane," Conference no. 2, Pursuit Aviation course (Maxwell Field, Ala.: ACTS, 1935–36), 2.

63. Futrell, 82.

64. Byrd, *Chennault*, 51.

65. Ibid., 51. For a detailed discussion of Chennault's ideas on pursuit/intelligence integration, see ACTS Pursuit Aviation course notes on "The Role of Defensive Pursuit" and "The Aircraft Warning Service and Alert Net," Conference nos. 3 and 4, Maxwell Field, Ala., 1935–36.

66. Finney, 64.

67. Ibid., 65.

68. Ibid., 71.

69. Ibid., 75.

70. Ibid., v.

71. Ibid.

72. Ibid., 32.

73. Ibid.

74. Ibid.

75. Ibid.

76. Crane, 64 and 38. "During the first half of 1943, Eighth Air Force put only 14 percent of their bombs within 1,000 feet of their targets. Poor visibility, fighter tactics, inexperience, poor training, flak, and camouflage led to errant attacks. By 1945, diligence, experience, refined tactics, and innovative techniques eventually brought accuracy up to 44 percent of all bombs falling within 1,000 feet of the target." Colonel Spaatz believed that "we have proven that with the limits of technology, our precision is in a relative, not a literal sense."

77. Byrd, *Chennault*, 52. For a discussion of pursuit aviation at ACTS, see ACTS, Pursuit Aviation Course, "History and Development of Pursuit Aviation," Conference no. 1, Maxwell Field, Ala., 1935–36, and ACTS, Pursuit Aviation Course, "Pursuit Airplanes," Conference no. 2, Maxwell Field, Ala., 1935–36.

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79. John A. Warden III, *The Air Campaign: Planning for Combat* (New York: Pergamon Press, 1989), 26.

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82. Ibid., 184.

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Chapter 4

Conclusion and Implication

Is the thought of déjà vu correct when thinking about the theories of the Air Corps Tactical School and Colonel Warden? Yes.

The experience of *war* had the most impact on the development of these theories, particularly on the core outline (shown by white boxes in fig. 7) which was common to both. Each theory was based on war with an industrially based, conventionally armed adversary. The enemy's infrastructure contained vital points, or centers of gravity, which were vulnerable to strategic air attack. Airpower was emphasized as the single military force able to obtain national security objectives and, relative to land power, do it at less cost.

In either theory—whether going through the people to get to the enemy leadership or directly targeting national capacity to get to leadership—forcing the enemy to accept US policy is the ultimate aim. If ACTS instructors had believed in a single center of gravity, they would have chosen the will of the enemy population. "The ultimate object of all military operations . . . is to destroy the will of the people at home, for that is the real source of the enemy's national policy."[1] The staff focused on the "people's" policy, not on the policy of the leadership, the armed forces, or the government. The people were seen as the basis of power and driving force behind the enemy's ability to resist or accept change in policy. ACTS's core theoretical thread can be described as policy—people—policy. If Colonel Warden argued for a single center of gravity, it would be the enemy leadership, "the only element of the enemy that can make concessions."[2] Warden views the five-ring model as a comprehensive targeting matrix to be attacked simultaneously, the best means to produce strategic paralysis. Colonel Warden's core theoretical thread can be best described as policy—leadership—policy.

Both theories were affected by the need to conduct military operations more efficiently and in accordance with international and sociocultural concerns. However, where contextual factors have changed over time, it has been by a matter of degree. Casualty aversion is as prevalent today as it was after World War I. Conducting military operations economically is as important today as it was during the Great Depression, although financial constraints are less stringent today.

The theories differ in the application of airpower. While ACTS's theory was driven primarily by the experience of World War I, Warden relies on the historical reference of war and *technology*. ACTS's theory was ahead of technology while Warden's theory capitalizes on technology that existed at the time of his writing. ACTS never validated the industrial web theory. Colonel Warden argues that the Gulf War validated his theoretical concept.

