

AIR POWER

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History





The Air Force *Historical* Foundation

Founded on May 27, 1953 by Gen Carl A. “Tooeey” Spaatz and other air power pioneers, the Air Force Historical Foundation (AFHF) is a nonprofit tax exempt organization. It is dedicated to the preservation, perpetuation and appropriate publication of the history and traditions of American aviation, with emphasis on the U.S. Air Force, its predecessor organizations, and the men and women whose lives and dreams were devoted to flight. The Foundation serves all components of the United States Air Force—Active, Reserve and Air National Guard.

AFHF strives to make available to the public and today’s government planners and decision makers information that is relevant and informative about all aspects of air and space power. By doing so, the Foundation hopes to assure the nation profits from past experiences as it helps keep the U.S. Air Force the most modern and effective military force in the world.

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Our latest issue of *Air Power History* has rather a split personality. It leads off with a lengthy article concerning the war in Vietnam, and follows that with three shorter articles all about World War II.

The first article, by Mike Hankins, concerns the effort to use real-time signals intelligence to support tactical aircraft involved in air-to-air combat. The fusion of multi-source intelligence into a single coherent set of warnings was called “Teaball,” and was the outcome of an effort by the Seventh Air Force commander, Gen. John Vogt, to give his pilots a fighting chance, one which they had been missing during early 1972.

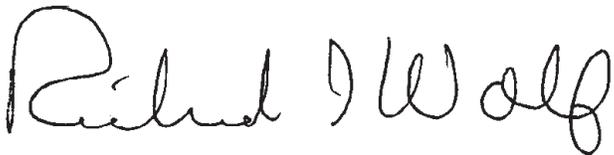
The second article is by John O’Connell, and is a fascinating discussion of the evolution of air-to-air tactics against the Zero by pilots who initially were flying inferior American fighters. Until the Zero’s pluses and minuses became known, pilots had to find a way to survive against the Zero early in World War II.

The third article is by our British expert on World War II aircraft, A. D. Harvey. His topic this time is the Italian Air Force in 1940, and the air offensive that they could never quite undertake.

The fourth and final article is by Daniel Haulman, and covers the Freeman Field Mutiny in which the Tuskegee flyers fought back against the personal racism they were subjected to by one of their commanding officers. It became the catalyst for providing the black flying units with black officers, which brought into question whether that was helping integration or encouraging segregation. Thought-provoking I think.

Of course, we have our customary lot of book reviews once again, twenty-one this time, starting on page 46. We also continue to list upcoming events of an historical nature starting on page 61, reunion happenings on page 63, and we finish up with our New History Mystery on page 64. We hope you enjoy this fascinating issue.

If you kept careful note, I skipped page 62, where we have an In Memoriam, but we also have a note which extends the In Memoriam from last issue of a former President of the Air Force Historical Foundation, Gen. William Y. Smith. The talk of his career focused overly much on his assignments and schools, and didn’t take the full measure of the man. We take this opportunity to expand on page 62.



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The Air Force Historical Foundation's Doolittle Award will be received by the U.K.-based 100th Air Refueling Wing

On August 23, 2016 it was announced that one of the Air Force Historical Foundation's highest awards will be presented to the U.S. Air Force's 100th Air Refueling Wing during ceremonies on September 27 in the Washington, D.C. area.

This year's honor, named after renowned aviator James H. "Jimmy" Doolittle, will mark the fifth time it has been awarded in recognition of a U.S. Air Force unit's significant contributions to air power history. The presentation will occur at 4:00 p.m. at the Air Force Memorial in Arlington, Virginia, followed by a reception and banquet at the nearby Army Navy Country Club.

Operating today from Mildenhall Royal Air Force Base in Suffolk, England, the 100th's historical roots began with its World War II ancestor: the 100th Bomb Group, a B-17 unit stationed at Thorpe Abbots, England. The Group inherited its "Bloody Hundredth" nickname due to the heavy losses it experienced on major missions, including the Regensburg-Schweinfurt raid in August 1943.

Beyond its World War II action, the 100th charted a remarkable history as a B-47 bomber unit, then as a reconnaissance wing during the Vietnam conflict and the Cold War, subsequently evolving to its current role as an air refueling wing.

After 47 years, the 100th returned to England at RAF Mildenhall, only twenty-three miles west of the original Thorpe Abbots basing location. At Mildenhall, the 100th ARW is the lone air refueling wing assigned to United States Air Forces Europe, and has distinguished itself in numerous U.S. Air Force and NATO operations such as Noble Anvil, Operation Enduring Freedom and Operation Iraqi Freedom.

"In each operation, the 100th has demonstrated gallantry, determination and superior management of joint operations in accomplishing its missions under difficult and hazardous conditions," said Major General Dale Meyerrose, President of the Air Force Historical Foundation. "The 100th is unquestionably a worthy recipient of the Doolittle Award."

About The Air Force Historical Foundation (www.afhistory.org)

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Be sure to go to our web site and sign up for what will surely prove to be the event of the season. Go to <http://afhistory.org/events/2016-doolittle.asp> to register and purchase your tickets.

Dear members and friends of the Foundation,

We are starting our 62nd fiscal year of operation, and we do so with a heightened sense of enthusiasm. As we reported in our last issue, we were finally able to focus on growing the Foundation. our Board re-examined our various responsibilities and support functions to ensure that they were commensurate with our responsibility to you, the membership, and the long-term growth and well-being of the Foundation. We: revised the Foundation bylaws that were approved during the annual membership meeting, recruited new Board of Director members that were elected during the annual membership meeting, and revived our strategic planning process.



We are welcoming as new Board members five accomplished individuals who will, we are certain, make great contributions to the Foundation: retired General Lloyd “Fig” Newton; retired Lt Gens Bob Elder and Nick Kehoe, retired Colonel Dick Anderegg, and retired Chief Master Sergeant Rob Frank. They, along with the incumbent Board members will ensure that AFHF will remain a strong, independent voice within our *air power* community, filling a special role of promoting the legacy of airmen, and educating future generations to aspire to follow in the monumental footsteps of those who “soared before.”

We are excited to announce the award winners of our major Foundation awards. Our General James H. Doolittle Award winner is the 100th Air Refueling Wing, previously known as the “Bloody 100th” of World War II fame. We are honoring this unit at the Air Force Memorial in Arlington, Virginia on September 27th. This year’s General Carl “Tooley” Spaatz Award is going to Dr. Donald B. Rice, the seventeenth Secretary of the Air Force. Dr. Mark Clodfelter is the winner of the Maj Gen I. B. Holley Award for a lifetime contribution to the documentation of Air Force history. We are working the arrangements for the latter two and those details will be forthcoming shortly.

