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COVER: Secretary Rice joins the future leaders of the Air Force, cadets at the Air Force Academy, during Spaatz Award ceremonies.



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From early refueling experiments to the scientific developments in navigation, this issue seems to lean on the earlier period of air power's history.

The first article, by John Andreas Olsen is a fascinating look back at a controversial air power theorist, John Boyd. Iconoclastic and often unmilitary, nonetheless Boyd is deserving of many of the laurels thrown his way. And Olsen gives him the coverage he deserves.

The second article is by Thomas Wildenberg, a well known scholar in the scientific developments of air power, and is an interesting piece about Charles Stark Draper and the development of inertial navigation. The author is working on a longer history of Draper and it should be fascinating.

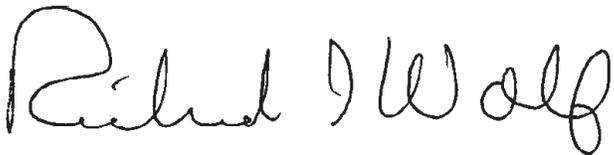
The third article is by David Vaughan on the experience of the Tuskegee Airmen while stationed at Oscoda Army Air Field. It is an exceptional contribution to the literature of the Airmen.

The fourth article is by Daniel Haulman, and covers the experience of Ralph Parr, an extraordinary fighter pilot who fought in three wars, becoming a double ace in Korea. It's truly another fine effort by Dan.

The fifth and final article is a story about refueling experiments undertaken at Rockwell Field, California, in 1923, and was contributed by Robert Bruce Arnold, grandson of Henry H. "Hap" Arnold. It draws on an old memoir of Hap Arnold's and is a fun read. Don't miss it.

Of course, we have our customary lot of book reviews once again, Fourteen this time, starting on page 50. We also continue to list upcoming events of an historical nature starting on page 61, reunion happenings on page 62, and we finish up with our New History Mystery on page 64. We hope you enjoy this fascinating issue.

Please don't skip over coverage of the Foundation's two annual awards and their attendant ceremonies. The Doolittle Award is covered on page 4 and the Spaatz Award is on page 5. Both of those are followed by the President's Message on page 6. Don't race by them in your haste to peruse the articles.



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100th Air Refueling Wing Receives Doolittle Award



One of the Air Force Historical Foundation's highest honors – its James H. "Jimmie" Doolittle Award – was given to a very worthy recipient during the organization's annual gathering in Arlington, Virginia, which included a special keynote address from current U.S. Air Force Vice Chief of Staff Gen. Stephen W. Wilson.

The Foundation's Doolittle Award recognizes a U.S. Air Force unit that has displayed bravery, determination, discipline, "esprit de corps" and superior management of joint operations in multiple conflicts – and few are as deserving as the **100th Air Refueling Wing** at RAF Mildenhall, UK.

The 100th traces its roots to the 100th Bomb Group, which arrived at Thorpe Abbots, England in June 1943. It inherited the "Bloody Hundredth" nickname from fellow bomb groups due to its

severe loss rate throughout World War II, during which the 100th flew a total of 306 missions.

Reactivated as the 100th Bombardment Wing at Portsmouth (Pease) Air Force Base, New Hampshire in 1956, it performed important Cold War-era global strategic bombardment training and global air refueling activities for ten years before being re-designated at the 100th Strategic Reconnaissance Wing and moved to Davis Monthan Air Force Base, Arizona in 1966. The 100th returned to England in 1992 as the 100th Air Refueling Wing, with its new base – RAF Mildenhall – located just 23 miles west of its original home at Thorpe Abbots.

Co-hosted by The Jimmy Doolittle Center and Jelly Belly Candy Company, the September 27 ceremony was held at the United States Air Force Memorial and Army Navy Country Club. L3 Communications and Pratt & Whitney were the event and reception partners, respectively, with Rolls-Royce North America, The Boeing Company and GE Aviation as the dinner partners. Also acknowledged for their support was the Air Force Sergeants Association.



The Doolittle Award was accepted on behalf of the 100th Air Refueling Wing by its current Commander, Col. Thomas D. Torkelson. Speaking at the U.S. Air Force Memorial with highly-recognizable Washington, D.C. landmarks as a backdrop, he highlighted the 100th's significant achievements over the past seven decades, and paid particular tribute to the active duty personnel that are continuing this great legacy today.



Members of the 100th Air Refueling Wing, both past and present, gathered for a "family photo" in celebration of the Doolittle Award. Fittingly, they are joined in this photo by the granddaughter of James H. "Jimmie" Doolittle, Jonna Doolittle (fourth from the left).



The Doolittle Award was formally presented to Col. Thomas D. Torkelson during the banquet, which was held at the Army Navy Country Club. Col. Torkelson and Jonna Doolittle shown are in the center, joined by the event's keynote speaker, U.S. Air Force Vice Chief of Staff Gen. Stephen W. Wilson (far left) and Air Force Historical Foundation President Maj. Gen. Dale Meyerrose (USAF Ret.)



A rousing keynote address by U.S. Air Force Vice Chief of Staff Gen. Stephen W. Wilson capped off the Doolittle Award ceremony. In his comments, Gen. Wilson spoke at length about the staggering losses that earned the 100th its "Bloody Hundredth" nickname during World War II and how the Wing and its personnel persevered.

Donald Rice Receives Spaatz Award



The Air Force Historical Foundation (AFHF) went cross-country to deliver its prestigious General Carl A. “Tooe” Spaatz Award – named after one of the organization’s founders and its first President – during a very special gathering at the United States Air Force Academy in Colorado on Thursday, November 3rd. With the spectacular Center for Character and Leadership Development as a backdrop, the event honored Dr. Donald B. Rice, 17th Secretary of the U.S. Air Force (1989-93), for his sustained, significant contributions to Air Force history during a lifetime of service.

The Air Force Historical Foundation’s Spaatz Award was created in 2007, with the inaugural honor given to Gen. David C. Jones, USAF (Ret) – beginning a succession of highly-esteemed recipients. This list includes: Maj. Gen. John R. Alison, USAF (Ret), 2008; Lt. Gen. Thomas P. Stafford, USAF (Ret), 2009; Gen. Larry D. Welch, USAF (Ret), 2010; Lt. Gen. James Clapper, USAF (Ret), 2011; Gen. John A. Shaud, USAF (Ret), 2013; Gen. Lloyd W. Newton, USAF (Ret), 2014; and Gen. Ronald R. Fogleman, USAF (Ret), 2015.

Donald B. Rice was the 17th secretary of the Air Force. He was born in Frederick, Md., in 1939. He earned a bachelor of science degree in chemical engineering from the University of Notre Dame in 1961, a master’s degree in industrial management in 1962, and a doctorate in economics in 1965, both from Purdue University. He was awarded three honorary degrees: doctor of engineering by Notre Dame in 1975, doctor of management by Purdue in 1985 and doctor of laws by Pepperdine University in 1989. From June 1965 to June 1967, he served on active duty as first lieutenant and then captain in the U.S. Army. In April 1972 Rice became president and chief executive officer of The RAND Corp., an independent, nonprofit, public service institution which conducts research and analysis on problems of national security and domestic affairs, and doctoral degree programs in several fields of public policy. He served in that capacity until May 1989, resigning to accept appointment by President Bush as secretary of the Air Force.

Dr. Rice held many other significant posts both in at out of government service. Included are Member, National Science Board, 1974-86; Chairman, National Commission on Supplies & Shortages, 1975-77; Director, Defense Resource Management Study, 1977-79; Member, Independent Bomber Force Review Commission, 1997; Member, Panel to Review Long Range Air Power, 1998; Member, U.S. Commission on National Security/21st Century, 1999-2001.

Dear Foundation Members and Friends:

Your Foundation wishes you the very best as we enter this holiday season. We entered 2016 with the optimism of new possibilities. With our improved investment portfolio now working for us, we are addressing the necessary long-range planning to protect and enhance our future. The Board of Directors that was seated in June broke into two committees, one focusing on our strategic vision and value proposition, and the other aiming at the elements necessary to execute and administer that vision. These committees are doing the hard work to carry us forward on a sound and sustainable path.

The health of our Foundation can be measured in terms of its membership. Our membership remains steady, and is intensely loyal and supportive. However, as our membership ages we must offset normal declines with new members if we are to remain viable. This is a daunting task, as it is universally recognized that younger folks do not tend to join organizations like ours. Early on the Board recognized that we must improve our outreach efforts if we hope to increase membership. Accordingly, a major focus this year has been to promote our Foundation's message in a variety of ways.



For the past ten years, it has been our practice to conduct, often on a single day, the presentation of our major awards—The Spaatz, Holley, and Doolittle Awards—followed by an awards banquet. Accordingly, the Board decided to increase exposure and expand our audience by splitting the events into three separate components. The first this year was the Doolittle Award presentation, held on September 27th, which is covered in depth elsewhere in this issue. By all accounts it was a resounding success: well attended by our members and veterans of the honored 100th Air Refueling Wing, and well supported by our corporate partners.

Recognizing that the Foundation may have become a bit too “Washington centric,” the Foundation went “on the road” to the United States Air Force Academy on November 3rd for the year's second event, presentation of the Spaatz award to Dr. Donald B. Rice, 17th Secretary of the Air Force. The newly opened Center for Character and Leadership Development provided the fitting venue for showcasing our Foundation and demonstrate our support of Air Force values and its future officers.

The third event of the year, presentation of the Holley and major writing awards, will return to the DC area at a date to be determined. We will again change up our format to either a late PM “beer call” or a luncheon, depending on the schedule of our keynote speaker. By refocusing our awards programs, we hope to attract more interest in our mission of knowing the past to shape the future.

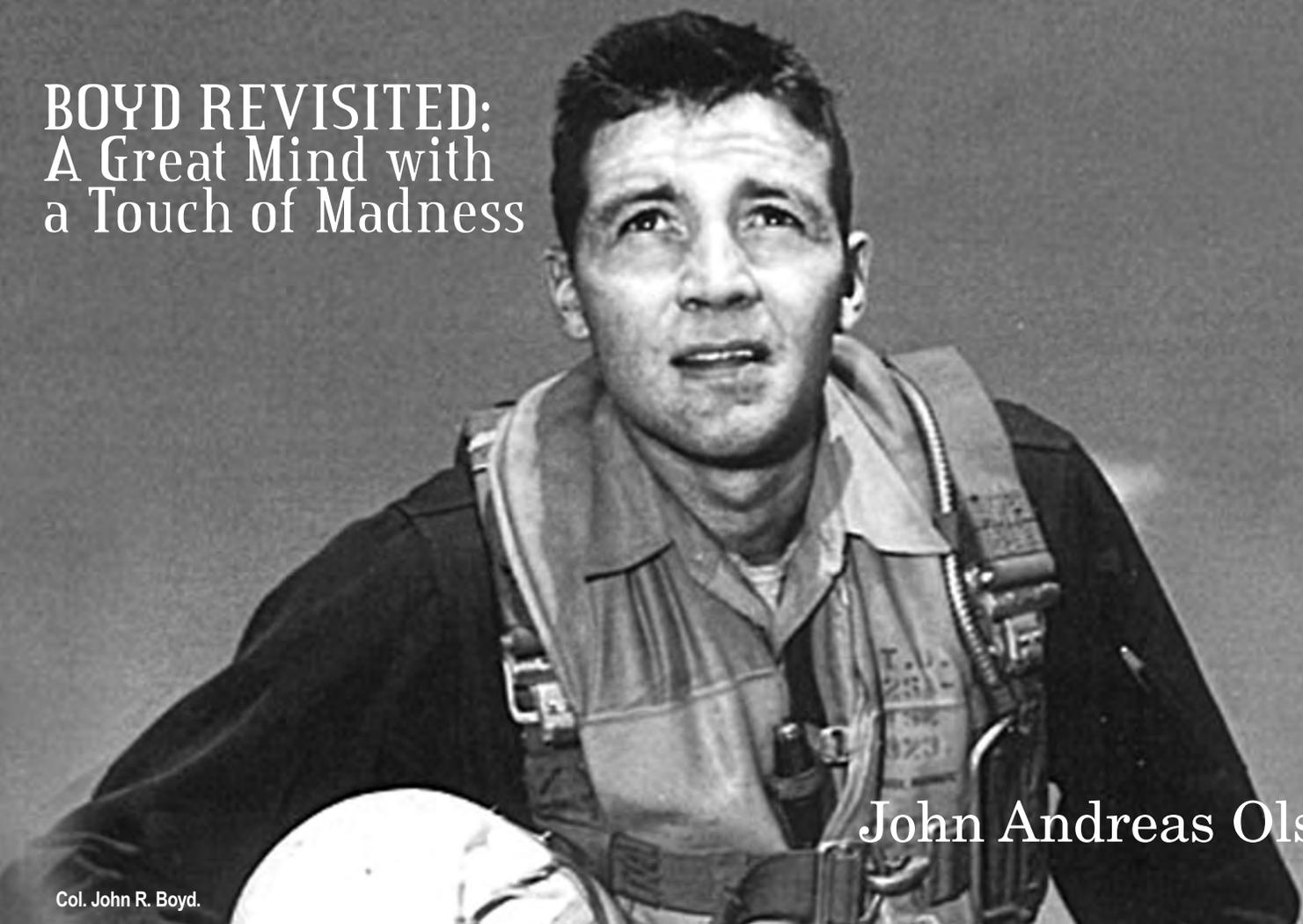
Finally, our social media programs, which are more attractive to younger membership candidates, are steadily growing stronger. Many of you receive our daily “This Day in Air Force History” emails, and our response to this effort has been very positive. To spread that effort a bit further, our daily vignettes are re-broadcast via Face Book and Twitter which opens our exposure an audience at least three times beyond just our email format. It is encouraging to see the many conversations that develop from the image and caption we deliver. We are enhancing our reputation as the reliable source for accurate and accessible history of the United States Air Force.

As always, let me thank you for the part that each of you played in the history and legacy of *Air Power*, and for your support. It makes our role that much easier, knowing you stand behind us. This is your Foundation. We need to hear your comments and suggestions as we continue to grow in the coming New Year. “Come up on voice”—ANYTIME!

A handwritten signature in black ink that reads "Dale W. Meyerrose". The signature is written in a cursive style and is positioned above a horizontal line.

Dale W. Meyerrose, Maj Gen, USAF (Ret)
President and Chairman of the Board

BOYD REVISITED: A Great Mind with a Touch of Madness



John Andreas Olsen

Col. John R. Boyd.

Colonel John R. Boyd (1927–1997) never wrote a substantial text on strategy.¹ He developed prodigious multiple-slide briefings and produced a few papers, but he never published anything formally. He was a gifted fighter pilot, but he never held a senior leadership position in the United States Air Force. He had little respect for the military chain of command and struggled to find a superior he admired. Most people who met Boyd felt uncomfortable in his company: he could be arrogant, loud, disrespectful, and single-minded to the point of obsession. He was an abrasive and uncompromising maverick who was intolerant of anyone who disagreed with him. He had the table manners of a five-year-old. Allegedly, he had an IQ of only ninety, which he claimed was an advantage because it forced him to be more efficient.²

Boyd lacked academic credentials; he was mainly self-taught and never obtained a postgraduate degree. He did most of his reading after he retired from the military. He could not afford to buy many of the books he read, instead surfing through bookstores and libraries, but he still insisted on sharing his ideas free of charge. His infamous 327-slide super-briefing, *Discourse on Winning and Losing*,³ took two or three days to deliver. He would give the presentation to anyone who would set aside sufficient time to listen, but he steadfastly refused to reduce to a more accessible length for busy senior audiences, on the avowed premise that if they did not have the time for it, he did not have the time for them. He was known as well for long late-night telephone calls to his closest friends, whom he subjected to an exhausting intellectual waterboarding. He lived like a Spartan, believed that “money corrupts,” and died a poor man, wondering if anyone would remember him.

Yet, despite all his idiosyncrasies and pathologies, many professional analysts rank the autodidact Boyd among the twentieth century’s most impressive general theorists of strategy. Professor Colin Gray, for example, includes him in his list of leading military thinkers among the likes of Bernard Brodie, Edward Luttwak, Basil Liddell Hart, Herman Kahn, and John Wylie.⁴ Boyd certainly was not “the most influential military theorist since Sun Tzu” or “the fighter pilot who changed the art of war,” but his *Discourse on Winning and Losing* is a universal theory of conflict filled with historical details, collected military wisdom, and insightful advice on how to reason strategically.

Creating the Legend: Books on Boyd

Four books help explain Boyd’s ideas and his watershed concept, the OODA (Observe-Orient-Decide-Act) Loop. Professor Grant T. Hammond’s *The Mind of War: John Boyd and American Security* (2001), the first book-length examination

of Boyd's military career and theories,⁵ explores the origins and evolution of Boyd's tactical, operational, and strategic thinking, and the significance and legacy of his ideas. It also links Boyd's theories to those of other military thinkers. By doing so, he offers considerable insight into the man and his times, combining studious breadth, depth, and context. Primarily an intellectual biography, *The Mind of War* also explains why some considered Boyd "Christ-like" while others viewed him as a "24-karat pain in the ass."

Although Boyd did not focus on business per se, he showed an interest in management theory

Robert Coram's *Boyd: The Fighter Pilot Who Changed the Art of War* (2002) takes a less scholarly and more personal approach.⁶ The book presents stories of Boyd's eccentricity, intellect, and moral courage; portraying him as a man who never played by the rules and who broke step and rank as he pleased. It tells the story of how he evolved from the reputed "40-Second Boyd" to the Mad Major, to the Ghetto Colonel, to Genghis John. It reads like a novel and has no footnotes. It also goes into detail about Boyd's private life and family issues, making no attempt to disguise the negative aspects—some of them so embarrassing that the author chose not to include them in the book.⁷ Coram offers a readable, colorful, and dramatic report, casting Boyd as a larger-than-life heroic figure at war with the Pentagon and subject to a series of conspiracies. Because of these qualities, Coram's book was a bestseller, but the author has also been criticized for overstating Boyd's

John Andreas Olsen is an active-serving colonel in the Royal Norwegian Air Force, currently assigned to London as defense attaché to the United Kingdom and Ireland. He is also a visiting professor at the Swedish Defence University and a non-resident senior fellow of the Mitchell Institute. His previous assignments include tours as director of security analyses in the Norwegian Ministry of Defence, deputy commander and chief of the NATO Advisory Team at NATO Headquarters Sarajevo, dean of the Norwegian Defence University College, and head of its division for strategic studies. Olsen is a graduate of the German Command and Staff College and has served both as liaison officer to the German Operational Command in Potsdam and as military assistant to the Norwegian Embassy in Berlin. He has a doctorate in history and international relations from De Montfort University, a master's degree in contemporary literature from the University of Warwick, and a master's degree in English from the University of Trondheim. Professor Olsen has published a series of books, including Strategic Air Power in Desert Storm (2003), John Warden and the Renaissance of American Air Power (2007), A History of Air Warfare (2010), Global Air Power (2011), Air Commanders (2012), European Air Power (2014), and Airpower Reborn (2015).

achievements and influence to the point of having written a hagiography. One reviewer found the book contained too many "inconsistencies, inaccuracies, leaps of faith, lack of sources, and cheap shots" to merit credibility.⁸

Although Boyd did not focus on business per se, he showed an interest in management theory, especially in themes such as competition, organizational survival, and adaptability. He wanted to prove that his Big Idea had universal applicability and therefore offered both encouragement and counsel when Chester W. Richards began work in the 1990s on what became *Certain to Win: The Strategy of John Boyd, Applied to Business* (2004)—a relatively short book that highlights the relevance of Boyd's philosophy to the entrepreneurial world. As a result, Richards, who came to know Boyd in the 1970s, contributed to Boyd's becoming known well beyond military circles.⁹

Air Commodore Professor Frans Osinga's *Science, Strategy and War: The Strategic Theory of John Boyd* (2007) contains the most systematic, detailed, and insightful treatment of Boyd's strategic reasoning and inter-disciplinary reading.¹⁰ Osinga focuses on the theories and theorists who influenced Boyd, and thus ranges widely over such topics as political science, epistemology, mathematics, sociology, psychology, physics, biology, neurology, computing, cosmology, economics, management theory and more. He notes that Boyd was the first to link Gödel's incompleteness theorem, Heisenberg's uncertainty principle, and the Second Law of entropy, using the seemingly unrelated fields of mathematical logic, physics, and thermodynamics to develop a comprehensive theory of conflict. Osinga explains what that means and demonstrates through his critical examination that Boyd's vision was far more comprehensive than most people recognize:

Boyd's work constitutes an eclectic search for patterns of winning and losing through a survey of military history; an argument against techno-fetishism and an attritionist, deterministic military mindset; a rediscovery of the mental/moral dimensions of war; a philosophy of command and control; a redefinition of strategy; a search for the essence of strategic interaction; a plea for organizational learning and adaptability; and, finally, an argument on thinking strategically.¹¹

Collectively, Coram, Hammond, Richards, and Osinga have made Boyd's strategic thinking accessible to military professionals and the public.¹² Their work provides a much-needed reader's guide to Boyd's puzzling slides and way of thinking, primarily because he struggled mightily to express precisely what point he wanted to make. The sheer scope and scale of Boyd's undisciplined, certainly unconstrained, sampling of many centuries and contexts also had the effect of numbing an audience intellectually,¹³ as illustrated by the 327-slide briefing, which would have benefited from careful and systematic editing.

Ultimately, Boyd's generic and conceptual outlook constitutes both the strength and the weakness of his thinking: his theories have impressive latitude and stand the test of time, but military planners understandably have

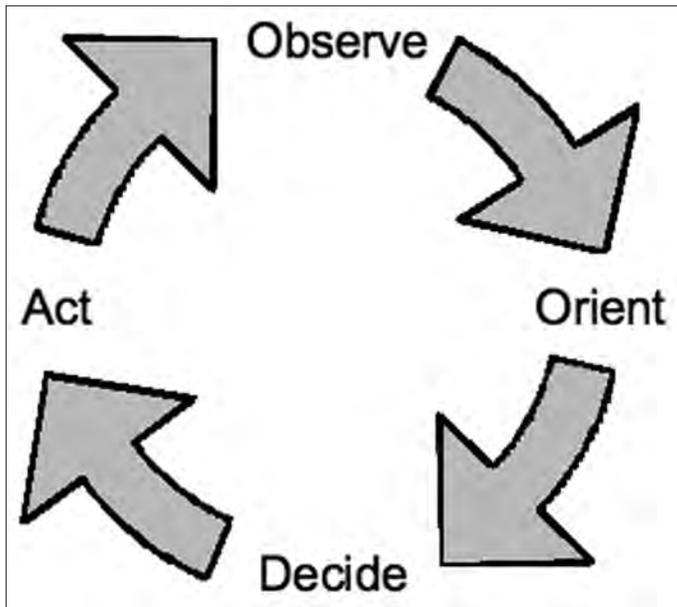


Figure 1: The Simple OODA Loop.

difficulty in translating what amounts to a series of elusive thoughts into practical actions. To put it another way, Boyd's theorems are so inclusive, yet so abstract, that they transcend time, place, and topic, but they are not ready-made for implementation.

The OODA Loop

Any appreciation of Boyd's strategic thought must start with the OODA Loop, which largely represents a grand extrapolation from his air-to-air combat experience in Korea. Although the Soviet-built MiG-15 enjoyed some performance advantages over the F-86, the latter's hydraulically boosted flight controls and better field of view from the cockpit gave *Sabre* pilots the critical ability to shift more rapidly from one maneuver profile to another during a dogfight. Because of the F-86's capacity for so-

called "asymmetric fast transient" maneuvers, its pilots accumulated an impressive kill ratio against the otherwise formidable MiG-15.¹⁴ Boyd codified this combat lesson in a tactical manual titled "Aerial Attack Study."

A few years later he quantified the ideas contained in the manual into his "Energy Maneuverability Theory" study, which compared US and Soviet flight performance envelopes at different speeds, altitudes, and gravity-forces. The study's findings, incidentally, became critical inputs into the design of the F-15 *Eagle* and F-16 *Fighting Falcon*. The Military Reform Movement, a diverse group of controversial and persistent civilians and ex-military members determined to change the attrition-centered doctrine that had governed the Vietnam War, used the OODA Loop as their common point of departure when they sought to revitalize maneuver warfare in the 1980s.¹⁵ Some of them referred to Boyd as their "spiritual leader."

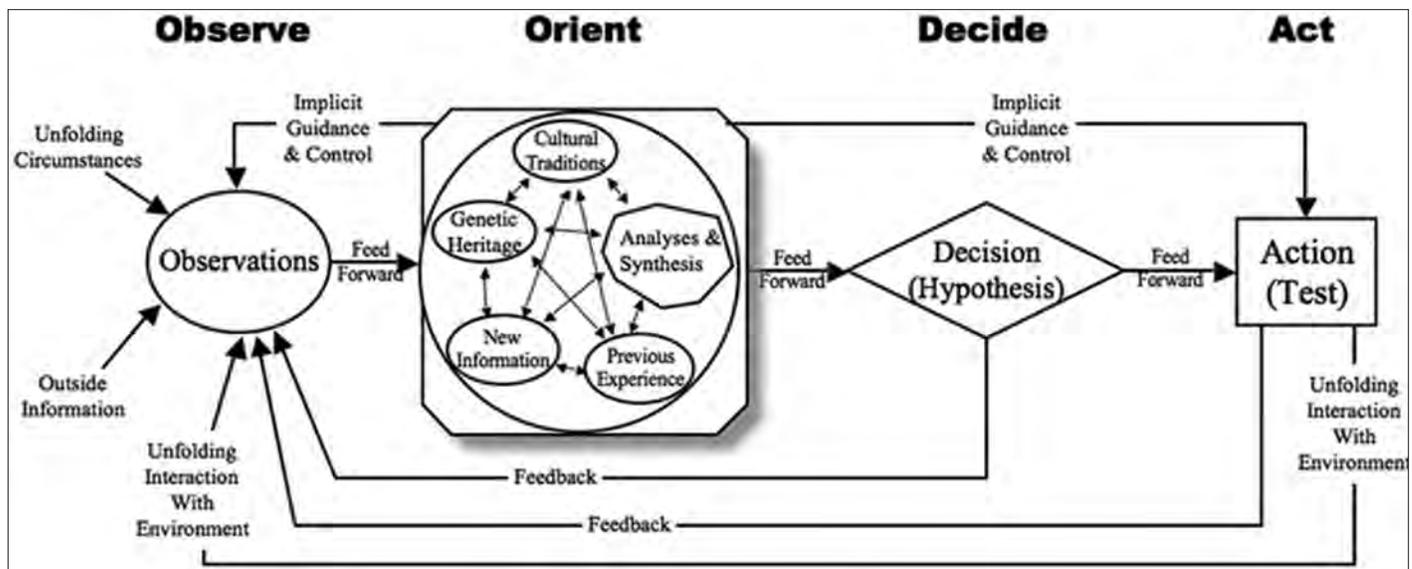
Although Boyd's strategic thinking encompasses far more than the OODA Loop, the cycle does indeed lie at the heart of his deliberations. However, the student of warfare must realize that Boyd himself never drew the "dumbed-down" version depicted in Figure 1, although it is this simplified model that has made him famous outside military circles. A narrow and shallow interpretation of the abridged model is also the usual basis for criticism of Boyd, reducing the model to a contest in which success comes simply from going through the OODA cycle "more rapidly than the opponent."¹⁶

In fact, Boyd did not see the observation-orientation-decision-action cycle as a series of simple, sequential, and repetitive acts, but as an interactive and ever-changing process. To understand the OODA Loop's extensive applicability, one must appreciate the "real OODA Loop" (Figure 2), with its focus on complexities, unpredictability, uncertainties, non-linearities, and intangibles.

Professor Hammond explains the OODA Loop:¹⁷

It is the basis for everything in Boyd's thinking and a metaphor for life itself. It is an extended biological metaphor

Figure 2: The Real OODA Loop.



for stimulus and response and a diagram for the way the mind works. It is an organic model, not a mechanistic one. Observation is really “sensing” but the acronym thus produced—SODA—did not pass the giggle test so Boyd used observation instead. And, for fighter pilots in early air-to-air engagements, “first sight wins the fight” was gospel. But successful use of the OODA Loop is a complex process. Observation entails the sensing of external information and the unfolding of circumstances. It is an assessment of our environment, our place in it, and the interaction of the two. It begins a process of scanning for danger, an adversary, and threats to us. It provides a base from which to proceed and feeds forward into the second part of the process, orientation.

Orientation, what Boyd called the big “O,” is the central part of the process. It is an amalgam of our genetic heritage, culture, education, experiences, and our analysis and synthesis—literally how and why we think as we do. This informs our action, which is a test of our hypothesis (decision). It may be correct or it may fail. But because of the series of forward and backward feedback loops, and the implicit guidance and control we can exert, we are able to revise and repeat the process continuously. Our insights condition our actions or reactions to the environment and events in it. These also are critical to understanding an opponent. It is a complex set of filters and inputs that leads us toward decisions. Orientation involves trade-off thinking to make selective judgments and projection into some future state of affairs and its consequences.

Based on this, we make a decision—a choice about how best to proceed to interact effectively with our environment. This choice, our decision, is the hypothesis to be tested. The test is the action we have selected and its implementation. We constantly monitor the success or failure of the action taken in an effort to comprehend, shape, adapt to and in turn, be shaped by the environment. As Boyd described it, it is a circular process with constant feedback and feed-forward channels and implicit guidance and control to help us cope with a constantly evolving, open-ended, far from equilibrium process of self-organization, emergence and natural selection.

The OODA Loop is thus an analytical and synthetic tool to deal with our environment and a strategic theory of how to do so. It is simple, elegant and comprehensive, able to describe, explain and predict. It is in essence, a depiction of life itself. Regrettably, its reduction and misunderstanding by many have demeaned the significance and utility of the concept.

The OODA Loop suggests a model for decision making and adaptive cognitive processes. Gaining knowledge of the strategic environment is the first priority, which includes recognizing the importance of ambiguity, cultural tradition, and genetic heritage. Indeed, for Boyd, cultural anthropology and ethnography became just as important as military intelligence; the former offered a psychological order of battle. Boyd’s magnum opus briefing, *Discourse on Winning and Losing*, emphasizes that the failure to assess accurately the strategic environment in which one operates

causes most defeats. “Orientation” is the central element of strategic thinking. The “real” OODA Loop thus emerges as an encompassing framework for strategy, in no small part informed by Neo-Darwinism and complexity theory, but as noted before, Boyd’s military thinking flowed from his fighter pilot experience. And there is the rub.

His grand theorizing, though replete with historical details intended to facilitate understanding, failed to extricate fully its DNA markers from the tactical level of warfare.¹⁸ Or, as Colin Gray puts it, Boyd “moved too easily from the tactical up the hierarchy of levels, through the operational, military strategic, grand strategic, and even beyond, apparently without understanding properly that strategy and its politics are radically different in their nature from tactics.”¹⁹ This criticism ties into Boyd’s strong emphasis on speed and tempo; at the tactical level they are all-important and key to success, but at the grand strategic level patience may indeed be a virtue.²⁰

Boyd and Warden: A Revealing Comparison

In reflecting on the fundamental tenets and utility of Boyd’s main ideas and their applicability to strategy and operational art today, twenty years after his death, it is instructive to compare, contrast, and reconcile Boyd’s theoretical approach with that of John A. Warden III, another radical and outspoken thinker from the United States Air Force whose ideas have had an impact on contemporary warfare. Warden developed the concepts underlying the strategy executed in Operation Desert Storm.²¹

The OODA Loop suggests a model for decision making and adaptive cognitive processes

Although Boyd and Warden knew about each other, neither man was terribly impressed by the other.²² They both challenged orthodoxy, but they would have lacked personal chemistry and their intellects would not have been compatible. Thus, they could not have collaborated effectively; opposites do not always attract. Personalities aside, Boyd and Warden offer two distinct approaches to the study of war: Warden’s practical, focused on the physical realm, Boyd’s more philosophical, tuned towards the moral and mental aspects of warfare. The concepts developed by both men remain broadly relevant and can inform future military thinking, especially when the best qualities of each are combined in a theory for achieving systemic paralysis of the adversary. In the words of David S. Fadok, the first to make such an assessment, “John Boyd and John Warden are twin sons of different mothers.”²³

A Strategy for the Future: Systemic Paralysis

The concept of systemic paralysis represents strategy in its ideal form. Every action should contribute to achieving the desired outcome as quickly and effectively as possible. This effects-based theory signifies the deliberate matching

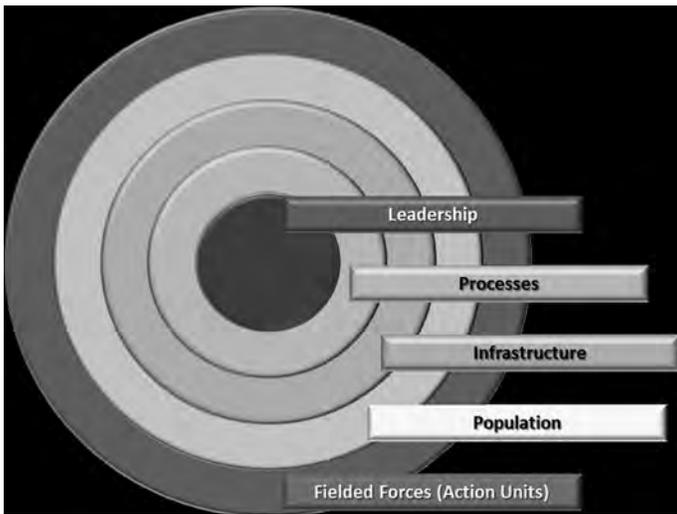


Figure 3: The Five Rings Model.

of ends (objectives), ways (strategy), and means (capabilities) with the overall purpose of convincing or forcing the opposing leadership to capitulate or yield adequate concessions. The nonlethal intent of incapacitation challenges the old notions of attrition and annihilation of ground forces, and instead focuses on defeating the enemy by immobilizing his war-making and war-sustaining systems. The concept aims at organizational collapse through rapid and concurrent degradation of the opponent's entire system. The plan of attack combines decision making, operational tempo, and firepower, all directed against the opponent's centers of gravity. How a campaign accomplishes this depends on the situation, but the criteria for success usually include minimum costs in terms of casualties and treasure, minimum damage to the environment and infrastructure, and an end-state acceptable to most parties involved.²⁴

Systemic paralysis transcends the purely military sphere by considering the adversary as a multidimensional system. Actions focus on the opponent's leadership, decision-making processes, and mechanisms of command, control, management, and communication. In essence, this approach identifies and exploits critical vulnerabilities and key linkages near-simultaneously, rather than seeking to engage the enemy sequentially in a set-piece strategy fixated on combating military forces. To elaborate further, systemic paralysis temporarily neutralizes the adversary's key functions, breaks the adversary's cohesion, disrupts the adversary's adaptability, and deprives the adversary of the capacity for timely reorientation. Disrupting an opponent's decision-making calculus renders the opponent increasingly deaf, dumb, and blind, and incapable of organized and effective collective action. Unable to keep pace with the tempo of events, the adversary's decisions and actions become random and strategically irrelevant.