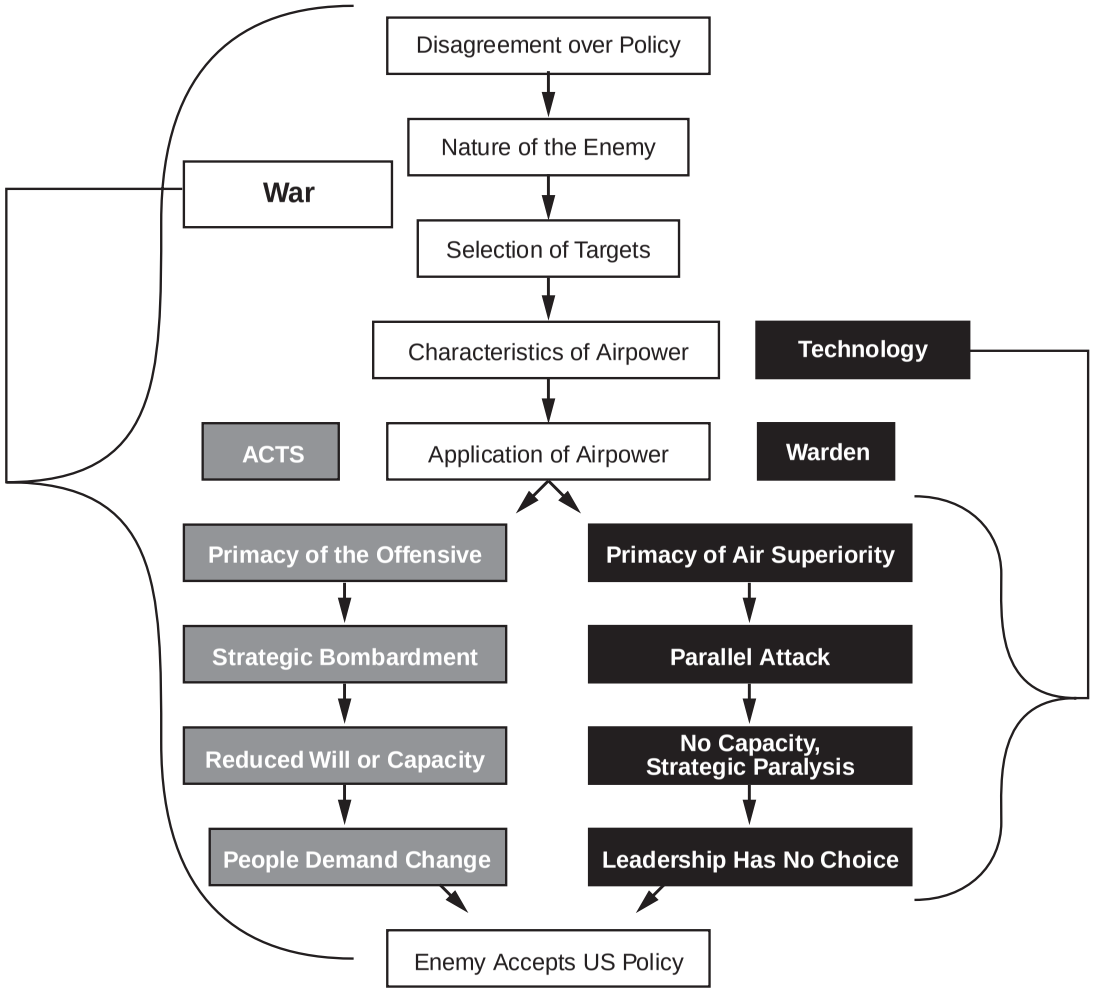

Figure 7. The Influence of War and Technology

In sum, the theories merge more than they diverge. Was Operation Desert Storm the culmination of a revolution in military affairs as suggested by Colonel Warden?[3] Thomas A. Keaney and Eliot A. Cohen say no: "If a revolutionary change in the conduct of war is under way, the harder parts of its implementation may still lie in the future . . . [Desert Storm] bore a striking family resemblance to the way in which American planners had constructed and executed air campaigns as far back as World War II."[4] Conrad Crane notes that "the military ethics and accuracy espoused in doctrinal literature on air operations today and demonstrated so convincingly during Operation Desert Storm have evolved directly from the effort and intent of the experience in World War II."[5] Accordingly, Warden's theory is best described as evolutionary. The following formula expresses the conclusion.