For years, the Foundation has believed that we have been too Washington-centric: holding all our events there, drawing our board members from there, etc. Additionally, we’ve been actively seeking opportunities to host more events in a given year. The board is now in the planning stage of periodically moving events to other locales and venues around the Country where our name is less recognized, but where we believe there are fruitful results to be gained in terms of visibility, new supporters, and members. Some details are yet to be worked out, but we should be able to make this information available in the very near future.

I am also pleased to report that our outreach and recognition efforts, led by our use of social media and our daily “This Day in Air Force History” emails, are producing growth in areas where we had seen little progress in recent years. Recently, we gained new members from areas where we were sorely lacking in the past, including an Active Duty and Senior Non-commissioned Officers. Our message is now beginning to reach the broader audience that it needs to, but we have much room for continued growth.

Lastly, we need to be realistic. This remains a tough economic environment for non-profits like ours. That's why your continued support is needed now as much as ever. Invite a friend to join and share in helping our Foundation remain a strong, viable voice within our *air power* community. As always, let me thank you for the part each of you has played in the history and legacy of *air power* across the decades, and for your generous contributions to the Foundation. Without your support we could not survive. We are deeply grateful—and welcome your feedback.

Respectfully,



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

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The Jeaball Solution: The Evolution of Air Combat Technology in Vietnam, 1968-1972

Michael Hankins

EC-121s on the ground at Korat RTAFB.

Air-to-air combat was never the most dangerous threat to American pilots in the Vietnam War, although its prevalence grew as the war unfolded. The air-to-air war consisted of three distinct phases aligned with the timing of major U.S. bombing campaigns, as these campaigns drew MiG fighters to the skies. The first phase coincided with the “Rolling Thunder” campaign initiated in March 1965. In November 1968, Rolling Thunder ended, beginning a second phase marked by an almost complete cessation of air-to-air encounters. The third phase began with the opening of Operation Linebacker, lasting from May to October 1972.

The air-to-air combat performance of the U.S. Air Force (USAF) and Navy during the entire war has been a sore subject for many advocates of American air power. The most commonly used metric for measuring air-to-air success or failure is the “kill ratio,” a measure of how many enemy planes are shot down compared to each single loss. After building a legacy of dogfighting success in the World Wars, and after F-86 Sabre pilots in Korea earned a kill ratio of 10:1 (or as high as 15:1 depending on the source), American pilots were frustrated at shooting down seventy-two MiGs while losing twenty-eight planes during the entire Vietnam War, earning an overall ratio of approximately 2.5:1.¹ Although destroying more than two enemy craft for every one lost hardly seems like a failure (especially given the total losses of over 2,300 aircraft from other causes), many pilots, personnel, and scholars have viewed the situation in exactly those terms, citing the higher ratios of previous wars and the North Vietnamese Air Force’s (NVNAF’s) increased ability to prevent U.S. bombing missions. As journalist and historian Robert Wilcox noted, U.S. forces were struggling against the “supposedly ‘inferior’ North Vietnamese pilots.”²

Looking closer at the war’s three phases, a distinct picture emerges. U.S. pilots were successful in the first few years of the war, but by 1968, the Navy was embarrassed by losing three F-4 Phantom fighters for eight kills, a less than 3:1 ratio, while the Air Force approached a 1:1 trade, losing seven F-4s for ten kills. Although this close analysis may seem to be quibbling over small numbers—especially when considering the exchanges of World War II that numbered in the hundreds of planes—the air battles of Vietnam can nevertheless reveal important patterns in military thinking, doctrine, and technology. The totals seem smaller than the swarms of fighters in previous wars because of the growing cost of planes in a comparatively technologically advanced age, added to the U.S. government’s increased reluctance to tolerate heavy combat losses. The nature of limited war in Vietnam combined with waning domestic support, rendering the United States military increasingly intolerant of civilian and friendly casualties. This attitude included pilots and their multi-million dollar aircraft, which the Air Force and Navy were reluctant to risk.

During the second phase—the bombing halt from the end of 1968 until Linebacker in 1972—both the U.S. Air Force

and the Navy sought to rehabilitate their air combat performance through technological improvements to their aircraft and weapons systems. But the most famous change was not technological: the Navy's Fighter Weapons School, also known as "Top Gun," was created specifically to train its pilots to become air-to-air combat specialists. The school was effective. Navy pilots improved from a 3:1 kill ratio in 1968 to a 6:1 ratio in the Linebacker campaigns of 1972.³ In his 1984 memoir, Navy fighter ace (the first American Ace of the war) and Top Gun trainee Randy Cunningham boldly stated, "My training is the reason I'm alive today."⁴ The Air Force, in contrast, struggled in the early months of Linebacker, earning a negative kill ratio for the first time in the war and perhaps in its existence. Many historians point to the lack of improved Air Force pilot training and the initial failure of new Air Force technologies (such as new missiles and aircraft upgrades), judging the Navy as an example of "correct" adaptation.⁵

This narrative—of the Navy's "right" choice to reinstate high-level combat training—is far from complete. Aviation analyst William A. Sayers has already cautioned that kill ratios can be misleading, especially when examining the small sample sizes seen in air-to-air combat in Vietnam, suggesting that the comparison between Top Gun cadets and the Air Force can be problematic given the facts that the Navy encountered so few MiGs, and almost none of the more dangerous MiG-21s during the Linebacker phase. Sayers has argued that tactical doctrine, rather than individual pilot training, was the determiner of victory—yet this analysis misses one other key development.⁶

Although the Air Force did not change its training program as did the Navy, it did experiment with a number of new technological systems designed to aid pilots through a network of radars, enemy identification systems, and surveillance. These systems were marginally successful at best until August, 1972, when the Air Force instituted a technological change known as Project Teaball—a Ground Controlled Intercept (GCI) system that could electronically track all aircraft in the skies at any given time. This network was similar to the Soviet GCI system used by North Vietnam during the entire war, and similar to the Navy's GCI system, known as "Red Crown," that contributed to its success. But Teaball was more ambitious. It relied on sur-

veillance from the National Security Agency (NSA) of enemy communications, combining this intelligence with radar data from stations throughout Vietnam, synthesized by a supercomputer, to give near-real-time information to pilots about enemy locations and movement. Teaball the U.S. represented the culmination of an evolutionary process of adaptation to the technological environment of air combat over North Vietnam.