Boyd contributes to this strategic concept with his emphasis on, knowledge of, and insights into "sensing" and "situational awareness." His methodology is process oriented because he focuses on actions that lead to mental and psychological incapacitation. To Boyd, war is competition: a duel, a confrontation between two or more complex

systems in which organizational and individual adaptability is central to survival. Boyd was greatly inspired and influenced by the Chinese concept of *cheng/ch'i*, "creation and destruction," and concluded that the four most important parameters in a strategy are variety, rapidity, harmony, and initiative. Boyd sought to "destroy" external bonds in order to "create" mismatches between the opponent's perception of the situation and the reality, believing that this mental disconnect would in turn lead to the collapse of the enemy's will to resist.

Boyd further explored the concept that success could be achieved by means other than kinetic force: that the real target was the enemy's will to start, continue, and endure a fight. He ultimately sought to impair and erode the opponent's ability to function as an effective contestant rather than to disable the opponent physically. He considered progressive psychological effects critical: the possibility of defeating an opponent by leaving it confused, disoriented, and disintegrated, caught by surprise rather than diminished as a result of heavy casualties. His theories emphasize the cognitive and moral spheres of conflict and ultimately amount to a doctrine for teaching scholar-warriors how to *think*. Orientation is the intellectual core of Boyd's strategic reasoning, while time is the key to its application.

The OODA Loop, like most theories, has shortcomings and must be applied with caution, but it has great utility when viewed in the context of Boyd's overall theorizing, and not least when combined with an alternative approach to warfare.²⁵ In contrast to Boyd's process-oriented approach, Warden's methodology is form-oriented in the sense that his objective is physical incapacitation of the enemy regime: the outcome does not depend on the enemy's inability to think or react. Then and now, Warden emphasizes the material and spatial sphere of conflict. He argues that precision-guided munitions have revolutionized warfare by replacing the old notion of mass, and suggests that a relatively small offensive force can prosecute a large number of targets simultaneously and precisely, generating a disproportionate impact. Warden's foundational conceptual framework is the Five Rings Model, presented in Figure 3.

The OODA Loop, like most theories, has shortcomings and must be applied with caution

Target analysis is critical to Warden's concept.²⁶ The five concentric rings (leadership, processes, infrastructure, population, and fielded forces) capture a strategic approach that devotes considerable attention to target selection, classification, prioritization, and execution. According to Warden, most socio-economic systems have all five rings, or centers of gravity, and the most effective strategy consists of attacking the entire system concurrently. He advocates simultaneous, inside-out strikes against the five centers of gravity, with steadfast emphasis on the leadership, the bull's-eye. His strategy sets out to neutralize the tangible resources that enable the enemy to resist, depriving the adversary of key war-making and war-sustaining tools.

Warden teaches scholar-warriors how to *act*: to master the principles of war. He speaks of parallel or concurrent warfare to distinguish it from gradual, incremental, or sequential warfare, and emphasizes degradation of the entire enemy's system, with the objective of bringing about strategic collapse.

Warden's approach moves from theory to practical action, but is somewhat more prescriptive than heuristic; while Boyd offers a general mindset Warden suggests a specific target set. Warden is willing to dictate a way forward; Boyd was very reluctant to give operational details. While Boyd sees the enemy system as open and adaptive, Warden seeks to force it to behave as a closed system that cannot respond effectively. Warden seeks to overcome variables and uncertainties, while Boyd highlights their importance to making the right decisions. Both share the perception that time is of the essence: the keys to delivering the knockout blow are tempo and precision, creating instantaneous impact on key nodes in the system.

Warden has always believed in the ability of high technology to improve weapon quality

While Boyd seeks to coerce the enemy psychologically, to convince the enemy that its best option would be to modify unacceptable behavior, Warden argues in favor of rapidly compelling the opponent to change its actions. Both focus on the disruption of the enemy's leadership, but Boyd attempts to influence the leaders' reasoning processes, thereby forcing mistakes, where Warden emphasizes using force to break the tangible connections between the leaders and the levers of power they wish to employ. Unlike Boyd's coercive theory, Warden's denial strategy is concrete.

Warden has always believed in the ability of high technology to improve weapon quality, whereas Boyd was at times skeptical of technological innovations, often arguing in favor of low-technology solutions. Even so, both men's theories center on leadership: Boyd's seeks to disrupt and disorient the decision-making process itself, while Warden prefers to take out the leaders' command and control facilities. While Boyd focuses on fog, friction, and chaos as fundamental characteristics of war, Warden suggests a solution to minimize the impact of such intangibles through instant and overwhelming pressure. Boyd seeks to shatter cohesion from within, "folding an opponent back inside himself," and creating a sort of implosion through menace, uncertainty, and mistrust. By contrast, Warden offers a targeting scheme for physical explosion and is critical of any offering that borders on "mysticism."

In reality, an effective strategy must combine the two strands to create the maximum possible leverage: physical "inside-out warfare" (impose defeat on the enemy), mental "getting inside the enemy's head" (make the enemy defeat himself), and moral stamina to complete the task. Although one theorist emphasizes "explosion" and the other "implosion," both seek to make the enemy collapse as a re-

sult of pressure, whether external or internal. In essence, Boyd's process-oriented theories constitute an essential ingredient of the concept of systemic incapacitation through psychological and temporal paralysis. When joined with Warden's form-oriented theories that aim at systemic incapacitation through physical and spatial paralysis, a new comprehensive approach emerges: one that takes both the intangible and tangible aspects of contemporary warfare into account.

Warden's methodological approach bears a strong resemblance to that of Antoine-Henri Jomini, who spoke and wrote the language of neoclassical rationalism better than most. Jomini was committed to simplification, prescriptions, and checklists; he sought to produce practical guides to the conduct of war rather than abstract analyses of its nature and to reduce the complexity of warfare to a small number of crucial factors. Like Jomini, Warden uses deductive Newtonian reasoning to search for enduring and eternal "truths." Warden and Jomini are thus "linear" in their analyses, pursuing a certain causality or predictability in warfare. Their belief in recipes for success stands in sharp contrast to the intensely subjective approaches that characterized the works of Boyd and, long before him, Carl von Clausewitz, both of whom insisted on war's nonlinearity and complexity. Although Boyd liked to criticize Clausewitz's *On War*, he followed in the Prussian's footsteps more than he would admit. As Peter Faber points out:²⁷

For Clausewitz, reading On War was analogous to turning a prism. He figuratively wanted you to turn his thoughts in your hand – obsessively and frequently – in order to see the "colors" of war from multiple angles, and by doing so start to acquire a sense of war's inner truth... That On War thus ended up being a "maddening maze" of caveats and qualifications was not beside the point – it was the point. The same restlessness held true for Boyd. He left disparate theoretical "breadcrumbs" in his wake and he did so because he also subscribed to a prismatic approach to thinking about war.

At the macro-level Boyd offers a general way of thinking that is at times heuristic, esoteric, and prism-like, while Warden prescribes concrete formulas for action, including identifying specific target sets, and principles which can be scientifically derived and universally applied. Boyd warned against "the single truth." Both approaches have shortcomings, but when integrated and adapted to the situation at hand, their theories create a comprehensive conceptual framework for imposing systemic paralysis through strategic effects on the enemy. Boyd's intangible and elusive OODA Loop theory of conflict complements Warden's theory of strategic attack against the Five Rings. Fadok concludes:

Whereas Boyd speaks of operating at a faster tempo or rhythm than one's opponent, Warden describes the strategic and operational advantages inherent in high-technology "hyperwar." Whereas Boyd talks of creating a highly fluid and menacing environment to which the enemy cannot

Warden's Five Rings Model

Closed and interdependent system
Pre-defined centers of gravity
Capabilities (system “explosion”)
Form-oriented (tangibles)
Physical and spatial deprivation
Compel opponent (deny functions)
Parallel attack and inside-out warfare
High-technology proponent (quality)
Deductive, deterministic and linear
How to act (prescriptive)
Principles of war (specific target-set)
Jominian practical approach to war

Boyd's OODA Loop

Open, complex and adaptive system
Non-cooperative centers of gravity
Will and morale (system “implosion”)
Process-oriented (intangibles)
Psychological and temporal disorientation
Coerce opponent (offer choice)
Fast transient maneuvers
High-technology critic (quantity)
Inductive, open-ended and non-linear
How to think (heuristic)
Philosophies of war (general mindset)
Clausewitzian esoteric approach to war

Table 1: Warden Boyd Model.

adapt, Warden advocates parallel attack against the enemy's key operational and strategic nodes. And, whereas Boyd focuses on disputing the enemy's command and control (C²) process via operation within the OODA loop, Warden concentrates on disrupting the enemy's C² form via attack upon an interdependent system of Five Rings with leadership at its center.²⁸

This allows strategists to concentrate on “the enemy as a system,” focusing attention on its regime, leadership, and command-and-control apparatus—a construct in which the decision-making entity represents both the cause of the conflict and the source of any sustainable solution. Acknowledging the danger for misinterpretation and polarization, Table 1 offers twelve contrasting views of Warden and Boyd to frame comparisons.

Expanding and continuously updating the Boyd Warden model could offer a new starting point for those in pursuit of modern-day victory.²⁹ The synthesis of Boyd and Warden can also prove instructive in the context of operational art; the theory and practice of planning, leading, and executing campaigns.

Operational Art and Creative Thinking

Operational art links strategy and tactics; it lies at the heart of the military profession itself. Because the tactical framework is too narrow and the strategic perspective too broad to ensure the most effective employment of military power, this third component of military art occupies an intermediate position between policy and strategy on the one hand and tactics on the other. Operational art consists of orchestrating tactical actions within a larger design that contributes to the objectives set by strategy. It embraces a commander's ability to take a complex and often unstructured problem and provide sufficient clarity and logic to enable detailed planning and practical orders. It helps the military services move beyond their tactical-technological

focus and better connect operations to the political endgame.

Despite all the detailed literature and combat-proven importance of operational art, too many theoreticians and practitioners give it short shrift. Combining key aspects found in the theories of Boyd and Warden contributes not only to filling the gap, but also to revitalizing the significance of operational art by presenting insights into the three major components of operational thought: the conceptual (mind), physical (body), and moral (soul).

Boyd's and Warden's primary contributions to strategic theory, military doctrine, and ultimately operational art lie beyond the specifics of their teachings; it is one of attitude, the way they suggest that we approach the subject of war. They inject creativity and imagination into strategy, they challenge dogma and orthodoxy, and they offer perceptual thinking, examining possibilities rather than merely probabilities.

The Warden-Boyd construct adheres to the dictum, often attributed to Albert Einstein, that “education is not the learning of facts, but the training of the mind to think.” Both Warden and Boyd instinctively adopted alternative approaches to thinking: they explored new possibilities, viewed events from a fresh perspective, and sought increased understanding of phenomena through cross-disciplinary studies. They were driven by intellectual curiosity and impatience with established boundaries. Both men had the determination, commitment, and personal courage to confront prevailing beliefs and doctrines, providing impetus for new military thinking in the United States and elsewhere despite vocal and forceful opposition. Further, both were intellectual leaders who inspired others to follow in their footsteps.

The military, more than most organizations, follows the old school of established thought, emphasizing truth, logic, and argument at the expense of imagination, intuition, and innovation, focusing on “what is” rather than “what can be.”³⁰ The Western military education system generally em-



Col. John R. Boyd.

phasizes and rewards left-brain functions, and is less concerned with the equally important right-brain qualities. To improve our understanding of the military profession it is necessary to master both sides. Modern strategic thought and military doctrine must combine science and art. To overcome inadequate and static contemporary thinking we must transcend standard patterns of logic. Military leaders must encourage soldiers, sailors, and airmen to “think outside the box,” to take creative thinking seriously, devote time to it, and exercise it: to “think about how we think.” Importantly, “creative thinking” is a skill that can be exercised and developed.

Boyd in Perspective

Scholar-warriors should pay close attention to operational art to improve planning for future conflicts. All should go through the continuous process of learning, unlearning, and relearning to improve our patterns of thought and action to avoid dogma. The future strategists should use elements of Boyd’s insights to explore new options, to investigate alternative avenues of strategic thinking. He or she should focus on the future, heeding his advice: “Don’t be a member of Clausewitz’s school because a lot has happened since 1832.” The true art of strategic thinking lies in acknowledging and understanding the “classics,” and then adding that comprehension to other approaches to establish conceptual advances that challenge current ways of thinking.

Since his death in 1997, Boyd has at times been presented in legendary terms, according him a status grossly

out of proportion to his actual achievements. This occurred partly because his dedicated followers, the so-called “acolytes,” did everything they could to ensure his legacy.³¹ Boyd was a colorful and unorthodox person. He has influenced contemporary strategic thought, but his contributions must be viewed in perspective.

For example, to state that Boyd was “the best fighter pilot in America” is unreasonable. He was called “40-Second Boyd” because as an instructor at the Fighter Weapons School he claimed he could defeat any “opponent” in simulated air-to-air combat in less than 40 seconds. According to General Charles A Horner, air commander of Operation Desert Storm, “Boyd had one tactic where he would flat plane his F-100 and cause the pilot in his F-100 to overshoot. Not a good tactic in real combat where it would park you and you would become a sitting duck for another enemy jet.”³² Boyd’s “Aerial Attack Study” contributed to the manual for air tactics, but it is an exaggeration to claim that Boyd “changed the way every air force in the world flies and fights.” Boyd was no doubt pioneering in developing the “Energy Maneuverability Theory,” and his findings were important input for the “Fighter Mafia” when they contributed to the development and design of the F-15 and F-16, but to describe him as “the father” of these aircraft is an exaggeration; in fact, he opposed some of the features that became their hallmarks of success.³³

[Boyd] has influenced contemporary strategic thought, but his contributions must be viewed in perspective

After retirement Boyd made key contributions to the Military Reform Movement and its focus on maneuver warfare, but it is misleading to say that “his ideas led to America’s swift and decisive victory in the Gulf War.”³⁴ In assessing the speed and scale of that victory, it is important to grasp that coalition accomplishments were, in large measure, made possible by the 38-day comprehensive air offensive that preceded the 4-day ground campaign. The fighting on the ground unfolded without the fluctuating fortunes that normally mark military campaigns, not because of Boyd’s contribution to maneuver warfare, but because the air operations, with more than 1,800 combat aircraft in action, roughly 110,000 sorties recorded, and more than 90,000 tons of aerial ordnance delivered, decided the outcome of the battle well before the ground offensive began. Moreover, there is no evidence that he was influential in designing the “left hook” into Iraq. To refer to him as “the most influential military thinker since Sun Tzu wrote *The Art of War* 2,400 years ago” is preposterous. Professor Lawrence Freedman offers a perceptive conclusion:

The lasting importance of Boyd’s work lay in the focus on disrupting the enemy’s decision-making, encouraging uncertainty and confusion. Under his influence, established notions of command and control were amended to take account of how information was collected, interpreted, and



F-100.

then communicated. By the time he died in 1997, the revolution in information and communication technologies was well underway. Boyd had set the terms for its military exploitation.³⁵

Some of the key literature on information warfare, network-centric warfare, and command and control frequently refer to the OODA Loop. Boyd's strategic concepts and mindset also made important contributions to operational art and creative thinking. Boyd offers an important corrective to mainstream thinking. It is the task of today's scholar-warriors to make the most of his ideas by rediscovering, repackaging, and updating his work from time to time. The armed services would also do well to heed his advice that the military establishment needs to promote thinkers and warriors, not bureaucrats and careerists.³⁶

Conclusion

Finally, much has been written about Boyd's eccentric personality. Hammond sums it up neatly and accurately: "Boyd was both brilliant and a misfit who was his own

worst enemy."³⁷ He always considered himself an outsider, an underdog: it is quite astonishing that he attained colonel rank. He would probably not have reached that rank had he been a member of any other military service: all too often he circumvented the chain of command and disobeyed orders.

What can be said with certainty is that Boyd was an original, with all the advantages and drawbacks that originality implies. Some view "genius" and "madness" as opposites on a straight line; in reality, however, they have significant elements in common. Both geniuses and madmen think idiosyncratically, challenge convention, and act as they choose rather than as society and bureaucracy dictate. Thus, the line separating them actually bends, bringing the two ends toward each other to the point where they almost meet and become one. The person who operates in this twilight zone cannot always differentiate good ideas from delusions. One is reminded of Aristotle's comment: "No great mind has ever existed without a touch of madness." As for John Boyd, the maverick fighter pilot turned strategic thinker: his like does not often appear; luckily his mindset lives on.³⁸ ■

NOTES

1. John Richard Boyd was born January 23, 1927, in Erie, Pennsylvania. He served as an enlisted man in the Army Air Corps from 1945 to 1947 and as an officer in the United States Air Force from July 8, 1951, to August 31, 1975. He died of cancer March 9, 1997, in West Palm Beach, Florida, and is buried in Arlington National Cemetery (Section 60, gravesite 3,660).
2. For a brief introduction to Boyd and the statement on IQ, see Franklin C. Spinney, "Genghis John," *Proceedings* (July 1997): pp. 42-47. The Intelligence Quotient (IQ) is an attempt to measure a person's mental agility in which a score around 100 is "average."
3. John Boyd's slides and point-papers are available at <http://dnipogo.org/john-r-boyd>, accessed July 5, 2016. The U.S. Ma-

rine Corps houses all of John Boyd's books and papers in its Archives at the Research Center at Quantico.

4. Colin S. Gray, *Modern Strategy* (Oxford: Oxford University Press, 1999), pp. 90-91; *Airpower for Strategic Effect* (Maxwell AFB, Alabama: Air University Press, 2012), p. 206; and correspondence with author May 10, 2015.
5. Grant T. Hammond, *The Mind of War: John Boyd and American Security* (Washington D.C.: Smithsonian, 2001).
6. Robert Coram, *Boyd: The Fighter Pilot Who Changed the Art of War* (New York: Little, Brown and Company, 2002).
7. Coram, "Interview (Boyd: The Fighter Pilot Who Changed the Art of War)," *Span video*, retrieved November 29, 2012.

8. See for example David Mets, "Boydmania," *Air and Space Power Journal*, vol. 18, no. 3 (Fall 2004), pp. 98-108; and Richard P. Hallion's book review in *RUSI Journal*, vol. 148, no. 3 (June 2003), pp. 104-6. The quote is from C. R. Anderegg, comments on Coram's book passed to Richard P. Hallion, May 12, 2003, and shared with the author July 24, 2016.
9. Chet Richards, *Certain to Win: The Strategy of John Boyd, Applied to Business* (Bloomington, IN: Xlibris, Corp, 2004). For a condensed version, see "Boyd's OODA Loop (It's Not What You Think)," March 21, 2012, www.jvminc.com/boydsrealooda_loop.pdf, accessed July 20, 2015.
10. Frans P. B. Osinga, *Science, Strategy and War: The Strategic Theory of John Boyd* (London: Routledge, 2007).
11. Frans Osinga, "The Enemy as a Complex Adaptive System: John Boyd and Airpower in the Postmodern Era," in John Andreas Olsen (ed.), *Airpower Reborn: The Strategic Concepts of John Warden and John Boyd* (Annapolis, Maryland: Naval Institute Press, 2015), p. 92.
12. Both Hammond and Osinga offer shorter versions of their book-length treatments. Hammond, "From Air Power to Err Power: John Boyd and Operational Awareness," in Peter W. Gray and Sebastian Cox, *Air Leadership: Theory and Practice* (London: The Stationary Office, 2002), pp. 107-128; and "On the Making of History: John Boyd and American Security," *The Harmon Lecture, 2012*, US Air Force Academy, downloaded from www.usafa.edu/df/dfh/docs/Harmon54.pdf, accessed July 8, 2016. Osinga, "The Enemy as a Complex Adaptive System," pp. 48-92; and "Getting' a Discourse on Winning and Losing: A Primer on Boyd's Theory of Intellectual Evolution," *Contemporary Security Policy* 34, no 3 (December 2013).
13. Colin S. Gray, correspondence with author, May 10, 2015.
14. Most sources refer to the kill-rate as 10:1, but the USAF claim is contested by for example Xiaoming Zhang, who suggests that the rate may have been as low as 2:1. See *Red Wings over the Yalu: China, the Soviet Union, and the Air War in Korea* (Austin: Texas A&M University, 2003), pp. 202-203.
15. William S. Lind, *Maneuver Warfare Handbook* (Boulder: Westview Press, 1985); *FMFM-1 Warfighting* (Washington D.C.: U.S. Marine Corps, 1989); and William S. Lind et al., "The Changing Face of War: Into the Fourth Generation," *Marine Corps Gazette* (October 1989): pp. 22-26. For a critique, see Antulio J. Echevarria II, *Fourth-Generation War and Other Myths* (U.S. Army War College: Strategic Studies Institute, 2005).
16. Osinga, *Science, Strategy and War*, 6; and "The Enemy as a Complex Adaptive System," pp. 49-51 and pp. 191-192.
17. Hammond, "On the Making of History," pp. 8-10.
18. Colin S. Gray, correspondence with author, May 10, 2015.
19. *Ibid.*
20. See Tom Hughes, "The Cult of the Quick," *Aerospace Power Journal*, vol. XV, no. 4. (Winter 2001), pp. 57-68; James Hasik, "Beyond the Briefing: Theoretical and Practical Problems in the Works and Legacy of John Boyd," *Contemporary Security Policy*, vol. 34, no. 3 (December 2013), pp. 583-599; and Jim Storr, "Neither Art nor Science—Towards a Discipline of Warfare," *Royal United Institute Journal*, vol. 146, no. 2 (April 2001), pp. 39-45. Osinga counters these points in *Science, Strategy and War*. He also argues that Boyd had a much more nuanced perception of speed than critics warrant.
21. For more on Warden, see John Andreas Olsen, *John Warden and the Renaissance of American Air Power* (Potomac Books: Washington D.C., 2007). For details on the origins of "Instant Thunder," see Richard T. Reynolds, *Heart of the Storm: The Genesis of the Air Campaign against Iraq* (Air University Press: Maxwell Air Force Base, 1995).
22. Warden knew of Boyd through his work on the Energy Maneuverability Theory and the Military Reform Movement. Warden does not believe that the OODA Loop is an accurate or useful description of how decision making works. John A. Warden, correspondence with author, July 29, 2016.
23. For an excellent comparison of Warden and Boyd and the notion of strategic paralysis, see David S. Fadok, "John Boyd and John Warden: Airpower's Quest for Strategic Paralysis," in Phillip S. Meilinger, *The Paths of Haven: The Evolution of Airpower Theory* (Maxwell Air Force Base, Alabama: Air University, 1997), pp. 357-398. Lt. Gen. Fadok presented his original thesis with the same title when he was a major at the School of Advanced Airpower Studies in 1995. The quotation is from his original thesis, page 37. Fadok retired January 1, 2015 as Commander and President of the Air University. Another first-class comparison between Boyd and Warden is Alan Stephens' "Strategic Paralysis: Strategy as an Idea" in Alan Stephens and Nicola Baker, *Making Sense of War: Strategy for the 21st Century* (Cambridge: Cambridge University Press, 2006), pp. 134-165.
24. Stephens, "Strategic Paralysis," p. 134.
25. Boyd has influenced U.S. Army and U.S. Marine Corps doctrine: he contributed to the rediscovery of maneuver warfare, resulting in the AirLand Battle Doctrine, presented in 1983 and refined in 1986. John Warden's book, *The Air Campaign*, completed in 1986, was an alternative to the ground-centric AirLand Battle Doctrine. In *The Air Campaign* Warden connects air power doctrine to the operational level of war; he introduces the concept "air campaign," he focuses on the importance of air superiority, offers a linkage between ends, ways, and means, and makes the case for how air power can play a leading as well as supporting role in warfare. Warden proposed an alternative to air power only being there "to support the ground commander's scheme of maneuver." John A. Warden III, *The Air Campaign: Planning for Combat*, (Washington D.C.: National Defense University, 1988). After the Gulf War of 1991, the book became standard text at most air force academies in NATO.
26. For more depth, see John A. Warden III, "The Enemy as a System," *Airpower Journal IX* (September 1995), and a further update in "Smart Strategy, Smart Airpower," in Olsen, *Airpower Reborn*, pp. 93-127.
27. Peter R. Faber, "Carl von Clausewitz and John Boyd: A Provisional Comparison," unpublished manuscript, sent to author May 30, 2016.
28. Fadok, "John Boyd and John Warden," p. 37.
29. Although their strategic thinking is universal, the central characteristics are especially applicable to air power. For further elaboration, see John Andreas Olsen, "The Quest for a New Airpower Strategy," *Air and Space Power Journal*, May-June 2015, pp. 29-41. While Boyd does not offer an air power theory, his thoughts on conflict have significant implications for the employment of air power at all levels of war. For an overview, see Fadok, "John Boyd and John Warden" and for deeper insight into Boyd's relevance to contemporary air power, see Osinga, "The Enemy as a Complex Adaptive System," pp. 80-92.
30. See Edward de Bono, *How to Have a Beautiful Mind* (London: Ebury Press, 2004). Boyd was familiar with de Bono's work.
31. The "Acolytes," Boyd's strongest supporters were: Thomas P. Christie, Pierre M. Sprey, Raymond J. Leopold, Franklin "Chuck" Spinney, James Burton, and Colonel Mike Wyly.
32. General (ret.) Charles A. Horner, correspondence with author, May 4, 2015.
33. The claims quoted in this paragraph can be found in Coram, *Boyd*, pp. 3-10.
34. General Charles C. Krulak, *Inside the Pentagon*, March 23, 1997, p. 5. See also Coram, pp. 420-435.
35. Lawrence Freedman, *Strategy: A History* (Oxford: Oxford University Press, 2013), p. 197.
36. See Boyd's 1991 House Armed Services Committee Testimony <https://www.c-span.org/video/?17753-1/us-military-reform-oper-desert-storm>, April 30, 1991, accessed July 28, 2016.
37. Hammond, "On the Making of History," 7.
38. I am most grateful for input to this essay provided by David A. Deptula, Peter R. Faber, Colin S. Gray, Richard P. Hallion, Benjamin S. Lambeth, Margaret S. MacDonald, Phillip S. Meilinger, Frans Osinga, Richard T. Reynolds, Alan Stephens, Martin van Creveld, and John A. Warden.

Origins of Inertial Navigation



The Air Force B-29 on loan to the MIT Flight Test Center that was used as the Flight Vehicle for FEBE and SPIRE. (Photo courtesy of the MIT Museum.)

Thomas Wildenberg

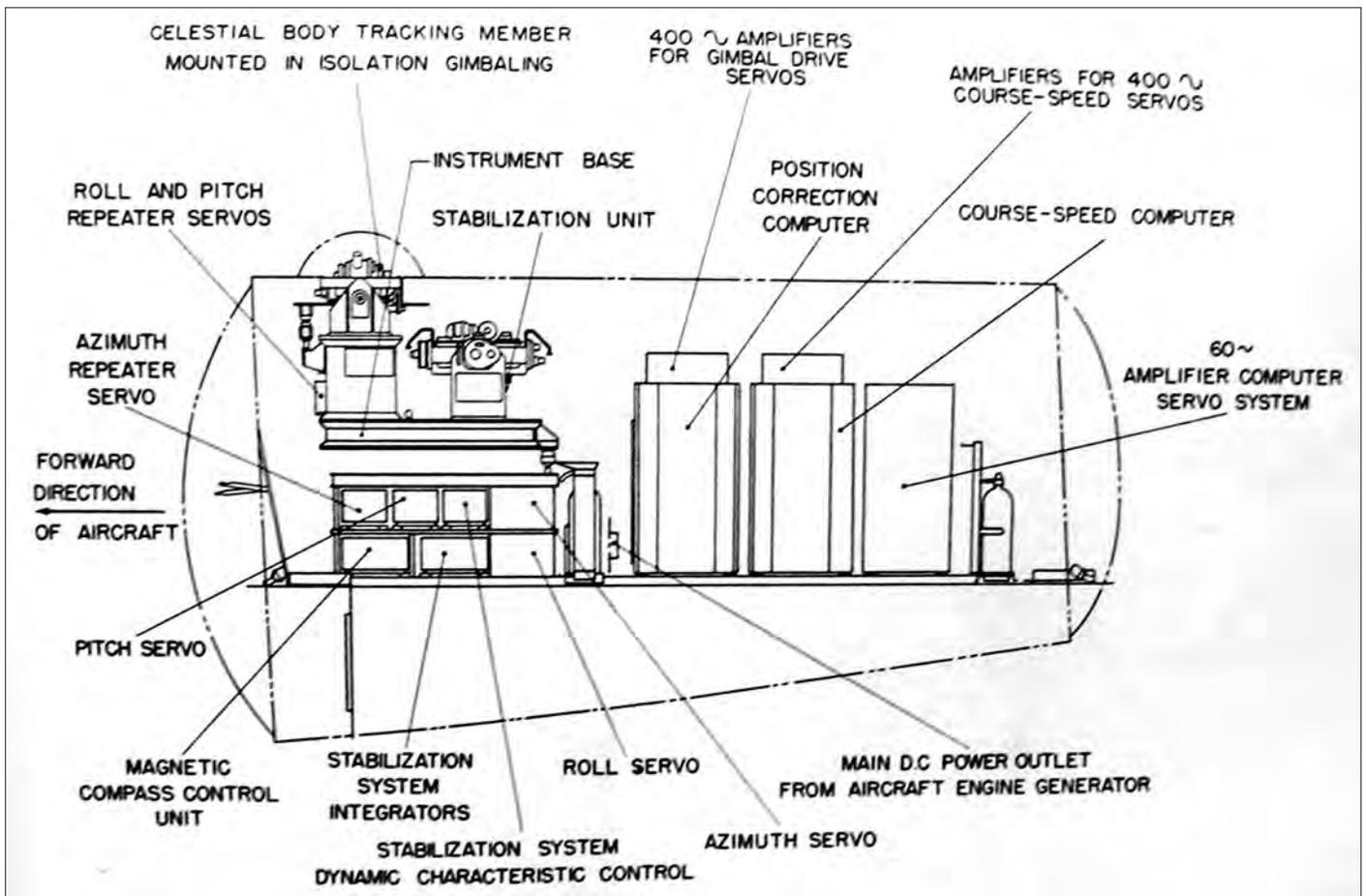
Charles Stark Draper, director of the MIT Instrumentation Laboratory and Col. Leighton (Lee) B. Davis had become good friends while developing the A1 gunsight (see “The A-1C(M) Gunsight: A Case Study of Technological Innovation in the United States Air Force,” *Air Power History*, Vol. 56, No. 2, Summer 2009). They were flying back to Wright Field in mid August 1945 when they received word over the radio that Japan had surrendered ending World War II. What followed led to the development of the first inertial navigation systems.

Draper, who was known as “Doc” to his close friends, fellow professors, and students, was an avid flyer and an expert in aircraft instrumentation. In later years he liked to claim that he got the idea for an inertial navigation system “out of a bottle of whiskey.”¹ It was a story that he told so often that the actual facts became muddled over the course of time.

Inertial navigation had been something that Draper had been thinking about for a long time when he broached the subject to Lee Davis. When they learned about the Japanese surrendered, as Doc was found of telling his son James, Davis reached under the pilot’s seat and pulled out a bottle of scotch.² As they were celebrating the end of the war with Doc’s “soothing syrup,” Davis talked about the rearrangements in spending that would come from the cancellation of weapons that were no longer needed.³ Doc saw an unusual opportunity to gain support for a project that had been in the back of his mind since the early thirties: the development of a self-contained inertial navigation system could provide the pilot with an airplane’s location in bad visibility without the assistance of external instruments.⁴

Doc knew that Davis understood his suggestion because he had devoted a fair amount of his time studying gyro principles while he was a graduate student at MIT. Both men realized that such a system – if it could be developed – would overcome the huge navigation problem experienced by the crews of the Air Forces’s [Ed. note: this refers to the U.S. Army Air Forces, not United States Air Force] long range bombers during the war. The two men discussed the details of just such a system during the remainder of their trip back to Wright Field.

