AIR COMMAND AND STAFF COLLEGE
AIR UNIVERSITY

Looking Skyward

The Emergence of an Air-Minded Culture in the US Army

RONALD G. MACHOIAN
Major, USAF

Air Command and Staff College
Wright Flyer Paper No. 17

Air University Press
Maxwell Air Force Base, Alabama

August 2004

This Wright Flyer Paper and others in the series are available electronically at the Air University Research Web site http://research.maxwell.af.mil and the AU Press Web site http://aupress.maxwell.af.mil.

Disclaimer

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

Foreword

It is my great pleasure to present another of the *Wright Flyer Papers* series. In this series, Air Command and Staff College (ACSC) recognizes and publishes our best student research projects from the prior academic year. The ACSC research program encourages our students to move beyond the school's core curriculum in their own professional development and in "advancing air and space power." The series title reflects our desire to perpetuate the pioneering spirit embodied in earlier generations of Airmen. Projects selected for publication combine solid research, innovative thought, and lucid presentation in exploring war at the operational level. With this broad perspective, the *Wright Flyer Papers* engage an eclectic range of doctrinal, technological, organizational, and operational questions. Some of these studies provide new solutions to familiar problems. Others encourage us to leave the familiar behind in pursuing new possibilities. By making these research studies available in the *Wright Flyer Papers*, ACSC hopes to encourage critical examination of the findings and to stimulate further research in these areas.

RONALD R. LADNIER
Brigadier General, USAF
Commandant

Preface

This brief study of the earliest American Airmen and their influence on the development of an air-minded culture is a work in progress. Historians have given this subject incomplete attention, and there remains a rich opportunity for rewarding scholarship on the topic. I hope that continued research in this area will strengthen the interim conclusions presented here, adding historical depth to the legacy of those men who dedicated their careers to building a United States Air Force.

I would like to thank Lt Col Joseph Reynolds, USAF, for his encouragement and guidance during the completion of this endeavor. I researched this project under the auspices of the Air Command and Staff College at Maxwell AFB, Alabama, and conducted it at the Air University Library, Maxwell AFB, Alabama, and the US Army Combined Arms Research Library at Fort Leavenworth, Kansas.

Abstract

The twentieth century's first decades were a time of enormous technological achievement that had profound influences on the modern battlefield. The invention of the airplane and its subsequent adaptation for military use inarguably changed the face of twentieth-century warfare. It was during this dynamic period that America's earliest Airmen began to articulate ideas on how airpower might best be used and what its presence might mean to the future conduct of war. These thoughts represented the barest beginnings of an air-minded culture in the US military. In addition to defining what American soldiers knew and believed about aviation, this culture eventually founded the professional impetus for a separate air arm. Thus, a study of the ideas put forth by these first Airmen is an important historical endeavor, lending a more complete understanding of the development of American airpower.

This paper relies primarily on articles that appeared in contemporary professional journals and popular periodicals. Airmen laid out a collective argument from which emerge several identifiable themes—crude tenets about the application of airpower as a weapon of war. Conclusions posit these themes as the reflection of a coherent air-minded perspective and discuss their historical relevance as a benchmark for later efforts to further develop American airpower. Secondary support comes from extant historical monographs that provide an account of military aviation's early development.

Looking Skyward

I realized that I was entering upon a career of unknown proportions but one which, I felt, provided I remain alive, would not only prove most interesting but, also, rewarding in the professional military field.

—Brig Gen T. Dewitt Milling, USAF

When World War I began in 1914, it ushered in four years of rapid change in the still embryonic military application of manned flight. As events in Europe deteriorated into brutal war of previously unseen proportions, few onlookers could conceptualize the huge impact that military aviation would later have on twentieth-century warfare. During the years preceding the war, in the United States as elsewhere, professional soldiers often looked on aeronautics with a reactionary attitude that kept the new technology at arm's length and deprived it of institutional support. Yet a handful of American officers had given a great deal of thought to the vast range of martial possibilities that might follow man's flight into the air. Some of these men had the professional foresight and enthusiasm to see beyond the contemporary flying machine's demonstrated capabilities to visualize how aerial combat might look in the future, and perhaps more importantly, what effect it could have on the battlefields below.

Perhaps taking their cue from the day's progressive reformers, many of these would-be Airmen sought to popularize their ideas through publication—risking the ridicule of their peers and even professional censure. Their thoughts, though perhaps appearing simplistic and even naïve when viewed in hindsight, seeded an "air-minded" culture that eventually helped to define modern military airpower. These records will guide this paper's examination of early efforts to build an American air force, looking for the cultural foundations of the tenets later espoused by the likes of Billy Mitchell, Henry "Hap" Arnold, George Kenney, and Carl Spaatz. It will attempt to identify common themes that reflect what early Airmen knew and espoused about their developing expertise. As modern Airmen now look toward the challenges of a new century, perhaps they

will find some relevance in these all-but-forgotten endeavors of the past.

The Beginning

As the twentieth century approached, the US Army found itself in a cultural abyss, caught between the antiquity of its role as a frontier constabulary and the demands of a rapidly industrializing world. Reform-minded soldiers, writing in a genre that historians have since termed *professionalist*, publicly called for institutional redirection. With the advent of breech-loading artillery, turreted steel warships, and rapid-fire machine guns, a handful of astute soldiers recognized that industrial progress threatened to transform modern warfare into something even more horrifying than its past, and they worked to ensure that the United States was not left wholly unprepared.

In this context in 1896, Capt William A. Glassford, US Army Signal Corps, wrote of a "new engine of the art of war," cautioning his brother officers that its study was of the utmost importance if they were to prevail in the coming century. Glassford, whose article appeared in the widely read *Journal of the Military Service Institution of the United States* (*JMSIUS*), was writing of the manned balloon, a machination for which he saw two distinct uses on the battlefield, the most obvious of which was reconnaissance. Military forces had used the balloon with limited success during the American Civil War, and it took no great visionary to realize that forces might continue to expand the balloon's utility. But even at that early date, Glassford recognized the unlimited potential of manned military flight. Aviation, he believed, could easily transform warfare if dirigibles or "flying machines" served as offensive weapons, carrying "bodies of high explosives" that turned them into "superterranean torpedoes." This still unproven concept of aerial combat had become a fascination for some soldiers, just as it had for many of their civilian contemporaries.[1]

Glassford's purpose was not to prophesize, but rather to lobby for his service branch, the Signal Corps, and specifically its fledgling attempt to develop an air arm. He did not dally long on thoughts of aerial bombardment, instead

transitioning to an artful argument for an expanded balloon service for battlefield communication and reconnaissance. Nevertheless, even though he set aside the concept of aerial bombardment as somewhat futuristic, a capability that is "not yet accomplished," his implication was clear. If manned aerial reconnaissance were a reality needed by any modern army, then its eventual progeny would be a lethal application. The air would soon become a medium for twentieth-century war.