With this early warning system, F-4 Phantom crews experienced a level of situational awareness that allowed all the other developments in technology, tactics, and training to be used to their fullest. By taking the Soviet ground control model and applying it in a slightly different way, Air Force pilots gained the initiative to attack MiGs on their own terms. In the last month of Linebacker, Air Force fighters succeeded in protecting bombing formations while netting a kill ratio exceeding 3:1 against MiGs—especially impressive considering that almost all the losses incurred during this period happened when Teaball experienced technical failure.⁷ After Top Gun became active, the Navy fighters increased from a 3:1 to a 6:1 ratio, but after Teaball's introduction, the Air Force improved from a negative exchange to a ratio exceeding 3:1. In terms of overall improvement (especially considering the much larger number of encounters and more advanced MiG-21s that attacked the Air Force), Top Gun worked, but Teaball worked better.

Kill ratios can be misleading, especially when examining...small sample sizes

This article contends that the Air Force should not be overly criticized for its reliance on—and enthusiasm for—technological innovation. Some scholars have portrayed the service as stubbornly refusing to innovate in important areas, such as training procedures and tactics, while adhering blindly to hollow technological solutions such as long-range guided missiles.⁸ The story of Teaball demonstrates an Air Force that was open to change, and was able to adapt its technological culture to meet new challenges. Equally important, this analysis suggests that although the narrative of Top Gun as the "correct" approach is appealing to the romantic image of the daring and skilled fighter pilot, the Air Force's systems-based approach was equally (if not more) effective and important to the future of air-to-air combat, as Teaball formed the basis for the role of Airborne Warning and Control (AWACS) that has become key to present-day air combat doctrine. This assessment is not meant to diminish the success of the Top Gun program and its skilled pilots, but rather to argue that a romantic view of air combat (if possibly subconscious) should not obscure the fact that technological solutions were essential in the last throes of the Vietnam War, when both approaches worked in tandem.

To Bring Them to Their Knees

In November 1968, President Lyndon Johnson halted the Rolling Thunder bombing campaign, hoping to en-

Mike Hankins is originally from Dallas, Texas. After majoring in jazz performance as an undergraduate, he received his master's degree in history from the University of North Texas in 2013, under the direction of Robert Citino. His thesis examined the F-4 Phantom in the role of air-to-air combat in the Vietnam War. He also explored elements of ancient history, publishing original research on the military campaigns of Cicero and contributed several articles to ABC-CLIO's Encyclopedia of Conflict in Greece & Rome, to be released later this year. In 2013 Mike began his doctoral work at Kansas State University under the direction of Donald Mrozek, where he continues to focus on air power, air combat, and technology during and after the Vietnam War.



An EC-121D over Thailand in 1972.

courage Hanoi to curtail their ground activities and their support for the insurgency in the South, although the North Vietnamese did not enter a formal agreement. As a result of the halt, air-to-air combat was nearly absent in Southeast Asia from the end of 1968 until 1972. However, American interdiction efforts—air attacks against supply lines along the Ho Chi Minh Trail in Laos—continued, spurring MiGs into action in 1970, if only for a few brief encounters. In January, two MiG-21s attacked an HH-53 rescue helicopter. In March of the same year, Navy F-4s escorting a reconnaissance flight engaged and shot down a MiG-21 and a MiG-17.⁹ These brief encounters were stark exceptions to the general lack of air combat during this time.

From December 26 to 30, 1971, USAF flew over one thousand sorties in Operation Proud Deep Alpha

In 1971, the NVNAF harassed American interdiction missions in Laos that were typically flown by slow moving propeller craft, helicopters, or the cumbersome B-52 bombers, all of which were vulnerable to attack from nimble MiG interceptors. The North Vietnamese's primary tactic was a low altitude approach, beneath U.S. radar coverage, quickly climbing to an attack position to make a single attack before retreating at high speed. These hit-and-run, "pop-up" attacks mimicked the tactics perfected by the NVNAF in 1967 and 1968, primarily operating under strict coordination from their GCI controllers.¹⁰

The increase in MiG activity in 1971, combined with the introduction of Surface-to-Air Missiles (SAMs) and an expansion of anti-aircraft artillery (AAA) in Laos, produced American responses. Air bases at Udorn and Da Nang placed an increasing number of F-4s on alert status specifically to deal with the air-to-air threat. Despite many technological improvements to these aircraft, they were unsuccessful in shooting down any threatening MiG fighters. Additionally, USAF recalled large numbers of previously withdrawn F-105 Thunderchiefs to the theater to help suppress enemy ground-based air defense systems.¹¹ The largest U.S. response followed the North Vietnamese shelling of Saigon in December 1971. President Richard Nixon claimed that the attack, which some U.S. planners believed foreshadowed an invasion, violated the terms of the 1968 bombing halt agreement and provided a justification to expand American air power.¹²

From December 26 to 30, 1971, USAF flew over one thousand sorties in Operation Proud Deep Alpha, which concentrated on supply targets and air defenses in North Vietnam below the 20th parallel—south of Hanoi, which was situated just above the 21st parallel. Geography, delineated by longitude, often dictated target choices, as the risk to American pilots grew significantly the further north they had to fly, and U.S. planners believed that attacking more northern targets could potentially trigger international involvement from China or the Soviet Union.¹³ Bad weather and poor planning plagued the Proud Deep Alpha strikes and rendered many of the attacks ineffective. These attacks also failed to dissuade MiG activity, which increased at the start of the new year, from twenty-one

known attempts on the Laos interdiction effort in December 1971, to thirty-three incursions in January 1972.¹⁴

During the first few months of 1972, Nixon pursued renewed negotiations with North Vietnam and continued to boost airpower in the region, sending additional F-4s, and more significant, thirty-seven more B-52s to the theater, nearly doubling their numbers for a total of eighty-four Stratofortresses. His appeal to negotiations failed. After several postponements of potential peace talks, North Vietnam launched an attack known as the Easter Offensive on March 30, 1972. This attack provided Nixon with both justification and domestic support for retaliation. Although still committed to the overall withdrawal of American ground forces, the president ordered further buildup of airpower. Over one hundred additional B-52s arrived in the theater, constituting over half of the bombers in Strategic Air Command's (SAC's) inventory. Naval airpower also increased, adding two carriers to the pair already stationed in the Gulf of Tonkin. By the summer, six carriers lined the Gulf. The number of F-4 Phantoms in Southeast Asia nearly doubled, from 185 just before the offensive to a total of 374 in May—approximately one hundred more than had ever been in the theater at any one time previously. This massive consolidation of airpower launched Operation Freedom Train on April 5. These strikes were also limited, concentrating on supply and air defense targets such as the large number of SAM sites. Despite greater success against these targets than achieved during Operation Proud Deep Alpha, a USAF study reported that Freedom Train failed to diminish the flow of supplies and material.¹⁵

During ... Proud Deep Alpha and Freedom Train, MiG tactics remained similar to those developed in 1968

During these operations, the air-to-air war intensified as MiGs flew an increasing number of sorties, expanding their efforts into the southern areas below the 20th parallel. These flights approximately doubled from five per day late in 1971 to an average of ten daily flights early in 1972.¹⁶ This time, U.S. forces proved to be successful against MiG fighters. From March 30 through May 8, the U.S. shot down eleven MiGs, almost all of which were the previously deadly MiG-21s. The Air Force and Navy claimed six and four of these kills respectively, the remaining one shredded by B-52 gun turret operators. During this period, MiGs killed only one F-4.¹⁷ Although MiG engagements did increase, they were still quite rare compared to the frequency of attacks before November 1968.