When Doc returned to Cambridge he discussed the idea with key members of his staff. Although the present state of the gyroscopic art precluded their use for inertial navigation, Doc and his colleagues “felt very strongly that self-contained [inertial navigation] systems were possible and that with existing motivation, useful results could be brought to realization in a few years.”⁵ After reviewing the theoretical and technological issues surrounding the project, Doc returned to Wright Field to discuss it with Davis and a small group of engineers from the Armament Laboratory led by John Clemens. As Doc would write in 1969, “With the war just finished, the problems of accurate bomb and rocket deliveries after long flights over unfriendly ground environments were large in the minds of Colonel Davis and his scientists, Dr. John E. Clemens and Dr. Ben Johnson.”⁶ Because gyros drifted over time, a stellar sighting system was added to provide the ac-



Plan view: FEBE System installed in the aft pressurized compartment of a B-29.

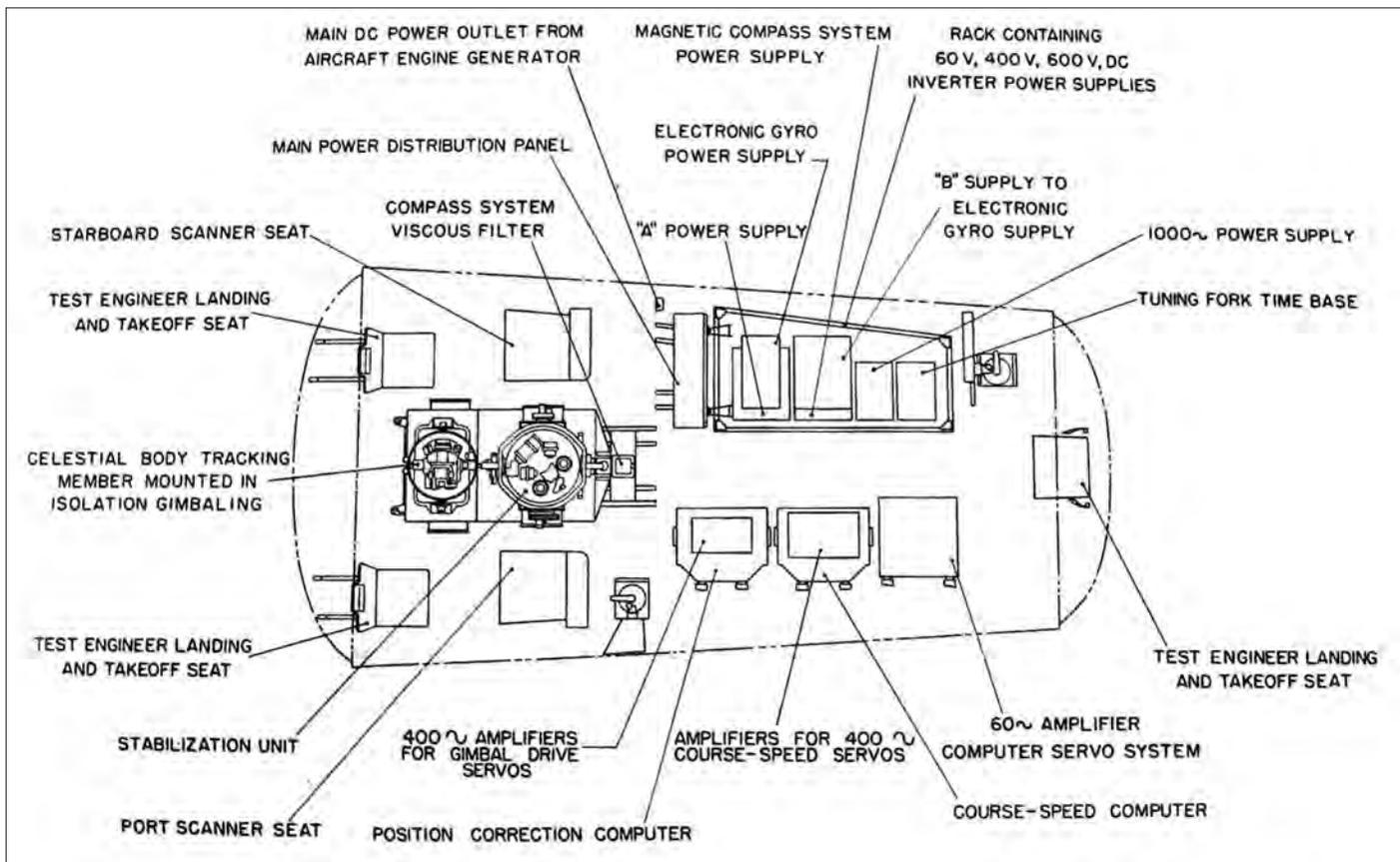
curacy needed for the long duration flights the system was designed to be used for. Once the aircraft achieved cruising altitude, it would lock onto a celestial body and correct any errors in the flight path caused by drifting of the gyros or other factors. Draper regarded the star tracker as a temporary necessity based on the limited accuracy of the gyros then available for aircraft use, but he felt that it was a “messy and inelegant,” approach to the problem.⁷

On August 23, 1945, the Instrumentation Laboratory submitted a proposal to the authorities at Wright Field for a Stellar Bombing System designed primarily for operation in jet propelled aircraft as a bombsight, noting “the possi-

bility of eventually robotizing the system for use with guided missiles”⁸ Draper as Donald MacKenzie noted in *Inventing Accuracy*, was well aware that stellar observations were “subject to interference by weather, aurora, meteors and countermeasures.”⁹ Although Doc would have preferred a closed “black box” solution, he was a pragmatic engineer who understood the severe limitations of the gyroscopes then available.

Less than a month later, the Laboratory received a letter contract to study the possibilities of the inertial navigation system Doc had proposed. To help conduct the study Draper recruited Walter Wrigley, a former doctoral student who had spent the war years working as an R&D project engineer for the Sperry Gyroscope Company.¹⁰ One of the key problems that had to be solved in order to construct a workable inertial guidance system was how to accurately indicate the direction of the vertical (the line running from an aircraft’s center of gravity to the center of the earth) from a rapidly moving vehicle. To many in the scientific community this seemed an impossible task based on Einstein’s general theory that an observer inside a closed box could not distinguish the effects of linear acceleration from the effects of a gravitational field.¹¹ One physics textbook published in 1942 went so far as stating that it was impossible to construct a device “to indicate the true vertical unaffected by accelerations of the airplane when in curved flight.” The authors of this work were unaware, no doubt, of Walter Wrigley’s dissertation.¹² In his doctoral thesis, su-

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Elevation view: FEBE System installed in the aft pressurized compartment of a B-29.

pervised by Draper and submitted on March 9, 1940, Wrigley provided a comprehensive mathematical analysis of the methods available for indicating the direction of the vertical from moving bases.¹³ Wrigley's conclusion that a "damped gyroscopic servo-controlled by a pendulum," offered the most practical solution led the ground work for constructing an inertial navigator adding to Doc's conviction that such systems were now a possibility.¹⁴

The problem Doc now faced was obtaining precision sensors that could produce the accuracy needed

After the Instrumentation Laboratory submitted its initial study of a Stellar Bombing System, the U.S. Air Force, which was established on September 18, 1947, gave the green light to proceed with an experimental program designed to test the possibilities of actually constructing an inertial navigation system.¹⁵ The project was begun on November 21, 1947, under the name of the Stellar Inertial Bombing System (SIBS).¹⁶ It was later changed to FEBE, a variation of the Sun God, Phoebus, in reference to the use of the sun for stellar tracking purposes.

The problem Doc now faced was obtaining precision sensors that could produce the accuracy needed over the five to ten hours that would be required during the long distance flights the system was designed for. Flight tests of an ARMA¹⁷ Stable Element commonly used in U.S. Navy fire control systems to determine the vertical was installed

in an Air Force DC-2 in an attempt to satisfy the Air Force's desire to use existing technology.¹⁸ The equipment, which was large and heavy, proved unsuitable for the task. Doc and his staff at the Instrumentation Laboratory concluded that new sensors would have to be developed without dependence on anything available from existing technology. A rigorous analysis of the use of inertial space references for navigation purposes completed by the Instrumentation Laboratory in February 1947, pointed to the gyroscope, rather than the accelerometer as the key sensor.¹⁹ Their analysis was based on the aircraft bombing mission, an application distinguished by long flight times and a low-acceleration environment in which the heading errors produced by gyroscopic drift was the primary inaccuracy in system.

As Walter Wrigley had suggested, a stable platform indicating the true vertical could be constructed using three servo-controlled, single-degree of freedom gyroscopes. To understand how this works, imagine that the gyros are fixed to a flat board mounted on gimbals so that it is free to move in all directions in such a manner that they detect the motion of the board about its roll, pitch and yaw axes. Suppose this assembly is placed in an aircraft with the board aligned parallel to the horizon so that a perpendicular line through its center establishes the direction of gravity and thus the direction of the vertical. Let's also assume that the gyros are constructed so that their output, as they precess, are proportional to velocity of the change in direction experienced by the gyro rotors due to the forces of acceleration acting on the board as it begins to move through

space. Integrating these signals provides a measure of how much the board has been displaced along each of the three axes of roll, pitch and yaw. These signals can then be sent to small motors attached to the platform's gimbals. When the aircraft's attitude or heading changes, the integrated signals from the gyros will cause the servo motors to move the platform back to its original starting position keeping the board in a horizontal position thereby maintaining a true indication of the vertical.

The second sensor needed was a highly accurate accelerometer. Let's suppose that two of these accelerometers have also been placed on the board perpendicular to one another so that they can measure the acceleration in the north-south and east-west directions. When the signals from these accelerometers are integrated twice ($a = v \quad v = d$) they provide a measure of the distance traveled over an interval of time.

To start the system, the stabilized platform is aligned to the horizontal and positioned so that the sensitive axis of the north-south accelerometer is pointed to the north. The latitude and longitude of the starting point and destination is then set into the system, and the integrators are trimmed to zero. As soon as the aircraft begins its takeoff run, the accelerometers will sense the resulting accelerations providing a measure of how far the aircraft has moved. These distances are then converted into corresponding changes in latitude and longitude and added to the starting point coordinates to show the aircraft's new position.

Several difficult problems had to be overcome before a working unit could be fabricated

Although the concept involved in building an inertial navigation system was now straight forward, several difficult problems had to be overcome before a working unit could be fabricated. The most difficult of these was to develop a set of gyroscopes, accelerometers, and the other components needed for the system that were small enough to fit into an aircraft, yet accurate enough to provide the precision required during the long flight times specified by the Air Force. A separate issue was the need to take into account the effects of gravity as the stable platform moved over the earth's surface so that the platform remained at right angles to the earth's radius.

To compensate for the earth's rotation Wrigley applied Schuler's Principle of an "earth-radius pendulum." Maximilian Schuler was working to improve his cousin's gyrocompass in 1923 when he hypothesized that a solution to the vertical could be achieved if the vehicle traveling over the earth was attached to a pendulum whose center of gravity was at the center of the earth.²⁰ As the vehicle moved, the pendulum would continue to indicate the direction of the vertical.

Of course a pendulum of this size could never be built, but Wrigley realized that the disturbing effects of gravity on the stable platform could be removed by designing into it a simple feedback loop that continuously caused the plat-

form to remain horizontal. "Such a system could be seen as working as if it kept horizontal by an earth-radius pendulum."²¹ In order to work properly, such a feedback system would have the same 84-minute²² natural frequency period of Schuler's pendulum. Thus concept, apparently coined by Wrigley, is named Schuler Tuning.²³

Although several other firms were actively engaged in developing inertial navigation systems for various U. S. Air Force programs, some in the scientific community remained skeptical of this unproven technology.²⁴ George Gamow, a prominent physicist and a member of the Air Force's Scientific Advisory Board (SAB) was highly skeptical of this approach to the guidance problem facing the U. S. military services as they attempted to develop air-breathing intercontinental guided missiles that were capable of attacking the Soviet Union. In February 1948, Gamow, noted for his brilliant mind an ebullient sense of humor, was working on the long-range navigation problem as a consultant to the Johns Hopkins Applied Physics Laboratory (APL).²⁵ On the 13th of that month, a day Gamow referred to as "Black Friday," he issued a scathing memorandum addressed to Ralph E. Gilbert, the newly appointed the director of APL, attacking the concept of an inertial navigation system.²⁶ In his memorandum, titled "Vertical, Vertical, Who's got the Vertical," Gamow argued that the inertial navigation systems then under development by the Instrumentation Laboratory and other contractors working for the Air Force, were impractical because they would have to work flawlessly. These instruments would have to be capable of indicating an aircraft's initial position and velocity with perfect accuracy if such a system was to function as intended. However, an aircraft's position, as he stated in his memorandum, "is completely undetermined, unless its initial position and velocity are known exactly and the integration [of velocity] is carried on faultlessly all the way through." At the time it was written no instrument existed that could satisfy this criteria, but Gamow underestimated the capabilities of Doc's laboratory, which, as we shall see in the pages to come, was able to develop such a device.

But this was not the only criticism leveled by Gamow. Of greater concern was the issue of correcting the errors that would inevitably be introduced by inaccuracies and outside inputs. Doc would address this issue later on, but for the time being Gamow's memo, which was laced with vivid caricatures mocking the current attempts at developing an inertial navigation system, caused quite a row within the inertial navigation community, according to those interviewed by Mackenzie for *Inventing Accuracy*.²⁷ Because Gamow was a member of the Advisory Board's panel on guidance and control, his ideas carried considerable weight and had the potential of catastrophically derailing Doc's program as well as those of his competitors. As Doet and Söderqvist noted in their book on the *Historiography of Contemporary Science*, "The multiplicity of groups working on the [inertial navigation] problem aggravated the task of responding to Gamow's criticism," which became essential if Draper and the other contractors expected the Air Force to continue funding the development of this yet to be proven technology.



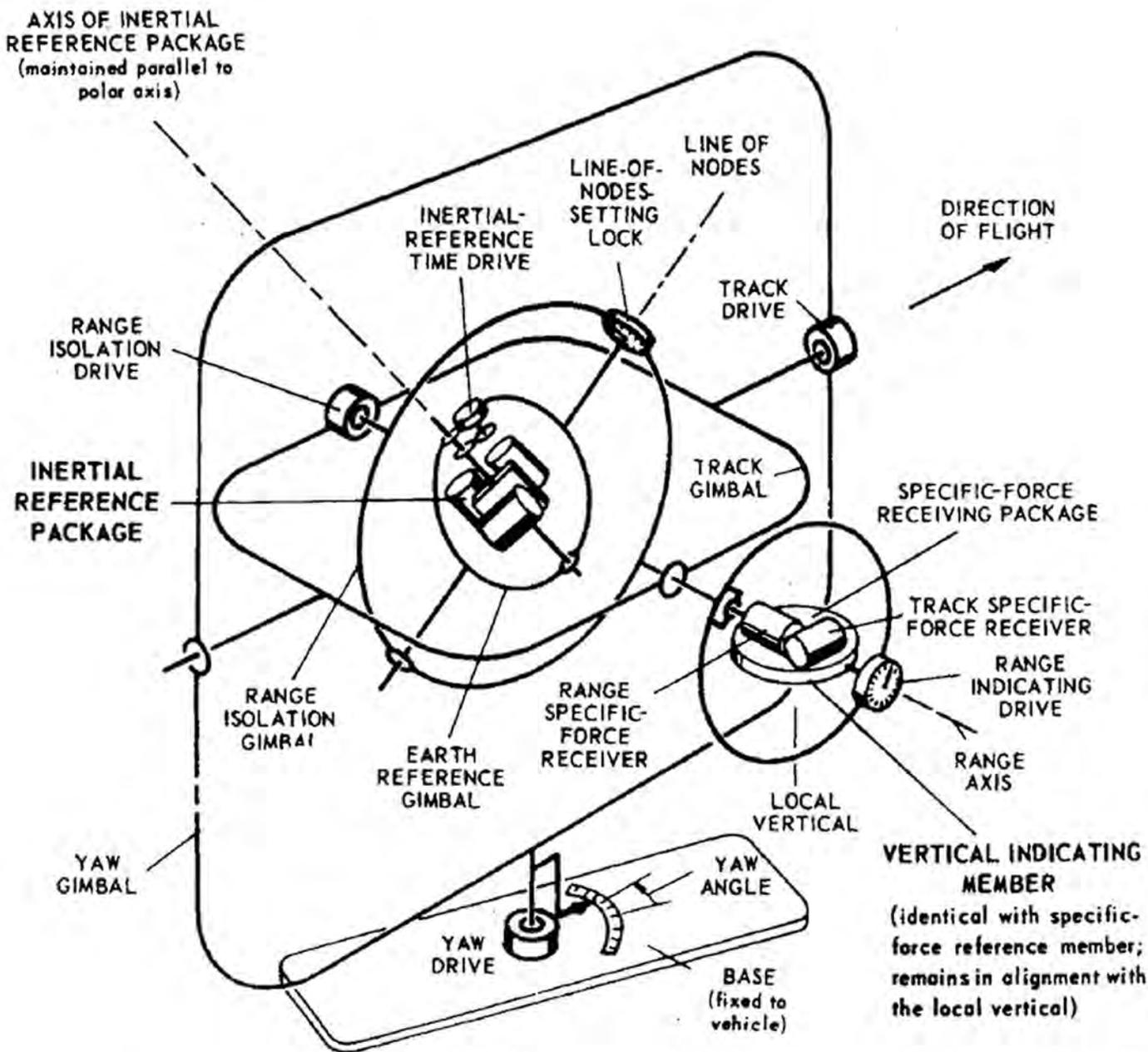
Charles Stark "Doc" Draper (left) tours Wernher Von Braun through the MIT Instrumentation Lab during a March 1964 NASA VIP visit.

What transpired during the next twelve months, as far as I can determine, does not show up in the historical record. Although Draper was not a member of the SAB Guidance and Control Panel and was not mentioned by name in Gamow's memorandum, its content was undoubtedly of great concern. The Armament Laboratory was not a traditional source of research monies for guidance work. The situation facing Draper and Leighton Davis, his patron, was clearly put forth by Michael Dennis: "Few organizations were capable of supporting Doc's research; of others on the funding food chain perceived Draper's research as a technological 'dead end,' then Davis and Draper were in jeopardy."²⁸ Where, when, or if Gamow's memo was circulated or discussed is not known. But Draper, who was member of the SAB's Guided Missile Panel had the connections and political clout to do something about it. Using his contacts within the SAB, he arranged to conduct a classified conference on guidance at MIT in February 1949. The meeting, which was held under the auspices of the SAB, was titled a "Seminar On Automatic Celestial and Inertial Long Range Guidance Systems."²⁹ Although the stated purpose of the meeting was "a means of promoting a wider dissemination of information on the basic theory involved" in the guidance problem, Doc used it as a clever means of refuting Gamow's contemptuous opposition to inertial navigation.³⁰

Doc invited every major firm and component manufacturer working in the field to demonstrate the progress that had been made in the past few years. Although Gamow was also invited, he probably recognized that the "meeting was 'stacked' against him" and decided not to attend.³¹ The instrument errors that Gamow claimed would make inertial navigation unusable could be corrected – according to Draper – by a process he termed "smoothing." As put forth in Doc's opening statement to the scientists who had come to MIT for the seminar on guidance, "the amount of smoothing that can be used is limited by the fact that any increase in smoothing always brings with it an increase in the time required for a system to solve its guidance problem."³² Doc went on to explain the importance of solving the conflict between smoothing and solution time, which would have a prominent place in the papers to be presented.

A separate issue was the need to take into account the affects of gravity as the stable platform moved

This was Doc's hidden agenda for presenting the details of FEBE, the experimental inertial navigation system being assembled by the MIT Instrumentation Laboratory



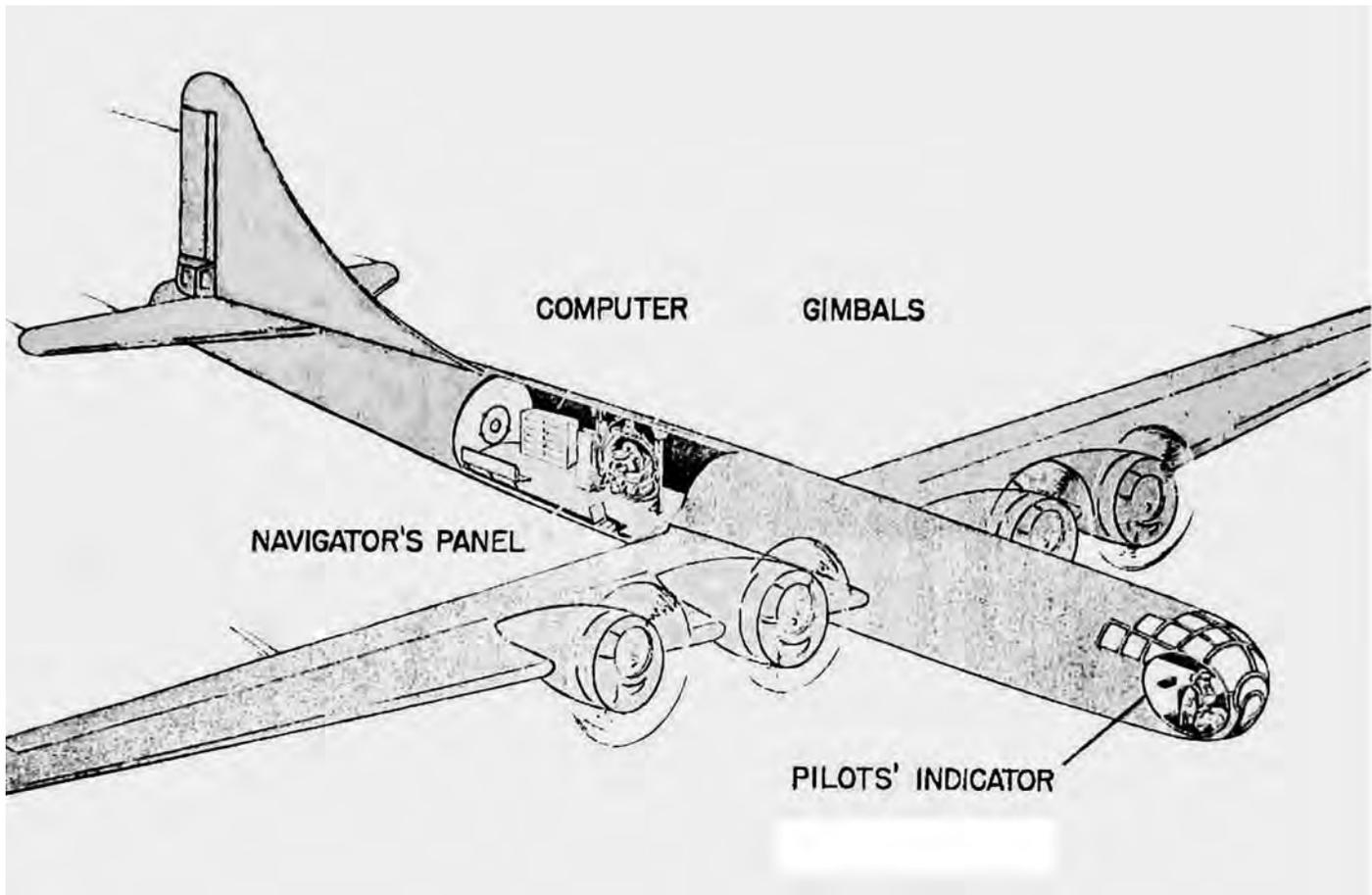
Schematic illustration of the SPIRE inertial navigation system.

under Doc's supervision. Although it had yet to be flown, it was nearing completion and was soon to be tested. Doc staff was responsible for presenting 8 of the 25 sessions conducted during the course of the three-day meeting. This was twice as many as the Lab's nearest competitor: the North American Aviation Company that was working to develop an inertial navigation system for the Navaho intercontinental missile on a another Air Force contract.

FEBE was a demonstration system engineered to validate the design assumptions needed to create a true inertial navigation system – a so called “black box” that would function without any external inputs. It was designed to investigate the dynamics of a closed loop automatic navigation system, study the various instruments and their organization, and to establish a correlation between the

results of flight tests and theory.³³ Although FEBE could operate at night using navigational stars, the sun was selected as the celestial reference so that records of the actual ground track could be more easily made to ascertain the system's accuracy. The sensors used in FEBE were based on Marine gyrocompasses and the gyroscopic elements of Doc's World War II anti-aircraft fire control systems.³⁴

The system, which weighted 4,000 pounds when fully assembled, was installed in a B-29 so that it could be systematically tested in the in 1949. It was flown for the first time on May 5, 1949.³⁵ This “shakedown” flight was followed by nine more experimental flights designed to test the system's accuracy and see how it behaved over long distances. Because of equipment malfunctions on two flights and an abnormally erratic reading on another, only six of



SPIRE components located within the B-29 test vehicle.

the flights produced acceptable results.³⁶ When averaged together they yielded mean error of five nautical miles. Although this made FEBE unsuitable for the bombing mission, the results were encouraging enough that the Air Force issued a follow on project to the Instrumentation Laboratory to design, build and test a navigation and guidance system that would depend only upon the inertial and gravitational inputs. This project was named Space Inertial Reference Equipment (SPIRE).

To construct SPIRE, Doc's team at the MIT Instrument Laboratory designed an inertial platform using three single-degree-of-freedom gyros that the lab had developed for improved accuracy. The system was loaded into a B-29 on loan from the U.S. Air Force on January 23, 1953, and given a one-hour shakedown flight on Friday, February 6.³⁷ Draper was so confident in its success that he secretly planned to demonstrate the system enroute to a top-secret government sponsored symposium on inertial navigation that was scheduled to begin in Los Angeles, California, on Monday, February 9.

The flight was uneventful and the navigation system seemed to be working fine until they reached the Rocky Mountains. Just south of Denver, north of Colorado Springs they climbed to twenty thousand feet to clear the mountains. The weather had been clear until they reached the Rocky Mountains when they ran into dense cloud cover. An hour or two from Denver, Chip suddenly noticed that

that the B-29 was turning to the right about ten to twelve degrees as they encountered some unexpected air turbulence.

"Chipper," Doc exclaimed over the intercom, "what the hell's going on up there?"³⁸

"Doc," Chip replied, "the system is commanding a turn to the right."

Doc and the crew monitoring the system in the back of the plane knew that something was awry because they could see the gimbal turning with respect to the aircraft. But they couldn't see what was happening to the rudder. There was a note of panic over the intercom, but Doc remained calm.

"Let's not do anything," he said. "Let's leave it alone. Let's see what it's going to do."

Unbeknownst to those on board the B-29, they had encountered a weather front and were being blown southward. SPIRE, sensing the wind drift adjusted the rudder so that the aircraft would stay on track. When they broke out of the cloud cover over the San Joaquin Valley they were right on course.

The aiming point for the flight was the intersection of the runways at their planned destination. An indicator light had been installed in the left side of the cockpit to show when they were over the aiming point. When it came on, Chip looked down to see that they were passing over the apron area near the airport's building about eighteen

hundred feet from the aiming point. Although the accuracy was classified at the time, the system error over the 12-hour, 2,600-mile flight (according to Collins) was one one-hundredth of a percent (0.00013). Over the years, Chip's enthusiasm for this accomplishment clouded his memory for the actual error according to the data recording during the flight was nine nautical miles.³⁹ Nevertheless Doc was ecstatic with SPIRE's results, for they demonstrated beyond a shadow of a doubt that a completely self-contained system using sensors that relied solely on inertial principles could be successfully used to navigate long distances.

SPIRE was the forerunner of the modern inertial navigation systems

During their flight across the country Doc and Roger Woodbury plotted the B-29's progress on a long roll of paper, showing the intended course and the actual course using photographs of prominent landmarks taken through

the nose of the B-29 to verify their results.⁴⁰ After landing at 9:28 in the evening Doc and the rest of the SPIRE team stayed up all night putting Lambert conformal maps on the big board behind the seminar podium adding a brightly colored tape showing the exact track the B-29 had followed across the continent.

When the symposium began the next day, Doc was introduced as the first speaker. "Gentlemen," he began, "we have a system that works. We did it."⁴¹ Then, to the astonishment of the other attendees, he went on to describe the historic flight he had just made, "giving credibility to the enormous potential of inertial guidance."⁴²

SPIRE was the forerunner of the modern inertial navigation systems that the aviation community depended upon before the advent of GPS. It also established MIT's Instrumentation Laboratory as the leader in inertial navigation and guidance, forming the foundation for the Laboratory's future development of the guidance systems for the Thor, Polaris, Titan, Poseidon, and Trident ballistic missiles. ■

NOTES

1. Draper Oral History, p. 79.
2. James Draper, interviews with author November 15, 2012.
3. Davis suggested that some funds assigned to purchase bomb shackles might not have to be used. See Draper, "On the Evolution of Accurate Inertial Guidance Instruments," p. 24.
4. Draper, "Remarks on Instrumentation Laboratory," p. 19.
5. Draper, "Origins of Inertial Navigation," p. 455.
6. Draper, "Remarks on Instrumentation Laboratory," p. 19.
7. Mackenzie, "Stellar-Inertial Guidance," p. 196.
8. Ferguson, FEBE entry, CSDL-HC Finding Aid. Note: because this endeavor involved navigation, it did was not assigned to the Armament Laboratory to which Davis was assigned, but to another organization at Wright Field. See Draper, "On the Evolution of Accurate Inertial Guidance Instruments," p. 24.
9. MacKenzie, *Inventing Accuracy*, p. 76. There is no evidence to support McKenzie's suggestion that stellar-inertial navigation was "an added attraction of being, superficially at least ... more familiar to Air Force officers, who were by then well accustomed to the use of star-sightings in navigation." On the contrary both Davis and Clemens were well familiar with Draper's capabilities and would not have felt the need to "guild the Lilly." Besides, a study project with no hardware was not very expensive and would have been a "no brainer," with Davis's approval.
10. Wrigley biography, Massachusetts Institute of Technology, *Instrumentation Laboratory*, Biographies Section, p. 5.
11. See MacKenzie, *Inventing Accuracy*, pp. 66-67.
12. F. K. Richtmyer and E. H. Kennard, *Introduction to Modern Physics*, third edition (New York: McGraw-Hill, 1952), p. 51, as cited by Mackenzie, *Inventing Accuracy*, p. 67.
13. Wrigley, "An Investigation of Methods Available for Indicating the Direction of the Vertical from a Moving Base, Ph.D. Dissertation, MIT, 1940.
14. *Ibid.*, p. 86.
15. Ferguson, FEBE entry, CSDL-HC Finding Aid.
16. Bogsian, "An Experimental Automatic Long Range Guidance System, Project FEBE," Preface, in *Seminar on Automatic Celestial and inertial Long Range Guidance Systems*, Vol. I, p. 141.
17. Arma Engineering Company.
18. Draper, "The Evolution of Aerospace Guidance Technology at the M.I.T. 1935-1951," pp. 232-33.
19. Mackenzie, "Missile Accuracy," p. 201.
20. MacKenzie, *Inventing Accuracy*, p. 76.
21. *Ibid.*, p. 70.
22. If a satellite were circulating the earth every eighty-four minutes, it would have to be at tree-top height.
23. *Ibid.*, see note 121, p. 71.
24. These programs included Northrop's Snark and North America Aviation's Navaho air breathing missiles. Hughes Aircraft was also working on an Air Force contract to develop a celestial navigation and guidance system.
25. Eric Roston in *The Carbon Age*, page 17 characterized George Gamow as "a hard drinking Soviet émigré to the United States with a brilliant mind, [and] an ebullient sense of humor ..."
26. George Gamow to R. E. Gibson, dated Black Friday [February 13?] 1948. Cabinet 5, Drawer 4, File Gamow, Applied Physics Laboratory Archives as cited by Dennis, "A Change of State," pp. 416-18.
27. MacKenzie, *Inventing Accuracy*, footnote 130, p. 75.
28. Dennis, "A Change of State," pp. 419-20.
29. Scientific Advisory Board, Office of the Chief of Staff U.S. Air Force, *Seminar on Automatic Celestial and inertial Long Range Guidance Systems*, Vol. I (hereafter MIT Guidance Seminar), passim.
30. *Ibid.*, p. 2. The politics behind Gamow's memorandum, which is beyond the scope of this monograph, is summarized by Dennis on pages 420-21 of his dissertation.
31. MacKenzie, *Inventing Accuracy*, p. 72.
32. MIT Guidance Seminar, Foreword, p. 2.
33. *Ibid.*, p. 184.
34. Draper, "Origins of Inertial Navigation," p. 457.
35. Ferguson, FEBE entry, CSDL-HC Finding Aid.
36. Draper, "Origins of Inertial Navigation," p. 456.
37. Ferguson, SPIRE entry, "CSDL Historical Collection Projects."
38. *Ibid.*
39. Ferguson, SPIRE entry, "CSDL Historical Collection Projects."
40. "Laboratory Aviator Extraordinaire," *D-notes*, May 20, 1988, p. 3.
41. Chip Collins, interview conducted on October 16, 2012,
42. Morgan, et al. *Draper at 25*, p. 11.

The World War II Training Experiences of the Tuskegee Airmen at Oscoda Army Air Field



David K. Vaughan

Colonel Frederick Kimble reviews the first class of flying cadets at Tuskegee Field early in 1942. Only five of the original thirteen graduated.

Increasing recognition has been deservedly given to the *Tuskegee Airmen*, the black pilots who received their initial training at the Tuskegee Institute during World War II. Although the phrase *Tuskegee Airmen* was not used during the war, it became widely known after it first appeared as the title of Charles Francis' 1955 book about the African-American pilots who flew in the war. These men were named Tuskegee Airmen after the flying field near Tuskegee, Alabama, where one of the first educational institutions intended for blacks had been established after the conclusion of the Civil War. Once approved by the U. S. Government, flight training began at Tuskegee in 1941, and a training program was established that lasted throughout the war. All African-American pilots who flew in World War II learned to fly at the Tuskegee Airfield, and many African-American enlisted men who served in black aviation units were trained there as well. While the term *Tuskegee Airmen* initially referred to only the pilots and other flight crew members, such as navigators and bombardiers, it was soon expanded to include the enlisted men who supported and maintained the aircraft flown by the black airmen.