Only a few months later, *JMSIUS* added an interesting postscript to Glassford's article. The journal reported on a series of experiments conducted by the British army. Working in conjunction, experts from the British ordnance and ballooning schools successfully brought down a tethered observation balloon with a field artillery piece drafted into an inventive antiaircraft role. Firing at a distance of about 4,000 yards with shrapnel shell, a crew hit the unmanned balloon on the sixth shot, sending it back to earth—a rather ominous demonstration that the military use of aerial vehicles would, in fact, not go uncontested. The air was clearly attracting interest as a third dimension for man's terrible activity of war.[2]

In the decade that followed, the US Army expanded its use of balloons, as did other nations around the world. By 1900 manned balloons were certainly not strangers to the world's battlefields. The Union and Confederate armies had both employed them with limited success during the American Civil War, and ballooning had since found its way into the great armies of Europe. The idea of carrying warfare into the air in at least an auxiliary role was slowly gaining a small but significant foothold within professional military circles. In 1870 besieged Parisians used balloons to communicate with the outside world during the Franco-Prussian War, supposedly carrying "thousands of letters, and several hundred carrier pigeons" in the effort.[3] In 1892 the US Army Signal Corps followed suit with its own balloon section, and a few years later, soldiers from this fledgling air force took part in the American advance toward Santiago, Cuba. At the Battle of San Juan Hill—made famous by the exploits of Pres. Theodore "Teddy" Roosevelt's "Rough Riders"—the unit's single balloon was unceremoniously forced to retire from the field when it came under all-too-accurate Spanish rifle fire while helping to direct American artillery batteries. Floating within range of

enemy small arms was a dangerous undertaking, and the conquest of the air awaited further invention. The development of heavier-than-air powered flight would finally change this equation in the Airman's favor.[4]

After the Wright brothers' groundbreaking flight at Kitty Hawk, North Carolina, in 1903, the idea of manned flight as a weapon of war moved closer to reality. By the end of 1905, the US government still had shown little regard for the Wrights' invention, while Western European governments were astutely beginning to negotiate for the rights to it. Two years later when Roosevelt directed the purchase of an aircraft for the Army's use, the United States began to show interest in the advent of manned motorized flight. As a result the Army acquired a Wright flying machine in early 1908. Even if the airplane caused less than a storm of excitement in the months following its birth at Kitty Hawk, the idea of flying increasingly caught the attention of both soldier and civilian.

In the United States, the "Aero Club of America"—mimicking the *Aero-Club de France*—took the lead as a public lobby for air-minded activity. Lt Frank Lahm, a cavalryman whose attentions had left horses and turned to the clouds, bragged in early 1906 that "this recently organized club is starting out under very auspicious circumstance. Already it has a membership of over two hundred, including many of New York's most prominent people."[5] The club purchased hot-air balloons and took every opportunity to push the grand spectacle of aerial flight before the public eye. As a soldier, Lahm viewed aviation as an endeavor with great military potential. In an article that touted the exhilaration of flying, he pointedly moved the discussion to a more utilitarian call for the military use of powered aircraft: "Those who have studied the question carefully are generally of the opinion that it is neither the spherical nor the dirigible that is to solve the question of the 'conquest of the air.' It must be solved by a machine that is 'heavier than the air.' "[6] The Aero Club, Lahm wrote, had "opened the way," and it was now up to the government to seize the moment and press forward public aviation to keep pace with Europe's great armies. Thus early on in their kindred struggle, soldiers and civilians allied themselves in the name of a shared interest in the future of manned flight.[7]

Like many who attempt to carve inventive new paths from convention, a combination of personal and institutional interest spurred Lahm's enthusiasm for flying. In 1906 he participated in the first annual Aeronautic Cup Race, a balloon race that originated in Paris, France, and stretched across the English Channel. Sixteen entries representing seven countries (including three from Germany) competed in a festive sporting atmosphere. Lahm, along with Henry B. Hersey—a veteran of Roosevelt's Rough Riders—piloted the *United States*, the sole American entry, sponsored by the Aero Club of America.[8]

After covering an impressive 402 statute miles in just over 22 hours, the crew of the *United States* proudly took first prize. More importantly, to at least Lahm, the contest demonstrated the balloon's great potential as a viable weapon of war. A few months later, he reported the event in the pages of *JMSIUS*: "It is interesting to note," he observed, "that six of the sixteen balloons in this year's contest carried regular Army officers either as pilots or as assistants. The balloon holds an important place in warfare." European armies, he warned, were even then taking great pains to build well-trained balloon corps: "When the next war comes, let us not be found wanting in this particular branch of military science." Clearly, Lahm's love for flying was closely intertwined with a fervent conviction that the air would soon become the realm of soldiers. Like-minded writers echoed this prophecy and it became a recurring theme in the period's air-minded literature.[9]

There was also Charles DeForest Chandler—like Lahm, a ballooning enthusiast who worked tirelessly to carve an embryonic air force from the Army's Signal Corps. In the fall of 1906, Chandler was also involved in a highly publicized balloon ascent, an event that took place in Massachusetts under the Aero Club's auspices. When the Signal Corps decided to purchase two more balloons the next year from Mr. A. Leo Stevens, Chandler was the government representative to test fly one of them. The *Army and Navy Journal* (*ANJ*) reported that the test sortie "proved satisfactory in every respect," taking the crew a distance of 140 miles in about four and one-half hours, from Washington, D.C., to a spot near Harrisburg, Pennsylvania. The War Department paid Stevens $1,200 for the balloon, and a

year later, Chandler flew it in the "Lahm Cup," a contest named in honor of Lahm's ground-breaking accomplishment in Paris a year earlier.[10]

With the support of Brig Gen James Allen, chief signal officer, the Army picked up its long-dormant efforts to build some semblance of an effective aerial auxiliary. The balloon corps had fallen into nonexistence following the Spanish-American War, and to rebuild, it was necessary to start almost from scratch. On 1 August 1907, the Signal Corps officially designated an Aeronautical Division and broadly tasked it with "all matters pertaining to military ballooning, air machines, and kindred subjects."[11] Fortunately for the Army, there were men like Lahm and Chandler who, through their active interest in civilian aeronautical activities, possessed a ready knowledge of balloon aviation and had already given much thought to its application to the military art. The corps placed Chandler in charge of the new division, and he began finding adequate expertise and resources to build his tiny air force.[12]

During the spring and summer of 1907, the corps detailed several officers and enlisted men to various training schools and duties that laid the groundwork for an eventual Army air service. A few months later, after the division had become an official part of the Army, Fort Omaha, Nebraska, became the site of a government balloon plant of which Chandler took command. Prominent civilian balloonists, such as Leo Stevens of New York City, played a key role by training enlisted men on the finer technical points of maintaining and repairing their craft. Once again, the existence of civilian sport ballooning in the United States proved an invaluable resource that greatly accelerated the Army's own efforts. As Lahm and Chandler remembered, an enthusiastic cadre of air-minded young officers found a spiritual outlet among like-minded civilian Airmen. This utilitarian *esprit* helped to publicize aeronautics in general and thus encouraged the development of a formal military flying program.[13]

A Handful of Soldiers and an Airplane

Attempts to expand the Army's use of hot-air balloons were by no means the sole efforts to build an Army air

service. At the same time, other soldiers were developing an interest in not only lighter-than-air flight, but also in powered flying machines and their potential for military use. In August 1908, Lt Benjamin D. Foulois graduated from the Signal Corps's school of application at Fort Leavenworth, Kansas. While there military flying attracted his interest, and he wrote a thesis entitled "The Tactical and Strategical Value of Dirigible Balloons and Aerodynamical Flying Machines," an effort that foretold the direction of his later career. Up to this point, he had been an average soldier with very little to set him apart from his peers, but Foulois subsequently emerged as a pioneering voice for American military aviation.[14]

After school at Leavenworth, Foulois was assigned to special duty with the Balloon Detachment at Fort Myers, Virginia, a propitious stroke for both his career and the Army. He quickly became absorbed in military aviation, first becoming proficient in hot-air ballooning and then learning to operate, repair, and maintain dirigible airships from none other than aviation pioneer Glenn Curtiss. Foulois, Lahm, and Lt Thomas E. Selfridge each learned to fly Army Dirigible No. 1 during the summer of 1908 and took the airship on several exhibition tours that were unashamedly intended to draw public attention to the Army's flying program.

At this stage of development, military aviation was little more than an interesting sideshow that looked to public approval and applause as its primary conduit to further government support. Army balloons and dirigibles were taken to state fairs and aviation "meets" whenever possible to "sell" manned flight as an endeavor with both military and civilian potential. Even after Lieutenant Selfridge was killed in an airplane crash that also injured Orville Wright, the intrepid group of young soldiers continued to seek out any opportunity to expand their skills and build support for the development and purchase of further aircraft. Foulois especially was convinced that the future belonged to powered flight and turned his attention to "heavier-than-air" flying machines.