With further attempts at negotiation failing and convinced that Hanoi was confident of an imminent victory, Nixon sought to escalate the conflict. After communicating with Soviet leadership, he became satisfied that such escalation would not provoke international intervention, freeing him to use air and naval power with more aggression. Speaking to National Security Advisor Henry Kissinger, Nixon stated, "I intend to stop at nothing to bring the enemy to his knees."¹⁸ To this end, the president

approved a strategic air campaign designed to destroy the war-making capabilities of North Vietnam. The plan was more aggressive than previous campaigns, allowing strikes on previously forbidden targets, such as enemy air defenses, and the plan included the controversial mining of Hai Phong harbor. Most notably, the new plan eliminated the concept of gradual escalation. Rolling Thunder had relied on this concept, attempting to entice Hanoi to the peace table by slowly extending the geographic reach of bombings as well as increasing the risk to civilians through target selection. Nixon's new campaign, first designated "Rolling Thunder Alpha," and later renamed to "Operation Linebacker," was far more direct. As General William Momyer, then commander of Tactical Air Command (TAC), noted, planners intended these attacks to "force North Vietnam to realize the futility of trying to conquer South Vietnam by force. . . . The purpose underlying the entire campaign was to break the enemy's will and ability to continue fighting."¹⁹ Linebacker began on May 10, 1972, with an attack on Paul Doumer Bridge in Hanoi, and continued until late October. With the advent of such vigorous U.S. bombing efforts, the MiG fighters of the NVNAF came out in force, and air-to-air combat renewed in earnest.

Nothing to Compare: New Gear, New Men, and New Strategies

During Operations Proud Deep Alpha and Freedom Train, MiG tactics remained similar to those developed in 1968: single high-speed attacks under GCI control, or using one MiG element to draw escort fighters away and allow a second element to attack. The NVNAF also continued the use of wheel formations, remaining in defensive circular patterns that prevented attackers from initiating a dogfight, orbiting specific points and awaiting the opportunity to strike.²⁰

During these operations, and as Linebacker unfolded, U.S. forces employed a host of new technologies to give them an edge in air-to-air combat. The "Combat Tree" system communicated with enemy IFF (Identify Friend or Foe) signals to identify radar contacts from long distance, in theory allowing long-range Sparrow missiles to use their full thirteen-mile range.²¹ This tactic did not always unfold as intended in actual combat as restrictive rules of engagement prevented some attempts at long-range attacks. Combat Tree's true worth was the early warning it gave pilots of the location of MiGs in the area, allowing them to begin an engagement earlier on their own initiative.²² The Air Force's F-4 'E' model improved weapons controls, featured wing slats to increase agility and stability, and included an internal cannon for close-range kills, complementing its missile armament.²³ The F-4E was a response to pilot complaints during the Rolling Thunder period, and a tacit admission by the Air Force that air superiority, gained through a traditional dogfighting context, was indeed still relevant to modern warfare.

Linebacker also employed different strike formations than the smaller, more versatile ones used in Rolling Thunder. By 1972, a series of new technological tools encouraged

a shift toward larger flights with aircraft that were heavily modified to fulfill specialized roles. Such an approach contrasted the earlier “universal pilot” and multi-role aircraft design philosophy that had been the hallmark of USAF, in which both pilot training and aircraft procurement were guided by versatility at the expense of specific expertise. In part, this shift was a response to the growing MiG threat, evidenced by the formations’ much larger combat air patrol (CAP) forces.²⁴

The most useful new tool was chaff—thin strips of metal thrown into the sky in order to interfere with enemy radar signals and mask the location of bombing formations. Chaff had been available during Rolling Thunder, but the Air Force lacked an effective dispenser for it until the Linebacker Campaign, when many F-4s underwent modifications to fire chaff cartridges. During a strike, several F-4s flew ahead of other aircraft and laid a “chaff corridor.” In theory, the rest of the strike could fly through this corridor and complete its mission, while enemy radar would detect only a large indistinguishable cloud of contacts. This plan was somewhat effective, although the corridor’s existence was quite brief and strike aircraft often flew outside the thin corridors, making themselves vulnerable to enemy ground defenses such as SAMs or AAA. Another key tool (although not new to Linebacker) was “Iron Hand” flights, affectionately known as “Wild Weasels.” These flights consisted of four aircraft, usually F-4s or F-105s, half carrying specialized air-to-ground missiles, and the others loaded with conventional bombs. Planners and pilots considered these missions to be among the most hazardous in Southeast Asia, tasked with attacking SAM sites head-on. When a SAM radar activated, the flight could launch a “Shrike” missile designed to home in on radar signals and destroy the site. With the site’s location revealed, the accompanying aircraft followed with a conventional bomb attack. The delicate timing of a SAM site revealing its location by activating its radar and the interval between a Wild Weasel flight and the following bombing formation created a high speed, electronic “cat and mouse” game. Directly attacking SAM sites with little protection placed these flights under considerable risk, and their effectiveness was controversial, as the destruction of SAM sites was difficult to confirm. Yet even if they failed to destroy launch sites, the presence of the Weasels did often suppress SAMs, keeping them from activating and firing.²⁵

Linebacker organized these various elements into a large strike force. Each flight included eight to sixteen main strike planes. Eight to sixteen escort planes accompanied these as protection from MiGs. In front of this formation flew eight to sixteen chaff-dispensing planes, also escorted by eight to sixteen fighters. Four to eight Wild Weasel aircraft preceded these flights. Twelve to twenty planes acting as MiGCAP protected the formation. Additionally, further out from the formation, other planes flew “Barrier CAP” (BARCAP) to provide further protection from enemy MiGs. In support of these craft flew several fuel tankers with their own CAP flights and weather reconnaissance and photo-reconnaissance flights. According to F-4 ace pilot Richard S. Ritchie, “depending on the tar-

get and the size of the force, there were generally seventy-five to one hundred and ten airplanes.”²⁶ The vast majority of these planes played a support and protection role while the number of planes performing the actual bombing of a target was relatively small.