The first graduates of the Tuskegee flying program formed the core of the 99th Fighter Squadron, which was sent directly to North Africa in April, 1943, after the successful conclusion of Operation Torch, the Allied invasion of North Africa. There the pilots of the 99th refined their flying and gunnery techniques before being assigned to combat duty. The 99th flew in combat in North Africa and the Mediterranean Theater for several months. The next, much larger, group of Tuskegee-trained pilots was assigned to the 332nd Fighter Group, but instead of being sent directly to a combat theater, as the 99th had been, they were sent to airfields in the United States to practice their flying and gunnery skills. The 100th was the first of three squadrons assigned to the 332nd Pursuit Group, all of which were manned by black pilots; the other two squadrons in the group were the 301st and 302nd Fighter Squadrons. In spring 1943, shortly after the 99th Fighter Squadron was dispatched to North Africa, the pilots and ground support men of the 332nd Fighter Group were assigned to Selfridge Field, located twenty miles northeast of Detroit. Soon after their arrival at Selfridge, most of the black pilots and enlisted men were sent to an army airfield farther north, at Oscoda, Michigan, to practice their gunnery and bombing skills and complete their operational training. The training program at Oscoda was conducted from April to December, 1943.

Most historical accounts of the Tuskegee Airmen mention the training conducted at Oscoda briefly, if at all, suggesting that the bulk of training was conducted at Selfridge Field. However, the combat training conducted at Oscoda was extended, intensive, and thorough. The men who trained at Oscoda occupied field facilities for extensive periods of time during their training; they were assigned to the field at Oscoda, they took off from the field at Oscoda, they flew their



The photo that helped to start it all: Eleanor Roosevelt and Chief Anderson in a Piper Cub, April 19, 1941. (All photos courtesy of the author.)

gunnery missions in the local area, and they returned to land at Oscoda. In addition, most of the elements of the 96th Service Group, a support group with units consisting of African-American enlisted men, were assigned to the army flying field at Oscoda for the full nine-month period to provide administrative and maintenance assistance for the men involved in flying operations there.

Most of the men who were sent to Oscoda remained at the field for weeks at a time, the final group of men leaving Michigan in December, 1943, when the three squadrons of the 332nd Fighter Group, the 100th, the 301st, and the 302nd, were deployed to the European war zone. Even though Selfridge Field was the operational center of the units assigned to the Group, and Oscoda was referred to as a “sub-base” of Selfridge during this period, it could be safely said that Oscoda was the real training base for the men of the 332nd Fighter Group, not Selfridge Field. The story of the training of these African-American pilots and their support personnel at Oscoda deserves to be better and more completely known.

Flight Training at Tuskegee

Soon after Congress passed the Selective Service Act of 1940, which was intended to end racial discrimination

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in selection of recruits for the Armed Forces, the War Department announced the establishment of the 99th Pursuit Squadron. The 99th was officially activated at Chanute Field, Illinois, on March 22, 1941, and was intended to consist of African-American pilots and support personnel. Because there were as yet no African-American pilots, the squadron initially consisting of a few white officers and enlisted men. The Army then took steps to establish a flying training program for African-Americans. Six institutions were selected to offer Civilian Pilot Training Programs (CPTP) for African-Americans: Tuskegee Institute, Howard University, West Virginia State College, Delaware State College, North Carolina Agricultural and Technical College, and Hampton Institute.¹ The CPTP was administered by civilians, not military personnel, and its goal was to prepare American men as potential pilots in the military forces, if and when America should be involved in the war. General Hap Arnold initiated the CPTP plan early in 1940, to avoid a shortage of pilots like that which had occurred when America entered World War I. Arnold expected that the European war would eventually involve American military forces, and he did not want the American military to lack qualified aviators when it did.

The 99th was officially activated at Chanute Field, Illinois, on March 22, 1941

Unwilling to integrate black pilot trainees with white trainees, the Army determined to establish a military flight training base at one of the CPTP locations serving black pilots. The decision narrowed to Hampton Roads or Tuskegee. On April 19, 1941, Eleanor Roosevelt, a staunch supporter of equal rights for African-Americans, visited Tuskegee Institute. When she asked “Can negroes really fly airplanes?” she was invited to go for a ride in a Piper J-3 Cub, one of the small training aircraft on the field, flown by a black pilot, Charles “Chief” Anderson. A photo taken at that moment shows a smiling Eleanor Roosevelt sitting in the back of the Piper Cub with Chief Anderson at the controls of the aircraft.²

The first class started flight training at Tuskegee three months later; this class included Benjamin O. Davis, Jr., son of the first black army officer to achieve the rank of general; Davis was the first black aviator to solo an airplane in the military training program at Tuskegee. From that date until March 23, 1946, sixty pilot training classes were conducted at Tuskegee, which graduated nearly 1000 pilots.³ The program at Tuskegee benefitted from the willing participation of the cadre of white officers who conducted the training, foremost among whom was its commanding officer, Colonel Noel Parrish. Many of the men who were part of the first seventeen classes, those who graduated after November, 1942 but prior to August, 1943, became part of the 332nd Fighter Group, and were assigned to one of the three squadrons that that were a part of the 332nd Group, the 100th Fighter Squadron, the 301st Fighter Squadron, and the 302nd Fighter Squadron.



Instructor Robert Long (left) and the five graduates of the first flying class at Tuskegee: George Roberts; Benjamin O. Davis, Jr; Charles Debow; Mac Ross; and Lemuel Custis.

The Development of the 332nd Fighter Group at Tuskegee and its Transfer to Selfridge Field

On October 13, 1941, the Army Air Forces activated the 332nd Pursuit Group. This action occurred six months after the formation of the 99th Pursuit Squadron and two months before the Japanese attack at Pearl Harbor. Its initial commanding officer was Major (later Lieutenant Colonel) Sam Westbrook, a white West Point graduate. However, because all of the first graduating Tuskegee pilots had been assigned to the newly formed 99th Pursuit Squadron, the 332nd remained largely a skeleton unit, with only a few enlisted men placed in the unit for administrative duties. The 100th Pursuit Squadron, the first squadron to be assigned to the 332nd Pursuit Group, was established according to orders issued on December 27, 1941 and February 19, 1942.⁴ (Later in 1942, all Pursuit designations were changed to Fighter designations, and the 332nd became the 332nd Fighter Group and the 100th Pursuit Squadron became the 100th Fighter Squadron.) By the end of December 1942, the manning strength of the 100th Fighter Squadron had increased from one officer and fifteen enlisted white men to 75 officers and 934 enlisted men, of whom the great majority were black.⁵

During 1943 the 332nd Fighter Group and its associated squadrons were transformed from skeleton units to combat-ready units. On January 15, 1943, the emblem of the 332nd Fighter Group was approved. The central image of the unit patch was a black panther breathing fire, a patch design that was generally preferred over the other squadron patch designs. On that date 1st Lt Frederick E. Miles, a non-flying officer, was assigned as commanding officer of the 301st Fighter Squadron, the second fighter squadron assigned to the Group. On January 26, 1st Lt Mac Ross was assigned as commanding officer of the 100th Fighter Squadron, and the 366th and 367th Service Squadrons and the 43rd Medical Support Platoon were as-

signed to the 96th Air Service Group; their tasks were to provide support services for the fighter squadrons of the 332nd Fighter Group.⁶ At this time these units were located at Tuskegee Airfield. The second and third squadrons assigned to the 332nd Fighter Group were the 301st and 302nd Fighter Squadrons. Much later, after the Group was assigned to a combat theater in Europe, the 99th Fighter Squadron officially joined the Group as well.

By the middle of March, 1943, the number of pilots and enlisted men at Tuskegee had grown significantly. The men of the 99th Fighter Squadron had been waiting for further training since they had graduated from their pilot training classes (eleven classes of pilots—75 men—had graduated in the previous twelve months). To help with training, a number of P-40 aircraft had been delivered to the airfield at Tuskegee, where the men who had completed their initial flight training flew them to become familiar with the higher performance fighter aircraft they could expect to fly in combat. The members of the 99th trained in these P-40s, flying them at Tuskegee and, temporarily, at Dale Mabry Airfield, near Tallahassee, Florida, in January. Due to its reluctance to locate African-American military personnel on military fields with white units, the Army Air Force had not identified any other military field to which the African-American airmen could be assigned, and as other pilots continued to graduate and recently trained enlisted men arrived at Tuskegee, the numbers of men soon exceeded the capability of the facilities at Tuskegee to accommodate them. The military authorities had no choice but to send the units to which the men had been assigned to other locations.

As a result, early in April, the 99th Fighter Squadron departed Tuskegee for its new assignment overseas, in French Morocco, where it was eventually attached to the 33rd Fighter Group in the Twelfth Air Force. Because the men in the unit had not been able to complete their combat training in the continental United States, the squadron, under the leadership of Lt Col Benjamin Davis, was directed to conduct its own training in North Africa before being assigned combat missions. To avoid a similar deficiency in training, and to alleviate crowded conditions at Tuskegee, the pilots and enlisted men in the 100th, 301st, and 302nd Fighter Squadrons were sent to Selfridge Field in Michigan.

On October 13, 1941, the Army Air Forces activated the 332nd Pursuit Group

On March 15, 1943, the 403rd Fighter Squadron was activated at Selfridge Field, located northeast of Detroit. This squadron consisted of white personnel and white pilots; the unit was given the task of training the pilots of the 332nd Fighter Group after they arrived at Selfridge Field, and later at Oscoda. The 332nd received a large number of recently trained enlisted maintenance men on March 21, increasing the 332nd personnel strength to such a size that there was no room for the men at Tuskegee, and the sup-



Morse Code training class at Tuskegee Institute, January 22, 1942. Left to right: James B. Knighton, Lee Rayford, C. H. Flowers, Jr., Captain Roy Morse (instructor), Mac Ross, Sherman W. White, and George Knox.

port units began to be transferred to Selfridge Field.⁷ On 26 March 1943, the first members of the ground support units of the 332nd Fighter Group and its three squadrons boarded a train at Tuskegee, which carried the men to Detroit. The pilots assigned to the 332nd Fighter Group flew P-40 aircraft from Tuskegee to Selfridge Field on March 28. On April 4, the men in the units of the 96th Service Group completed their move to Selfridge Field. On April 5 Lieutenant George L. Knox replaced Lieutenant Mac Ross as Commanding Officer of the 100th Fighter Squadron; Mac Ross, a member of the first class to graduate from Tuskegee, was later assigned as Group operations officer.⁸ The last troop train carrying the remaining members of the 332nd arrived at Selfridge on April 12.⁹

Once arrived at Selfridge, the pilots of the 100th Fighter Squadron immediately began to investigate

Once arrived at Selfridge, the pilots of the 100th Fighter Squadron immediately began to investigate their new surroundings from the air, flying their P-40 aircraft low over the city of Detroit, announcing their presence with a display of aerial acrobatics that pleased some citizens and displeased others.¹⁰ They also began to investigate the social life of the black community of Detroit, which was happy to accommodate the arrival of their flying black brothers of the Army Air Forces. However, the atmosphere at Selfridge Field was not as cordial, as the men were denied the use of the white officers' club and were told to modify a utility building for use as their club, an action that did not please the pilots. In addition, the base commander restricted the actions of the men while on base, limiting the facilities they could visit.¹¹

Shortly after their arrival at Selfridge Field, the pilots of the 100th Fighter Squadron were assigned to Oscoda Army Air Field (OAAF) to begin their combat and survival

training. On April 12, 1943, a little over two weeks after the first pilots of the 332nd Fighter Group arrived at Selfridge, and just as the final contingent of ground support personnel arrived at Selfridge, part of the Group moved from Selfridge Field to OAAF. On May 4, 1943, the 403rd Fighter Squadron, the unit designed to provide combat flight instruction to the pilots of the 332nd Group, moved to OAAF, and one day later the 301st Fighter Squadron transferred to the airfield at Oscoda as well. The Headquarters of the Group remained at Selfridge until May 21; it returned to Selfridge on July 9, 1943, when the majority of the pilots in the 100th Fighter Squadron had completed their training. The 302nd Fighter Squadron had insufficient numbers of support personnel, so only the pilots of that unit moved to Oscoda.¹² Thus, by the first week of May, the bulk of the men and aircraft had moved from Selfridge to Oscoda.

On May 5, 1943, approximately two weeks after the first contingent of Tuskegee airmen arrived at Selfridge, a bizarre incident occurred involving the Selfridge Field commander, Colonel William Colman. Colman shot and wounded a black driver who had been dispatched to drive Colman from his office to his quarters. The driver, Private William R. McRae, was wounded when the colonel shot him twice with his pistol. When the incident was first announced in the press, it was perceived as a racially motivated action. Further investigation showed that the accident occurred at night, and in the darkness, the colonel may have thought that he was shooting at his usual driver, a white airman who may have been having an affair with his wife. The colonel was inebriated at the time and later said that he could remember nothing of the incident.¹³ He was subsequently court-martialed and dismissed from the service. McRae, who recovered, was a member of the 44th Base Service Squadron, not a member of the group of Tuskegee airmen, but the incident added to an atmosphere of racial tension at the field and the nearby community. Some thought that the move to Oscoda was made because of the increased racial tensions caused by the Colman shooting, but in fact the move to Oscoda was underway before the incident occurred.

The pilots and support personnel were sent to Oscoda for two reasons. One reason was that there were no gunnery or combat training areas in the Selfridge Field area. The second reason was that the gunnery and bombing ranges at Oscoda had been used by the flying personnel assigned to Selfridge since 1924. The men of the 332nd Fighter Group were sent to Oscoda because that field had always served as the location for gunnery and combat training for all combat units assigned to Selfridge Field, not because of racial unease in the Detroit area.

The Army Air Field at Oscoda

The airfield at Oscoda had first been established in 1924, a year after one of the flying officers assigned to Selfridge Field, Lieutenant Ennis Whitehead (later a general in the Air Force) struck up a friendship with the brother of an Oscoda banker; the men met while fishing on Lake St. Clair, which bordered Selfridge Field on three sides. The



Looking north along Main street, Oscoda, Michigan, early 1940s.

Oscoda man extended an offer to Whitehead to visit Oscoda and fish in the Au Sable River, which flowed into Lake Huron between the villages of Oscoda and Au Sable, and on Van Ettan Lake, a large lake located five miles northwest of Oscoda. Whitehead accepted the offer, and when he visited Oscoda early that summer, he noticed that there was an extended, relatively flat area immediately south of Van Ettan Lake. He reported back to his commanding officer at Selfridge Field, Major Carl Spaatz, later a key general in the air war in Europe during World War II, that he had found a promising location on which he believed a flying field could be established. Spaatz and his second in command, Major Thomas Lanphier, visited Oscoda in July of 1923 and urged the citizens of Oscoda to join in a cooperative effort to make the field suitable for use by the Army Air Service.¹⁴

The local citizens enthusiastically welcomed the idea of building an airfield for the Air Service, as a devastating fire had burned through the adjoining towns of Oscoda and Au Sable in 1911. The fire had effectively destroyed the area businesses and industries (mostly moribund logging efforts) and generally plunged both towns into financially distressed conditions. A group of local citizens raised the necessary money, and the land, forty acres of jackpine-covered land on the south edge of Van Ettan Lake, was cleared. The name given to the field initially was the Loud-Reames Aviation Field in honor of two local fliers, Harold Loud and Walter Reames, who died in separate flying incidents during and after World War I.¹⁵ The field was later re-named Camp Skeel, to commemorate a well-known Selfridge Air Corps pilot, Burt Skeel, who was killed in a Dayton, Ohio, air race in the fall of 1924, and that was the name to which the field was referred until the onset of World War II.

In September, 1923, construction of an aerial gunnery range was begun on the west perimeter of the airfield. The local newspaper reported that "all pilots at Selfridge Field will have gunnery training at Oscoda."¹⁶ In February, 1924, the first effort at flying out of the airfield at Oscoda was

attempted. The airfield at Camp Skeel was used regularly for gunnery practice in the 1920s and 1930s and was used even in the winter months so that Selfridge pilots could practice winter flying techniques, landing on skis on the frozen surface of Van Ettan Lake.

The local citizens enthusiastically welcomed the idea of building an airfield for the Air Service

After September, 1939, when the war in Europe started, the training program at Camp Skeel intensified, as more modern aircraft were brought into the Army Air Corps, and the threat of a potential enemy became more real. Fliers stationed at Selfridge Field increasingly used the Camp Skeel facilities for gunnery practice and cold-weather operations. After the Japanese attack at Pearl Harbor on December 7, 1941, construction efforts at Camp Skeel increased significantly. During the winter of 1941 and 1942, additional facilities were built at Camp Skeel, including two runways, a taxiway, and an apron, all built of soil cement, a mixture of ground soil and cement. Prior to the construction of these runways and taxiway, the landing and taxi area had consisted of bare soil. The old buildings were torn down and more modern buildings were constructed. Additional training began to be conducted at an airfield at Alpena, forty miles farther north, as well.¹⁷

After the attack at Pearl Harbor, a second phase of construction started in July of 1942 and included a sewage disposal plant, water reservoir and water mains, a centralized electrical distribution system, and over sixty operations and support buildings. In addition, the two runways built the previous winter were replaced with three concrete runways and concrete taxiways and parking ramp. On June 19, 1942, operational control of Camp Skeel was given to 3rd Air Force, and in August, 1942 the field was officially renamed Oscoda Army Air Field, a name it held throughout World War II. The mission of the field was to provide



Flight instructor briefing Tuskegee pilots, Oscoda AAF, early May 1943. George Knox, squatting, far right.

operational training, primarily tactical flight training and gunnery practice for units about to be sent to active theaters of war.

A third phase of construction started in December of 1942; in this phase a fire station and utility yard were built and additional hospital and maintenance facilities were added.¹⁸ By the spring of 1943 the field facilities had improved significantly, and it was fully operational and ready to receive its first training units. The first unit to be assigned at Oscoda for wartime training was the 332nd Fighter Group, the first members of which arrived in the middle of April, 1943.

If the black airmen thought that racial attitudes would improve as they were assigned to more northern locations, they were quickly disillusioned. As soon as they learned of the plan to train black airmen at the airfield at Oscoda, the members of the Board of Supervisors of Iosco County (the county in which the villages of Oscoda and Au Sable and the neighboring town of East Tawas were located) dispatched a message to the War Department requesting that the contingent of airmen from the 332nd Fighter Group be transferred away from the air base at Oscoda, because having “Negroes at the base would create social and racial problems in . . . a community where no persons of the Negro race have ever lived, and where there are no facilities for the entertainment of such colored persons.”¹⁹ It seems evident that in its statement that there were “no facilities” for the black airmen that the Board was thinking of facilities separate from those used by the white population.

Michigan Governor Harry Kelly and Senators Homer Ferguson and Arthur Vandenberg all voiced their opposition to the appeal. Governor Kelly stated that he was “not in sympathy” with the request, because it was “definitely contrary to the war effort.” Senator Ferguson said that he was “surprised that the people in Iosco County would think of such a thing,” and Senator Vandenberg, speaking more bluntly, called the people of Iosco County “foolish and unpatriotic,” adding that the request was “disgraceful.”²⁰ The request of the Iosco Board of Supervisors was not ap-

proved; the black airmen stayed, and their training program began.

Coming from the fully segregated South, the Tuskegee Airmen were undoubtedly dismayed, but probably not surprised, to discover that racial prejudice could exist in the far North as well. They had to content themselves with the idea that they had a more important enemy to confront in Europe.

In spite of the formal complaint made by the Iosco County Board of Supervisors, apparently the men were well received by the majority of the local citizens. The 332nd Group correspondent, Sergeant Burt Jackson, writing in the 22 April edition of the *Selfridge Field News*, stated that the men assigned to train at Oscoda “are pleased that the only thing that is frigid is the weather, for the people of the region have been more than hospitable. And more and more of the fellows seem to be singing that popular song, ‘This is Worth Fighting For.’”²¹

Combat Training at Oscoda

Soon after he arrived at Selfridge from Tuskegee, George Watson, one of the black enlisted men in the 366th Service Squadron, which was part of the 96th Service Group, was disappointed to learn that he and his fellow squadronmates would have little time to enjoy the social life in Detroit. Seven days after they arrived at Selfridge, they were directed to move north to Oscoda, to “Indian country,” as Watson called it, as part of the advance party to prepare the field for the intensive training program that would be conducted there for the remainder of the year.²²

Seven days after they arrived at Selfridge, they were directed to move north to Oscoda

Watson and his fellow airmen left Selfridge Field early in the morning of April 12th in a convoy of more than 100 vehicles, carrying members of the 332nd Fighter Group and the 96th Service Group. They stopped at a country road intersection near Bay City for lunch. They arrived in Oscoda later the same day, “cold, tired, and hungry.” Worn after their uncomfortable ride in military trucks, they were provided a warm meal that lifted their spirits a little, and then were “bedded down” in the recently constructed huts. Their first task was to construct a rifle range: they located an appropriate site in the woods on the west side of the field, and, according to Watson’s account, “from morning till night the sharp cries of ‘timber’ could be heard.” Initially told that they would be there for only thirty days, they were dismayed to discover that the entire Group would soon be joining them for what was clearly going to be a longer stay.²³ Within a week of their arrival, they were ready to begin their training.

An illustrated article published in *Click Magazine*, dated September 1943, featured the training activities of the black airmen shortly after they arrived at Oscoda. It described the air base at Oscoda as being “unique among



Tuskegee aircrew members loading ammunition, P-40, OAAF, summer 1943.

Army posts” due to its location on “Lake Huron’s sandy pine shores.”²⁴ The airfield at Oscoda was definitely unique among army posts; its remote northern location offered experiences not likely to be encountered at flying fields in the south. One of the pilots, Vernon Haywood, who graduated from the Tuskegee flying training program in April of 1943, recalled that “the deer had to be chased off the field” before flying activities could begin in the morning, and the presence of more threatening wild life could complicate a late evening trip to the toilet: “Bears roaming through the camp at night would often cause the most aggressive fighter pilot to unashamedly inquire of his cabin mates if anyone else needed to make a run” to the field’s latrine and bathing facility.²⁵ Curtis Robinson, Vernon Haywood’s Tuskegee classmate, who also trained at Oscoda, said “the place was really like a “recreational ‘escape,’ having all types of [vacation] cabins and a recreational beach.”²⁶

The *Click* article indicated the activities of the men when they were not flying:

*Off-duty, they ‘shoot the breeze’ in the pilots’ room, in the two-bed ‘hutments,’ the mess hall. Or they pile into cars and go to one of the nearest villages for a movie or bowling. The quiet resort towns have welcomed the Oscoda men with warm sincerity.*²⁷

The nearest villages were the twin towns of Oscoda and Au Sable, two miles east of the field on the Lake Huron shore; Oscoda was situated on the north side of the mouth of the Au Sable River, and Au Sable was situated on the south side. East Tawas and Tawas City were located about fifteen miles farther south, along the scenic Tawas Bay shoreline. The largest major cities to the south were Bay City and Saginaw, and the largest city to the north was Alpena. Given the inhospitable attitude towards the pilots and ground support personnel of the 332nd Fighter Group

reflected in the message sent to the War Department by the Iosco County Board of Supervisors, the article’s statement that the men were “welcomed” with “warm sincerity” in the nearby towns may be seen as the unidentified writer’s attempt to present the racial situation in a more positive perspective.

The first pilots to be trained at Oscoda were the members of the 100th Fighter Squadron, which had the most complete complement of fliers. At this point the 100th was led by Lieutenant George Knox, from Indianapolis; his Operations Officer was Lieutenant Elwood Driver, from Trenton, New Jersey. Some of the other squadron pilots who trained at Oscoda included Lieutenant Edward Gleed, from Lawrence, Kansas; Lieutenants Peter Verwayne, Walter Palmer, and Wilmeth Sidat-Singh, of New York City; Lieutenant Wilmore Leonard, of Salisbury, Maryland; and Lieutenant Robert Deiz, of Portland, Oregon. Other black pilots were Lieutenants Charles Williams, Henry Perry, Armour McDaniel, James Polkinghorne, Edward Toppins, Nathaniel Hill, Quitman Walker, Harold Sawyer, Ulysses Taylor, Lawrence Dickson, James Carter, Clarence Allen, Vernon Haywood, Curtis Robinson, Leroy Bowman, and Jerome Edwards.

The airfield at Oscoda was definitely unique among army posts [with] its remote northern location

George Knox, the squadron commander, was a member of the third class to graduate from Tuskegee, in May of 1942; Deiz, Leonard, Toppins, and Perry were members of the sixth Tuskegee flying class (September, 1942); Driver and Hill had graduated in the seventh class (October, 1942); Edwards had been in the eighth class (November 1942); Gleed and Verwayne had been in the ninth class (December 1942); McDaniel and Walker had been in the tenth class (January, 1943); Polkinghorne was a member of the eleventh class (February 1943); Sidat-Singh, Allen, Bowman, and Dickson were members of the twelfth class (March 1943); Williams, Taylor, Carter, Haywood, Robinson, and Sawyer were the most recent graduates—they had been members of the thirteenth class (April 1943).²⁸ As other pilots completed their basic training program at Tuskegee throughout the summer and early fall of 1943, they were assigned to Selfridge and Oscoda as well.

Mac Ross, who initially had been the commanding officer of the 100th Fighter Squadron, was now serving as the Operations Officer of the 332nd Fighter Group, but flew as one of the pilots in the 100th Fighter Squadron.²⁹ He, along with Benjamin O. Davis, the first black general in the United States Air Force, had been a member of the first graduating class at Tuskegee (March 1942).

The primary elements of training for the men at Oscoda included gunnery and bombing practice, in which they attacked ground targets at the west edge of the airfield, floating targets in Lake Huron, and shot at tow targets extending behind tow aircraft. The pilots also practiced formation flying, combat tactics, and night flying. The enlisted



Support personnel of the 96th Service Group at Oscoda AAF, summer, 1943.

men were required to run a newly constructed obstacle course. For the ground support men, mostly enlisted men and a few supervising officers, it meant developing aircraft maintenance skills under field conditions, far from centralized repair facilities. And for both officers and enlisted men, it meant accustoming themselves to living in primitive operating circumstances, of the kind they would experience when they reached their combat locations. According to Henry Moore, one of the aircraft crew chiefs in the 302nd Fighter Squadron, the field at Oscoda was “set up to simulate the conditions the men would be facing when they landed in Italy, [the men living in] tents and aircraft parked on steel matting, . . . where the meals were served in an open field and under the trees between the tent areas.”³⁰ One enlisted man, Elvin Thomas, remembered seeing deer and bear and “lots of snow in the wintertime.”³¹ The training program was also intended to develop a sense of unit cohesion among all of the men in the unit, pilots as well as ground crew, officers and enlisted men both.

Throughout the summer of 1943 the pilots flew the P-40F and P-40N models of the Curtiss “Warhawk”

Throughout the summer of 1943 the pilots flew the P-40F and P-40N models of the Curtiss “Warhawk,” a single-seat fighter first flown operationally in 1940; by 1943 it was largely relegated to a training role. Accidents began to occur almost as soon as the pilots of the 100th Fighter Squadron arrived at Oscoda. On April 17, shortly after the 100th had arrived at Oscoda, Mac Ross was involved in a ground accident. Two days later, Armour McDaniel was involved in a ground accident, and two days after that, on April 21, Peter Verwayne was involved in another accident. Henry Perry was involved in two accidents in the last days

of the month, on April 23 and 29. On May 1, Edward Toppins was involved in an accident, and on May 6, James Polkinghorne had an accident.³² Although no information is available about the causes of these accidents, they probably resulted from the challenges of learning to fly the P-40, a much more powerful aircraft than the aircraft the pilots had been flying in their training program at Tuskegee.

One young Oscoda boy, Jerry Wagner, whose family lived near the entrance to the airfield during the war, had many opportunities to observe aircraft taking off and landing. He later recalled that although the pilots were “excellent flyers, they had problems landing the aircraft.” Wagner says that he “witnessed many of these smoke- and spark-filled skids down the runway” as he sat on his bicycle at one of his favorite observation spots overlooking the field.³³ The P-40, the primary training aircraft, was a “tail-dragger” aircraft; that is, it featured two main landing gear which extended from the wings of the aircraft, and a tail wheel. There was a relatively narrow distance between the two main landing gear of the P-40, and if the pilot lost directional control while landing, it would be easy for the aircraft to start spinning around, performing what was referred to as a “ground loop.” One experienced P-40 pilot related that the P-40N could be a difficult airplane to land, especially in a crosswind; if the pilot wasn’t careful he could “lose control in [a] high wind during a landing” and “cartwheel around.”³⁴ If an aircraft started to “cartwheel around” during a landing, it would probably scrape a wingtip on the ground, generating the kind of “spark-filled skid” that Wagner observed.

It is tempting to blame the inexperience of the pilots for the unusually high number of accidents that occurred in April and May of 1943; however, the aircraft themselves may have contributed to the problem. The liquid-cooled Allison engine could quickly overheat if the aircraft did not become airborne as soon as possible after starting, and there were other engine problems as well. As one black maintenance man stationed at Oscoda reported later,

In a few cases, we had to hold [water] hoses on those old Allison [engines] due to overheating while warming up. It was a shame to think that our boys were expected to fly those things. It was all my men could do to keep them air-worthy. We lived in continual fear that someone wouldn’t return due to a failure [of the aircraft] beyond our control. When they returned from a flight, it appeared quite frequently as though they’d flown through an oil storm [a reference to oil streaks on the fuselage behind the engine].³⁵

The unit experienced its first fatality at Oscoda on May 7, 1943, three days after the arrival of the 403rd Fighter Squadron, whose pilots were supposed to train the pilots of the 332nd. Jerome Edwards was the first pilot to lose his life when his engine failed on take-off at the airfield at Oscoda, and it “plowed into some trees.” He “banged his head against the sunsight, and was killed instantly.”³⁶ Two days later, on May 9, a second fatality occurred, when Lt Wilmeth Sidat-Singh’s aircraft crashed into Lake Huron.



Tuskegee personnel attending chapel services, OAAF, September 1943.

Sidat-Singh and fellow pilot Charles I. Williams were flying a training mission over Lake Huron, east of East Tawas, when Sidat-Singh's engine failed. Sidat-Singh bailed out of his P-40 and deployed his parachute. Williams stated that Sidat-Singh failed to release his parachute before he struck the water. Williams continued to circle overhead, hoping to see some sign of life, but he was forced to land at the airfield at Oscoda when his fuel ran low. Sidat-Singh's body was not recovered until June 26th, nearly seven weeks after the accident occurred.³⁷ When his body was recovered, there was no evidence that his body had been dragged under the water by the parachute, and it appeared that he may have released himself from the parachute before he hit the water. He may have dropped from too great a height and struck the water with such force that he was temporarily stunned and was pulled under the water by the weight of his water-logged clothes.³⁸

The loss of Sidat-Singh was an especially devastating blow not only to the other pilots but to the larger African-American community as well, and news of his death was widely reported in the black press. Sidat-Singh had been one of the more popular and more famous of the black airmen; the stepson of a Manhattan physician from India, Sidat-Singh was an athlete with exceptional skills. He had demonstrated great prowess on the football field at Syracuse University in the late 1930s. According to one account, Sidat-Singh's passing abilities and poise impressed Grantland Rice, one of the top sports writers of the time, who thought he was as good as such well-known professional football players as Sid Luckman and Sammy Baugh.³⁹ Sidat-Singh was an excellent basketball player as well, and he was one of the stars on the Lichtman Bears, a semi-professional basketball team based in Washington D.C. With

Sidat-Singh as a high-scoring guard, the team compiled a record of 22 wins and no losses during the winter of 1941-1942. But after the Japanese attack at Pearl Harbor, Sidat-Singh wanted to contribute more to the war effort than play basketball, and he first joined the Washington police force, and then signed up to fly with the Army Air Forces; he wanted to become one of the first African-Americans to fly in combat.⁴⁰ Because he was such an exceptional athlete, many who knew him believed that he should have been able to extricate himself from his disabled aircraft when it crashed. But such was not the case. His body was eventually interred in the Arlington National Cemetery.

Sidat-Singh had been one of the more popular and more famous of the black airmen

Soon after Sidat-Singh's accident, 332nd Group Commander Colonel Sam Westbrook temporarily grounded all planes in the unit, requesting new planes be assigned.⁴¹ On May 16, Colonel Westbrook was replaced as Group Commander by Colonel Robert Selway, and Westbrook was re-assigned as the Group's executive officer.⁴² Although the reassignments were described as "routine," it seems likely that Westbrook was held partially accountable for the string of accidents that had occurred in the previous three weeks. Like Westbrook, Selway was a white officer and a West Point graduate.

The article in *Click Magazine* includes a brief narrative account of the training activities conducted at Oscoda, and features photos of several of the pilots, including squadron commander George Knox, operations officer El-



Unidentified Tuskegee airman cleaning P-39 aircraft, Selfridge Field, September 1943.

wood Driver, A Flight commander Robert Diez, and five other pilots. It also includes a photograph of Jerome Edwards making a firing pass on a ground target in his P-40, indicating that the photos in the article were taken early in May, immediately after the arrival of the pilots at the field at Oscoda and just before the death of Edwards. The article does not comment on the deaths of either Edwards or Sidat-Singh or on any of the lesser accidents that occurred.