In the spring of 1909, the Army's chief signal officer called Foulois to his office and asked his opinion on the future of military aviation. Would dirigibles or these still poorly tested

aeroplanes warrant government investment as a potential weapon of war? His answer in favor of heavier-than-air machines contradicted the beliefs held by most of his seniors within the Signal Corps: "I recommended that the procurement of Dirigible Balloons be discontinued and that our future military air development be concentrated on the development and use of the airplane."[15] This somewhat maverick opinion would soon prove prophetic as European powers began building the industrialized armies that future events would hurl into a world war.

Across the Atlantic Ocean, careful observers reached similar conclusions, predicting the importance of powered flight to future military operations. Two years earlier the *Army and Navy Journal* had reprinted portions of an essay written by Maj B. F. S. Baden-Powell, retired from the venerable Scots Guards, in which he warned the British government to take heed of the prospect of aerial warfare or risk domination from the continent:

> The whole subject of aerial warfare is a new one which has not yet been seriously considered. It opens up a vast field which demands our close study. . . . Even now we must bear in mind that an attack may be made on our ships from above. We must at once consider what is necessary to be done in order to protect our vessels from missiles from the blue. If in the future all nations adopt airships for war much of our insularity will be gone, and we must make due preparation.[16]

Like Foulois and even Lahm, Baden-Powell forecast that the aeroplane would soon supplant lighter-than-air vehicles as the most formidable weapon of the air: "There is looming hazily in the dim and perhaps distant future another means of offense and defense, probably far more deadly and effective than the dirigible balloon, and moreover, one which would speedily drive this leviathan from the face of the skies. I refer to some machine on the aeroplane principle. . . . Let us, then, encourage invention along these lines, so that we may still have some bulwark to protect our shores."[17] Imperialistic competition framed such arguments, and they added an ominous sense of importance to the struggles of contemporary Airmen—a view implicitly shared by the *ANJ*'s editors by their choosing to reprint and discuss Baden-Powell's article. Although still most often seen as merely a novelty by onlookers at sporting

events and exhibitions, aviation's potential as a weapon of war was not missed by an astute few.[18]

Foulois spent the spring of 1909 working with the Wrights at Fort Myers, Virginia, trying to absorb as much as he could of their hard-earned knowledge as they rebuilt the damaged machine that had killed Selfridge. He and Lahm both flew as observers when the type A aircraft was once again deemed airworthy and began a series of demonstrations and tests to widen the envelope of manned flight. Each effort drew large crowds of spectators, at least some of whom, Foulois suspected, actually turned out in hopes that they might witness a spectacular disaster, a "real old-fashioned Roman Holiday with all its bloody trimmings," as he wryly joked years later. The Wrights' successful work led to the Army's purchase of the aircraft on 2 August, a giant milestone in the fight for a real American air force.[19]

By this time speculation about the airplane's military role was becoming a topic of conversation in the public sphere and was drawing interest even from those who doubted or feared its maturation. Accordingly, the *ANJ* began reporting on the progress made in aeronautics on a semiregular basis. It updated readers on the Wrights' continued work and sometimes excerpted related articles that appeared in contemporary British journals, adding editorialized comments for an American audience. Impressive German progress in the dirigible arena also received a great deal of attention, leading *ANJ* to comment in April 1908 that "the idea of aerial navigation, both for commercial and military purposes, has caught the German fancy, and it is said that the Kaiser is ambitious that Germany shall predominate the navigation of the air in the same degree that England predominates in the navigation of the seas."[20] Three months later, in an editorial entitled "Preparing for Aerial War," *ANJ* summarized the Signal Corps's latest progress, concluding that "the dreams of Army enthusiasts in air navigation that the fate of nations soon will be decided in the blue battlefields of the sky may be nearer coming true than one imagines."[21] Although still marked by the camaraderie of entrepreneurial effort, developments in aeronautics were increasingly couched in terms of international competition as many realized the

great economic and military importance that would soon accompany the "command of the air."

In the early fall of 1909, three Army officers—Lahm, Foulois, and Lt Frederick E. Humphreys trained in the Army's new Wright Flyer at College Park, Maryland, under Wilbur Wright's personal tutelage. In November, with Lahm and Humphreys at the controls, this airplane was badly damaged, bringing progress at College Park to a halt for several months. During the interim Foulois became the Army's sole assigned aviator when the other two officers returned to their line branches after four years of detached service in the Signal Corps. Thus, the Army finally had an airplane, but no one qualified to fly it. Shortly thereafter, the Army ordered Foulois and a supporting crew of enlisted troops to Fort Sam Houston, Texas, to continue training in the now-repaired "Airplane No. 1." The Army told him to "take plenty of spare parts" and teach himself how to fly—no small order for a young man who had not yet flown solo.[22]

As Foulois and his detachment made their way to Texas by way of Chicago for an exhibition, two significant but unsung developments foretold the future of military aviation. The first of these was crude experimentation with wireless communication between air and ground. While "No. 1" was suspended indoors from the roof of the Chicago Coliseum, the crew undertook tests that convinced them of the practicality of communicating while in flight. It was obvious to those involved that this simple test held special promise for the airplane's role as an observation platform or scout. The second development also took place at a public exhibition—a civilian flying show staged in Los Angeles, California.

When Lt Paul W. Beck gained permission to attend the Los Angeles show as an observer, he took along a simple bomb-dropping sight that he fabricated. With the help of a French aviator who brought his machine to the show, Beck tested his new invention. While flying at about 250 feet above the ground, he dropped three 15-pound weights at a predetermined target. Although unsuccessful in the attempt due to some faulty calculations, Beck adequately demonstrated that a mechanical sight was indeed a feasible machination for the purpose. Thus, within a period of days, the Army learned that pilots could not only communicate

from the air, but could also drop bombs with at least some reasonable hope of accuracy—important achievements to those who kept a keen eye toward the future.[23]

Technological development in the field of aeronautics continued at a rapid pace as numerous articles in the day's journals and magazines easily attest. The significance of this dizzying advance was not lost on those soldiers who stopped to consider the utility of military flight. In 1910 Capt G. L. Townsend, an infantry officer attending the Army Staff College at Fort Leavenworth, took up this topic in a paper that eventually appeared in the *Infantry Journal*: "In approaching this subject [aviation] one must be prepared to use his imagination largely and even touch on the borders of prophecy because one achievement is hardly recorded which in itself upsets previous calculations than another is announced that makes changes again necessary."[24] But Townsend rightly noted that soldiers were not so interested in aeronautical progress for its erudite celebration as they were for the more practical purpose of determining the flying machine's suitability for military use. For air-minded soldiers, a personal fascination with flight was founded on a more fundamental interest in their profession's growth and progress.

Townsend's essay is especially significant in that he was writing under the influence of the Army's inner circle of burgeoning Airmen. He footnoted the "very considerable assistance" of Maj Edgar Russell—a prominent member of the Signal Corps's Aeronautical Board of 1908 that also included Lahm and Foulois—and acknowledged the published work of Lieutenant Colonel Glassford as well as that of British Colonel Capper.[25] Thus exposed to an already identifiable "corporate" intellect regarding military aviation, Townsend highlighted the airplane's potential for strategic and tactical reconnaissance (though noting that the airplane would not—at least for now—replace cavalry in these roles) and underlined its abilities to act as a messenger and perform coastal patrol. These arguments were framed in historical terms, drawing on the recent Spanish-American War to catch the interest of his reading audience: "In the operations around Santiago where transport was so difficult and scouting by cavalry nearly impossible, the possession of four or five aeroplanes would have been

of inestimable value to the American Army as they could have been taken where the balloon trains could not go."[26] He also addressed the possibilities of aerial bombardment, but concluded, like most of his contemporaries, that the airplane currently was of only limited application in this role. Looking at aviation through a conventional template, soldiers were predisposed to view flight as merely an extension of the cavalryman's eyes and ears. But even this relatively narrow mind-set acknowledged an expanding future: as Townsend observed, continued invention would rapidly thrust military flying into a wide array of roles and missions. The question that posed itself for the immediate future was what course the Army should take in its half-hearted pursuit of the air.