The NVNAF acquired a new aircraft, the MiG-19 “Farmer,” designed specifically for the air-to-air role

Because of the vast amount of resources used for these strikes, and the time involved in staging them, bombing missions flew much less frequently than during the Rolling Thunder period. Usually only one Linebacker strike flew each day, yet weather problems forced cancellations of 30 to 50 percent of them. Because the number of strikes was so limited, and the priority was attacking targets that directly related to the flow of war-making supplies to the South, USAF could not pursue its previous strategy of attacking airfields to destroy MiG forces on the ground. Planners believed that time and resources were hardly adequate to attack the large number of relevant targets such as bridges, railroad yards, and power facilities. As a result, airfields received a much lower targeting priority. Strike planners also recognized that attempting to destroy MiGs on the ground by bombing airfields would likely be ineffective in any case. By this time, the North Vietnamese did not usually keep their MiGs on airfields, but hidden miles away from their runways. High-speed taxiways connected the runways to the often heavily camouflaged revetments, effectively hiding enemy MiGs from sight while still allowing them to take off quickly on short notice.²⁷

The NVNAF also introduced several changes during Linebacker. A new version of the MiG-21 “Fishbed,” the ‘J’ model, was more agile and effective in air-to-air confrontations.²⁸ More significant, the NVNAF acquired a new aircraft, the MiG-19 “Farmer,” designed specifically for the air-to-air role, evidenced by its superior agility. Despite its capabilities, manufacturers produced few 19s, believing it would soon become obsolete, overtaken by newer fighters still in development.²⁹ The Farmer was Chinese built, equipped mainly with two or three internal cannons although some carried air-to-air missiles.³⁰ Although the MiG-21 continued as the primary NVNAF fighter for the remainder of the war, the 19 was a dangerous addition that Ritchie warned was “underrated.”³¹

At the beginning of Linebacker, both sides placed new people in their cockpits. USAF personnel policies dictated the removal of many experienced pilots, replacing them with inexperienced crews untrained in air-to-air combat. As F-105 and F-4 pilot Ed Rasimus recalls, because of “the AF policy of no involuntary second tours, there were a lot of F-4 front seats to fill, so the job was opened up to new pilot training grads. . . . [The] requirement was supposed to be prior fighter qualification, but there was apparently considerable latitude in who could fill the slots.”³² The NVNAF received classes of new pilots trained during the bombing halt. Instructors refined the effective tactics used

in 1968 and taught them to a new group of young North Vietnamese aircrews. Thus, the North Vietnamese experienced an increase in relative air combat skill level as American crews degraded. Concurrently, the North Vietnamese augmented their GCI network, incorporating improvements in signal interception (SIGINT): the ability to listen in on American communications and deliver detailed information to MiG pilots. Their geographical reach also expanded. By the time of Linebacker, the NVNAF added several new airfields increasingly further south, some extremely close to the Demilitarized Zone, potentially allowing MiGs to access South Vietnamese airspace.³³

North Vietnamese pilots had long relied on GCI to direct their movements. American forces used the concept to some degree yet tended to rely more on the initiative and skill of individual pilots. During the years of Rolling Thunder, both the Navy and Air Force fielded several systems that provided extensive radar coverage of the theater. The goal of these systems was not to directly vector American planes or dictate their attack patterns as the North Vietnamese did, rather they sought to increase situational awareness, warning pilots of impending attack by indicating the presence and location of MiGs. From 1965 through 1968, a confusing web of systems performed this early warning role. An Air Force-operated ground radar at Da Nang known as the control and reporting center (CRC) supplied radar coverage to the South and East. Adjacent to this facility was the primary mission planning facility for the Seventh Air Force, code named “Motel,” which provided orders for all missions into North Vietnam and was responsible for controlling these missions by collating other data sources and passing relevant information to pilots. Another radar further north at Dong Ha known as “Waterboy” covered the southern areas of North Vietnam, although few air-to-air engagements occurred there at that time.

For engagements out of the range of these systems, the Air Force continually flew an EC-121 known as “College Eye” to provide further radar detection. Although College Eye provided excellent coverage over water, it was often ineffective over land. Other radar stations existed in Thailand, including “Brigham,” at Udorn, and “Invert,” at Nakon Phanom. These stations contributed ground control and navigational assistance, although their range was quite limited, providing almost no coverage of North Vietnam itself. [See **Figure 1.**] The Navy used a system called “Red Crown,” a ship-based radar located in the Gulf of Tonkin, to provide early warning of approaching MiGs. There was some limited cooperation between Red Crown and College Eye during Rolling Thunder. During those years, none of these systems were effective for strikes further North than the 19th parallel, where air combat was more likely, and some of these systems, such as Red Crown, could not effectively track planes below 10,000 feet, a severe limitation because MiG tactics often included very low altitude approaches.³⁴

In 1967, new EC-121s known as “Rivet Top” arrived in the theater with specialized surveillance equipment designed to intercept North Vietnamese communications and quickly pass on vital information to American pilots. Rivet Top was a success, demonstrating that surveillance of

North Vietnamese radio transmissions could make a significant contribution to American air-to-air efforts. In its limited time of employment, American forces claimed twenty MiG kills, thirteen of which received direct contributions from Rivet Top.³⁵ The late arrival of these systems during Rolling Thunder kept them from contributing to the air-to-air effort in a larger way. At the beginning of the Linebacker Campaign, the Navy’s Red Crown ship returned, and the Air Force instituted a system known as “Disco,” essentially a slightly upgraded version of College Eye. Under Disco, multiple EC-121s provided a larger area of radar coverage and continued the SIGINT (signals intelligence) role provided by the Rivet Top equipment, although the system suffered many of the same problems that plagued the College Eye system, such as a limited range, limited crew and equipment capacity, and the need to stay in slow controlled orbits.³⁶

The Air Force continually flew an EC-121 known as “College Eye” to provide further radar detection

Effective GCI proved to be one of the key determinants of victory in air combat. Although the MiG high-speed hit-and-run tactics were clearly difficult for American forces to counter, GCI controllers dictated those tactics to North Vietnamese pilots. Denying the initiative of individual pilots through strict ground control was a key feature of Soviet airpower doctrine, reflective of Russian centralization and authoritarianism. NVNAF pilots received stringent instructions on almost all aspects of their flight in real-time from their controllers, who were often pilots themselves. This situation was obvious to American intelligence agents who intercepted North Vietnamese radio transmissions and recorded conversations between pilots and controllers.