Due to the arrival of new pilots from the Tuskegee training program and the transfer of others to the 99th Fighter Squadron in North Africa, there were numerous personnel changes. On May 21, the Headquarters of the 332nd Fighter Group moved to Oscoda, joining the other units of the Group that had moved to OAAF on 12 April. On May 29, Lieutenant Robert B. Tresville replaced Lieutenant William T. Mattison as commanding officer of the 302nd Fighter Squadron. By the end of May, the number of personnel assigned to the 332nd Fighter Group totaled 110 officers and over 1000 enlisted men.⁴³ If an average of one-tenth of the men remained at Selfridge Field during the training program, the African-American population at Oscoda during the height of the training program would have totaled nearly 1000 men, the largest number of airmen that had ever been assigned to Oscoda for training at any time up to that point. On June 10, the 96th Service Group officially moved from Selfridge Field to OAAF. The 96th Service Group included all of the ground support functions needed to support the personnel activities of the pilots and maintenance men in the squadrons.⁴⁴

On June 16th, the third and last fatal accident directly associated with the training program at Oscoda occurred when Nathaniel Hill, piloting a BT-13, a two-seat training aircraft, crashed into Lake Huron near Oscoda. The men had apparently been flying a weather observation flight and Hill became disoriented while flying in low cloud and poor visibility.⁴⁵ Both Hill and his passenger, Lieutenant Luther Blakeney, a weather officer assigned to the 100th Fighter Squadron, died in the crash. The news of Hill's

death arrived at the Hill family residence in Washington DC on the same day that his parents received a letter from their son, in which he stated that he had "just been chosen as one of the eight to go overseas to help those flyers that are already flying [in the 99th Fighter Squadron]." In his letter he wrote that "all of us are willing to go and we feel qualified to take care of ourselves whenever and wherever we go. I am proud that I have been chosen to go."⁴⁶ Hill's comments indicate that in addition to training pilots in the 332nd, pilots were also being trained as replacements for the pilots of the 99th Fighter Squadron, as pilots from the 99th completed their tours of duty and returned to the United States.

On June 20 and 21, nearly two months after training had begun at Oscoda, race riots occurred in Detroit, in which 34 people died, including 25 whites and 9 blacks, and 670 people were injured. Although the rioting had nothing to do with the black airmen stationed at Selfridge, Colonel Selway ordered all black airmen restricted to the field, and placed white guards around the black airmen's compounds to ensure that no one attempted to venture into Detroit.⁴⁷ Although many of the black airmen resented Selway's actions, it may be that he wanted to ensure that no airman was caught up in the Detroit turmoil. Fortunately, many of the 332nd Group's pilots and ground crew were in Oscoda at the time.

The Black Training Experience at Oscoda

That the pilots enjoyed and benefitted from their flying training experiences at Oscoda is evident in the comments many of them made later. Walter Downs, who had graduated from primary flight training at Tuskegee in February of 1943, related that at Oscoda he and his fellow pilots "did a lot of acrobatics and succeeded in thinking up tricks not in the book." He recalled that local farmers soon began to complain about aircraft buzzing their farms at low altitudes, causing their china dishes to fall to the floor and disrupting the chickens' egg-laying habits. In one particularly memorable episode, he and his fellow pilots decided to make a low pass on a local train: "One morning I was out with a flight, and it struck us to play peek-a-boo with a train. We'd fly straight at the engine and then pull up" and then perform "all kinds of loops just in front of the engine. We enjoyed ourselves immensely, though I suspect the engineer was not nearly as delighted with our antics as we were."⁴⁸

The local rail line was part of the Detroit and Mackinac Railway; the D&M track ran past the eastern edge of the airfield on a north-south line. The low-flying antics of the black pilots over the train were quickly reported to the field, and the price Downs and the other pilots paid for their actions was swiftly exacted:

Our commanding officer, who had news of our performance before we got out of our planes . . . chewed us out in the proper military manner; he didn't miss a syllable, comma, or period. Our punishment was to walk around the entire base with parachutes on our backs until he gave the order

for us to stop. He halted the march about our second time around. We didn't mind the walking because we had really enjoyed playing dippsy-doodle with the train. But we didn't repeat it.⁴⁹

Downs emphasized the significance and scope of the training conducted at Oscoda, stating that the airfield at Oscoda "became home to a large part of the 332nd Fighter Group."

Jerry Wagner recalled what it was like when the African-American pilots trained at Oscoda. Never having seen any African-Americans before, he was fascinated by the habits of the black airmen, and he was especially impressed with their flying abilities. The pilots, Wagner says, "acquired a reputation for superb flying and gunnery," adding:

As I was an astute observer of aircraft and flying techniques, I held their daredevil ability in high esteem. If they wanted to roll the aircraft, they rolled it. If they wanted to snap-roll the airplane, they snap-rolled it. These flyers did their own thing. Often they liked to fly in small formations, wingtip to wingtip, right down on the deck. Then they would be going straight up to become just specks in the blue. Between the clouds they would dog-fight with a skill and precision that was spellbinding to see. This squadron was probably the most unorthodox that was ever stationed here. They liked to fly their airplanes in every position but level.⁵⁰

It is easy to imagine the sense of freedom that the black pilots must have felt, finding themselves in a position to control a powerful single-engine aircraft in an environment where white society did not control their every move.

The African-American newspapers followed the progress of the black pilots with keen interest

The African-American newspapers followed the progress of the black pilots with keen interest. One account that appeared in several newspapers told how the pilots were going about the task of "achieving A-1 efficiency in flying, shooting, mechanics, and theory, so that they will be ready to take their places besides flying comrades already in the thick of the battle on fighting fronts." The article was accompanied by several photographs of the black pilots and ground crew members engaged in various activities at the Oscoda airfield, including loading ammunition into a P-40, cleaning .50 caliber machine guns, and standing inspection. One photo showed four pilots, Lieutenants Wendell Pruitt, Andrew Maples, John Gibson, and Milton Hall, walking off the flight line after completing their gunnery training.⁵¹

One black pilot who trained at Oscoda, Curtis Robinson, described in some detail how gunnery practice was conducted: "After our planes, which had three .50 caliber machine guns in each wing, were loaded with color-coded ammunition, we would start our practice." The tow plane pulled a long cloth target behind it. Once it was in position,

flying along the Lake Huron shore,

The rest of us pursued the plane and shot at the target. When pilots fired, we shot all six of our machine guns and aimed through a sight that was made of glass. Every fourth bullet from our guns was a tracer bullet that would light up and show us whether or not we were hitting the target. . . . After the [tow] plane dropped the target following our runs, ground crews would retrieve it to see what color the bullet holes were.⁵²

The instructors would then count the number of bullet holes of different colors to determine the accuracy of shooting of each pilot. Robinson stated that other flight training included dive-bombing and strafing at ground targets.

Unlike the major city newspapers, which were read by white readers, and which generally ignored the progress (or even existence) of black military units and personnel, the African-American newspapers, especially the *Pittsburgh Courier*, followed the activities of all black military units, especially the flying units, with intense interest, reporting on the movements, difficulties, accidents, and successes of the black airmen. In their wartime reporting activities, the African-American press provided two important functions for black readers: to develop a sense of pride in the black community as a result of the achievements of the black soldiers, sailors, and airmen in the effort to win the war, and to report on any incidents that appeared to reflect the harmful effects of segregation.

In spite of the initial official reluctance to accept the presence of black airmen in some local communities, the town of Oscoda soon provided entertainment for the men assigned at the field. One report in the *Selfridge Field News*, dated June 3, 1943, stated that the citizens of Oscoda put on a "Soiree" for the men at the field:

Under the leadership of Mayor Lloyd D. McCuaig of Oscoda and a committee of 14 women headed by Mrs. George Beard, the townspeople invited the soldiers to the local USO club, a converted town hall. They had to save up ration points for weeks in order to serve baked ham, escalloped potatoes, and 15 cakes. Two Indian women, Miss Helen George and her mother, walked 10 miles into town to volunteer their services.⁵³

The Detroit USO assisted with the event by providing three busloads of girls driven up to Oscoda especially for the event. The 105 girls on the buses were provided by the Lucy Thurman YMCA in Detroit, a facility for black women that had been established in 1933.

During the summer, personnel changes and additions continued. On June 29, 1943, Elwood Driver replaced George L. Knox as commanding officer of the 100th Fighter Squadron. And on July 6, 1943, Driver was replaced by Robert Tresville, newly promoted to the rank of Captain. In July the 332nd Fighter Group received a large number of enlisted men who had been trained in a variety of ground maintenance tasks: airplane mechanics arrived from Buffalo, New York, and Chanute Field, Illinois. Ar-



Colonel Benjamin O. Davis briefing reporters (mostly members of black press) during his visit to the Pentagon after his return from Europe, September 1943. His father, General Benjamin O. Davis, sits at his side.

morers came from Buckley Field, Colorado; radar mechanics from Tomah, Wisconsin; and radio personnel from Fort Monmouth, New Jersey, and Camp Crowder, Missouri.

When the two-month training period ended, the squadrons rotated back to Selfridge Field. On July 9th and 10th, the Headquarters of the 332nd Fighter Group and the 100th Fighter Squadron, moved from Oscoda back to Selfridge, but the 96th Service Group remained at Oscoda. The 403rd Fighter Squadron, whose task was to train new pilots, also moved back to Selfridge, but the 301st and 302nd remained at Oscoda to continue training.⁵⁴ The 301st and 302nd continued to receive new pilots as they graduated from the training program at Tuskegee.

Although the number of flying accidents was reduced..., accidents and incidents occurred

Although the number of flying accidents was reduced as the program continued, accidents and incidents occurred. Robert Dean, a white enlisted man who was assigned to OAAF in 1943 as a surgical technician, recalled several incidents in which the black officers and enlisted men were hospitalized for injuries or illnesses. Dean recalled treating one black officer who had been involved in an air-to-air accident who came into the hospital “bloodied up” when the propeller of another aircraft broke through the canopy of his aircraft. Fortunately, both aircraft landed safely and both pilots survived. Dean also recalled a black maintenance sergeant who had been badly burned when he attempted to clean his woolen uniform with 100 octane aviation fuel, which caught fire. One black enlisted man died from the effects of a ruptured internal organ, probably an appendix, before he could be moved to more sophisticated hospital facilities near Detroit.⁵⁵

The pilots continued training in P-40 aircraft until late September, when the P-40 was replaced with the P-39 Airacobra. Early in October an “Airacobra College” was established at Selfridge Field “to give a thorough schooling in P-39 Airacobras to pilots and ground crews of the 332nd Fighter Group” assigned to Selfridge and Oscoda.⁵⁶ The “around-the-clock program for mechanics and flyers” was directed by Colonel Selway in an effort to standardize transition training into the new aircraft, probably to avoid having a series of accidents as the pilots transitioned into the new aircraft such as had occurred in April and May. The P-39 had a tricycle landing gear, with a nose wheel instead of a tail wheel, which made the aircraft easier to land than the tail-dragging P-40. As a result, the accident rate was reduced significantly; some pilots were killed in flying accidents, but these occurred in the Selfridge Field area, not at Oscoda.⁵⁷ On 3 October the 403rd Fighter Squadron moved back to Oscoda from Selfridge.⁵⁸ It was probably involved in providing training to the pilots who were now flying P-39s instead of P-40s.

The Arrival of Colonel Benjamin O. Davis, Jr.

In September, another significant event occurred, as Lieutenant Colonel Benjamin O. Davis, Jr., returned from Italy, where he had been the squadron commander of the 99th Fighter Squadron, to take command of the 332nd Fighter Group. Before he could take command, however, he was called to Washington DC, where he defended the success of the 99th Fighter Squadron in its combat performance in North Africa and Italy. An Army report submitted by Colonel William Momyer, who had been the commanding officer of the Group with which the 99th flew in North Africa, stated that the 99th had not performed as well as it should have, and that it and similar units staffed by African-American pilots should be assigned secondary

roles in national defense. The report had been approved by every level of command through which it had passed, including Generals Edwin House, John Cannon, and Carl Spaatz, even though these officers had previously applauded the achievements of the 99th.

Davis, the son of an army general, was profoundly upset with the report, and testified before the War Department Committee on Special Troop Policies that the 99th “had performed as well as any new squadron, black or white, could be expected to perform in an unfamiliar environment.”⁵⁹ The members of the committee agreed with Davis’ assessment and urged the army to reconsider any actions it might have been contemplating regarding assigning flying units manned by black officers and airmen to secondary defense roles. As a result, the Army Chief of Staff, General George Marshall, directed that a study be made of the performance of the 99th. This report concluded that “an examination of the record of the 99th Fighter Squadron reveals no significant general difference between this squadron and the balance of the P-40 squadrons in the Mediterranean Theatre of Operations.”⁶⁰ The 99th was not removed from combat operations, and the other squadrons of the 332nd Fighter Group—the 100th, the 301st, and the 302nd—soon joined it in combat.

Having successfully defended the record of the 99th, Davis returned to Michigan early in October. He was officially installed as the Commanding Officer of the 332nd Fighter Group in a special ceremony on October 11 held at the Selfridge Officer’s Club, which had previously been designated as off-limits to black airmen. Special guests who attended the ceremony included Davis’ father, Brigadier General Benjamin O. Davis, Sr., the first black general in the U. S. Army; Colonel Robert Selway, Jr., outgoing Group commanding officer; Colonel William L. Boyd, Selfridge Field Post commander; and Major Harriet M. West, one of the two black majors in the Women’s Army Corps. Other officers attending the promotion ceremony were lieutenants George Knox, James Pugsley, Robert Tresville, Charles DeBow, Edward Gleed, Morris Johnston, Nelson Brooks, Vernon Punch, James Carter, and Ray Ware.⁶¹

On October 17, less than one week after Davis’ installation ceremony at the Selfridge Officers’ Club, Brigadier General Frank O’D. Hunter, commander of First Air Force, visited Selfridge on short notice. All black officers who were flying in the Selfridge area were instructed to return to the field immediately and land. Black officers were told to report to the field auditorium, where Hunter addressed the officers of the 332nd Group in a stern manner, stressing the need for discipline.⁶² As there was no stated reason for Hunter’s abrupt, forceful, and short-notice message to the black officers, it seems likely that it was his way of saying that the recent use of the Selfridge Officers’ Club for Colonel Davis’ ceremony was a one-time event, and that policies of segregated social facilities at Selfridge Field would continue. Hunter had just returned from England, where he had been serving under General Ira Eaker in the Eighth Air Force. He had taken command of First Air Force only two weeks before Davis’ promotion ceremony, and apparently was not pleased with the use of the Selfridge Field

Officers’ Club as the site of a black officer’s promotion ceremony, even for so distinguished an officer as Benjamin O. Davis, Jr. Hunter continued to enforce his segregationist policies after the arrival of the 477th Bombardment Group in 1944.⁶³

After his arrival at Selfridge, Colonel Davis immediately began a personal familiarization program in the P-39, which he had not previously flown. He thought the P-39 was a “beautiful, small-looking fighter-bomber with a tight, crowded cockpit.” Because he was six feet, two inches tall, Davis had to squeeze himself into the cockpit: “my head rubbed against the canopy, and I had to keep my back bowed.” After his first familiarization flights in the P-39 at Selfridge, Davis “flew up to [the] gunnery camp at Oscoda, where I flew the strafing, dive-bombing, and skip bombing maneuvers I supposed would be our bread and butter in Europe.”⁶⁴

In October, the first full month in which the pilots of the 332nd flew the P-39, the weather turned colder, but in spite of the cold weather, flying training activities continued. In the winter weather, snow on the runway could cause a challenge. Clarence Dart, who completed his training at Tuskegee in November of 1943, was one of the last Tuskegee pilots to complete his combat training at Oscoda. He reported that the field at Oscoda “didn’t have very good snow removal systems,” and that landing on a snow-covered runway could be exciting: “if you weren’t lined up [with the center of the runway], [if] you were a little off line, next thing you know you would be going down the runway round and round.”⁶⁵ “A lot of times,” he said, “we’d fly . . . in snowstorms,” adding that their “instrument training was very valuable.”

Recent graduates of the Tuskegee program were sent to train at Oscoda as the training period came to closure. Three of them, Roger Romine, Hubron Blackwell, and George Haley, were subjected to an especially intense winter training schedule in the P-39, and became the subjects of a wonderfully comic poem:

The 302nd worked like bees
To get their outfit overseas,
But none worked as long and hard as these—
Romine, Blackwell, Haley.

With frigid feet and fingertips,
Horseshoe spine and aching hips
Commanding colonels still plan trips
For Romine, Blackwell, Haley.⁶⁶

But the cold weather did not dampen the pilots’ enthusiasm for participating in extracurricular aerial activities. Lieutenant Walter Palmer, who had graduated from the Tuskegee program in June, 1943, was assigned to the 100th Fighter Squadron in the fall. After being checked out in the unit’s P-39s at Selfridge, he was transferred to Oscoda AAF to complete his combat training. At Oscoda, he participated in aerial and ground gunnery, cross-country flying, and formation flying. One of the pilots’ favorite activities was flying under bridges, and the largest major

bridge nearest Oscoda was the Blue Water Bridge, which connected Port Huron, Michigan, with Point Edward, Canada. Built in 1938, its center span was 870 feet wide with a clearance of approximately 150 feet above the surface of the water. It would have been an obvious landmark as the pilots flew from Selfridge Field north along the St. Clair River to Port Huron, and then along the eastern shore of Lake Huron's Michigan thumb region and across the Saginaw Bay to the East Tawas and Oscoda area. Palmer recalled that the bridge was "high enough above the water to permit a fighter plane to fly under," not only in the daytime, but at night as well:

We would often fly under it on daytime flights but the more daring of us would test our instrument flying skills by flying under it on night flights. It was only natural for a fighter pilot to buzz and chance fate in other ways—as natural as a dog barking! We felt it was a means of improving our instrument flying technique. . . . [F]lying under a bridge [at night] tested a pilot's mettle to actually fly on instruments alone.⁶⁷

Palmer was not the only Tuskegee Airman to fly under the Blue Water bridge. Alexander Jefferson admitted that he found the challenge of flying under bridges more than he could resist: "We went under the Blue Water Bridge between Port Huron and Sarnia. The Ambassador [bridge, between Detroit and Windsor, Ontario] was old hat; besides it was too high. However, I'm not going to lie. I think all of us were scared when we did it."⁶⁸

However, Palmer was not satisfied with the thrill of flying under bridges. When he learned that the Tuskegee football team would be playing a game against West Virginia State College, also an all-black educational institution, in Detroit on Saturday, November 6, he decided to provide an aerial display to greet the participants, to let them know that "we [the Tuskegee pilots] were doing all right up here" in Michigan.⁶⁹

He was scheduled to lead a flight of four aircraft on a training flight on the day of the game. As an assistant flight leader of A flight, Palmer had the authority to alter the flight profile as he thought appropriate, and he changed the flight routine from a transition flight (in which the aircraft would practice formation flying) to a cross-country flight, and he led the other pilots on a direct course from Oscoda to the University of Detroit football stadium, where the game was being played. As Palmer reports the event,

When we got there, we made a cursory pass . . . at about 500 feet. I said to the others, "They will never even know it was us that came by. . . . Let's go in a little closer." The others decided they would head homeward. I headed in again a little lower mainly to check for wires and other obstructions that might be in my path. There being none, I decided to make my third pass a real buzz job. [There were, in fact, tall light towers along the east and west sides of the field, which was oriented in a north-south direction.] I came down below the level of the stands and performed a slow roll as I pulled up.

When executed properly it is a beautiful maneuver and this one was executed to perfection.⁷⁰

Unfortunately for Palmer, the former 332nd Group Commander, Colonel Robert Selway, was seated in the stands watching the game. Selway spotted the aircraft markings and immediately called Selfridge Field and ordered that the pilot be grounded pending a court-martial. When Palmer landed at Oscoda, he was placed under house arrest, and Palmer was transported in a military vehicle to Selfridge "to be court-martialed." Because Palmer possessed excellent flying skills, as testified to by his fellow pilots (and his own aerial performance), Palmer was not dismissed from the service, as he feared; instead he was sentenced to a loss of seventy-five dollars of his monthly pay for three months and removed from his position as Assistant Flight leader.⁷¹

When Palmer was stationed in Oscoda in the fall of 1943, local attitudes towards the black airmen had become more accepting; Palmer was able to install his wife (they had been married that summer) in a room in the town's only hotel, the Welcome Hotel. He thought that the town was a "vacation paradise," even in November. Situated on the east bank of the Au Sable River, the Hotel made full use of its proximity to the river, and the hotel staff did not have to worry about what would be served for dinner. Palmer recalled that

The fishing poles were always suspended [over the river] from the back porch and when we ordered a fish dinner we never knew what we would get on our plate: it was that fresh! It was prepared beautifully and always tasted delicious. Several of the officers and their wives lived in the hotel and ate in the hotel dining room.⁷²

An African-American enlisted man assigned to OAAF, Elvin E. Thomas, had a similar experience involving the Welcome Hotel. During his stay at Oscoda, he and his wife rented a room in the hotel for \$10 a week, and his wife was promptly hired as a waitress. Thomas credited the hotel owners, Gordon and Charlotte Welcome, with providing the black airmen a comfortable environment free from the policies of segregation. Thomas later recalled how the black airmen could come into the hotel and order drinks at the bar.⁷³ The freedom to enter a hotel which catered to white people and not be told to leave or to sit in a reserved area was a "new experience for many of the men" who trained in Oscoda.

Preparation for Departure

On the first of November, the 553rd Fighter Squadron was activated at Selfridge to train replacement pilots for the 332nd Fighter Group. The 553rd was staffed by all black personnel, including pilots who were returning to the United States after flying in combat in the 99th Fighter Squadron in North Africa and Italy. The 553rd was intended to replace the 403rd Fighter Squadron, which was staffed by white personnel and which had provided flight

instruction of the pilots of the 332nd Fighter Group since May. The 553rd was tasked to provide combat training for the black pilots who had completed their initial flight training at Tuskegee but who needed further operational training before being assigned to a combat squadron. On November 12, Lieutenant Louis R. Purnell of the 99th Fighter Squadron was assigned as commander of the 553rd Fighter Squadron at Selfridge Field. Four days later, with sufficient black pilots assigned, the 553rd Fighter Squadron moved from Selfridge to Oscoda. Among the pilots assigned to the 553rd were Lieutenants Herbert V. Clark, William Campbell, and Spann Watson, all returned combat pilots from the 99th Fighter Squadron. A few days later, the 302nd Fighter Squadron, the last of the three squadrons to be trained at Oscoda, returned to Selfridge.⁷⁴

All training ended in December, as the pilots and support personnel prepared for the expected move to a combat theater. On December 15, the 403rd Fighter Squadron was disbanded at Selfridge Field. Its training mission had been taken over by the 553rd Fighter Squadron, which continued to operate at Oscoda until December 27, when it too returned to Selfridge. The 553rd remained at Selfridge until May 14, 1944, when it was transferred to Walterboro, South Carolina.⁷⁵

During the first two weeks of December, the men of the 332nd Fighter Group prepared to ship out to the combat zone; they assumed that they would be joining the 99th Fighter Squadron in Italy. On the 16th of December the enlisted men of the 332nd Fighter Group were given a farewell party at Selfridge. Four days later the officers of the 332nd Fighter Group were given a sendoff party at Detroit's Labor Temple. On the following day, the 21st of December, all 332nd Fighter Group personnel were restricted to Selfridge pending transfer. They departed Selfridge on the 22nd of December for overseas duty, boarding a train to Virginia. They arrived at Camp Patrick Henry, Virginia, on Christmas Eve. The personnel of the 332nd Fighter Group departed Hampton Roads, Virginia, on January 3, and arrived in Italy on February 3, 1944.⁷⁶

The airmen of the 332nd Fighter Group acquitted themselves well in their combat activities while flying in Europe. Of the men identified in this article, eight were credited with shooting down enemy aircraft (Robert Diez, Elwood Driver, Edward Gleed (2), William Campbell (2), Walter Palmer, Armour McDaniel, Edward Toppins (4), and Wendell Pruitt), and thirteen received the Distinguished

Flying Cross (Benjamin O. Davis, Edward Gleed, William Mattison, Clarence Dart, Edward Driver, Roger Romine, Vernon Haywood, Edward Toppins, Louis Purnell, William Campbell, Walter Palmer, Wendell Pruitt, and Quitman Walker).⁷⁷ Five died later while in the service of their country, three in Europe and one in the United States: James Polkinghorne was reported missing in action in May, 1944; Robert Tresville was reported missing in action in June, 1944; Mac Ross died in a plane crash in Italy in July, 1944; Roger Romine was killed in an aircraft accident in November 1944, and William Mattison was killed in a plane crash after the war ended, near Toledo, Ohio, in January, 1951.⁷⁸

When the members of the 553rd Fighter Squadron departed Oscoda Army Air Field on December 27, the last of the Tuskegee-trained flying personnel left Oscoda. The majority of both flight and ground personnel of the 332nd Fighter Group had received their combat training at Oscoda, which had been home to approximately 1000 black officers and enlisted men from April to December, 1943. Although the units were operating out of Selfridge Field, and Oscoda was always referred to as a "sub-base" of Selfridge, the airfield at Oscoda was the primary location of the combat training that the pilots and ground support personnel of the three squadrons, the 100th, the 301st, and the 302nd, received. There was one more chapter to be added to the training experiences of the Tuskegee Airmen during World War II, the establishment of the 477th Bomb Group, in which the men flew B-25 aircraft. But no B-25 training was conducted at Oscoda.⁷⁹

In most accounts, including the information posted on the web site of the Tuskegee Institute, the combat training that the men of the 332nd received at Oscoda is mentioned in passing, as a kind of historical footnote to their assignment at Selfridge Field. But the majority of the men in the Group received their most extensive combat training at Oscoda, and Oscoda deserves recognition as an important location that played an essential role in the combat success of the group known today as the Tuskegee Airmen. Oscoda Army Airfield was later renamed Wurtsmith Air Force Base after World War II ended, and became the home of several Air Defense Command and Strategic Air Command units before it was closed in 1993. However, in its long seventy-year existence as an active training and operational airfield, perhaps no training event was as historically important as the training that was conducted for the men we know today as the Tuskegee Airmen. ■

NOTES

1. Charles E. Francis and Adolph Caso, *The Tuskegee Airmen*, 4th edition, revised (Boston: Branden Publishing, 1999), p. 42.
2. Francis and Caso, pp. 464-465.
3. Francis and Caso, pp. 430-456.
4. Daniel Haulman, *Tuskegee Airmen Chronology*. Haulman has often updated his *Chronology*, which appeared in print in 2010. The most recent version, dated 2015, is available electronically. All references are to the 2015 electronic version.
5. David R. Jones, Leroy P. Gross, and Roslyn Marchbanks-

Robinson, *United States Army Aeromedical Support to African American Fliers, 1941-1949: The Tuskegee Flight Surgeons*. (San Antonio: USAF School of Aerospace Medicine, 2007), p. 77.

6. Haulman, *Chronology*.

7. Jones, Gross, and Marchbanks-Robinson, p. 77.

8. Haulman, *Chronology*.

9. Jones, Gross, and Marchbanks-Robinson, p. 77.

10. Alexander Jefferson, oral comments in "The 'Spookwaffe,'" in Mary Penick Motley, ed. *The Invisible Soldier: The Experience of*

- the Black Soldier, World War II* (Detroit: Wayne State University Press, 1975), p. 217.
11. Charles W. Dryden, *A-Train: Memoirs of a Tuskegee Airman* (Tuscaloosa: University of Alabama Press, 1997), pp. 167-171.
 12. Francis and Caso, p. 117.
 13. Frank B. Woodford, "Mind a Blank on Shooting, Colman Says," *Detroit Free Press*, 13 September 1943, p. 1. Article can be found on *Newspapers.com*.
 14. Mary Jane Henigar, "Our Base: Wurtsmith—The Early Years," *Times to Remember: Memories and Stories of Early Au Sable and Oscoda, Michigan* (Oscoda: AuSable-Oscoda Historical Society), pp. 64-65.
 15. *Ibid.*, pp. 62-63.
 16. *Ibid.*, p. 67.
 17. Mary T. Wolf, *Wurtsmith Air Force Base, 1924-1980*, p. 8. Unpublished (1980). A draft copy prepared by Sergeant Mary Wolf, 379th Bomb Wing Historian.
 18. *Ibid.*, pp. 9-10.
 19. John E. Williams, "Plea to Oust Flyers from Town in Michigan Scored," *The Pittsburgh Courier*, 24 April 1943, p. 1. Article can be found on *Newspapers.Com*.
 20. Williams, "Plea," pp. 1, 4.
 21. "332nd Fighter Group," Burt E. Jackson, *Selfridge Field News*, 22 April 1943, p. 8. Copies of the *Selfridge Field News* can be found in the Bentley Historical Library, University of Michigan, Ann Arbor, Michigan.
 22. Dave Benjamin, "Serviceman Still Answers the Call: George Watson, Sr., Relates Experiences with Tuskegee Airmen," *The News Transcript*, Greater Media Newspapers. Online version, 8 March 2005.
 23. George Watson, Sr., *Memorable Memories* (New York: Carlton Press, 1987), p. 53.
 24. "All-Negro Fighter Squadron Ready for Action," *Click Magazine*, September 1943, p. 40.
 25. Vernon V. Haywood, "They Said We Could Not Fly," *North Carolina's WWII Experience*, UNCTV.Org, 29 March 2014.
 26. George Norfleet, *A Pilot's Journey: Memoirs of a Tuskegee Airman, Curtis Christopher Robinson* (Washington, D. C.: Robnor Publishing, 2010), p. 103.
 27. "All-Negro Fighter Squadron Ready for Action," p. 40.
 28. Francis and Caso, pp. 430-437.
 29. Haulman, *Chronology*.
 30. Henry L. Moore, Biography, *Ken Arnold's 1919 Home Page*, WingsAcrossAmerica.US, 29 March 2014.
 31. Elvin Thomas, Oral History Interview, *Veteran's History Project*, American Folklife Center, The Library of Congress, 26 October 2011.
 32. "Oscoda Army Air Field, Michigan, Accident Listing," *Accident-Report.Com*, 24 April 2014.
 33. Jerry Wagner, *World War Two Oscoda and AuSable* (Iosco County Historical Association, 1987), p. 10.
 34. Joel D. Thorvaldson, Biographical Comments, *Pacific Wrecks.Com*, 17 November 2014.
 35. Robert A. Rose, *Lonely Eagles* (Los Angeles: Tuskegee Airmen Chapter, 1980), pp. 66-67.
 36. John B. Holway, *Red Tails: An Oral History of the Tuskegee Airmen* (Mineola, New York: Dover Publications, 2012), p. 51.
 37. Luke Cyphers, "The Lost Hero: Wilmeth Sidat-Singh a Two-Sport Star at Syracuse," *New York Daily News*, 25 February, 2001. Online version.
 38. "Lieutenant Sidat-Singh's Body Recovered from Lake by Coast Guard," *The New York Age*, 3 July 1943, p. 1. Article can be found on *Newspapers.Com*.
 39. Cyphers, "The Lost Hero."
 40. Dave McKenna, "The Syracuse Walking Dream," *Washington City Paper*, 23 May 2008, *WashingtonCityPaper.Com*.
 41. "New Planes Needed; Colonel Westbrook Grounds 332nd Until New Ships Arrive—Sidat-Singh Still Missing," *The Pittsburgh Courier*, 22 May 1943, op. 1. Article can be found on *Newspapers.Com*.
 42. Haulman, *Chronology*.
 43. *Ibid.*
 44. *Ibid.*
 45. "Body of Lt Hill Recovered," *The [Oscoda] Press and Huron Shore Resorter*, 30 July 1943, p. 1.
 46. "Mourn Son Killed in Selfridge Plane Crash," *Baltimore Afro-American*, 22 June 1943, p. 3. Article can be found on *Newspapers.Com*.
 47. Haulman, *Chronology*.
 48. Walter Downs, oral comments in "The 'Spookwaffe,'" in Mary Penick Motley, ed. *The Invisible Soldier: The Experience of the Black Soldier, World War II* (Detroit: Wayne State University Press, 1975), p. 208.
 49. *Ibid.*
 50. Wagner, p. 10.
 51. "Day by Day," *The Pittsburgh Courier*, 21 August 1943, p. 12. Article can be found on *Newspapers.Com*.
 52. Norfleet, pp. 103-104.
 53. "News Items and Notes Around the Field," *Selfridge Field News*, 3 June 1943, p. 7.
 54. Jones, Gross, and Marchbanks-Robinson, p. 78; Haulman, *Chronology*.
 55. Robert Dean, Oral History Interview, Wisconsin Veterans Museum Research Center, 6 February 1996.
 56. "Aircobra College' Started at Selfridge Field; Base Using Bell Aircraft Plant Facilities," *The New York Age*, 23 October 1943, p. 12. Article can be found on *Newspapers.Com*.
 57. Haulman notes the following fatalities in his *Chronology*: 14 October, 2nd Lt William H. Walker and 2nd Lt Leroi S. Williams of the 100th Fighter Squadron, killed in an air collision at Selfridge Field; 19 November, 2nd Lt Leon Purchase of the 302nd Fighter Squadron, killed in an airplane crash eight miles north-east of Selfridge Field; 29 November, 2nd Lt William Edward Hill of the 302nd Fighter Squadron, drowned after parachuting from his P-39 into Lake Huron.
 58. Haulman, *Chronology*.
 59. Benjamin O. Davis, *Benjamin Davis, American* (Washington DC: Smithsonian Institution Press, 1992), p. 105.
 60. Davis, p. 107.
 61. "Col. Davis, Jr., Takes Command of 332nd Group," *The Pittsburgh Courier*, 9 October 1943, p. 1. Article can be found on *Newspapers.Com*.
 62. Davis, p. 114; Haulman, *Chronology*.
 63. Francis and Caso, pp. 241-244. See also James C. Warren, *The Freeman Field Mutiny* (Conyers Publishing, 1996).
 64. Davis, p. 113.
 65. Clarence Dart, Tuskegee Airman, an interview conducted at Hudson Falls High School, New York, December 2003. *HFCSD.Org*.
 66. Holway, *Red Tails*, pp. 115-116.
 67. Walter J. A. Palmer, *Flying with Eagles: Memories of an Original Tuskegee Airman* (Indianapolis: Nova Graphics, 1993), p. 47.
 68. Jefferson, p. 217. See also Holman, *Red Tails*, p. 113.
 69. Palmer, p. 48.
 70. Palmer, p. 48.
 71. Holman, *Red Tails*, pp. 113-114.
 72. Palmer, pp. 46-47.
 73. Thomas, Oral History Interview.
 74. Haulman, *Chronology*; Jones, Gross, and Marchbanks-Robinson, p. 78
 75. Haulman, *Chronology*; Jones, Gross, and Marchbanks-Robinson, p. 78
 76. Haulman, *Chronology*; Jones, Gross, and Marchbanks-Robinson, p. 79
 77. Francis and Caso, pp. 395-401.
 78. Francis and Caso, pp. 409-412.
 79. The experiences of the Tuskegee Airmen in the 477th Bombardment Group is described in James C. Warren, *The Freeman Field Mutiny* (Vacaville CA: Conyers Publishing, 1996).