At this point, the airplane's use as a weapon of war was quite naturally pitted against that of its older cousins, the hot-air balloon and dirigible airship. Lahm, since returning to duty with the Army's venerable Seventh Cavalry in 1909, had remained deeply enamored with aviation, and took up this debate in earnest. In an article featured in *JMSIUS*, he outlined what he thought was the most likely role for military flying in the near term. His thoughts were clearly developed within a context of his times, and he had difficulty envisioning the great heights to which aeronautical development would soar within just a few years.

There were three basic missions for which aircraft of any type might be adapted in modern warfare. Lahm mused, "First, and by far the most important, is reconnaissance, both strategical and tactical; second, communication, particularly on the field of battle; third and last, combat."[27] Apparently, more serious attempts at dropping bombs from airplanes had followed Beck's little experiment. From these results, Lahm remained unconvinced of the further possibilities: "The idea of dealing death and destruction in the form of fire and explosives dropped from the air, of annihilating battleships, armies and cities, has from the first appealed to the popular mind. But let not the imagination run riot, for experiments show that, to produce its full effect, the explosive must be confined."[28] The problem, he believed, was primarily one of concentrating weapons within a tight-enough area to have an appreciable effect on

the target—a problem that would perplex later generations even after decades of technological advance.

But while Lahm doubted the ability of an aerial attack to render much more than a local moral effect, he remained enthusiastic about the airplane's use as an airborne scout. Perhaps this is not surprising since he was a cavalryman by trade, steeped in the traditions of armed reconnaissance and patrol. Thus, in 1911, he still saw military aviation as largely an extension of his current craft, acting as the eyes and ears of an army on the move: "Communication on the field of battle in these days of large armies and extended areas of combat has opened large field of usefulness to aircraft. . . . Reconnaissance is where aircraft will find their real sphere of usefulness. For this they are preeminently fitted, and here we may expect to see those changes in strategy and tactics due to the appearance on the horizon of a new and powerful arm."[29] He detailed the methods by which airplanes could successfully assume missions formerly conducted by squadrons of cavalry and then discussed the relative merits of powered aircraft and dirigibles in this role. The decided advantage, he concluded, went to the airplane with its much greater speed and ability to maneuver even in high winds.

Lahm failed to envision the degree to which aerial combat would continue to evolve. Like many others of his time, his imagination was tempered by conventional wisdom. He wrongly asserted that the "vulnerability of the aeroplane need hardly be considered," due to the inability of ground artillery fire to hit such a small, swift target. Of course, the arrival of antiaircraft weapons disproved this premise, but in its simplicity, the statement highlights the embryonic nature of manned flight. Lahm and his contemporaries had no baseline on which to build their conclusions. Yet, even if his predictions for the future were sorely inaccurate, his avid support for the airplane as a capable reconnaissance machine in the present would be borne out by unfolding events.

In the meantime, Benjamin Foulois had been busy carrying out his orders at Fort Sam Houston, where he had indeed taught himself to fly. His first flight in Texas was also his first flight alone, a singular act of courage that in retrospect might have bordered on sheer recklessness, especially with the fate

of his young colleague, Selfridge, still fresh in his mind. But despite inexperience, he and his tiny ground crew remained steadfast. By the end of the summer, they had proven their skills as burgeoning aviators—training flights of just under one-half hour became commonplace, even in mildly gusty winds. They also began to tinker with some innovative technical improvements. Not satisfied with the skid configuration that required launching their airplane from a sort of catapult contraption, Foulois and his crew rigged a wheeled tricycle-style chassis for ground maneuver. After some further improvement, the experiment proved a success, marking the installation of the first wheeled landing gear on a US military aircraft.[30]

The next fall, the practice of like-minded interchange between civilian and military Airmen was wisely continued. Demonstrating some understanding that flying was indeed a pioneering endeavor with a particular brand of expertise, the Army ordered Foulois northward to attend the International Aviation Meet at Belmont Park on Long Island (22–30 October) as well as a second meet that took place in Baltimore early the next month.[31] At these events he had an opportunity to discuss and exchange ideas with some of the world's foremost aviators and aircraft designers. Even if nothing else was gained from the experience, meeting and sharing ideas with others who pressed forward down a similar path must have been great encouragement to the young soldier. At the time the United States "air force" was certainly a very lonely branch of service.

A Fledgling Air Force on the Border

In early 1911 chaotic events on the Texas-Mexican border proved fortuitous for the immediate future of Army aviation. When political intrigue and open violence in Mexico ostensibly threatened US investments there, the Army dispatched troops posthaste as a public show of resolve to protect American interests. The Army pieced together a provisional "Maneuver Division" from widespread continental regiments and deployed it to a tent city near San Antonio. Although most observers recognized that armed intervention in Mexico was not likely anytime soon, the circumstances were wisely seen

at the War Department as a rare opportunity to employ a large modern army in an operational environment. Under the command of Gen William H. Carter, a prime mover behind the Army's ongoing process of professional reform, the division bedded down and began training on a scale rarely—if ever before—seen by the US Army.[32]

The Army had recently gained a second, more advanced aircraft due to the benevolent auspices of Robert F. Collier, a visible patron of American aviation. Collier purchased a Wright "Type B," and promptly loaned it to the War Department for further development and training. P. O. Parmelee, a civilian pilot under the Wrights' employment, accompanied the machine to Fort Sam Houston. Parmelee trained Foulois on the aircraft, and with the Maneuver Division and its press entourage only a short distance away, the two made a 106-mile nonstop flight from Laredo to Eagle Pass to demonstrate the aircraft's usefulness as a reconnaissance vehicle. In his memoirs, Foulois claimed that the sortie was made on orders to scout for Mexican irregulars—the first official operational reconnaissance flight in a powered aircraft in US history.[33]

The flight out was quite successful, accomplished in a little over two hours, but the return trip along the Rio Grande River ended in a much less satisfactory manner when engine trouble forced the plane and its crew into a crash landing. The aircraft and its occupants ended upside down in about four feet of muddy river water—fortunately unhurt, but nonetheless embarrassed and sorely disappointed. Luckily for America's fledging air service, the Type B was a stout machine. It was soon fished from the water and returned to airworthy shape at a nearby Army encampment.[34]

A few weeks later, while the Maneuver Division continued to prepare as if it might go into action south of the border, Foulois and Parmelee took an opportunity to show General Carter the aircraft's great potential in the field. Carter, a veteran cavalryman of the Indian Wars, was deeply impressed when the Airmen delivered written orders to troops 26 miles away and returned with a reply in "a trifle more than an hour," an eye-opening accomplishment in 1911.[35] This feat was followed by the aircraft's participation in a formal review of troops—probably a first in the history of US Army pomp and circumstance. Another airplane also flew in this parade-

ground-style review, a Curtiss machine that was deployed to Texas for similar purpose.

While Foulois, Lahm, Chandler, and Humphreys had been working with the Wright company, a second group of air-minded Army officers had likewise begun working with Curtiss. Although friendly competition existed between the two companies, they shared a unique enthusiasm, and by all accounts, their working relationship in Texas was cooperative. The two sections were organized into a sort of expeditionary "aero company," and the border deployment was becoming a highly successful venture for the flyers. Just before the parade-ground review, Wright pilot Frank T. Coffyn (who had replaced the departed Parmelee) had established a new rate-of-climb record, an act calculated to attract public attention and impress the Maneuver Division's senior leadership.[36] This demonstration of aviation's maturing capabilities was shattered when a second accident befell the Signal Corps's Aeronautic Division, taking the life of Lt George E. M. Kelly, a member of the Curtiss contingent.