As Ritchie described,

The average North Vietnamese fighter pilot is strictly tied to the ground radar control officer, who is a pilot, and he follows the instructions from the ground implicitly. They tell him when to go burner, when to arm his missiles, when he’s clear to fire, when to jettison his tanks, when to break off, where to land, and what heading to turn to; everything is controlled from the ground.³⁷

During much of the Cold War era, American forces often spoke of a qualitative difference between them and their communist enemies, viewing themselves as superior in training and technology.³⁸ Yet in the skies over North Vietnam, a Soviet model of centralized control that bypassed individual pilot skill and aircraft performance negated this difference—if it existed at all. Some American pilots and air war planners recognized that the lack of such a system among U.S. forces was a detriment. According to General John Vogt, director of the Joint Staff and later commander of the Seventh Air Force,

The last eight months of Rolling Thunder, the enemy com-

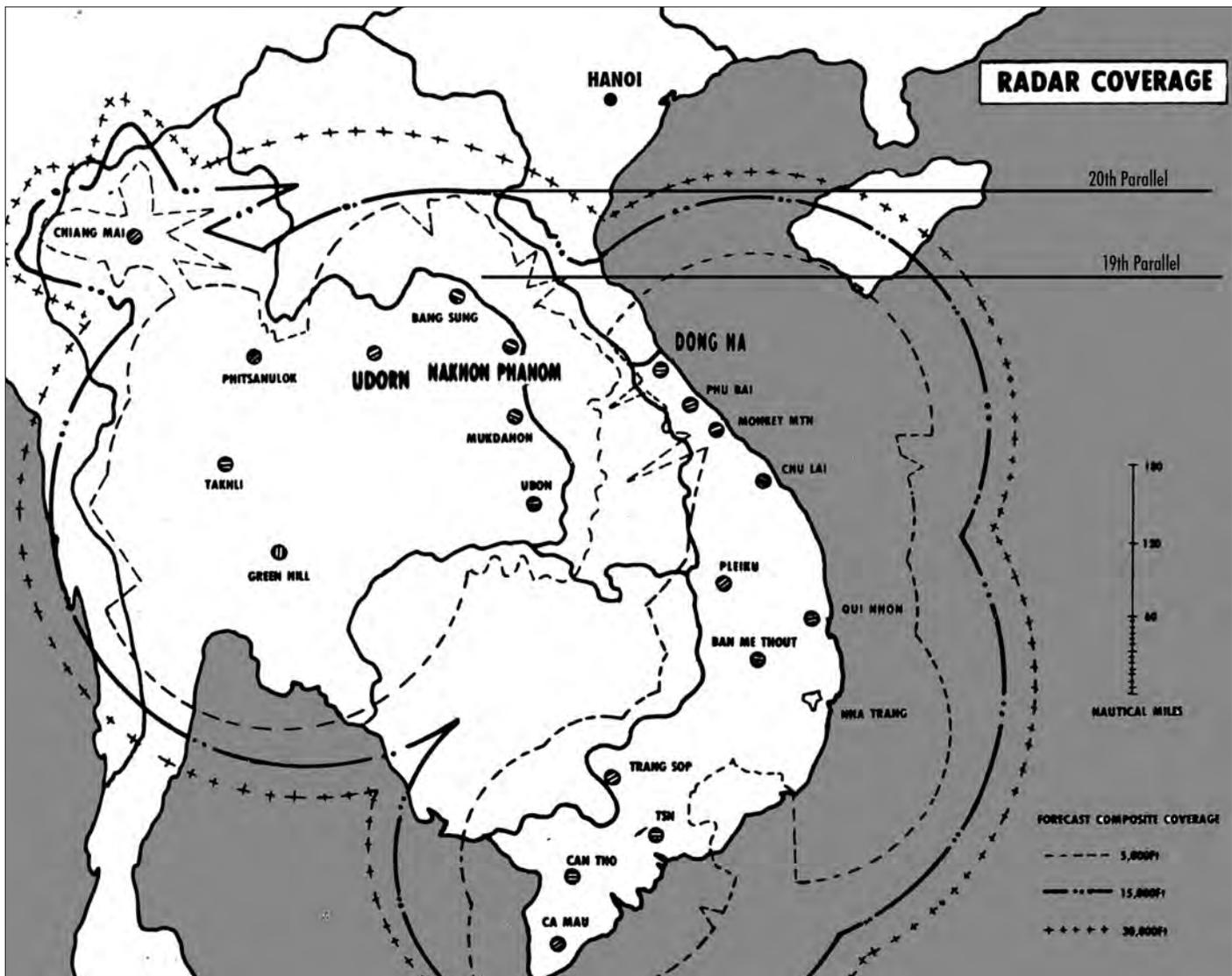


Figure 1 shows the radar coverage of systems prior to Teaball. Note that coverage above the 20th parallel, where air combat was much more likely, was almost nonexistent.

*mand and control system had been so refined and so perfected, with Soviet technical help, that we were barely breaking even in our loss-to-victory ratios. . . . The operation cost U.S. an airplane almost every time we went up there. The enemy had adopted high speed [one pass] tactics using the MiG-21, good vectoring, and good control by his radars. We had nothing to compare with it in those days.*³⁹

Ritchie went so far as to state that in the case of B-52 strikes, flying a protective escort without GCI warning of incoming MiGs was “useless.” According to him, employment of U.S. GCI “was one of the primary reasons that we were able to engage MiGs and effect kills.”⁴⁰

Essentially, American forces had struggled heavily in air combat engagements during the last few months of Rolling Thunder because Soviet airpower doctrine proved to be superior. Effective MiG tactics, combined with (and dictated by) a Soviet model of centralized control, gave the North Vietnamese a large advantage, balancing an Amer-

ican qualitative and quantitative superiority. However, although the NVNAF used a strict GCI model during the entire war, not until mid-to late 1968 did its tactics evolve into such an effective form. These tactics did not allow MiGs to gain air superiority but simply maintain a near 1:1 ratio against American planes. Such an even trading of blows could not lead to true victory, although it did allow the NVNAF to achieve its primary goal of interrupting American bombing strikes, preventing them in many cases from hitting their targets. Yet the NVNAF could not sustain such high losses for long.

Some U.S. leaders and pilots recognized that the lack of effective GCI was a key contributor to their struggles even as Linebacker began. The severe limitations of American equipment limited U.S. GCI capability. College Eye, Disco, Red Crown, and other radars possessed a restricted range, rendering them ineffective in the areas with the highest air-to-air activity, in addition to being prone to frequent technical failures.