Ralph S. Parr, Jr.,
USAF Fighter
Pilot
Extraordinaire

Daniel L. Haulman

In many ways, USAF fighter pilot Ralph Sherman Parr, Jr. was superlative. He flew 641 combat missions as a fighter pilot, probably more than any other USAF pilot, and served his country in three consecutive wars. He had five different tours of duty, one in World War II, two in Korea, and two in Vietnam. He shot down ten enemy airplanes during seven weeks during the Korean War, becoming a double ace. He shot down the last enemy aircraft downed during that war. He earned at least sixty military decorations, and is the only pilot to have received both the Distinguished Service Cross but also the Air Force Cross. In Vietnam he played a crucial role in the successful and heroic defense of Khe Sanh in 1968. In the course of his military career, he earned ten Distinguished Flying Crosses, the Silver Star, the Bronze Star, and forty-one Air Medals. By any measure, Ralph S. Parr, Jr. was one of the greatest fighter pilots in Air Force history.¹

Parr was born on July 1, 1924 in Portsmouth, Virginia, the son of a U.S. Navy pilot. He graduated from Bethesda-Chevy Chase High School in 1942, became an aviation cadet in the Army Air Forces in 1943, and earned his military pilot wings in 1944 and became a second lieutenant. He trained with class 44B at Blytheville, Arkansas, and flew so well he was kept to be an instructor pilot. After repeatedly requesting combat duty overseas, Parr was finally sent to serve as a P-38 Lightning pilot with the 7th Fighter Squadron of the 49th Fighter Group, which was stationed on the island of Luzon in the Philippines by the time he arrived in July of 1945. During World War II, he only flew a couple of combat missions, for convoy cover, because of his late arrival at the end of the war, and because his unit prepared and moved from the Philippines to Okinawa in August. By the time he was ready to fly again, from the new base, American B-29s had already dropped two atomic bombs on Japan, and the emperor had agreed to surrender. Parr was able to fly over Hiroshima and Nagasaki, but only to survey their ruins. The Japanese surrendered formally in early September, but Parr was far from finished serving his country in aerial combat.²

Parr remained in Japan in late 1945 and early 1946, flying P-51s from Chitose, but he returned to the United States and left the Army Air Forces to work toward a medical degree at American University. While in the Washington, D.C. area, he joined the Air Force Reserve and served with a P-51 unit at Andrews Air Force Base in Maryland. There was also an Air National Guard P-47 unit at Andrews, and he got to handle that kind of aircraft, too. Eventually, Parr decided to abandon his medical studies and join the active duty United States Air Force, which became independent from the Army in September 1947. He became a member of the 33d Fighter Group, which flew P-51s and later jet F-84s at Roswell, New Mexico.³

With his unit, Parr moved from Roswell to Otis Air Force Base, Massachusetts in November, 1948, and in early 1950,

he transferred to Langley Air Force Base, Virginia, where he learned how to fly the new jet F-86. He served on a gunnery team from Langley, which earned second place in the 1950 USAF gunnery meet at Las Vegas, Nevada.⁴

After North Korea invaded South Korea in 1950, igniting the three-year Korean War, Parr began flying fighter missions again. During his first combat tour in Korea, he flew 165 missions, flying jet F-80 fighter-bombers⁵ He served with the 7th Fighter Bomber Squadron, his old unit from World War II. While completing a successful tour, he did not shoot down any enemy airplanes, but he did destroy many enemy targets on the ground.⁶

After his first combat tour in Korea, Parr returned to the United States in April 1951, and was reassigned to the 94th Fighter Squadron at George AFB, California. There he flew F-86s again and practiced air-to-air tactics with the advanced fighters. He became proficient, and when he returned for a second combat tour in Korea, it was as a Sabre jet pilot. The F-86F was a much better aircraft for combating enemy aircraft in air-to-air combat than the F-80s Parr had flown on his first Korean combat tour.⁷

During his second combat tour in Korea, Parr, now a captain, flew with the 335th Fighter Interceptor Squadron of the 4th Fighter Interceptor Wing. During that tour of duty, Parr flew 47 missions, 30 of them involving aerial combat. He became an ace by shooting down five enemy MiG-15s in only eleven days, and in seven weeks he shot down five more enemy aircraft, including five more MiG-15s and a Soviet IL-12 aircraft. With ten aerial victory credits, he became a double ace. The time frame was June

7-July 27, 1953.⁸ The IL-12 was the last aerial victory of the war, and it was controversial. The Soviet Union claimed that the downed plane was an unarmed cargo aircraft, and it might have been carrying some top Soviet military officials. The Soviets charged Parr in the International Court of Justice, but he had done nothing wrong. The enemy aircraft was clearly over North Korea, it bore military markings, and the war was not yet over. The Soviets dropped the case, but only after they shot down an American RB-50 in the area, after the armistice.⁹

Parr earned the Distinguished Service Cross for a June 30, 1953 mission with his wingman, Lt. Al Cox. After being attacked by ten MiG-15s, which they fought successfully, downing two, they rushed to save their wing commander Col. James Johnson, whose own aircraft had flamed out and had attracted a host of enemy fighters. Despite the odds, Parr and Cox drove the enemy planes away, saving Col. Johnson. Parr flew 47 missions during his second combat tour in Korea, the one in which he became a double ace. By the end of the Korean War, Parr had flown three combat tours in two wars. During his two tours in Korea, Parr flew 212 combat missions. But still he was not finished serving his country in aerial combat.¹⁰

After returning from his second combat tour in Korea, in 1953, Ralph Parr served at Yuma, Arizona at the Air Defense Weapons Center, where there were other F-86s. He remained at that base for five years before moving to Tyn dall Air Force Base, Florida to serve as Staff Operations Officer with the 73d Air Division for a year. When he went overseas again, it was not for combat fighter missions. He next served, at the beginning of the Kennedy administration, as Operations Officer for the Military Assistance Advisory Group at The Hague in the Netherlands, where he helped the Dutch improve their air-to-air gunnery program. When he returned to the United States, in late 1962, he became Director of the Division Command Post at MacDill Air Force Base, Florida. Almost immediately the Cuban Missile Crisis erupted, and Parr worked closely with Gen Walter C. Sweeney, Jr. then commander of Tactical Air Command. They developed a crucial friendship during the crisis that eventually impacted Parr's future military career.¹¹

Following the Cuban Missile Crisis, General Sweeney chose Parr to help the USAF usher in the F-4 fighter aircraft, an airplane that was originally designed for the use of the U.S. Navy, but which had been allocated also to the Air Force for future fighter missions. Parr moved to Davis-Monthan Air Force Base in Arizona to help develop the use of the Phantom II, and sometimes served also at Nellis Air Force Base, Nevada, to test the F-4 against F-86 airplanes portraying enemy MiGs. In the process, Parr helped the Tactical Air Command develop new standards for air-to-air combat training. From there, Parr moved to Maxwell Air Force Base, Alabama, where he attended the Air War College of Air University in parts of 1966 and 1967.¹²

President Lyndon B. Johnson accelerated United States involvement in the Vietnam War in the mid 1960s, and more and more USAF units deployed to Southeast Asia. They included fighter wings and squadrons equipped

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TABLE: Ralph S. Parr's Combat Missions

War	Squadron	Group or wing	Aircraft flown	Combat missions
World War II	7th Fighter	49th Fighter	P-38 Lightning	2
Korea (1st tour)	7th Fighter Bomber	49th Fighter Bomber	F-80	165
Korea (2d tour)	335th Fighter Interceptor	4th Fighter Interceptor	F-86 Sabre	47
Vietnam (1st tour)		12th Tactical Fighter	F-4 Phantom	226
Vietnam (2d tour)		12th Tactical Fighter	F-4 Phantom	201
			Grand Total	641

with the F-4 aircraft with which Ralph Parr had become so familiar. Now a colonel, he moved to Vietnam in March 1967 as Assistant Deputy Commander for Operations of the 12th Tactical Fighter Wing, which was stationed at Phu Cat. During his first combat tour in Vietnam, Parr flew the F-4C, which had a front and back seat. When Parr flew combat missions, he sat in the front seat as pilot, and his back seater, who managed the weapon systems, was Capt. Tom McManus. During the 1968 siege of Khe Sanh, a U.S. Marine Corps base in northern South Vietnam, Parr and his wing flew fighters to protect C-130 cargo planes flying in crucial supplies, arms, and ammunition, and reinforcements. On one of those missions, on March 16, 1968, Parr was asked to destroy several enemy artillery sites that were threatening the Marines at Khe Sanh and the aircraft supplying them. Parr flew eight passes against the enemy gun positions, destroying two mortars and six other artillery pieces with napalm bombs despite having his own aircraft riddled with 27 bullets from enemy fire. For that mission, Parr earned the Air Force Cross, second only in honor to the Medal of Honor. His actions saved many American lives and helped the United States defeat the siege of Khe Sanh. Parr flew 226 missions during his first combat tour of duty in Vietnam.¹³

Returning to the United States in October 1968, Ralph Parr served next at the Air Force Military Personnel Center (AFMPC) at Randolph Air Force Base, Texas as Chief of Officer Assignments. His boss was an old friend: Maj Gen Robert S. Dixon, who had been his wingman during one of this combat tours in Korea. After serving fourteen months at AFMPC, Parr succeeded in getting one more combat tour in Vietnam.

Parr's second combat tour in Vietnam began in 1970. He went to Phu Cat, first serving as vice commander of the 37th Tactical Fighter Wing, and then as commander of the 12th Tactical Fighter Wing, his old wing, which replaced the 37th at Phu Cat on March 31. Despite his new administrative duties, Parr insisted on flying many combat missions himself, this time in the wing's new F-4Ds. Before his combat flying was over, he added another 201 fighter combat missions during his second Vietnam tour of duty.¹⁴ His total of missions during two tours in Vietnam was 427.¹⁵ Together with his 212 missions in Korea, his number of combat missions was 639. Added to his two combat missions in World War II, Parr's total number of combat missions, flying

fighter aircraft in three wars, was 641, probably more fighter combat missions than that of any other USAF pilot.

Ralph Parr left Vietnam a second time in February 1971. In April he was assigned to serve in the headquarters of the United States Air Forces in Europe, and moved to Germany. In August of the next year, he became Chief of Staff of the Military Assistance Advisory Group in Iran.¹⁶ In February 1974, Parr was assigned to Eglin Air Force Base, in Florida, where he served first as Director of Operations of the Tactical Air Warfare Center and then as Chief of Staff of the Armament Development Test Center. His extensive experience with different types of fighter aircraft in aerial combat gave him unique qualifications to do his job there.¹⁷

Parr's long military career ended at Eglin. After a hurricane hit the Florida panhandle, the fighter veteran fell from a roof he was examining for structural damage. He hit a metal ladder twelve feet below that caused him extensive injuries and required extended hospitalization. The experience persuaded him to accept a medical discharge in 1976.¹⁸

After his retirement from the Air Force, Colonel Parr moved to New Braunfels, Texas, near San Antonio. By then he and his first wife, Barbara Barnes, with whom he had two children, were divorced. His second wife, Margaret Bernstein, already had three children, who became his stepchildren. He lived a long life, passing away at the age of 88 on December 7, 2012, from complications of lung cancer.¹⁹

Ralph S. Parr Jr. did not shoot down more enemy aircraft than any other USAF pilot in the wars in which he served. His World War II career was not very different from a lot of pilots who served in the Army Air Forces. But for having served as a fighter pilot in World War II, Korea, and Vietnam, for having served five combat tours, for accumulating a record of 641 combat mission, for having been a double ace in Korea, for having shot down the last enemy aircraft downed during the Korean War, for becoming the only pilot to have earned both the Distinguished Service Cross and the Air Force Cross, for having earned at least 60 decorations (including ten Distinguished Flying Crosses), and for having flown more than 6,000 hours in fighter aircraft, Ralph Parr should be remembered as one of the greatest of those fighter pilots who served his country in the United States Air Force.²⁰ ■

NOTES

1. Clement E. Bellion, editor, "Ralph S. Parr, Fighter Pilot," *Daedalus Flyer*, vol. XXXVI (Summer 1996), no. 2, p. 15. This source claims that Ralph Parr flew a total of 661 combat missions, but multiple other sources say 641. I found confirmation that he flew 639 missions in Korea and Vietnam. Counting his two World War II missions, he would have flown 641: John L. Frisbee, "The Pinnacle of Professionalism," *Air Force Magazine*, vol. LXX, no. 2 (Feb 1987), p. 109; Adam Bernstein, "Retired Air Force Col. Ralph S. Parr, a Highly Decorated Pilot, Dies at 88," *The Washington Post*, Obituaries, Dec 19, 2012; Alex Salinas, "Parr: Legendary Double Ace Pilot Laid to Rest," *Joint Base San Antonio News*, Joint Base San Antonio-Randolph Public Affairs, Dec 20, 2012; Randy Roughton, "Double Ace," *Airman Online*, 2 Sep 2012; Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p. 30.
2. Clement E. Bellion, editor, "Ralph S. Parr, Fighter Pilot," *Daedalus Flyer*, vol. XXXVI (Summer 1996), no. 2, p. 21; John L. Frisbee, "The Pinnacle of Professionalism," *Air Force Magazine*, vol. LXX, no. 2 (Feb 1987), p. 109; Adam Bernstein, "Retired Air Force Col. Ralph S. Parr, a Highly Decorated Pilot, Dies at 88," *The Washington Post*, Obituaries, Dec 19, 2012; Tom Dillman, "Freedom's Hero-Colonel Ralph Parr," *Veterans News Now*, Jul 19, 2011; Randy Roughton, "Double Ace," *Airman Online*, 2 Sep 2012; Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p. 2-3.
3. Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p. 5.
4. Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p.6; Lineage and honors history of the 33d Fighter Group, at Air Force Historical Research Agency, Maxwell Air Force Base, AL.
5. Clement E. Bellion, editor, "Ralph S. Parr, Fighter Pilot," *Daedalus Flyer*, vol. XXXVI (Summer 1996), no. 2, p. 21; John L. Frisbee, "The Pinnacle of Professionalism," *Air Force Magazine*, vol. LXX, no. 2 (Feb 1987), p. 109.
6. John L. Frisbee, "The Pinnacle of Professionalism," *Air Force Magazine*, vol. LXX, no. 2 (Feb 1987), p. 109; Tom Dillman, "Freedom's Hero-Colonel Ralph Parr," *Veterans News Now*, Jul 19, 2011; Randy Roughton, "Double Ace," *Airman Online*, 2 Sep 2012.
7. Clement E. Bellion, editor, "Ralph S. Parr, Fighter Pilot," *Daedalus Flyer*, vol. XXXVI, no. 2 (Summer 1996), p. 21; John L. Frisbee, "The Pinnacle of Professionalism," *Air Force Magazine*, vol. LXX, no. 2 (Feb 1987), p. 109.
8. *USAF Credits for the Destruction of Enemy Aircraft, Korean War* (USAF Historical Study no. 81) (Washington, DC: Office of Air Force History, and Montgomery, Alabama: Albert F. Simpson Historical Research Center, Air University, Maxwell AFB, 1975), p. 28; Adam Bernstein, "Retired Air Force Col. Ralph S. Parr, a Highly Decorated Pilot, Dies at 88," *The Washington Post*, Obituaries, Dec 19, 2012; Tom Dillman, "Freedom's Hero-Colonel Ralph Parr," *Veterans News Now*, Jul 19, 2011; Randy Roughton, "Double Ace," *Airman Online*, 2 Sep 2012.
9. Clement E. Bellion, editor, "Ralph S. Parr, Fighter Pilot," *Daedalus Flyer*, vol. XXXVI (Summer 1996), no. 2, p. 21; Randy Roughton, "Double Ace," *Airman Online*, 2 Sep 2012; Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004.
10. John L. Frisbee, "The Pinnacle of Professionalism," *Air Force Magazine*, vol. LXX, no. 2 (Feb 1987), p. 109; Adam Bernstein, "Retired Air Force Col. Ralph S. Parr, a Highly Decorated Pilot, Dies at 88," *The Washington Post*, Obituaries, Dec 19, 2012; Tom Dillman, "Freedom's Hero-Colonel Ralph Parr," *Veterans News Now*, Jul 19, 2011; Randy Roughton, "Double Ace," *Airman Online*, 2 Sep 2012.
11. Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p. 19.
12. Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p. 20.
13. John L. Frisbee, "The Pinnacle of Professionalism," *Air Force Magazine*, vol. LXX, no. 2 (Feb 1987), p. 109; Adam Bernstein, "Retired Air Force Col. Ralph S. Parr, a Highly Decorated Pilot, Dies at 88," *The Washington Post*, Obituaries, Dec 19, 2012; Tom Dillman, "Freedom's Hero-Colonel Ralph Parr," *Veterans News Now*, Jul 19, 2011; Randy Roughton, "Double Ace," *Airman Online*, 2 Sep 2012; Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p. 21-22.
14. Lineage and honors histories of the 37th and 12th Tactical Fighter Wings and Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p. 26-28.
15. John L. Frisbee, "The Pinnacle of Professionalism," *Air Force Magazine*, vol. LXX, no. 2 (Feb 1987), p. 109; Randy Roughton, "Double Ace," *Airman Online*, 2 Sep 2012; Randy Roughton, "Double Ace," *Airman Online*, 2 Sep 2012.
16. Adam Bernstein, "Retired Air Force Col. Ralph S. Parr, a Highly Decorated Pilot, Dies at 88," *The Washington Post*, Obituaries, Dec 19, 2012; Tom Dillman, "Freedom's Hero-Colonel Ralph Parr," *Veterans News Now*, Jul 19, 2011; Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p. 29.
17. Tom Dillman, "Freedom's Hero-Colonel Ralph Parr," *Veterans News Now*, Jul 19, 2011; Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p. 30.
18. John L. Frisbee, "The Pinnacle of Professionalism," *Air Force Magazine*, vol. LXX, no. 2 (Feb 1987), p. 109; Research report of Maj William J. Conley, "Colonel Ralph S. Parr: An Eagle of the Generations of Greatness," Maxwell Air Force Base, Alabama: Air Command and Staff College, Air University, April 2004, p. 30.
19. Adam Bernstein, "Retired Air Force Col. Ralph S. Parr, a Highly Decorated Pilot, Dies at 88," *The Washington Post*, Obituaries, Dec 19, 2012; Alex Salinas, "Parr: Legendary Double Ace Pilot Laid to Rest," *Joint Base San Antonio News*, Joint Base San Antonio-Randolph Public Affairs, Dec 20, 2012.
20. John L. Frisbee, "The Pinnacle of Professionalism," *Air Force Magazine*, vol. LXX, no. 2 (Feb 1987), p. 109; Clement E. Bellion, editor, "Ralph S. Parr, Fighter Pilot," *Daedalus Flyer*, vol. XXXVI (Summer 1996), no. 2, p. 21; Adam Bernstein, "Retired Air Force Col. Ralph S. Parr, a Highly Decorated Pilot, Dies at 88," *The Washington Post*, Obituaries, Dec 19, 2012; Alex Salinas, "Parr: Legendary Double Ace Pilot Laid to Rest," *Joint Base San Antonio News*, Joint Base San Antonio-Randolph Public Affairs, Dec 20, 2012; Tom Dillman, "Freedom's Hero-Colonel Ralph Parr," *Veterans News Now*, Jul 19, 2011; Randy Roughton, "Double Ace," *Airman Online*, 2 Sep 2012.

ALL THROUGH THE NIGHT, ROCKWELL FIELD 1923, WHERE AIR-TO-AIR REFUELING BEGAN



DH-4s at Rockwell Field.

Robert Bruce Arnold

Today, in 2016, Naval Air Station North Island on San Diego Bay home ports several aircraft carriers. Now it's solely a U.S. Navy operation. Once, it was not. Once it was shared by one of the most important and busiest operational aviation installations of the U.S. Army. Today, there is only a brief mention on a small marker to stand as a reminder of the historic army flights that took place and the army aviation pioneers that flew in the skies above it. Until 1938, a good portion was known as Rockwell Field until the navy with aid of their champion, the President of the United States, Franklin Roosevelt, finally pushed the army out and most traces of that history, there, were erased ending a sometimes testy co-existence between the rival services.

Perhaps that's one reason that the first attempts and successes of air-to-air refueling that took place there are mostly unknown today. They are also overshadowed by the 1929 Fokker trimotor C-2A *Question Mark* 150 hour flight. While the Douglas C-1 refueling planes flew out of Rockwell, the glory of that New Year's Day achievement is now associated with the mission's start and end, at Van Nuys Airport to the north, near Los Angeles.

Six years before, the air-to-air refueling story began over San Diego's Coronado Peninsula. Rockwell, then, was one of the centers of military aviation in the United States dating back to the time when Glenn Curtiss using borrowed real estate started winter flight operation there. Curtiss, always a shrewd businessman, invited customers, the U.S. Navy and the U.S. Army to use his dirt air strip (it would not have paved runways for 30 years) and hangars. By 1913 the Army Aviation Section School was up and running and a dangerous time in the air, it was. Twelve out of the first 48 Army pilots died, several at Rockwell. The Navy came and went and came back. In 1917, after the United States finally entered World War I, the government seized the property for the war effort. After years of lawsuits that ended with a Supreme Court decision, the actual owner, the Spreckels Company, was paid off.

In October of 1922, Major Henry "Hap" Arnold, early pilot and future Five Star General and chief of the Army Air Forces in World War II, became commander. Other future army aviation leaders, and Hap Arnold associates, were there as well: Carl "Tooney" Spaatz, Ira Eaker and a young, hotshot pilot named Jimmy Doolittle.

Much history took place at Rockwell, most notably the repeated attempts and final success of the army's non-stop, coast-to-coast flights with their low powered Fokker T-2. Additionally, Doolittle would set records on distance flights including one to Florida in a de Havilland DH-4, the post-World War I work horse of the Army Air Service.

Hap Arnold for one hated the DH-4. He hated to fly it and hated its existence. To the air power visionary, this old, 1917 design represented everything that was wrong with the army's aviation program. As with the T-2, it was propelled by an obsolete engine, the Liberty. Once one of Arnold's own wartime production success stories, it became almost imme-



A formation of the undesirable DH-4s.

diately out of date but having been produced in huge quantities, a stingy Congress had mandated that all army airplanes would use them, until they were gone. The 12-cylinder engine, designed in five days and made by a team of automobile companies including Buick, Ford, Cadillac, Lincoln, and Packard, borrowed an existing Mercedes design for the overhead camshaft and valves.

With over 20,000 made, and thus lots in storage, that would be a long time. Arnold would remember that lesson of the DH-4 and the Liberty engine for the rest of his career and make decisions in late 1945, in an attempt not to saddle the future U.S. Air Force with a huge inventory of obsolete aircraft.

Lining the sea road around the perimeter of Rockwell Field were rotting wooden crates of army aircraft, mostly the hated de Havillands, produced during the war and never shipped to the front or used. To Arnold and his cadre of air force dreamers, they were a constant reminder of the millstone holding back the advance of air power. Most of them were still on the books as existing frontline inventory. The attitude in Washington was “use them until they run out, then you can ask for new models.”

Hap Arnold, inspired by the enthusiasm of his mentor

Robert Bruce Arnold is a grandson of General Henry H. “Hap” Arnold. His late father was Colonel W. Bruce Arnold, USAF. Portions of this article were adapted from their manuscript, Growing up Arnold, the Journey of the First Family of America’s Air Force. Robert Arnold is the owner and proprietor of Chandelle Winery in Sonoma, California and a writer.

Billy Mitchell, along with his Rockwell circle were convinced that record and notable flights would garner press coverage which, hopefully, would engage public, and eventually congressional, support of army aviation. This point of view would continue right up to World War II.

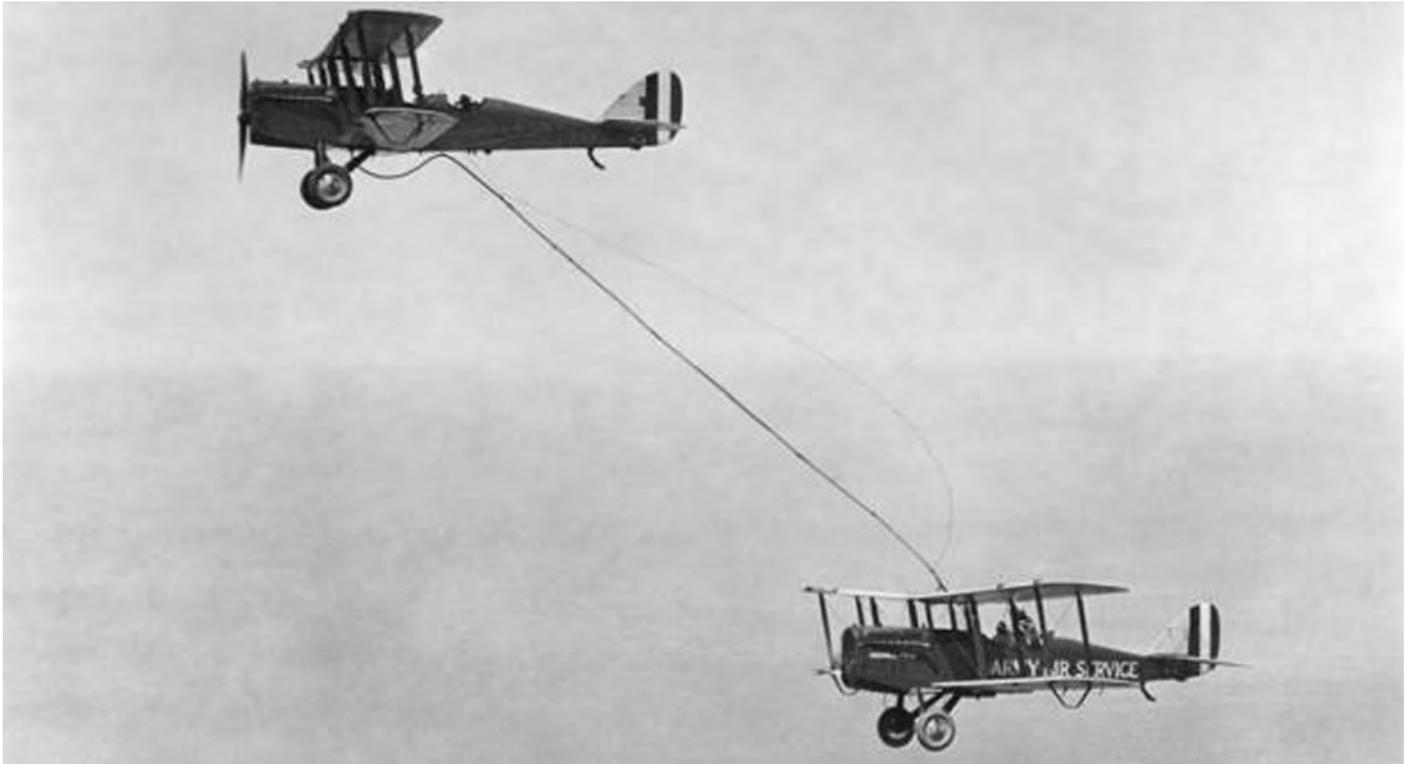
[Arnold] anticipated that the future would bring larger and more powerful engines

Arnold and his contemporaries were well aware that the future of military air operations required that planes must not only remain in the air for long periods but also carry meaningful loads of bombs. He anticipated that the future would bring larger and more powerful engines, but they would also consumer, larger amounts of fuel.

Two popular Rockwell pilots, Lieutenants Lowell H. Smith and John P. Richter came up with a plan using a hose between two planes to refuel their DH-4 in the air, a first. If that worked, then they would also go for the endurance record, set earlier by Macready and Kelly in the T-2 that they had later used for the non-stop, coast-to-coast flight. Smith was a well-regarded aviator having won the Transcontinental Race in 1919, and a longtime Arnold family friend as was “Rick” Richter.

Hap Arnold wrote in his later *Scientific American*, August 1925 article, “Contact and Refueling Now Accomplished in the Air”:

As is usually the case in advances taking place daily in aeronautics, there were no precedents to follow. The idea it-



The 1923 refueling test.

self was simple – sent up one plane and send up another when needed, carrying gas, oil, water or food to be transferred to the duration plane. In carrying out the idea, however, the procedure was not so simple.

The procedure was this: a 4 inch hose capable of moving 25 gallons of fuel per minute attached to the belly of one plane would be dropped and hang in the air. That plane would keep a straight and horizontal flight path. What was then called, “the duration plane” would pull up underneath and the flight observer in the rear seat of the open cockpit of the de Havilland would grab the end of the hose and insert the open end in a tank. He would open the valve on the end of it until capacity was reached. Then this brave soul would release the hose back into air, hopefully not being stuck by it as it swung by.

Two...pilots,...came up with a plan using a hose between two planes to re-fuel

After a six hour flight test of the hose system with Smith piloting and Richter receiving the hose that came down from a tanker DH-4 above ended with engine problems they planned their next attempt.

Fog is always an issue along the Pacific Coast and that day, August 27, 1923, at 5:04 AM was no exception. My father, Bruce Arnold, Hap’s son, remembered that day and night well and told the story like this:

It was early morning when Pop parked the family’s Willys-Overland in front of Flight Operations; most of the base person-

nel were there waiting for the takeoff. He found Smith and Richter inside talking to the pilots of the refueling plane.

“How’s the weather look?” he asked, shaking hands all around.

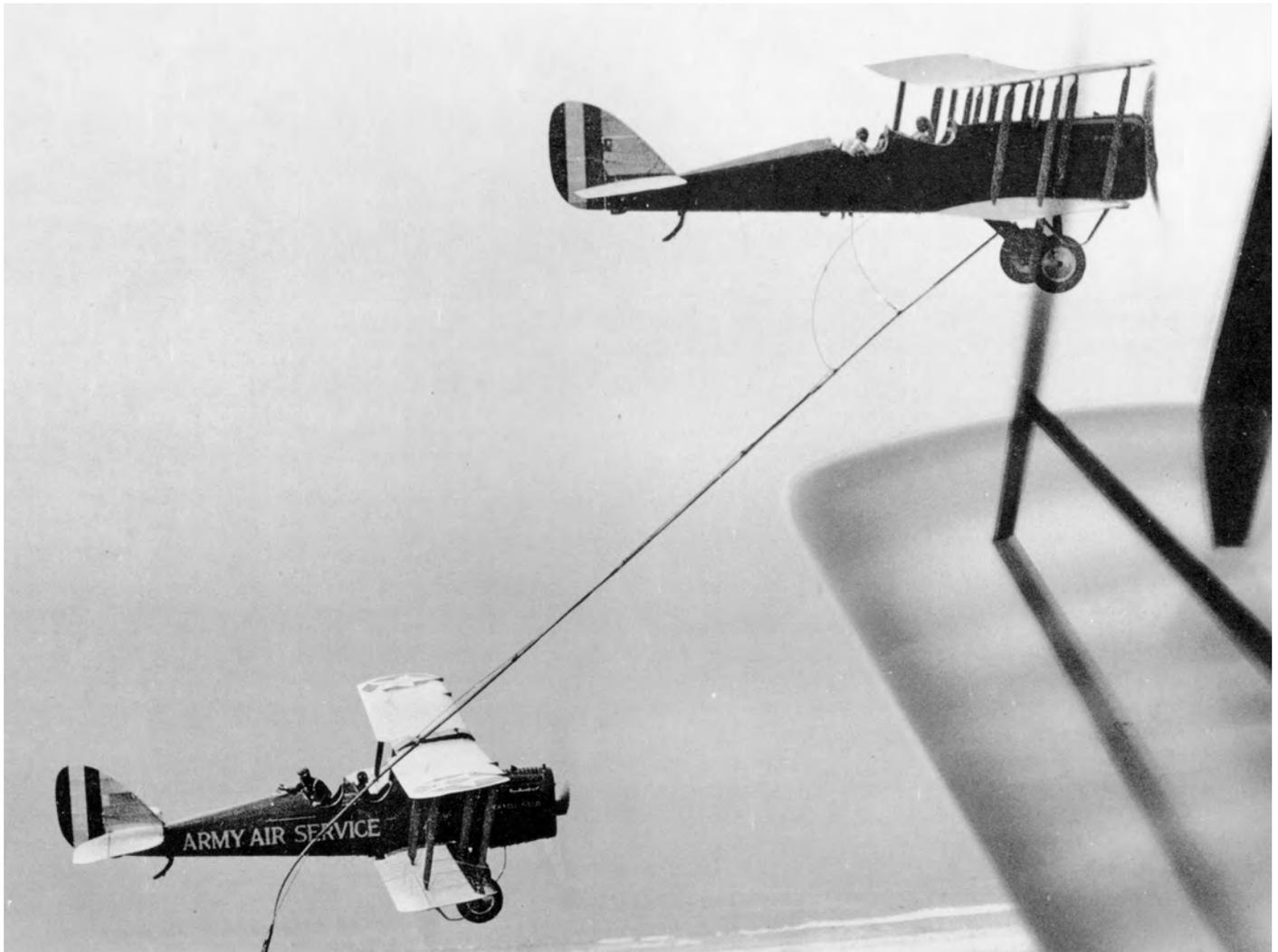
“There’s fog expected tonight,” Rick replied, hoping that Pop wouldn’t feel it necessary to call off the flight. Both pilots grinned when Pop answered, “Well, you’re both good, experienced pilots and you’ve flown in fog before. You know your course around this island like the back of your hand. Just don’t take any unnecessary risks. When you can’t fly under it, land.”