The officers who arrived in Texas with the Curtiss aircraft were inexperienced, even in terms of the day. On the morning of 10 May 1911, Lieutenant Kelly was flying solo to achieve his primary qualification when he died in a badly failed landing attempt. General Carter, who had lost one of his own sons in an industrial accident only a few months before, was disturbed by the young officer's accidental death and gave orders to discontinue flying in the division. The Army's first attempt to integrate airplanes with fielded troops thus came to a sad end. The aircraft were shipped back to College Park, Maryland, where the War Department planned to establish a formal flying school, and the assigned officers and enlisted men received orders to various points, some outside of aviation altogether.[37]

If the Army's first practical use of airplanes ended in tragedy, it did not stymie the progress of American military aeronautics for very long. The loss of the two men did not daunt soldiers who had dreamed of aerial exploits alongside both Selfridge and Kelly. Their enthusiasm emerged intact, and they continued to prod the Army into the sky—a frustrating struggle for even the most dedicated adherent.

Advocates for the Future

The development of aircraft and dirigibles progressed at a rapid pace as men continued to learn not only about their technology but also about the science of flight. In 1908 the *Scientific American* had 72 entries in the subject index that pertained to any aspect of either powered or lighter-than-air flight. Two years later there were 128 entries under the heading "Aeronautics" alone, and in October of that year, the topic warranted a special "aviation number," an issue specially dedicated to the progress of manned flight. Flying was clearly moving from the realm of fantasy to that of an accepted science, and enthusiasts were likewise becoming true "Airmen," with a corporate sense of their specialized expertise and the particular body of knowledge that it implied. Military aeronautics paralleled this larger evolution, and for many soldiers, the airplane's utility became a foregone, even if begrudgingly reached, conclusion.[38]

Thoughts of aerial combat continued to excite the public imagination, and several insightful articles addressed the topic. The question was no longer whether airplanes would be of military use or not, but only in what specific role they would become most useful, and especially whether they could actively take the war to the enemy by effectively dropping bombs on targets.

Using the airplane as an aerial observer and scout was comfortable even for those whose interests remained wedded to military traditions more attuned to the nineteenth century. However, for most, any more revolutionary role was unthinkable. In 1908 even the *Scientific American* doubted the airplane's utility as "a means of transportation on any extended scale," and further found that bombardment from the air "would be a practical impossibility, for reasons which it is not necessary here to enter into."[39] Though this comment was written before aircraft development obligated the writer to any other conclusion, it was less than visionary. Airmen and aviation enthusiasts seemed satisfied with fitting aircraft into already tried and familiar arenas. Within this genre, the *Scientific American* concluded "the military airplane of the future will find its greatest field of usefulness in the important work of scouting"—a conventional notion of what was then a revolutionary technology.[40]

In 1910 the same journal published a second article applauding the advent of aerial reconnaissance as an important "third dimension" in modern warfare: "The aerial scout must, of necessity, exercise an enormous influence upon the conduct of future campaigns, rendering the already difficult art of war perplexing to a degree that only the military man can fully appreciate." Once again, it discounted the idea that aircraft of any type could be used with strategic effect: "Outside of its scouting duties, we are inclined to think that the field of usefulness of the aeroplane will be rather limited." Like many others who doubted the concept of strategic aerial bombardment, the writer gave little credence to the hope that aircraft flying at several thousand feet might mass enough ordnance on a single target to accomplish any significant destruction.[41]

Interestingly, this same article admitted that limited offensive missions might realize some success. The airplane, it asserted, "would be admirably adapted" for "making raids into the enemy's country, cutting telegraph wires, blowing up bridges, and making sudden descent upon commissary depots with the object of . . . destroying enemy stores." The writer foresaw the airplane's later "interdiction" mission. Yet, he did not explain why aerial attackers might achieve sufficient accuracy to successfully strike isolated targets but still could not have an appreciable strategic effect on enemy cities, fleets, factories, and fielded armies. Again, aviation was conceptually limited to an auxiliary role—it might enhance the battlefield, but it was not allowed to intrude on the primacy of surface warfare.[42]

A year later, only a few months after Foulois and others had taken flight with the Maneuver Division on the Texas border, the *Scientific American* again addressed the topic, but this time with a different conclusion. Riley E. Scott, a former soldier turned inventor, wrote an article entitled "Dropping Bombs from Flying Machines: The Aeroplane as an Offensive Weapon of War." At the time, Scott, whose military service had been with the coastal artillery, was testing an aerial bombsight at the Army's new flight school at College Park, Maryland, and thus had a stake in persuading the public that military forces could prosecute effective bombardment from the air. Despite obvious bias,

his well-reasoned arguments painted the future in a manner that few active duty soldiers might then have dared.[43]

Scott admitted that much of what was previously written about the concept of aerial bombing was based on sheer fantasy—the entertaining product of reporters who "gave their imaginations full rein, with the result that cities have been destroyed, forts demolished, and battleships sunk." Even in these literary descriptions lies a hidden foundation of reality. Scott firmly believed that an airplane, if properly designed and employed, could drop bombs with a reasonable hope of accuracy. At the same time he rightfully assumed that aircraft would be pressed to higher altitudes as small arms and even antiaircraft artillery made low-altitude flying over enemy territory a dangerous activity. From higher altitudes the problem became one of placing bombs on target, a complicated but nonetheless solvable dilemma: "When we consider aeroplanes flying at reasonably safe heights . . . the problem of accurately dropping projectiles becomes a difficult one and scientific calculations must take the place of guess-work."[44]

Of course, in 1911 it was difficult for Scott or anyone else to imagine the degree of difficulty that high-altitude bombing would entail or even that the enemy counterthreat would climb to the attack. If specific points of his argument are found wanting under the clarity of historical hindsight, Scott must be applauded for his broader conclusions. In light of contemporary European advances, he wrote, "it might not be unwise for our Congress to depart from its usual policy of economy by appropriating a million dollars to enable the army and navy to fully test this new arm. Nations as well as individuals are sometimes a penny wise and a pound foolish."[45] This advice seems sadly prophetic in light of the earth-shaking events that soon turned Europe into a muddy killing ground. Unfortunately, for the young men who would march away to fight a world war, Congress ignored Scott's advice and the Army likewise failed to grasp the airplane's effect on twentieth-century warfare.

While the War Department and many others remained unsure of the airplane's future worth, some observers were hostile to its growing presence. Two contemporary editorials that appeared in the *Infantry Journal* were especially scathing. The first essay fretted that the time and money

spent on developing a flying corps would dangerously detract from building up the more traditional combat branches: "The aeroplane can do us no greater military harm than driving out of mind again that our need now is the same as always—merely men, not machines, even though they be new machines with all the fancied terrors that superstition and ignorance given to things unknown." The second editorial, written a year later in 1910, observed the shocking death toll wrought thus far by aviation-related accidents and sarcastically proposed that to achieve victory in modern war would simply be a matter of inducing the enemy to use their flying machines.[46]

Simultaneously, the irascible Homer Lea, a resentful military critic, launched an almost humorous attack. Historian Russell Weigley has described him as "touched with sickness and phantasms."[47] In August 1910 Lea published two essays in *Harper's Weekly*, chastising those who were foolish enough to chase the clouds:

> Mankind as a whole almost always transfers to the inanimate world those strange conceptions that are the product of his wants and fears. . . . Whatever possesses the potentiality of destructive power or is strange or vast fills his mind with dread. And now that man has come to the age of flying, he again turns his eyes heavenward and with the same credulity that peopled the heavens with gods and monsters, he marks out for himself new hopes and fears. About these strange craft soaring over head he has created a phantasmagoria of unrealities.[48]