An equally serious bureaucratic problem aggravated these technological difficulties. Some analysts, such as Delmar Lang of the NSA, had previously advocated combining intercepted enemy communications with GCI in order to provide a more accurate picture of enemy locations and movements—which was not a new concept. Lang had developed such a system in the Korean War, contributing to the success of F-86 Sabre pilots. Lang had offered to create a similar program in Vietnam, but both NSA and Air Force leadership, particularly Major General George Keegan, director of Air Force Intelligence, repeatedly turned him down.⁴¹ Interception of North Vietnamese transmissions was classified, and American pilots did not have proper security clearance. Thus, information about MiG movements was forbidden to at-risk American pilots. Although seemingly ridiculous, this policy was not unfounded. Historian Marshall Michel has noted, “The fact that the United States was listening to North Vietnamese transmissions was a closely guarded secret. How long could this be kept secret if, every time a MiG was about to attack, the U.S. aircraft was warned over the radio?”⁴² Using the data could undoubtedly aid American pilots, but using it too frequently could potentially alert the North Vietnamese that the U.S. was intercepting their signals.⁴³

The question of how to use the NSA’s intercepted information presented a dangerous dilemma for American planners who needed to balance using the data with keeping its existence secret. However, leaders in the Air Force—Keegan in particular—demonstrated a complete lack of discernment by choosing to ignore this dilemma altogether, refusing to pass on any information to American pilots in combat. This refusal created a sense of ill will between pilots and intelligence agents. As one historian has noted, “U.S. pilots, already frustrated by the small amount of data provided to them, felt betrayed when they learned that some losses over Vietnam could have been prevented if intelligence data had been shared with them.”⁴⁴ This animosity grew so prevalent that it received a name: “green door syndrome,” so labeled because in many combat wing bases in the theater, classified information was kept in vaults usually behind a green door.⁴⁵

U.S. pilots...felt betrayed when they learned that some losses over Vietnam could have been prevented

For U.S. forces, these technical, bureaucratic, and ethical issues limited access to accurate information, which was the first element of the successful Soviet GCI system. That system also relied on a second element: strict direction by ground controllers. But Americans conceived of GCI differently than did the North Vietnamese. The dictatorial style of strict ground control worked well for North Vietnamese pilots, but their American counterparts had no desire to implement such a system. Perhaps because of a differing cultural mindset, or simply because of pride, for U.S. pilots and planners, the version of GCI Americans longed for was simply the first element: access to real-time

information that they could then use at their own discretion. As Ritchie summarized, “We need the information that comes from the airborne GCI. Not necessarily a strict GCI environment, and not tied to the GCI controller the way the MiGs are, but we definitely need the information that the GCI can give us.”⁴⁶ In the American conception, GCI was simply a source of information, the lack of which resulted in a costly stalemate in the air-to-air war at the end of Rolling Thunder and as Linebacker began.

A New Bag of Tricks: Renewed Combat

Linebacker formations were large and unwieldy, limiting their frequency and the number of targets they could strike relative to the amount of resources they required. Yet they were undoubtedly effective in dealing with air defenses. Chaff corridors provided protection from the SAM threat, and the extensive CAP flights proved to be more successful in dealing with MiG attacks in the first month of the campaign. During Rolling Thunder, the NVNAF had relied on hit-and-run tactics that U.S. crews were unable to counter. New technologies, especially Combat Tree, combined with friendly GCI support from Red Crown and Disco, allowed U.S. pilots to regain the initiative. Long-range early warning of approaching MiG fighters allowed CAP flights to break off early and engage the MiGs proactively on their own terms, as opposed to the Rolling Thunder period, when F-4s often could not respond quickly enough to deal effectively with attacking MiGs.⁴⁷

The first day of Linebacker—May 10, 1972—witnessed two large air battles, dramatically escalating the air war and setting the tone for the rest of the campaign. During an attack on the Paul Doumer Bridge in Hanoi, the Air Force detected approaching MiGs with their Combat Tree equipment and quickly attacked. After engaging the first group of North Vietnamese fighters, a second group of MiGs surprised them, approaching unseen from low altitude, expanding what became a close dogfight. In addition, a lone MiG-19 attacked a separate flight of F-4s, destroying one before making a hasty retreat. The Navy, in a large strike near Haiphong harbor, encountered an even larger MiG battle. The Navy employed early warning from Red Crown, but more importantly used communications jamming to block North Vietnamese signals and separate the enemy pilots from their GCI controllers. This tactic removed the chief North Vietnamese advantage, allowing Navy pilots, crediting their Top Gun training, to chew through the attacking MiGs in what Navy pilot Randy Cunningham described as a “Turkey Shoot.”⁴⁸ USAF Phantoms shot down three MiGs for two losses, while Navy F-4s destroyed eight fighters without a single loss. Cunningham claimed three of those kills, making him the first ace pilot of the Vietnam War, only days after he received a “Dear John” letter from his wife.⁴⁹

A single isolated battle cannot accurately depict the larger nature of the campaign, but these encounters reveal a number of themes that became common for air combat in Linebacker. The key to American success was not necessarily tactical or technological alone but combining these ele-



A Lockheed EC-121D Constellation.