They all walked outside to the resounding cheers and good wishes of the crowd. Lowell and Rick continued on, out to the airplane. The waiting crew chief shook their hands and wished them well. The pilots listened carefully as the crew chief gave them a rundown on the work he had performed on the Liberty engine. Again, they looked over the gas receiving equipment that Lowell had designed and checked the plane’s control wires. Minutes later the crowd observed the sergeant pulling the prop through. The engine coughed and started on the first try. A miracle for a Liberty, and a good sign.

Everyone on that field listened intently to the engine. From long experience, they could tell by the sound that the Liberty was tuned to perfection. The pilots and mechanics turned to each other and smiled with satisfaction. No special test equipment in those days.

All watched as the DH taxied to the far end of the field and took off. The timers checked the clock as the wheels left the ground. The attempt to set an endurance record had begun.

When Pop returned home for dinner my Mother, Eleanor, but known to all as Bee, could tell he was worried.



The 1923 refueling test with a dangling hose.

She knew, of course, what everyone on the Post also knew: bad visibility might cause the flight to be cancelled in spite of the fact that everything else was going well. But, sensing that Pop wanted to talk about the flight, she pretended she didn't know a thing.

"Everything going all right with the refueling?" she asked,

"Yep. All going great. If that Liberty engine can keep going and if the weather holds..."

"You don't expect a hurricane or anything, do you? The weather has been so beautiful lately."

"No, but - well, it's a perfect condition for fog. In fact, some has already started coming in."

Mother went to the window. It was obvious that the fog was going to be heavy. "What will they do, Hap? Will they have to land?"

"Not if they can help it," he said, joining her at the window. "It's really moving in now. God, if we only had radios. Hand signals won't work in this weather. Sending notes down and back with the refueling hose isn't very reliable. With no way to communicate between planes it's hard as hell making connections."

"How can they be expected to continue then?" Mother asked.

"Sheer guts," he muttered. "I can't stay here," Pop added after a long pause. "I gotta get back to the flight line."

As night came on and the fog grew thicker, Lowell and Rick flew lower and closer to the island itself. As long as they could see the ground, they felt they could stay in the air and the refueling plane could find them. Pretty soon, they were flying at two hundred feet circling the island. Since our house was at one of their planned turning points, we became a pylon and every twenty minutes it sounded as if the old, low flying DH was coming in the windows. At one point, they flew as low as 50 feet under the fog.

Naturally, none of us kids could sleep, and everyone was getting edgy, especially as it approached the time when the refueling plane would take off and follow the flight path so that it could locate Lowell and Rick. By the time dawn broke, Mother was frantic, the kids were groggy, but Pop, who had come in some time after midnight, was jubilant. "They're going to make it, they're going to make it," he kept saying.

"I just wish to God they'd go ahead and make it, so we can all get some sleep," Mother replied.

"I've got to get back, down to the 'line'," answered Pop, not wishing to pursue the subject.

Around ten in the morning the fog lifted, and the planes

flew higher, thus relieving our house of its duty as turn marker. Activities at home returned pretty much to normal until that evening, when Pop brought home two very tired, sleepy pilots and toasted them with some of the fabled case of brandy, purchased before Prohibition for the someday in the distant future wedding of my sister Lois, and then moved many times. She was eight at this point. The saga and fate of that cache of brandy is another story.

"Say, this is great," said Lowell, inhaling the strong bouquet.

"A first calls for the best," said Pop proudly.

"If I had known we were getting this... Say, how about trying for [another] record tomorrow?" joked Rick.

History had been made that night and I will never forget the sound of that Liberty engine, right overhead, as each turn was made.

Hap Arnold wrote in his *Scientific American* piece that the detested Liberty engine, his nemesis of that time, did have a go at ending the mission early. It started missing badly.

Smith at once correctly diagnosed his trouble as a stoppage in the gas line. At first it seemed as if nothing could be done; but necessity is the mother of invention...He grabbed the only thing in sight, a flashlight, hit a three-way valve in the gas line, smashed the light but cleared the line. The engine took hold again and the plane missed the rocky cliffs alongside of a canyon by inches. (NB: they were flying across and back from the nearby Mexican border on that leg of the circuit)

Smith and Richter had made a 37 hours, 23 minute flight that totaled about 3,293 miles at an average speed of 88 MPH. They had set three new records: endurance, distance and speed. A total of 687 gallons of gasoline, 38 gallons of oil and four hot meals had been transferred. They weren't done yet. Two months later they flew from the Canadian Border to the Mexican just south of Rockwell in 12 hours, 13 minutes, refueling several times.

Again from Hap Arnold's *Scientific American* article:

This proved beyond any doubt the practicability of making contact and delivery fuel in the air under any and all circumstances. They had refueled in fog, over strange places, while crossing over mountain ranges in Oregon and while over the long, smooth Sacramento Valley.

In 1924, after the crash landing in Alaska of Major Fred Martin, Lt. Lowell Smith, a pilot's pilot, would take over the lead of the army's Round the World Flight in Douglas World Cruisers. Before starting out, on the waters off of Rockwell, he and the other mission pilots would learn to use the pontoons that would be fitted on these huge, two seater biplanes for parts of that epic 1924 adventure.

Smith, before beginning that historic flight, took Bee Arnold, his friend and the boss's wife, up for a spin in the rear seat of his Cruiser, *Chicago*, now on display at the National Air and Space Museum.

Lowell Smith was awarded the Mackay Trophy twice,



The 1929 Question Mark refueling test, which built on the 1923 test.

although not for the refueling mission, as was his friend and commander Hap Arnold.

My father, Bruce Arnold, remembered Lowell Smith not only as a great pilot and dashing figure, but as his friendly French teacher who always had treats and exciting flying stories for the Arnold kids.

Hap Arnold looked into the future of flight and was certain it would come to pass

The years 1922-24 saw record flights at Rockwell Field: the T-2, the first air to air refueling, support for the first Round the World Flight and many other firsts in army aviation. All were key to the rise of military flight in the United States. Rockwell's role, and even its name, is mostly forgotten now as all those who made history there have become faded old black and white photographs and the distinctive sound of the old Liberty engine, which powered most of them much to Hap Arnold's frustration, is now silent and unknown.

Major Arnold concluded in his 1925 article:

Heavy bombers with their full load of bombs can now leave small aerodromes and, after getting into the air, take on their full supply of gas and continue on their flight. Thus they will be able to take advantage of their full radius of action where formerly they could only partially fill their tanks when they took off a full load of bombs.

This was not the first or last time Hap Arnold looked into the future of flight and was certain it would come to pass. Twenty years later as commanding general of the largest and most powerful air force in history, as he would finally be in a position to set in motion, his visions for the future of airpower. ■

Thor Ballistic Missile: The United States and the United Kingdom in Partnership. By John Boyes. Stroud UK: Fonthill Media, 2015. Glossary. Illustrations. Tables. Appendices. Endnotes. Bibliography. Index. Pp. 208. \$40.00 ISBN: 978-1-78155-481-4

John Boyes's 2008 volume, *Project Emily: Thor IRBM and the RAF*, represented the first operationally focused, book-length study of the Thor intermediate-range ballistic missile (IRBM) since Julian Hartt's *The Mighty Thor: Missile in Readiness* in 1961. While publication of *Project Emily* on the eve of the fiftieth anniversary of Thor IRBMs achieving operational status in the United Kingdom (UK) seemed altogether appropriate, a subsequent visit to Vandenberg AFB, California, alerted Boyes to gaps in his original narrative. One might even say it validated radio broadcaster Paul Harvey's tagline, "The Rest of the Story."

That fiftieth reunion brought Boyes face to face, for the first time, with former Douglas Aircraft Company engineers who had worked on building the Thor IRBM, training the crews, and deploying it in the UK. Meanwhile, other American and British Thor veterans or civil servants who read *Project Emily* contacted Boyes. Still an active member of the Royal Air Force Historical Society and fascinated with the history of Thors in the UK, Boyes began conversing and corresponding, during the next few years, with some of his newfound, elderly Thor project participants. Eventually, he realized he had sufficient "new" material to justify a companion volume to *Project Emily*.

Not surprisingly, *Thor Ballistic Missile* contains most of what appeared in Boyes's first book, and the narrative structure remains the same. From an introductory discussion of the modern ballistic missile's emergence during World War II and its development as an important nuclear-weapon delivery system in the Cold War, this amateur historian guides readers chronologically and topically through the maturation of Thor; the slow progression toward a U.S.–UK agreement on its basing and respective levels of authority, crew training, and operations; full alert during the Cuban Missile Crisis of October 1963; and onward to the abrupt stand-down of the UK's Thor force, its dismantlement, and how the U.S. Air Force later used each of those missiles.

The fresh material in *Thor Ballistic Missile* includes a large number of recollections supplied by Boyes's more recent contacts, many previously unseen photographs, and detailed drawings of plans for each of the UK's Thor bases. Information from books and articles published since 2008 fleshes out portions of his second Thor volume, as do unpublished memoirs that became available during the past seven years. Personal anecdotes from participants especially tend to "make history come alive" in a way it did not in *Project Emily*. Spicing dry, technical details with tales of human interaction always makes for better historical narrative, as a comparison of Boyes's second book with his first clearly demonstrates.

Unfortunately, certain stylistic aspects of Boyes's first book that tended to make its reading tedious remain unchanged in his second volume. Too much passive voice, combined with inordinately lengthy paragraphs containing occasional thicketts of technological trivia, tend to bog down the narrative pace. Judged solely on the value of its content, however, *Thor Ballistic Missile* merits attention from anyone interested in Thor missile history and deserves a place next to *Project Emily* in every serious missile historian's library.

Dr. Rick W. Sturdevant, Deputy Director of History, HQ Air Force Space Command



An Illustrated History of the 1st Aero Squadron at Camp Furlong: Columbus, New Mexico 1916-1917. By John L. Deuble. Signature Book Printing, 2016. Photographs. Maps. Tables. Acronyms. Bibliography. Index. Pp 182. \$25.00 Paperback. ISBN: 978-0-692-60283-6

I admit up front that I have a strong bias toward this type of book. I love to study old period photographs; I grew up in New Mexico and enjoy learning about areas I never saw; and I'm a retired aerospace engineer who volunteers at the Smithsonian Air and Space Museum and am always searching to fill in the gaps in my knowledge of aviation history. This book provided a very thoroughly researched and well-constructed compilation that fully satisfied all three of my interests—and then some. It has much to offer historians, military air buffs, amateur explorers of our border with Mexico, and early aviation enthusiasts.

Deuble spent over 12 years researching his topic and has published over a dozen articles related to this book and a few nearby communities in New Mexico. In addition to researching published material, he personally interviewed descendants of key figures and pulled photographs and unique knowledge from their private holdings. The material was honed over years of standup presentations and feedback from audiences.

The book is a documentary-style treatment of an important period in military aviation: its infancy and evolution into modern warfare. Deuble logically organized the contents around the factors leading to the establishment of Camp Furlong as well as the assignment of the 1st Aero squadron and how it was implemented, structured, and supported. He provides a very thorough background to understand the bigger historical context of the Mexican Punitive Expedition of 1916-1917 as well as tracing where the 1st Aero squadron came from and how it got to Camp Furlong.

Using 130 vintage photographs, Deuble lays out the facts about how the squadron joined the expedition; its quarters, personnel, and use of a motor transport division;

a catalog of squadron aircraft; and a description of the aerodrome. He clearly explains the mission objectives—reconnaissance of the enemy, Pancho Villa, and communications among command components in hostile territory. But he also ties in so much more: the challenges of flying the earliest aircraft in brutal environmental conditions and how they evolved to adapt; use of the Brock Automatic Aerial Camera; first use of a motorized transport and logistics capability; and the first aircraft armament (a Winchester M1907 self-loading rifle).

Most remarkable for a book of this type is Deuble's attention to the human-interest side of the story. He follows each of the pilots from their early years through accomplishments in World War I and beyond. He pays special attention to the roles of the squadron commanders and connects their experiences to future contributions to military aviation strategy and logistics. He even includes short write-ups on the airfields named after pilots who flew at Camp Furlong.

I found the prologue to be at least as important as any of the book's chapters. For me, it set the stage for all that followed by explaining the Punitive Expedition, pointing out key locations on a comprehensive map, and outlining key involvement of the 1st Aero Squadron. The preface also served to list the special-interest items that Deuble uncovered in his research that had not been presented anywhere else.

Overall the book is easy to read and well laid out. It provides a wide window into a time, place, people, and events that had impacts far beyond this obscure moment in history.

Steven M. Goralczyk, NASM Volunteer / Docent, New Mexico Native



The Mediterranean Air War: Airpower and Allied Victory in World War II. By Robert S. Ehlers. Lawrence KS: University Press of Kansas, 2015. Maps. Photographs. Notes. Bibliography. Index. Pp. xvi, 520. \$ 39.95 ISBN: 978-0-7006-2075-3

In *The Mediterranean Air War*, Robert Ehlers presents the theater-wide air campaign from all perspectives and compellingly demonstrates its contribution to the eventual Allied victory. His preface unequivocally states he does not intend to focus solely on airpower but, rather, on the Allies' expert development of combined-arms warfare and how airpower contributed to this war-winning strategy. Ehlers presents convincing arguments supported by facts and a thorough understanding of not only the frontline combat tactics and strategy but also the command, logistics, and intelligence successes and failures of both sides.

Ehlers approaches the subject chronologically but starts not with Italian attacks in North Africa against

Egypt but, rather, British efforts against the Italians in East Africa. He demonstrates how this campaign impacted both sides and shows how, even at this early stage, the British were developing the command, intelligence, and logistics infrastructures necessary to sustain and build a war winning force. Conversely, he shows the Italian defects in these same areas. This establishes the theme of consistent failure by both Italians and Germans in this area throughout the Mediterranean campaign.

This focus on the bigger picture and, particularly, the often neglected areas of logistics and intelligence are the book's greatest strengths. Ehlers doesn't get bogged down in personalities or battlefield accounts, although these are present where appropriate. Instead, he discusses the broader topics such as the battle for supply and its impact on both sides. He also explains both sides' successful use of tactical intelligence and how the Allies excelled in strategic intelligence using decrypts from Enigma and other sources. His descriptions of the development and employment of tactical and strategic airpower clearly show that the Allies better understood that a long-term approach making the most of scant resources would win the day.

Allied development of combined-arms warfare makes up the bulk of the book. Ehlers describes the ground offensives on both sides and airpower's impact. The British were more effective in recognizing the need to collocate ground and air headquarters and constantly worked to improve air-ground coordination. Ehlers is highly critical of Rommel's tendency to marginalize his air commanders and his failure to recognize the British system's greater effectiveness. Rommel complained about the air pounding his troops routinely suffered but never recognized why the British were so successful in this area. If Rommel had adopted a similar system, his better equipment (Bf 109E) and, in many cases, better-trained aircrews might have been decisive, especially in the earlier campaigns. Ehlers traces the development of this combined-arms strategy throughout the entire North African campaign and on into Sicily and Italy noting the changes dictated by terrain and weather as the Allies moved north.

This book sets the standard for coverage of an often neglected area of World War II and airpower history. The book focuses heavily on the British experience from 1940 through 1942, although this is not surprising since it was the most fruitful period in the combined-arms concept development. There are some issues such as use of odd sources (he quotes Tedder's memoirs on the effectiveness of Allied strategic bombing instead of the more commonly used U.S. Strategic Bombing Survey). The maps focus almost exclusively on the ground campaigns. Ehlers spends a good deal of time discussing the battle for airfields throughout the war, but there isn't a single map highlighting where any of these are. The map of Malta and the ranges of various aircraft stationed there is the sole exception. Other maps are on such a scale as to be often hard

to read. These minor criticisms do not detract from the fact that this book deserves to be on the shelf of students of airpower history and any modern practitioner of combined-arms warfare.

Lt Col Golda Eldridge, USAF (Ret), EdD



German Rocketeers in the Heart of Dixie: Making Sense of the Nazi Past during the Civil Rights Era.

By Monique Laney. New Haven CT: Yale University Press. 2015. Photographs. Notes. Bibliography. Index. Pp. xv, 302. \$35.00 ISBN: 978-0-300-19803-4

On April 11, 1945, a unit of the U.S. Third Armored Division captured the city of Nordhausen in central Germany. Although not the heaviest fight of the war, that city will forever remain in the memories of the American soldiers as a place of horror. Hundreds of corpses lay sprawled over an abandoned Wehrmacht training base, and hundreds more filled the great barracks. In 1975, New York Governor Hugh Cary said, “Thirty years ago . . . I stood with other American soldiers before the gates of Nordhausen and witnessed the nightmarish horror of slave camps and crematoriums. I inhaled the stench of death and barbaric, calculated cruelty. . .”

These were slave-laborers, initially procured from the Buchenwald concentration camp and brought from the nearby underground V2 rocket factory by their SS guards when no longer able to work. As many as 20,000 of some 60,000 prisoners forced to dig the vast underground tunnels and work on the V2 rocket production lines perished from hard labor, beatings, hunger, disease, and executions. None of the thousands of German scientists, engineers, technicians, and production managers remained when the Americans arrived; some surfaced five years later in Huntsville, Alabama, as employees of the U.S. Army. They, and thousands more, were brought to the U.S. under Project Paperclip.

Well before the war ended, efforts were underway to exploit Nazi advanced military technology and technologists. Closely behind American combat units, specially organized teams moved quickly to collect coveted military assets including technical documents. Some Germans were brought into the U.S. as POWs to circumvent visa requirements. Those who were certain to be barred from employment in the U.S. under Project Paperclip had their investigative reports altered. And war crimes investigators were denied access to the immigrants. Laney calls this “Machiavellian logic and morality.” Where national security is concerned, you do whatever is required

In *The Rocket and the Reich*, one of Laney’s principle sources, historian Michael Neufeld noted that “. . . a sample of twenty-eight prominent [members of the Von

Braun rocket team] shows that thirteen or fourteen became [Nazi] party members and four, including von Braun were officers in the SS. . .” One of these, Arthur Rudolf, a highly honored U.S. Army and NASA official, relinquished his American citizenship in 1984 and left the country to avoid deportation proceedings alleging he was a war criminal. Fellow rocketeers worried who might be next. Laney devotes an entire chapter to the Rudolf case and its impact on the Huntsville community.

Though Paperclip is covered in detail, it was but the backdrop to understanding how the Germans, led by America’s future space-age hero, Dr. Wernher von Braun, were assimilated into the Huntsville community in the heart of Dixie as well as throughout the country. Lacey says that this study “reveals connections between immigration, race, ethnicity, science and technology, nation, history, and memory that affect Americans’ identities and political thinking. It shows the ways in which national decisions have both erased and magnified the rocket specialists’ participation in German weapons development with the help of concentration camp labor. . .”

Laney is the daughter of a German mother and an American father and was raised in both Tuscaloosa, Alabama, and Frankfurt, Germany. Her father married a daughter of one of the German rocket experts in Huntsville in his second marriage. This background is important, because she could empy the complicated process of relating to, negotiating, and struggling with the Nazi past. She notes that the German population had to reconcile official narratives with personal family histories, and the two seldom seem to mesh. Similarly, Americans have to understand that “it is important for the United States to come to terms with the fact that racism is ‘integral to our history and identity as a nation.’” There are, as African Americans pointed out even before we entered the war (and before the Holocaust became public knowledge), parallels between the treatment of Jews in Nazi Germany and blacks in the United States. When the Germans arrived in Huntsville in 1950, “they were not even citizens yet, had more privileges than the African Americans,” military veterans included.

As Laney explains, her book (an extension of her doctoral dissertation) explores how the Germans in Huntsville negotiated their lives in Hitler’s Third Reich in the U.S. context and how their white, Jewish, and African-American neighbors made sense of the Germans’ past in context of the U.S. legacy of slavery and Jim Crow. She came to “the heart of Dixie” and immediately recognized overt racism and the undeserved adoration afforded the immigrants from Hitler’s Germany. She was determined to investigate and document what was and should not have been. The result stands as an indictment of America’s military and civilian leaders in the aftermath of World War II. The Germans were placed above America’s black citizens in the interests of national security; and America’s leaders, military and civilian, shamelessly tolerated, even

supported, the injustice while misrepresenting the German rocketeers to the American people.

At the end of the conflict in Europe, misinformation and lies were fed the American people to justify bringing von Braun and his rocket team to the United States and eventual U.S. citizenship. Without reservation, I recommend this book as an outstanding contribution to the history of the Second World War and its aftermath.

Robert Huddleston, WWII combat pilot who served in Project Lusty at the end of the European conflict



History of Rocketry and Astronautics: Proceedings of the 45th History Symposium of the International Academy of Astronautics, Cape Town, South Africa; v. 42 of the AAS History Series, and v. 31 of the IAA History Symposia. Otfried G. Liepack, Ed. San Diego CA: Univelt, Inc. for the American Astronautical Society, 2014. Photographs. Illustrations. Notes. Index. Pp. 396. \$95.00, Paperback \$75.00 ISBN: 978-0-87703-627-2/978-0-87703-628-9

and

History of Rocketry and Astronautics: Proceedings of the 46th History Symposium of the International Academy of Astronautics, Naples, Italy, 2012; v. 43 of the AAS History Series, and v. 32 of the IAA History Symposia. Niklas Reinke, Ed. San Diego CA: Univelt, Inc. for the American Astronautical Society, 2015. Photographs Illustrations. Notes. Index. Pp. 450. \$95.00, Paperback \$75.00 ISBN: 978-0-87703-625-8/978-0-87703-626-5

These two volumes are worthy shelf companions to their many predecessors. In the style of AAS/IAA symposia proceedings, each offers expert research papers and memoir pieces addressing the history of astronautical science and technology. While many treat explicit programs, others trace notable pioneers, related scientific and technological developments, national rocketry and space development in various countries, issues related to the four-decade Cold War and the so-called “Space Race” within it, and social and cultural issues involving space-flight and astronautics.

Justifying their admittedly high price, both of these volumes are of extraordinary value, combining solid research and analysis with notes and references benefiting those pursuing further research. Of the two, I found volume 42 of the greatest interest. Indeed, it traverses a remarkable range of topics, a few of which are the first detailed history of the Soviet Union’s Spiral project and the BOR family of lifting reentry RPAs; NASA’s quest for a reusable spaceplane; the evolution of Japan’s space program; a reexamination of the place of Tsiolkovskii, Goddard, and Oberth in early spaceflight history (bottom line—the traditional assessment that these are the three

foundational icons largely holds up); early French guided missile development; and the strange history of South Africa’s attempt to develop a space booster and strategic atomic-armed ballistic missile based on Franco-Israeli technology. Volume 43 has trouble matching that redoubtable list of topics but has an excellent series of biographical essays on lesser-known astronautical visionaries, a good survey of the origins of French space policy, and another on the history of Soviet lunar space-probe flights.

The high standard of these works reflects the diligent efforts of editors Liepack and Reinke, made somewhat easier by the quality of the authors, including such space history stalwarts as Roger Launius, Michael Neufeld, Frank Winter, Philippe Jung, Å. Ingemar Skoog, Oleg Sokolov, and Charles Lundquist. It is refreshing as well to see that the AAS-IAA continues to encourage the submission of papers by new scholars entering the field of astronautical history. Both volumes have notable essays from names that undoubtedly will become more familiar to readers of space and rocketry history in the decades ahead. As always, great credit is due to Rick W. Sturdevant, series editor for these and other AAS-IAA historical publications, for overseeing this monumental series. Now if we could only have a similar series on the history of aeronautics... !

Dr Richard P Hallion, Science & Technology Policy Institute, Institute for Defense Analyses



B-17 Flying Fortress Restoration: The Story of a WWII Bomber’s Return to Glory in Honor of the Veterans of the Mighty Eighth Air Force. By Jerome J. McLaughlin. Sonoita AZ: Dudley Court Press, 2016. Photographs. Pp. 297. \$24.95 (Kindle \$7.00) ISBN 978-1-940013-25-1

In his second publication, Jerome McLaughlin presents a very straightforward and worthwhile description of what it takes to restore a World War II aircraft for museum display. He begins by describing what I believe is a baby-boomer phenomenon—wanting to know all about what all of our relatives did in the Second World War. McLaughlin’s first book was about his uncle, an Army Air Corps navigator who perished while dropping 101st Airborne troops on D-Day morning. His uncle’s C-47 went down after being hit by flak, and McLaughlin researched the entire event and wrote a very detailed book about his uncle and the event.

His style carries through in this book, starting from when he retired to Savannah, Georgia, and began volunteering at the National Museum of the Mighty Eighth Air Force. Later, the museum acquired a former firefighting B-17 from the Smithsonian’s National Air and Space Museum. McLaughlin describes the condition of the aircraft

when it arrived in Savannah and discusses the process of gathering the people (all volunteers) who would become the restoration staff. He became the project manager tasked to restore this aircraft and display it as it came out of the factory. The team was faced with dirt, defects, and missing parts, all which needed attention. Each potential roadblock was met by McLaughlin and his team working with known warbird organizations such as American Aero Services and Tommy Garcia (who helped prepare the B-17 for the movie *Memphis Belle*) to help get past hurdles. Other firms, such as the Gulfstream Corporation that painted the interior, also played a part. Almost all of the work of these outside firms came as non-solicited gifts.

Collecting missing parts was also a big effort, and McLaughlin describes what it took to barter, beg, and even dig up some parts for the aircraft. This B-17 has one unique feature that no other surviving B-17 has: all of its turrets are powered and operational. Another firm provided a power unit that uses museum electricity and converts it to the standard 24-VDC power for the aircraft's electrical system to power the turrets. The system also powers the original, functioning, wartime radio.

McLaughlin emphasized that all the work was accomplished by volunteers, the backbone of most aviation museums around the world. While he intersperses comments by many of them throughout the book, he provides stories in the book's final section from many of the volunteers about their restoration experiences.

The main mission of the museum is to honor the men of World War II's Eighth Air Force. The book has comments from many veterans—all in their late eighties and early nineties—who come to see the *City of Savannah* and reflect on how it touched them and their families.

The book is an easy-flowing read and full of facts about the manpower and materials required to restore a Second World War aircraft.

Tony Kambic, Fairfax VA, volunteer at NASM's Udvar-Hazy Center



Phoenix: A Complete History of the Luftwaffe 1918-1945: Volume 1 The Phoenix is Reborn 1918-1934. By Richard Meredith. Solihull UK: Helion & Company, 2016. Maps. Tables. Photographs. Notes. Appendices. Glossary. Bibliography. Index. Pp. xlix, 582. \$55.00 ISBN 978-1-910294-50-5

Richard Meredith has really done his homework. This volume (the first of three) takes the reader up to Hitler coming to power and describes, in well-annotated detail, how the Luftwaffe of World War II evolved into such an efficient and powerful arm of the German Military. Meredith spent many years and resources and left no stone unturned. His book provides a chronological history of

names, locations, ranks, organizations, and events. Students of the wartime Luftwaffe are provided so much detail that it sometimes gets blurry; but, as one finishes reading each chapter, it is more and more apparent why the Luftwaffe became such a strong and disciplined air force.

In this volume, Meredith starts the reader's journey at the end of the First World War and the Versailles Treaty that left the German military empty. He then describes how a few very dedicated and disciplined military officers maintained their focus and used their knowhow and influence to keep what was left intact and committed and evolved it into a highly educated, disciplined, and efficient air arm. He shows how the engineering firms, aircraft builders, and armament firms kept up competition in aviation to build a vast array of aircraft and weapons, even under the restrictions of the Versailles Treaty.

It is interesting to learn how air travel in mainland Europe was a factor in eventually eliminating the treaty's restrictions. Consequently, civilian aircraft production was increased, all while hidden advances in military aviation were running in parallel. The leaders of the evolving Luftwaffe also created strict new standards for the pilots, officers, and support staff that helped form a well-maintained organization. Meredith shows how civil-aviation (mostly sailplane) clubs were a grooming ground for future pilots. The reader is shown how the military leaders began to realize the needs for long-range bombers, separation of naval aviation, navigation aids, efficient weaponry, and strong leadership. Meredith firmly believes that Goering's selection of Erhard Milch (a civilian at the time) to oversee the development of the Luftwaffe was key to building this rising Phoenix.

I've been a Luftwaffe follower for over 50 years but still learned many new things from this highly detailed book:

- The numbering of aircraft (such as D-2600) came about because of the Versailles Treaty, was specified in order to keep track of how many aircraft Germany produced after World War I. It started with D-1. Hitler ended that when he came to power.
- The classy uniforms of the Luftwaffe were largely (no pun intended) influenced by Hermann Goering. He loved the piping, collar tabs, and sharp colors.
- The First World War's General von Seeckt played a very strong role in defining the standards of the German military: he ensured that officers earn university degrees and be multi-lingual.
- There was a lot of competition with other nations in Europe for air travel and even air races from city to city that gave fledging aviation manufacturers opportunities to test new engines and designs. These, in turn, aided military aircraft designs.

Meredith leaves nothing undocumented. He filled the book with footnotes that many times use up to one-third of the page. Many of the photographs are ones I've never

seen before and well show many of the key people and events involved with the rebirth of the Luftwaffe.

At first glance, I thought this book was going to be a heavy read, but in fact it was easy; with the new things I was learning, I found myself finishing it quickly. I eagerly await the remaining volumes.

Tony Kambic, Fairfax VA, volunteer at NASM's Udvar-Hazy Center



Dick Cole's War: Doolittle Raider, Hump Pilot, Air Commando. By Dennis R. Okerstrom. Columbia MO: University of Missouri Press, 2015. Photographs. Maps. Notes. Bibliography. Index. Pp. xiii, 321. \$29.95 ISBN: 978-082627355-0

On the night of November 9, 2013, three aging airmen, served by Air Force Academy cadets, sampled a rare bottle of 1896 Hennessy cognac before hundreds of dignitaries and other well-wishers who had gathered in the National Museum of the U.S. Air Force at Wright-Patterson AFB, Ohio. A fourth, too ill to attend, watched via television from afar. One of the three, Dick Cole, opened the bottle and then spoke: "Gentlemen, I propose a toast—to those we lost on the mission, and those who have passed away since. Thank you very much, and may they rest in peace."

It was a poignant moment, for the toast reflected the rapidly dwindling numbers of their comrades, the eighty Doolittle raiders who had struck at Japan on April 18, 1942, signaling the ending of their annual reunions, and their passing from the public scene. For Dick Cole, one of the three, it marked something else: the return of a hometown boy to special homage in a special place. Born in Dayton in 1915, he had gone to Ohio State; earned his wings as an Army Air Corps pilot in 1941; and then, early the next year, flown as copilot to Jimmy Doolittle himself.

Sadly, as these words are written, Dick Cole is now the sole survivor of the Doolittle raiders, still amazingly spry and energetic. Thanks to Dennis Okerstrom, his life story is now available for all to read. Okerstrom, previously known for other fine military aviation histories, particularly *Project 9: The Birth of the Air Commandos in World War II*, has written an outstanding book—one that is a fitting tribute both to its subject; the raiders; and, in a larger sense, to the Air Commandos, past and present. Okerstrom, a professional academic and aviator himself, came to the subject because of his earlier work tracing the establishment and combat history of the first Air Commandos, during which he had met Dick Cole.

After surviving a night parachute landing on a mountainside and evading Japanese searchers (thanks to the heroism—and sacrifice—of Chinese guerillas and ordinary citizens), Cole remained in the China-Burma-India (CBI) theater for over another year, flying as a supply pilot on

the formidable Hump airlift. Following a stint as a production acceptance pilot at Douglas, he subsequently returned as one of the first Air Commandos in the invasion of Burma. He ended the war a highly decorated veteran and a stand-out even among men such as himself. For all of this, he was—and is—unassuming and modest to a fault.

Okerstrom has rooted his book not only in the recollections of Cole and his comrades (and family) but also in thorough archival research and available literature including, of course, that of the late Carroll V. "C.V." Glines, the greatest of Doolittle raider chroniclers and Doolittle biographers. This book is as much a history of America's air war in the CBI as seen through the life of a single distinguished airman as it is a biography of an American warrior-patriot. Well-written, excitingly paced, and meticulously sourced, *Dick Cole's War* is an excellent book. In an era when the ranks of World War II veterans are thinning at a sorrowfully accelerating rate, it offers to new generations a reminder of what was at stake in the skies over Asia almost 75 years ago when a small band of Americans in B-25s took on the might of the Japanese empire, giving its militarist leaders a foretaste of what the B-29s would bring in larger measure in 1944-45. Highly recommended.