Although Lea's acerbic rantings were of little harm, they may have reflected the thoughts of many Americans and even some professional soldiers who disdainfully watched aviation progress. The advent of human flight generally and perhaps military flying especially was often difficult to reconcile with a comfortable past. As Americans left the relative security of the Victorian age, they entered a transitional period that gave many pause to yearn for more familiar surroundings, even on the battlefield.[49]

But for the truly converted, that handful of officers who was convinced of aviation's future, the Army required a capable and well-equipped air arm if it were to maintain US security in an increasingly dangerous world. This undertaking required more than just individual enthusiasm; it required institutional support—dollars that were not easily found in a peacetime budget. Almost as if on cue, Congress

allocated $125,000 for aeronautics in the 1912 military appropriations bill, giving the Aeronautical Division a much-needed boost at an opportune time. The Army ordered five new aircraft, established a flying school at College Park, and accepted three more young officers for training. Among the new students was Lt Henry "Hap" Arnold, a fun-loving West Pointer who later played a seminal role in the development of an independent air force. The year 1911 proved to be a pivotal year for American military aviation. The initial cadre of air-minded officers grew and so too did their ideas about the future.[50]

In the years that followed, increasing attention was given to military flying as more capable machines were developed and a greater number of officers became convinced that aviation could become a significant—even if auxiliary—part of the modern battlefield. This progress was by no means a torrent of arduous support. As Lahm and Chandler later remembered it, "The older officers of all armies, including our own, admitted only two military purposes for which airplanes could be employed—reconnaissance and rapid transportation of high ranking officers on strategical or tactical missions." Still, even if the Army's senior leadership showed little excitement for military flying, a small but growing number of aviators continued to dream of a potent American air force and lost no opportunity to lobby for its development: "The few air officers discussed among themselves the possibilities and probabilities of offensive air warfare when engineering progress would produce improved flight performances." However, such discussions would be of little value if not taken before a larger audience, and the day's professional and public media continued to present a viable forum for aviation's cause.[51]

In 1913 and 1914 numerous articles appeared in both the *ANJ* and the *JMSIUS* concerning the growth and future of Army aviation. Although some of these were reprints of essays written by British officers, it remains an important indication that American military journals chose to feature aviation topics at a time when much of their audience still found little value in machines of the air. From an article entitled "Aerial Reconnaissance, Its Possible Effect on Strategy and Tactics" (*JMSIUS*, November–December 1913) to an entire series on the "Progress in Aeronautics" (*JMSIUS*

1913–1914), soldiers and sailors alike were given ample opportunity to reflect on the valuable capabilities that aviation might bring to the modern battlefield. If there still remained "nonbelievers," it could not be for lack of exposure to the air-minded gospel. Concurrently, the argument for further aeronautical progress was supported by an accompanying maturation of aircraft technology, lending credibility to hopes for the future. Reasonable discussion concerning military flying thus became less a debate of *whether* aircraft had any viable utility and more a discussion of *how best* to use them.[52]

Foulois, now back in the Signal Corps and once again carrying the banner for Army aviation, entered his own voice into this dialectic. By 1913 it was apparent that the United States lagged behind many of its European competitors in the area of aeronautics, and he wrote an article for *JMSIUS* summarizing this predicament and lobbying for further support. Professional soldiers had used the likelihood of conflict with another major power as an anvil for their reform efforts since the turn of the century, and so-called preparedness themes were becoming a common thread in military writing. It was in this genre that Foulois framed his argument: "Practically every military power in the world today, except the United States, is taking up the systematic development and application of aircraft to military uses. . . . European powers are purchasing airships by the score, and aeroplanes by the hundreds."[53] He primarily blamed a lack of fiscal support for this condition. He was not satisfied with recent appropriations, which he characterized as "insignificant, as compared to the large sums being appropriated yearly in all foreign countries."[54] Beyond congressional purse strings, Foulois also pointed to the conservative American officer corps, an institution that was painfully slow to embrace aviation. Early American Airmen were considered to be "hopeless visionaries and daydreamers" by many of their professional colleagues, and naysayers watched their accomplishments with little applause. In the uncertainty of a dynamic world, it was perhaps only natural to look skeptically on inventions that might tear at the traditions of one's own profession.[55]

Foulois went on to discuss at length the various military roles and missions for which he believed both aircraft and dirigibles might be useful. In preemptory answer to lurking skeptics, he outlined the technical advances that had

taken place in recent years, making it possible to fly in almost all weather conditions and at altitudes and speeds not previously imagined. Even with this argument as his starting point, Foulois was remained fixed on the narrow concept that aircraft would largely remain auxiliaries of the surface battle, serving principally as the airborne eyes for the Army.

Still, he predicted that armies of the future would fight great struggles for control of the air, battling to take the proverbial "high ground" that would give them a decided advantage over their opponent. This premise implied the need for specialized pursuit planes, "designed primarily for offensive use against its own kind in the air," and in this seminal recognition, Foulois saw beyond present tradition and into the future.[56] Yet, there was no mention of aerial bombardment, a glaring omission for one who was enamored with carving a future for military aviation. It is not known whether Foulois had become frustrated by efforts to develop such a capability or if he believed that broaching the argument would be attempting to garner too much in one fell swoop. The fact that he did not approach the topic underlines the narrow path that even the enthusiastic few trod in their pursuit of a bona fide air force. Foulois's article thus stands as a valuable reflection of the manner in which American Airmen viewed their craft on the eve of World War I. The airplane was an important new weapon, but one that was seen as an adjunct of the combatants below.

Conclusions

In 1914 as events in Europe boiled over, even military aviation's most vocal proponents in the United States viewed it within conventional terms of surface warfare. In spite of efforts to improve bombsights and strengthen aircrafts' load-carrying capacities, accurate bombardment was at first thought to be too difficult an undertaking to make it a worthwhile endeavor. The outbreak of war in Europe eventually helped to revise these misconceptions. Wartime expediency dictated innovative manners with which to kill one's opponent, and by the end of the war's first summer, Airmen on the Western Front were dropping makeshift bombs on their

enemies. Over its course the war would bring further developments in aviation technology as well as the manner in which aircraft were employed. Aerial bombing and air-to-air combat became commonplace features of the battlefield, and during the interwar years, men such as Billy Mitchell and Hap Arnold seized the opportunity to carve out a new future for military aviation.

But none of this eventuality was a foregone conclusion during the century's first 14 years. These earliest pioneers worked from scratch to help define the beginnings of an air-minded culture for the future. Several themes emerge from their essays and articles, offering important insight into what Airmen of the day believed about the use of aircraft in war—that the airplane could act as an invaluable reconnaissance asset; that their use as real-time artillery observers would render that arm's fire much more destructive, changing the extant tactical balance; that the airplane's presence over the battlefield would revise the manner in which armies maneuvered and sought contact with the enemy; and perhaps most importantly, that seizing control of the air would become an important precursor to success on the earth's surface. Together, these tenets formed a foundation for the shared zeal that has since been termed *air-mindedness*.

At the same time, many of these young leaders understood that the use of military aircraft would continue to grow and their missions multiply as technological progress expanded the horizon of possibilities. Airmen seemed to realize that they, like the machines they flew, were indeed a pioneering vanguard in an arena with few boundaries. Although it is regrettable that at the time they largely accepted airpower as merely an adjunct of existing convention, it must be remembered that they did so pragmatically, reconciled to the powerful context of their era. Their work should be evaluated for what it was—a dedicated first step toward realizing the dream of military flight. The air-minded culture that they founded has helped guide subsequent generations of American Airmen through decades of institutional challenges.

Notes

1. William A. Glassford, "Military Aeronautics," *Journal of the Military Service Institution of the United States* (hereafter called *JMSIUS*) 18 (May 1896): 562.

2. "Military Notes," *JMSIUS* 20 (May 1897): 626.