Industrial Web + Technology = Enemy as a System

Implication

What if national stakes and interests preclude the application of the ACTS's and Warden's theories? In both of these theories, the application of airpower was focused at the "strategic" level of war, the level at which military operations have a direct effect on the attainment of national policy. However, airpower has also enjoyed success at the operational and tactical levels of war. As discussed in chapter 3, in 1939, ACTS instructor Colonel Wilson noted how the Germans combined airpower, armor, artillery, and infantry in successful blitzkrieg attacks at the start of World War II.[6] Colonel Warden lauded American Generals Douglas MacArthur and Kenney for successfully employing airpower in their advance across the southwest Pacific.[7] Both of these operational-level applications of airpower were important parts of the German and US strategy in World War II. Thus, ACTS and Warden had historical evidence to support the belief that airpower can be used to obtain tactical, operational, and strategic objectives. Belief in airpower's flexibility might have broadened the application portion of their theories and enabled both to match practice in World War II and the Gulf War respectively.

As noted in chapter 3, "limited" war evolved into "total" war. Total war was at its worst in World War I, the main driver of the ACTS's industrial web theory. World War I saw the use of airpower as did World War II. However, World War II introduced nuclear weapons that gave credence to Roosevelt's idea that airpower could serve as a deterrent. Thereafter, limited war reemerged to avoid total (nuclear) war. When nuclear weapons were used in 1945, the industrial web theory was complete. Since 1945 the United States has participated in many conflicts. Each enemy and war was unique, more so than just physical differences in vulnerability to airpower. Korea was different from Vietnam prior to 1968, which was different from Vietnam after 1968, which was different from El Salvador in the

1980s, which was different from Somalia in 1992, and so on. The point is that the nature of war has limited the application of airpower. If the nature of war changes, so should theory. The reemergence of limited war, and the asymmetric stakes and interests associated with it, may preclude the use of "strategic" bombardment options.

Airpower is employed today in a variety of applications to support US policy. In many cases, for example operations Deny Flight and Deliberate Force, airpower has emerged as the military instrument of choice because it permits US policy makers to match stakes with interests. Accordingly, the implication is that theory must address airpower employment within a broader context of possible wars, at all levels, in order for airpower to remain an effective, economical instrument of national policy.

Notes

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6. Robert F. Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force 1907–1960*, vol. 1 (Washington, D.C.: GPO, December 1989), 96.
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Glossary

Center of gravity refers to that point where the enemy is most vulnerable and where an attack will have the best chance of being decisive. It is synonymous with the Air Corps Tactical School's (ACTS) vital point. It is possible to have multiple centers of gravity or several targets which together form a center of gravity. The point is that successful attack of a center of gravity has direct, decisive effect on the attainment of national policy and the disintegration of the enemy's ability to resist.

Parallel attack is Col John A. Warden III's term for the simultaneous bombardment of all of an enemy's centers of gravity. Parallel attack is enabled by technologies associated with precision, which reduces the requirement for mass, and stealth, which permits an attacker to "get through" an enemy's air defenses.

Policy refers to the art and science of coordinating the development and use of a nation's various instruments of power toward achievement of national security objectives. Herein, both theories reference policy in the context of military operations as a subset thereof.

Theory—vice doctrine—is used to refer to the United States Army Air Corps and USAF development and use of these beliefs. The Air Corps, subordinate to the Army, never had formal doctrine based solely on the industrial web theory. USAF doctrine incorporates some of the ideas embodied in Colonel Warden's, "Enemy as a System," but it is not a carbon copy of his beliefs. The Air War Planning Division's (AWPD)-1, the plan developed by former ACTS faculty members that became the basis for strategic application of US airpower in World War II and Instant Thunder, Colonel Warden's strategic plan for defeating Iraq via airpower in the Gulf War, were officially recognized versions of these theories. Nonetheless, neither is recognized as an authoritative, stand-alone document; both are referred to as theory.

Serial attack is the sequential attack of vital targets by massed formations of bombers and was the operational method of strategic bombardment in World War II.

Strategic attack refers to military operations conducted against enemy centers of gravity (or vital points).

Strategic bombardment refers to strategic attack via the air.

Strategic paralysis is the condition wherein the enemy leadership has lost the capacity to respond, the objective of Warden's parallel attack.