Dr Richard P Hallion, Science & Technology Policy Institute, Institute for Defense Analyses



My Journey at the Nuclear Brink. By William J. Perry. Stanford CA: Stanford Security Studies, 2015. Photographs. Endnotes. Glossary. Index. Pp. xxix, 234. \$85.00(\$24.95 in paperback) ISBN: 978-0-847-968-1

Among all the literature on the dangers of nuclear weapons published since the early Cold War, this book may well be the most credible. As an 18-year old soldier in 1945, Perry was assigned to the occupation of Japan, where observing its devastation was "a transformational experience." He went on to earn a doctorate and work in various defense technology companies. In 1977, Secretary of Defense Brown recruited Perry as his Undersecretary of Defense for Research and Engineering. There he oversaw a revolution in military capabilities with the development of stealth technology, precision munitions, cruise missiles, advanced sensors, and the Global Positioning System. The purpose of these programs was to leverage American technical innovations to offset Soviet numerical superiority, especially in Europe. For Perry, another benefit of a new generation of conventional weapons was minimizing the need for battlefield nuclear weapons to counter a Warsaw Pact invasion. To reduce the vast size of the U.S. and USSR nuclear arsenals, he also helped negotiate the Strategic Arms Limitation Treaty II. Meanwhile, he also

attended to the Trident and MX nuclear missile programs (but soon regretted supporting the latter).

Returning to civilian life in 1981, Perry remained involved in national security affairs, international security, arms control, and improving relations with counterparts in adversary nations to help foster government-to-government contacts.

Perry returned to the Pentagon as Deputy Secretary of Defense in 1993 and became Secretary a year later. Despite post-Cold War budget cuts, he maintained credible defense capabilities and enhanced the quality of life for military personnel. To take advantage of the new international environment, he also participated in numerous diplomatic initiatives. Rather than just relying on the Cold War strategy of deterrence, he followed a policy of “preventive defense.” This included trying to keep new threats from emerging (sometimes through “coercive diplomacy”); alleviating the continuing danger of nuclear wars, accidents and proliferation; and promoting NATO’s “Partnership for Peace” to gradually expand the alliance’s role in Eastern Europe without alienating Russia.

One of his proudest achievements was implementing an operation authorized by an amendment sponsored by Senators Richard Lugar (R-IN) and Sam Nunn (D-GA), which he considers “one of the most enlightened pieces of legislation ever to emerge from Capitol Hill.” This involved rounding up “loose nukes” and dismantling missiles scattered among three former Soviet republics. Much of their reprocessed uranium was later used to power American nuclear plants (dubbed “Megatons to Megawatts”). To advance these programs and handle foreign crises—such as NATO airstrikes and deployment of peacekeeping forces to end the Serbian-sponsored civil war in Bosnia and preventing North Korea from developing plutonium-based nuclear weapons—Perry kept up a busy schedule of trips overseas. In all the chapters about his time in the Pentagon, he generously credits the contribution of many people he worked with, including current Secretary of Defense Ash Carter (who might be considered his protégé).

After returning as planned to private life in 1997, Perry still remained active in national security matters, especially (as indicated by his book’s title), the dangers of nuclear accidents, proliferation, terrorism, and war. “I believe it is imperative to share what I, as an insider, know and understand about these dangers, and what I think must be done to keep future generations safe from nuclear dangers that are growing greater every year.” The latter part of the book laments lost opportunities to further reduce nuclear arsenals, prevent North Korea from going nuclear, and sustain better relations with Russia. These relations began deteriorating in the late 1990s largely because of what he considers the too-rapid expansion of NATO all the way to Russia’s border.

October 2006 marked the 20th anniversary of the historic summit meeting in Reykjavik, Iceland, where President Reagan and General Secretary Gorbachev discussed

dismantling all nuclear weapons. Perry participated in a conference at Stanford’s Hoover Institute to commemorate their vision of nuclear disarmament. This led to the first of five op-eds in the *Wall Street Journal* signed by former Secretaries of State Henry Kissinger and George Schultz, Sam Nunn, and Perry, which reminded readers of the continued dangers posed by nuclear weapons and the need to begin a step-by-step global process toward their eventual elimination. These notables and other like-minded activists established the Nuclear Threat Initiative and the Nuclear Security Project to work toward this goal. In view of the recent nuclear buildup by Putin’s alarmingly belligerent Russia and other potential crises, Perry laments how badly the prospects for nuclear disarmament have worsened since the four colleagues published their last op-ed in 2013. Even so, Perry has vowed to continue his efforts to help save the world from a future catastrophe.

Lawrence R. Benson, retired Air Force historian, Albuquerque NM



Wings of Empire. By Barry Renfrew. Stroud UK: The History Press, 2015. Photographs. Notes. Sources. Index. Pp. 258. £25.00 ISBN 978-0-7509-6507-1

Wings of Empire is one of the great untold stories of the British Empire. Renfrew tells the story very well, including the Royal Air Force’s (RAF) strategy to ensure its continued existence, the actions it undertook to try to police the empire, how the events affected the airmen and officers involved, and what their lives were like on and off operations. A military historian, foreign correspondent and excellent writer, Renfrew has covered wars and unrest in Afghanistan, Russia, Africa, and elsewhere.

The overarching theme is the story of the RAF trying to preserve itself after World War I. To an American, this may seem a bit odd. However, the Royal Navy’s and British Army’s attempts to *dismember* the RAF after the war were simply the mirror image of U.S. airpower advocates trying to *create* an independent air force against the wishes of the U.S. Army and Navy. An important approach used by the RAF to try to make itself essential to Britain and, thus, fend off dismemberment, was to use Air Control to police the empire at a smaller and more affordable financial cost than could the army. Policing the empire generally meant putting down attempts on the part of natives to cease being part of the empire and to discouraging their waging war on each other. Air Control largely meant bombing villages in, usually, lightly populated areas where such unrest manifested itself. At times, the RAF and Lord Trenchard, its head, overreached themselves by trying to police territories which included significant urbanized areas: Air Control had no chance of success in Palestine.

In lightly populated areas, where Air Control had

some success, what was required was an integrated use of air power, ground troops, and armor (when available). However, the failure of pure Air Control was for a time obscured by incorporating armored cars and native troops under the command of RAF officers. This combination was particularly effective in Iraq and Trans-Jordan in the 1920s. Ultimately, the army (primarily the Indian Army) and the RAF learned to work well together in order to achieve some semblance of success on the North West Frontier of India.

In addition to military actions, Renfrew describes what life was like for the men involved. They tried to recreate the environment of their mess as if it were still in the UK. He does not spare description of the extreme contempt for the “natives” as people, the class consciousness, and the profound sense that Britons were destined to rule the “lesser people” of the earth. Of course, not everyone was so cavalier. Renfrew illustrates this with a quote from the Commander in Chief of the Indian Army, Field Marshal Sir Philip Chetwode:

Air Control, since it included killing the wives, children and animals of the people thought to be miscreants, was not a system that could survive scrutiny in the British press or in Parliament. However, just as this scrutiny was becoming unavoidable, WWII started and Air Control was quickly forgotten, in favor of the much more important task of defending the UK against Germany.

In his last chapter, *Legacy*, Renfrew makes some important observations. He points out that in insurgencies the UK dealt with after World War II (e.g., Malaya and East Africa) the British forces seemed to have truly forgotten all they had learned from the era of Air Control and had to learn much of it over again. Corporate memory is important. He also points out the similarities between Air Control as practiced by the RAF before the Second World War and the present-day U.S. use of drones in many of the same regions:

The use of drones by the United States against Islamic fundamentalists on the old North-West Frontier bears more than a slight resemblance to the RAF's mixed success against religious warlords in the same region. The men who chugged over the mountains in wooden biplanes could not have dreamed of pilotless aircraft controlled from thousands of miles away, but they would have immediately recognised the same problems of deciding who was a foe and who was not, and how and when to attack a village.

Air power must be intimately integrated with troops on the ground, and with armor if possible, in this sort of task if it is to be effective. The U.S. has realized this and has put Special Forces on the ground in the Near East to make its air attacks effective.

In summary, the book is easy and very interesting reading and is well-illustrated by an excellent section of vintage photographs on glossy paper. It is important for

what it has to say about the use and limits of airpower.

Leslie C. Taylor, docent, NASM's Udvar-Hazy Center



Striking the Hornet's Nest: Naval Aviation and the Origins of Strategic Bombing in World War I. By Geoffrey L. Rossano and Thomas Wildenberg. Annapolis MD: Naval Institute Press, 2015. Photographs. Maps. Notes. Bibliography. Index. Pp. xiv, 304. \$34.95 ISBN: 978-161251390-4

Professional military historians and popular aviation authors alike generally have ignored the early years of military aviation, the breadth of coverage of it paling next to the seemingly more compelling narratives of air combat from 1939 onwards. While the exploits of early military aviators excited the imagination of youngsters over the interwar years, surprisingly few solid and substantial accounts of it emerged in that period, save for some fine official histories. Then, the Second World War severely curtailed further professional interest in the “Great War.”

Thus, with very few notable exceptions—one thinks of I. B. Holley, Lee Kennett, and John Morrow—academic military aviation historians have toiled elsewhere. It is primarily through the popular historians and aviation writers—stalwarts such as Jack Herris, Peter Kilduff, R. D. Layman, and the late J. M. Bruce, Peter Grosz, Alex Imrie, and Heinz Nowarra, together with the many members and enthusiasts of *The League of WWI Aviation Historians* and the *Cross & Cockade Society*—that we have the detailed knowledge and understanding of First World War air organization and operations we possess. Indeed, almost a century after the guns were stilled on the Western (and every other) Front, the First World War remains a fruitful subject for examination by those tracing the roots of modern military aviation.

Finding solid and substantial naval aviation histories relating to the Great War is even more of a challenge, with the origins of naval aviation in the prewar era being arguably better covered than the actual combat record of Allied and Central Powers naval aviation forces in the war itself. Those that do exist focus primarily (and perhaps not surprisingly) on maritime air operations of floatplanes, seaplanes, and airships. Rarely mentioned, and then only in passing, are naval air attacks against industrial targets and bases. Yet, virtually from the war's outset, the British, French, German, Russian, and Italian navies, and America's thereafter, had ambitious plans for such strikes.

In this intriguing and eminently satisfying book, Rossano and Wildenberg place a long-overdue spotlight on the U.S. Navy's early efforts at strategic bombing, a story largely absent from standard histories of the evolution of

strategic bombing, and thus most welcome. Operating from bases along the Channel or just inland from it, Navy and Marine airmen of the Navy's "Northern Bombing Group" (NBG) flying American-built British de Havilland D.H. 4 bombers struck at a variety of German targets. For a variety of reasons (including difficulties getting the right aircraft and training), the program never fulfilled the hopes of its architects, in part because it began just weeks before war's end. Nevertheless, as the authors point out, it marked an important moment in both the evolution of naval aviation and the genesis of American thinking about strategic air attack.

Rossano and Wildenberg are familiar names to readers of naval history, and their book reflects both deep research and thoughtful interpretation and analysis. I was particularly pleased that they illuminate the important work of Harry F. Guggenheim, the son of mining magnate Daniel Guggenheim, both as a junior naval officer working to acquire aircraft for the NBG and, in his own right, as a perspicacious prognosticator of nascent strategic bombing thought. Guggenheim *père et fils* later established The Daniel Guggenheim Fund for the Promotion of Aeronautics which, lasting from 1926 into 1930, was responsible for dramatically reshaping American aviation and redressing shortfalls in research and education that had hindered its expansion.

The book has a few shortfalls. Though the bibliography is excellent, it is surprising that neither Tami Davis Biddle's *Rhetoric and Reality in Air Warfare* nor R. D. Layman's *Naval Aviation in the First World War: Its Impact and Influence* make the listing. The 3-page last chapter, on lessons and legacies of the naval bombing campaign, offers a good summary but otherwise is far too brief, perhaps reflecting that, in the end, the NBG, while noble in intent, achieved little in practical reality. The authors allude to the subsequent influence one NBG planner, junior naval reserve officer Robert Lovett, had over America's Second World War strategic bombing efforts, when he was Assistant Secretary of War for Air, working with the Army Air Forces' General Hap Arnold. While undoubtedly true, one wishes they had more thoroughly explored this significant and largely unappreciated connection. Despite these few deficiencies, *Striking the Hornets' Nest* is a welcome and substantial contribution to the literature of the first war in the air. Given its appearance during the centenary of the "Great War," it is a most timely (if long overdue) one as well.

Dr Richard P Hallion, Science & Technology Policy Institute, Institute for Defense Analyses



The Lafayette Escadrille: A Photo History of the First American Fighter Squadron. By Steven A. Ruffin. Havertown, PA: Casemate, 2016. Photographs. Appen-

dices. Bibliography. Index. Pp. 288. \$37.95 ISBN: 978-1-61200-350-4

If a picture is worth a thousand words, then Steven Ruffin has produced the equivalent of a quarter-million words in his *Photo History*. Ruffin searched through American and French museums and university archives to gather a wealth of photographs—primarily glossy-colored backed up by black-and-whites—of the men and aircraft of the Escadrille. During his travels, he also photographed the squadron's operating sites and memorials commemorating its achievements.

Military historian Blaine Pardoe, who has written much about the Escadrille, lauded this work: "Ruffin hit some of the same places I did for photos of the unit. What he brought to the table was context. [Many of the] photos are in boxes down at Washington and Lee University. Ninety-percent are unlabeled. Steve Ruffin dove into that treasure trove (and others) and not only identified the men, but where they were and when they were there. This book is chocked full of photographs, many of which we simply haven't seen. It is a testimony to how he must have buried himself in the research."

As a further result of his research, Ruffin recreated the escapades of the thirty-eight Americans who voluntarily flew for France before the United States entered the First World War. Nine died in action and two perished in crashes. His detailed accounts of their lives made me feel as if I knew each man personally.

Escadrille pilots came from both rich and poor backgrounds, but mostly from well-to-do families. Their commonality was a quest for adventure, and their earlier life experiences paralleled the dynamics they encountered as flyers. Before their acceptance into the Escadrille, they generally served as front line Foreign Legion soldiers or ambulance drivers for the French Army.

Ruffin presents a continuous narrative about the Escadrille's daily combat, victories and losses, numerous crashes, personality clashes, relocations, attacks by German bombers, and changes of aircraft. He often quotes the participants themselves who wrote about their experiences. Most fittingly, Ruffin provides histories of the post-war lives of the Escadrille survivors.

Helpful features of the book include a map of the Escadrille's aerodromes; four-perspective drawings of the squadron's aircraft; and a roster of the flyers, which I frequently referenced.

During the First World War, my father was a teenager who idolized the men of the Lafayette Escadrille, a feeling he never lost. The bedtime stories he told me often focused on the flyers mentioned in Ruffin's book—along with the feats of Eddie Rickenbacker and his "Hat-in-the-Ring" Squadron. Ruffin's storytelling significantly expanded that of my father and should captivate any person interested in aerial warfare.

The flyleaf calls Ruffin's book "undoubtedly the finest

photographic collection of the Lafayette Escadrille to appear in print.” Along with Pardoe, I wholeheartedly agree and would add that the text is excellent as well.

Henry Zeybel, Lt Col, USAF (Ret)



Milestones of Flight: The Epic of Aviation with The National Air and Space Museum. By F. Robert Van Der Linden, Alex M. Spencer, and Thomas J. Paone. Washington DC: National Air and Space Museum in association with Zenith Press, 2016. Photographs. Diagrams. Index. Pp. 207. \$35.00 ISBN: 978-0-7603-5027-0

Milestones of Flight features well-researched historical essays and stunning photography of aircraft selected from the National Air and Space Museum’s (NASM) extensive collections for their significant place in aerospace history. Composed by the museum’s own expert curators, the 26 chapters adroitly describe the importance of each aircraft’s development, production, and use. Accompanying timeline graphics clearly illustrate each plane’s career and the particular artifact’s journey through the decades to its museum acquisition. Among those aircraft included are the Caudron G.4, Curtiss D-III, Douglas World Cruiser, Arlington Sisu 1a glider, 1903 Wright Flyer, P-51, B-29 *Enola Gay*, and *Spirit of St. Louis*. The museum is on the cutting edge; even the Predator is here. *Milestones of Flight* gives the reader a good overall picture of the depth and breadth of history-making aviation.

These are not dry chronological sketches; the experienced aerospace historians expertly reveal the true impact of these planes. Reflecting the latest scholarship, the text is clear and lively and pull the reader into the drama of each aircraft’s story in a manner reminiscent of immediate postwar writing. Determined investigation has uncovered detailed provenances for the museum’s meticulously restored specimens. For instance, the 1903 Wright Flyer, loaned in 1928 to the Science Museum in London, sat out Word War II in England, securely cached in an underground vault. Details of preservation of century-old aircraft indicate the magnitude of the NASM staff’s accomplishment: the original 1916 fabric remains on the Museum’s Caudron G.4; restoration of the *Enola Gay* took two decades and three hundred thousand hours; the *Spirit of St. Louis* is carefully coated with an anti-corrosive compound.

Each chapter opens with a dramatic shot of the artifact aircraft on display at the museum. Care is taken to include at least one photo of the cockpit of each, tying it to those courageous souls who flew their charges across the ocean, around the world, or to the edge of space – all on

the strength of a few analog instruments in a non-networked aircraft. The effect is immersive: even the endpapers portray a DC-3 cockpit. One or two detail pictures, plus an historical shot or two of the particular artifact, wherever possible, round out the coverage. Photos of the artifacts as exhibited display professional composition, lighting, and clearance of background clutter to assure lasting value.

Unfortunately some typos appear, especially in photo captions. In a few instances the text appears to have been rapidly edited, with choppy sentences and paragraphs betraying what apparently had to fit the available space. There are a few quibbles with facts. Although no longer in use in the US military, the F-4 Phantom continues in service in a number of foreign air forces. The noted Carl Cover was a Douglas, not a TWA test pilot. The FJ-1 Fury was an early carrier fighter, but not the first; Grumman and McDonnell aircraft preceded it to sea. The Doolittle raid’s influence on enemy strategy and planning is not cited as a reason for the Battle of Midway. General Arnold’s key role in driving the B-29 program is not mentioned.

Milestones of Flight will spur the reader’s curiosity about the Museum’s aircraft and artifacts, the history surrounding them, and details of the extraordinary care that goes into restoring and maintaining these valued heirlooms. Fortunately the Museum has spawned an impressive stable of works to meet that need. Van Der Linden’s *Best of the National Air and Space Museum* (2006), and *The Nation’s Hangar: Aircraft Treasures of the Smithsonian* (2011) provide an in-depth grounding in the NASM’s place in aerospace technology development, historical research, and preservation. Some of the pictures are the same, but Van Der Linden’s thorough volumes are the story behind the story.

Further explorations of the history of flight, aerospace technology and exploration as presented at the NASM appear in R.G. Grant, *Flight: The Complete History* (2007), Philip Whiteman, *Aircraft: The Definitive Visual History* (2013), Dana Bell, *In the Cockpit: Inside 50 History-Making Aircraft* (2007), and Andrew Chaiken, *Air and Space: The National Air and Space Museum Story of Flight* (2008). Utilizing the full scope of the museum’s artifacts—aircraft, archives, and such objects as ancient instruments and pressure suits—provides insight into the skilled detective work behind NASM’s exhibits.

Printed on heavy archival-quality stock and sturdily bound in cloth, this coffee table-sized work is intended for repeated perusal, reference, and re-reading and is highly recommended.

Steve Agoratus, Hamilton NJ



Books to Review

- Belanger—*Ecologies of Power: Countermapping the Logistical Landscapes and Military Geographies of the U.S.* Department of Defense. 448p.
- Erickson—*History of Rocketry and Astronautics, Vol 45.* 270p.
- Graham—*SR-71 Flight Manual: The Official Pilot's Handbook Declassified and Expanded with Commentary.* 1000p.
- Laurier—*Fighter! Ten Killer Planes of World War II.* 192p.
- Rickman—*Finding Dorothy Scott: Letters of a WASP Pilot.* 243p.
- Stoler and Holt—*The Papers of George Catlett Marshall, Vol 7, "The Man of the Age": October 1, 1949-October 16, 1959.* 1046p.
- Stout—*Vanished Hero: The Life, War, and Mysterious Disappearance of America's World War II Strafing King.* 289p.

History Mystery Answer



The aircraft is the Bell UH-1 "Iroquois," or as it's more affectionately known the "Huey." The Huey first flew on October 20th, 1956. Today, both the U.S. Marine Corps (UH-1Y) and the Air Force (TH-1H and UH-1N) continue to fly the "Huey."

Air Force officer, 1st Lt James P. Fleming, received the Medal of Honor for actions while flying a Huey. On Nov 26th, 1968, as described in the award citation while flying a UH-1F, Lieutenant James Fleming "went to the aid of a 6-man special forces long range reconnaissance patrol that was in danger of being overrun by a large, heavily armed hostile force. . . . Fleming descended, and balanced his helicopter on a river bank with the tail boom hanging over

open water. The patrol could not penetrate to the landing site and he was forced to withdraw. Dangerously low on fuel, Capt. Fleming repeated his original landing maneuver. Disregarding his own safety, he remained in this exposed position. Hostile fire crashed through his windscreen as the patrol boarded his helicopter."

To learn more about the Air Force's Hueys and the current UH-1N visit:
<http://www.nationalmuseum.af.mil/Visit/MuseumExhibits/FactSheets/Display/tabid/509/Article/195972/bell-uh-1p-iroquois.aspx>

Coming Up



Compiled by
George W. Cully

January 5-8, 2017

The **American Historical Association** will hold its 131st annual meeting at the Colorado Convention Center and other sites in Denver, Colorado. This year's theme is "Historical Scale: Linking Levels of Experience." For registration information and other details, see the Association's website at <https://www.historians.org/annual-meeting/registration>.

March 1-3, 2017

The **Air Force Association** will hold its annual Air Warfare Symposium at the Rosen Shingle Creek Hotel in Orlando, Florida. For additional details, see the Association's website at <http://www.afa.org/airwarfare/home>.

March 7-9, 2017

The **American Astronautical Society** will host its 55th Robert H. Goddard Memorial Symposium at the Greenbelt Marriott in Greenbelt, Maryland. For more information as it becomes available, see the Society's website at <http://astronautical.org/events/goddard/goddard2017/>.

March 13-15, 2017

The **Association of the United States Army** Institute of Land Warfare will present its annual Global Force Symposium and Exhibition at the Werner von Braun Center in Huntsville, Alabama. For details, see the Association's website at <http://ausameetings.org/globalforce2017/>.

March 30-April 2, 2017

The **Society for Military History** will hold its 84th annual meeting at the Hyatt Regency Jacksonville Riverfront in Jacksonville, Florida. This year's theme is "Global War: Historical Perspectives." For

further information, check the Society's website at <http://www.smh-hq.org/2017/2017annualmeeting.html>.

April 3-6, 2017

The **Space Foundation** will present its 33rd annual Space Symposium at the Broadmoor Hotel in Colorado Springs, Colorado. Details for registration and other info can be had at the Foundation's website: <http://www.spacefoundation.org/events/space-symposium>.

April 6-9, 2017

The **Organization of American Historians** will hold its annual meeting at the New Orleans Marriott in New Orleans, Louisiana. This year's theme is "Circulation." For further info, see the Organization's website at <http://www.oah.org/meetings-events/meetings-events/call-for-proposals/>.

April 13, 2017

The **Society for History in the Federal Government** will hold its annual meeting at the National Archives and Records Administration (NARA) Building in Washington D.C. The theme of this year's meeting is "A Return to Archives." For more information, see the Society's website at <http://shfg.org/shfg/events/annual-meeting/>.

April 26-28, 2017

The **Army Aviation Association of America** will host its annual Army Aviation Mission Solutions Summit at the Gaylord Opryland Hotel in Nashville, Tennessee. For particulars, see the Association's website at <http://www.quada.org/index.php>.

May 8-11, 2017

The **Association of Unmanned Vehicle Systems International** will host its premier annual event, "XPONENTIAL 2017," at the Kay Bailey Hutchison Convention Center in Dallas, Texas. For registration and other info, see the AUVSI website at <http://xponential.org/xponential2017/Public/Enter.aspx>.

May 9-11, 2017

The **American Helicopter Society International** will hold its 73rd annual forum and technology display at the Fort Worth Convention Center in Fort Worth, Texas. The theme of this year's gathering is "the future of vertical flight." For more details, visit the Society's website at <http://www.vtol.org/annual-forum/forum-73>.

June 5-9, 2017

The **American Institute of Aeronautics and Astronautics** will host AVIATION 2017, its premier annual aviation and aeronautics forum and exposition, in Denver, Colorado. For more information as it becomes available, see the Institute's website at <http://www.aiaa.org/Forums/>.

July 11-16, 2017

The Womens' Aviation Association better known as **The Ninety-Nines** will hold its annual convention at the Westin Riverwalk Hotel in San Antonio, Texas. For more details, visit the Association's website at <http://www.ninety-nines.org/who-we-are.htm>.

Readers are invited to submit listings of upcoming events. Please include the name of the organization, title of the event, dates and location of where it will be held, as well as contact information. Send listings to:

George W. Cully
3300 Evergreen Hill
Montgomery, AL 36106
(334) 277-2165
E-mail: warty@knology.net

PROSPECTIVE REVIEWERS

Anyone who believes he or she is qualified to substantively assess one of the new books listed above is invited to apply for a gratis copy of the book. The prospective reviewer should contact:

Col. Scott A. Willey, USAF (Ret.)
3704 Brices Ford Ct.
Fairfax, VA 22033
Tel. (703) 620-4139
e-mail: scottlin.willey@gmail.com

July 23-29, 2017

The **International Congress of History of Science and Technology** will hold its 25th meeting in Rio de Janeiro, Brazil, on the Praia Vermelha campus of the Federal University of Rio de Janeiro (UFRJ). This Congress' theme will be "Science, Technology and Medicine between the Global and the Local". More details can be had on the ICHST's website at <http://hssonline.org/the-25th-ichst-meeting-in-rio-de-janeiro/#more-5876>.

July 23-29, 2017

The **International Committee for the History of Technology** will hold its 44th annual meeting in conjunction with the ICHST meeting to be held in Rio de Janeiro, Brazil. For details, see the Committee's website at <http://www.icohtec.org/annual-meeting-2017.html>.

September 12-14, 2017

The **American Institute of Aeronautics and Astronautics** will host SPACE 2017, its premier annual

space and astronautics forum and exposition, in Orlando, Florida. For more information as it becomes available, see the Institute's website at <http://www.aiaa.org/Forums/>.

October 4-8, 2017

The **Oral History Association** will hold its annual meeting at the Hilton Minneapolis Hotel in Minneapolis, Minnesota. For further details, see the Association's website at <http://www.oral-history.org/annual-meeting/>.

Reunions

1st Fighter Assn. Sep 7-10, 2017, Dayton, OH. Contact: Bob Baltzer
1470 Foxtale Ct,
Xenia, OH 45385
937-427-0728
robertbaltzer@sbcglobal.net

58th/60th Fighter Interceptor Sqdn. Sep 20-23, 2017, Fairborn, OH. Contact: Richard Doritty
5598 St Rt 37,
Sunbury, OH 43074
740-965-2455
voodoo101b@gmail.com

302nd Buckeye Wing Assn. Aug 16-18, 2018, Fairborn, OH. Contact: Jerry Millhouse
6715 Yorkcliff Pl,
Dayton, OH 45459
937-433-3156
jmillhouse@aol.com

312th Depot Repair Sqdn. Apr 27-30, 2017, Fairborn, OH. Contact: 4072 Old Manchester Ct,
Mason, OH 45040
513-254-8025
ninaprobelt@gmail.com

366th Fighter Assn. Sep 19-24, 2017, Fairborn, OH. Contact: Paul Jacobs
2409 Mallard Ln, Apt. 1,
Beavercreek, OH 45431
614-906-4470
paul@jacob.net

425th Tactical Fighter Training Sqdn. Oct 3-4, 2017, Fairborn, OH. Contact: Richard Kaercher
P.O. Box 446,
Cedarville, OH 45314
937-766-2502
rlmjkaercher@reagan.com

463rd Airlifters Assn & 316th TAW at Langley AFB 1965-1975 - Joint Reunion. Nov 6-9, 2016, Long Beach, CA. Contact: Phil Tenney
626-822-0262
jptenney66@gmail.com

548th Recon Technical Grp. Jul 12-14, 2018, Fairborn, OH. Contact: Cecil Brown
2459 S Old Oaks Dr,
Beavercreek, OH 45431
937-426-0948
cecilb211@ameritech.net

610th Military Airlift Support Squadron. August 23-25, 2018, Fairborn, OH. Contact: Harold Mitchell
354 Sussex Cir,
Vacaville, CA 95687
707-447-3536
mitch610mass@aol.com

6694th Security Sqdn. Aug 17-20, 2017, Fairborn, OH. Contact: Richard Krejsa
121 Crestfield Place,
Franklin, TN 37069
615-791-9012
rkrejsa@bellsouth.net

Cam Rahn Bay AB. Sep 28 - Oct 1, 2017, Dayton, OH. Contact: Diana Westphal
673 West Rock River Circle,
De Pere, WI 54115
920-609-5672
dwestphal8@new.rr.com

PTC-68A. Oct 16-19, 2017, Fairborn, OH. Contact:

Bil Fitzpatrick
2869 N. Teetime Ct,
Wichita, KS 67205
316-640-1373
wfitzpatrick1@att.net

PTC-68H (Moody AFB). Jun 7-9, 2018, Fairborn, OH. Contact: Tom Crowley
9168 Woodstream Ln,
Dayton, OH 45458
937-885-5286
tj-bj@woh.rr.com

PTC-69-03. 28 Sep 28 - Oct 1, 2017, Dayton, OH. Contact: Emery Kiraly
9221 Aldershot Dr,
Bethesda, MD 20817
301-469-0838
madlazlo@yahoo.com

UPT Class 69-05E (Webb AFB). Oct 26-29, 2017, Fairborn, OH. Contact: A. J. Thrush
186 Skyline Dr,
Lancaster, OH 43130
740-653-7585
ajthrush@sbcglobal.net

Det. 3, 3345th Tech Sch, Indiana Univ, Russian V 1965. Jun 22-25, 2017, Fairborn, OH. Contact: Cal Meyaard
521 Conkey Dr,
Fenwick, MI 48834
616-761-3824
cmeya@lycos.com

DOD Military Working Dogs. May 21-24, 2017, Fairborn, OH. Contact: Bill Louk
60 Linnet St,
Rochester, NY 14613
585-647-3057
billlouk1@gmail.com
<http://clarkk9.us/reunion-2017htm>

F-15 Gathering of Eagles 45. Jul 27-29, 2018, Fairborn, OH. Contact: Donna Friedman
2508 Cedronella Dr,
Chapel Hill, NC 27514
919-382-7271
donnafriedman26@gmail.com

F-86 Sabre Pilots Assn Reunion. Apr 23-25, 2017, Las Vegas, NV. www.gold-coastcasino.com/groups. Group Code: AAIRF86. Contact:

F-86 Sabre Pilots Association
P.O. Box 34423
Las Vegas, NV 89133-4423

Iceland Radar Sites—all years. 667th, 932nd, 933rd, 934th AC&W Sqdns. Apr 11-14, 2017, Tucson, AZ. Contact:

William Chick
littlechick@msn.com
www.usradarsitesiceland.com

Luke F-15s. May 5-7, 2017, Dayton, OH. Contact:

Gene Thweatt
1616 Shannon Ln,
Evansville, IN 47725
812-867-5550
thweattgene@aol.com

Pioneers of Stealth. Sep 27 - Oct 1, 2017, Fairborn, OH. Contact:

Jon Griffith
5048 Ackerman Blvd
Dayton, OH 45429
937-434-4223
griffinj@ameritech.net

Thailand, Laos, Cambodia Brotherhood.

Sep 20-24, 2017, Fairborn, OH. Contact:
Ray and Marie Boas
102 Stonecress Ct,
Greenville, OH 45331
937-548-9172
Raymar1970@embarqmail.com

Troop Carrier/Tactical Airlift Assn.

Oct 11-13, 2018, Fairborn, OH. Contact:
Sam McGowan Jr.
3727 Hill Family Lane,
Missouri City, TX 77459
281-744-0020
semcgowanjr@gmail.com
www.troopcarrier.org

Vietnam Helicopters Pilots Assn. Jul

1-6, 2017, Indianapolis, IN. Contact:
Mike Law
2100 North Highway 360 - Ste 970,
Grand Prairie, TX 75050
830-730-0950
mglaw@earthlink.net

Vietnam/Thailand Air Force “Sky Cops” Apr 27-30, 2017, Fairborn, OH. Contact:

Pat Houseworth
540 West Livingston St,
Celina, OH 45822
419-586-3076
pathouseworth@gmail.com

VQ Assn (Fleet Air Recon Sqdn). Oct 12-15, 2017, Dayton, OH. Contact:

Clint Epley
1016 Meckel Dr,
Canyon Lake, TX 78133
830-964-2461
epley@gvtc.com

List provided by:

Rob Bardua
National Museum of the U.S. Air Force
Public Affairs Division
1100 Spaatz Street
WPAFB, OH 45433-7102
(937) 255-1386

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In October 2016, this aircraft celebrated the 60th Anniversary of its first flight. During those sixty years, all three services and the Marine Corps along with a host of other nation's militaries have flown one or more variants of this aircraft. The aircraft has proven itself to be a true global workhorse. Multiple Medal of Honor recipients received their award to their actions while flying this aircraft. Name the aircraft and name the Air Force Medal of Honor Recipient who received the Medal of Honor for his actions while flying this aircraft.





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