3. Frank P. Lahm, "Ballooning," *JMSIUS* 38 (May–June 1906): 509.

4. For narrative histories of the US Army's early attempts to develop a balloon corps, see Juliette A. Hennessy, *The United States Army Air Arm: April 1861 to April 1917* (Montgomery, Ala.: USAF Historical Division, Research Studies Institute, Air University, 1958; reprint, Washington, D.C.: Office of Air Force History, 1985); and Frederick S. Haydon, *Aeronautics in the Union and Confederate Armies* (Baltimore: The Johns Hopkins Press, 1941).

5. Lahm, "Ballooning," 510–11. For autobiographical notes on Lahm's military career, see Frank P. Lahm, "Early Flying Experiences," *The Air Power Historian* 2 (January 1955): 1–10.

6. Lahm, "Ballooning," 513.

7. Charles De Forest Chandler later wrote that the Aero Club of America had greatly influenced the Army's revived interest in an active balloon corps during the twentieth century's first decade, Charles De Forest Chandler and Frank P. Lahm, *How Our Army Grew Wings: Airmen and Aircraft Before 1914* (New York: The Ronald Press Co., 1943), 56–57.

8. Lahm, "Early Flying Experiences," 2–3.

9. Frank P. Lahm, "The First Annual Aeronautic Cup Race, and Its Interest to the Army," *JMSIUS* 40 (January–February 1907): 17. Also see Lahm and Chandler, *How Our Army Grew* Wings, 58–67; and *Army and Navy Journal* (hereafter called *ANJ*) 44 (27 October 1906): 227.

10. *ANJ* 44 (8 June 1907): 1118; and Capt Charles DeF. Chandler, "Winning the Lahm Cup," *JMSIUS* 42 (January–February 1908): 119–25. On the Army's purchase of balloons "nine and ten," see Lahm and Chandler, *How Our Army Grew Wings*, 76–77. The numeration "nine and ten" is based on the fact that the Army had apparently purchased only eight previous balloons in the decades since the Civil War.

11. Quoted in Hennessy, *Army Air Arm*, 15.

12. On the creation of an aeronautical division, see Lahm and Chandler, *How Our Army Grew Wings*, 80–81.

13. Lahm and Chandler detail the training given this initial cadre of air force maintainers in ibid., 77–79.

14. As a later chief of the Army Air Corps, there is a great deal of historical material documenting Foulois's long service career. For further study, see Benjamin D. Foulois, *From the Wright Brothers to the Astronauts: The Memoirs of Major General Benjamin D. Foulois*, ed. C. V. Glines (New York: McGraw-Hill Book Co., 1968); and also John F. Shiner, "The Army Air Arm in Transition: General Benjamin D. Foulois and the Air Corps, 1931–35" (PhD. diss., The Ohio State University, 1975). Foulois later wrote that his graduation thesis at the Army Signal School was little more than a fantastic editorial piece that "generally followed the lines of one of Jules Verne's flights of imagination" predicated on the Wright Brothers' recent success in building a workable flying machine, Benjamin

D. Foulois, "Early Flying Experiences: Why Write a Book? Part I," *The Air Power Historian* 2 (April 1955): 20.

15. Foulois, "Early Flying Experiences," 23.

16. "Airships for War," *ANJ* 44 (17 August 1907): 1374.

17. Ibid.

18. Lahm had issued a similar warning a year earlier, arguing that development of an air arm was necessary "if we are to keep pace with European armies," see "Ballooning," 514.

19. Foulois, "Early Flying Experiences," 24–25. The Wrights' work at Fort Myers during the spring and summer of 1908 was part of a bid process managed by the Army Board of Ordnance. According to the *ANJ*, "successful machines" were required to carry two men a distance of 125 miles at speeds of 40 miles per hour and had to be capable of transportation in an ordinary Army wagon and then assembled in about one hour. Three of the 41 bidders received funding for further work, with the Wrights receiving $25,000—see *ANJ* 45 (15 February 1908): 628.

20. "Progress in Aeronautics," *ANJ* 45 (18 April 1908): 876. For further examples of contemporary coverage of aviation development, see "Aeroplane Experiments," *ANJ* 45 (23 May 1908) 1031–32; and "Mechanical Flight," *ANJ* 45 (4 July 1908): 1210.

21. "Preparing for Aerial War," *ANJ* 45 (25 July 1908): 1293.

22. This account comes from Foulois, "Early Flying Experiences," 27. Also see Lahm and Chandler, *How Our Army Grew Wings*, 162–68.

23. Lt Paul Beck's attempt is in Lahm and Chandler, *How Our Army Grew Wings*, 87–88.

24. G. L. Townsend, "The Use and Effect of Flying Machines on Military Operations," *Infantry Journal* 7 (September 1910): 245.

25. On Maj Edgar Russell's participation on the 1908 Aeronautical Board, see Lahm and Chandler, *How Our Army Grew Wings*, 113.

26. Townsend, "Use and Effect of Flying Machines," 250.

27. Frank P. Lahm, "The Relative Merits of the Dirigible Balloon and Aeroplane in Warfare," *JMSIUS* 48 (March–April 1911): 200.

28. Ibid.

29. Ibid., 201–02.

30. Airplane No. 1 later received a four-wheeled "landing gear" arrangement devised by the Wrights—see Lahm and Chandler, *How Our Army Grew Wings*, 183–84.

31. Ibid., 181–82.

32. On the Maneuver Division's deployment, see Ronald G. Machoian, "Between the Old and the New: General William Harding Carter and the American Army" (PhD. diss., University of Missouri, Kansas City, 2002).

33. Foulois notes that he and Parmalee were "ordered to reconnoiter along the Rio Grande River" in *From the Wright Brothers to the Astronauts*, 83.

34. On this flight and its less-than-happy ending, see Foulois, *From the Wright Brothers to the Astronauts*, 83–85; "The Wright Army Biplane," *Scientific American* 104 (1 April 1911): 324; and Hennessy, *The United States Army Air Arm*, 40.

35. Gen William H. Carter to Ida Carter, 8 May 1911, Carter family papers. Lahm and Chandler recorded the total elapsed time for delivering

the order and returning at one hour and 45 minutes. The Curtiss aircraft was deployed by a second group of Army officers along with representatives of the Curtiss company. See "How Our Army Grew Wings," 186, 189–90; and "Aeroplanes are Reviewed for the First Time," *San Antonio Express*, 23 April 1911. The Carter Papers are part of a private collection; copies of cited materials are in the author's possession. Foulois detailed the Texas border deployment in "Early Flying Experiences, Why Write a Book? Part II," *Air Power Historian* 2 (July 1955): 45–59.

36. On Coffyn's record-setting flight, see "Aeroplanes Are Reviewed for the First Time," *San Antonio Express*, 23 April 1911.

37. Foulois outlines his own opinions on the Kelly accident in "Early Flying Experiences, Part II," 55–57. He placed a great deal of the blame on the Curtiss section's relative inexperience.

38. The subject indices for the *Scientific American* are in volumes 98, 99, 102, and 103. In 1910 entries under "Aeronautics" were broken down into subsections, including one for "military aviation." The "aviation number," an issue devoted to several aspects of flying, was *Scientific American* 103 (22 October 1910).

39. "The Aeroplane Military Scout," *Scientific American* 99 (19 December 1908): 450. *JMSIUS* 49 (July–August 1911): 135–38 reprinted this article in part three years later.

40. "The Aeroplane Military Scout," 450.

41. "Air Craft in War: The Possibilities of Aeroplanes and Dirigibles," *Scientific American* 103 (17 September 1910): 319.

42. Ibid., 320. For another contemporary critique of aerial bombardment, see "The Myth of the Aeroplane Bomb," *Scientific American* 103 (16 July 1910): 42.

43. Riley E. Scott, "Dropping Bombs from Flying Machines: The Aeroplane as an Offensive Weapon of Warfare," *Scientific American* 105 (28 October 1911): 388–89. Scott's design later won an award in a 1912 international competition in France. See Lahm and Chandler, *How Our Army Grew Wings*, 206–09, 276; and Hennessy, *The United States Army Air Arm*, 105.

44. Scott, "Dropping Bombs from Flying Machines," 388.

45. Ibid.

46. "Concerning Aeroplanes for Army," *Infantry Journal* 7 (November 1910): 461; and "Concerning the Development of Flight," *Infantry Journal* 7 (January 1911): 618–19.

47. Russell F. Weigley, *Towards an American Army: Military Thought from Washington to Marshall* (New York: Columbia University Press, 1962), 153.

48. Homer Lea, "The Aeroplane in War: Some Observations on a Military Decision, Aeroplanes as Destructive Agents," *Harper's Weekly* 54 (20 August 1910): 8.

49. The second part to Lea's two-part serial ran a week later with the subtitle "Aeroplanes as a Means of Reconnaissance," *Harper's Weekly* 54 (27 August 1910): 11, 26. This essay was no less critical than the first.

50. On Hap Arnold, see Dik Alan Daso, *Hap Arnold and the Evolution of American Airpower* (Washington, D.C.: Smithsonian Institution Press, 2000). Arnold was originally sent to Dayton, Ohio, where he and Thomas DeWitt Milling trained at the Wright brothers' aviation school. After less

than two months training, the two men reported to College Park as instructors to help open the Army's new school. See pages 49–50.

51. Lahm and Chandler, *How Our Army Grew Wings*, 208; and ibid., 208–09.

52. Capt W. A. De C. King, "Aerial Reconnaissance, Its Possible Effect on Strategy and Tactics," *JMSIUS* 53 (November–December 1913): 450–55. King's essay was extracted from a transcript of a lecture that originally appeared in the *Royal Engineers Journal* (September 1913). The "Progress in Aeronautics" series, reprinted from *The United Service*, ran in *JMSIUS* during 1913 and 1914. Its author was another British officer, Maj H. Bannerman-Phillips, who addressed a wide variety of topics concerning the use of aircraft and airships in military operations. A summer 1913 entry is perhaps especially interesting in that he discusses the increasing volatility of European competition for supremacy in the air. See "Progress in Aeronautics," *JMSIUS* 53 (July–August 1913): 126–32.

53. Benjamin D. Foulois, "Military Aviation and Aeronautics," *JMSIUS* 52 (January–February 1913): 98.

54. Ibid.

55. "The Men and the Machines, 1913–1915: A Chronological Treatise on the Growth of Air Power," *The Air Power Historian* 3 (October 1956): 171.

56. Foulois, "Military Aviation and Aeronautics," 102.

Sources and Works Cited

Articles

"Aeroplane Military Scout, The." *Scientific American* 99 (19 December 1908): 450.

"Air Craft in War: The Possibilities of Aeroplanes and Dirigibles." *Scientific American* 103 (17 September 1910): 319–20.

"Airships for War." *Army and Navy Journal* 44 (17 August 1907): 1374.

Anderson, Orvil A. "Fifty Years of Growth." *The Airpower Historian* 4 (July 1957): 163–67.

"Aviation Exploits at Home and Abroad: Foulois on the Mexican Border." *Scientific American* 104 (1 April 1911): 324.

Bannerman-Phillips, H. "Progress in Aeronautics." Parts 1–7. *Journal of the Military Service Institution of the United States* 53 (July–August 1913): 126–35; (November–December 1913): 456–63; 54 (January–February 1914): 119–23; (May–June 1914): 451–58; 55 (July–August 1914): 149–57; (September–October 1914): 338–44; and (November–December 1914): 508–14.

Bonney, Walter T. "Chiefs of the Army Air Force." *The Airpower Historian* 7 (July 1960): 129–42.

Chandler, Charles De Forest. "Winning the Lahm Cup." *Journal of the Military Service Institution of the United States* 42 (January–February 1908): 119–25.

"Concerning Aeroplanes for the Army." *Infantry Journal* 7 (November 1910): 461.

"Concerning the Development of Flight." *Infantry Journal* 7 (January 1911): 618–19.

Foulois, Benjamin D. "Military Aviation and Aeronautics." *Journal of the Military Service Institution of the United States* 52 (January–February 1913): 98–119.

_____. "Why Write a Book?" Parts 1–3. *The Airpower Historian* 2 (April 1955): 1–35; (July 1955) 45–65; 3 (April 1956): 114–33.

Glassford, William A. "Military Aeronautics." *Journal of the Military Service Institution of the United States* 18 (May 1896): 561–76.

"How Air Power Grew." *The Airpower Historian* 3 (April 1956): 134–37.

Kaempffert, Waldemar. "Aircraft and the Future." *The Outlook* (21 June 1913): 452–60.

King, W. A. de C. "Aerial Reconnaissance, Its Possible Effect on Strategy and Tactics." *Journal of the Military Service Institution of the United States* 53 (November–December 1913): 450–55.

Lahm, Frank P. "Ballooning." *Journal of the Military Service Institution of the United States* 38 (May–June 1906): 509–14.

_____. "Early Flying Experiences." *The Airpower Historian* 2 (January 1955): 1–10.

_____. "The First Annual Aeronautic Cup Race, and Its Interest to the Army." *Journal of the Military Service Institution of the United States* 40 (January–February 1907: 11–17.

_____. "The Relative Merits of the Dirigible Balloon and Aeroplane in Warfare." *Journal of the Military Service Institution of the United States* 48 (March–April 1911): 200–10.

Lea, Homer. "The Aeroplane in War: Some Observations on a Military Decision." Parts I and II. *Harper's Weekly* 54 (20 August 1910): 8–9; and (27 August 1910): 11, 26.

"Men and Machines, 1913–1915: A Chronological Treatise on the Growth of Air Power, The." *The Airpower Historian* 3 (October 1956): 171–78.

"Military Aeronautics." *The Outlook* (19 April 1913): 885–86.

"Preparing for Aerial War." *Army and Navy Journal* 45 (25 July 1908): 1293.

Scott, Riley E. "Dropping Bombs from Flying Machines: The Aeroplane as an Offensive Weapon of Warfare." *Scientific American* 105 (28 October 1911): 388–89.

Townsend, G. L. "The Use and Effect of Flying Machines on Military Operations." *Infantry Journal* 7 (September 1910): 244–58.

Books

Chandler, Charles De Forest, and Frank P. Lahm. *How Our Army Grew Wings: Airmen and Aircraft Before 1914*. New York: The Ronald Press Co., 1943.

Daso, Dik Alan. *Hap Arnold and the Evolution of American Airpower*. Washington, D.C.: Smithsonian Institution Press, 2000.

Foulois, Benjamin D. *From the Wright Brothers to the Astronauts: The Memoirs of Major General Benjamin D. Foulois*. Edited by C. V. Glines. New York: McGraw-Hill Book Co., 1968.

Goldberg, Alfred, ed. *A History of the United States Air Force, 1907–1957.* Princeton, N.J.: D. Van Nostrand Co., 1957.

Haydon, Frederick S. *Aeronautics in the Union and Confederate Armies*. Baltimore: The Johns Hopkins Press, 1941.

Hennessy, Juliette A. *The United States Army Air Arm: April 1861 to April 1917*. [Montgomery, Ala.] USAF Historical Division, Research Studies Institute, Air University, 1958. Reprint, Washington, D.C.: Office of Air Force History, 1985.

Shiner, John F. "The Army Air Arm in Transition: General Benjamin D. Foulois." PhD. diss., The Ohio State University, 1975.

_____. *Foulois and the U.S. Army Air Corps, 1931–1935.* Washington, D.C.: Office of Air Force History, 1983.

Weigley, Russell F. *Towards an American Army: Military Thought from Washington to Marshall*. New York: Columbia University Press, 1962.