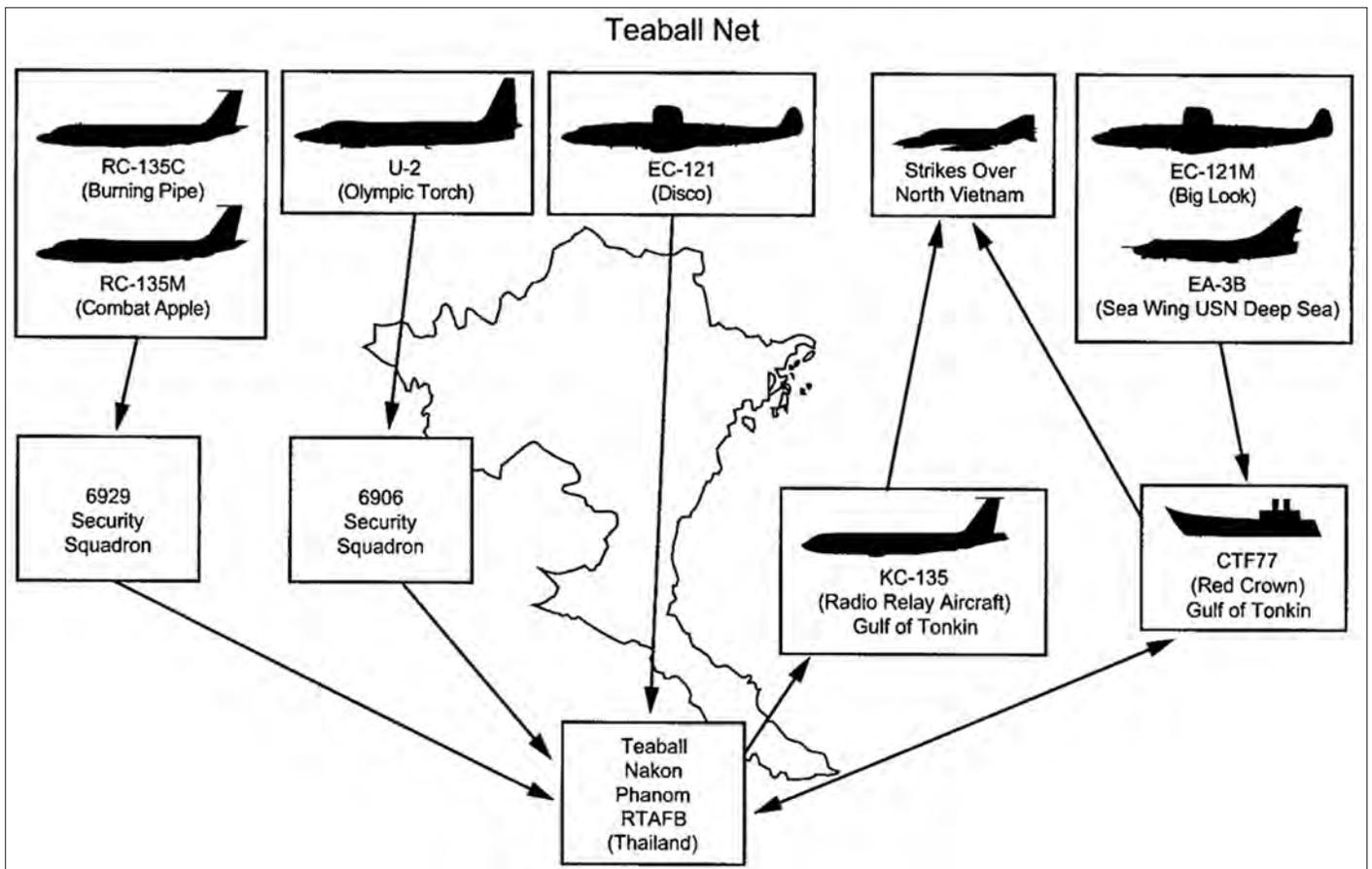
ments to provide a vast increase in pilot situational awareness. The importance of early warning given by GCI was thus paramount to U.S. success in these encounters. For American forces, Red Crown and Disco provided knowledge of enemy fighter locations quickly enough for CAP flights to prepare, build up their speed, and engage in favorable conditions. Early warning was the extent of American employment of GCI—it did not attempt to control U.S. flights in actual combat. Pilots simply enjoyed enhanced situational awareness, freeing them to use their individual ability. For Navy aviators, this freedom meant employing their newly honed Top Gun skills. In a sense, this extensive training—consisting of many practice missile firings and air-to-air combat training against other aircraft that simulated MiG characteristics—was simply another way to increase situational awareness by acclimating pilots to the stresses of combat and giving them familiarity with many combat scenarios. While GCI allowed U.S. pilots to take the initiative, Top Gun training helped them to keep that initiative by remaining calm as the battle unfolded. Jerry Beaulier, a graduate of Top Gun's first class, remembers, "What the training did for me is it kept my feet on the ground. It kept me thinking properly. I didn't get buck fever. . . . You know all the things that are going to happen to you before you get there. You got a whole bag of tricks."⁵⁰ At the same time, by jamming enemy communications, North Vietnamese pilots, accustomed to strict control from the ground, could not enjoy a similar situational awareness.

The battles on May 10, also demonstrated the increasing specialization of Air Force wings. Most of the kills of that fight, and of the entire month, were the work of the

555th Tactical Fighter Squadron (TFS), proudly referred to as the "Triple Nickel" squadron, a part of the larger 432nd Tactical Fighter Wing (TFW). In accordance with a broader shift in its doctrine, the Air Force assigned specific tasks to the various TFWs in the theater. The 8th TFW concentrated on the ground strike role, the 388th performed anti-SAM operations and escort, and the 432nd specialized in the air-to-air role. The latter therefore received most of the Combat Tree equipment, communicating extensively with Red Crown and Disco to seek out enemy MiGs and attack them before they threatened a strike formation. This specialization revealed USAF's acknowledgment that these various roles required distinct skill sets, a movement away from the "Universal Pilot" concept in which pilots received broad, generalized training in multiple areas rather than specialized expertise in any specific role. Planners and pilots regarded air-to-air roles, especially MiGCAP, as the most difficult. One Air Force report stated, "MiGCAP required the highest skill and experience level of any F-4 mission, demanding highly specialized and thoroughly trained fighter pilots for the role."⁵¹

The importance of early warning given by GCI was thus paramount to U.S. success

The battle also revealed some problems for American forces. Malfunctions continued to plague air-to-air missiles despite the several improvements. The Air Force continued to struggle with the use of "Fluid Four" formations. In order



Figures 2a (above) and 2b (right) depict the flow of information from various radar and SIGINT sources, to the Teaball center and eventually disseminated to pilots.

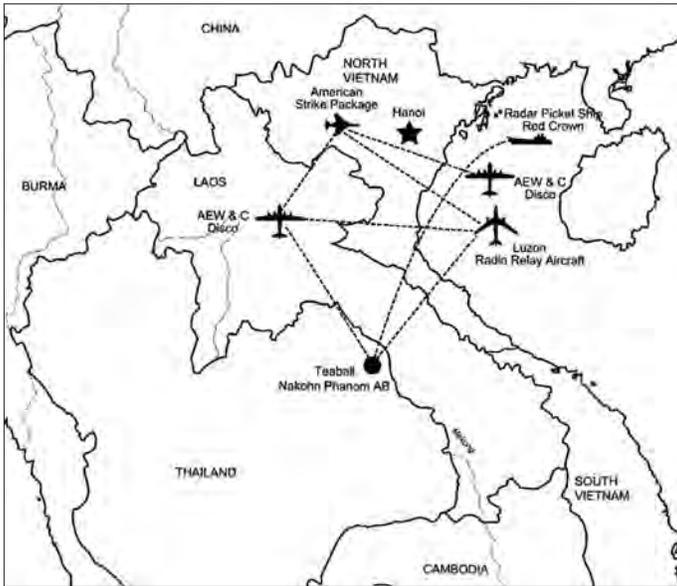
to maintain high speeds relative to the slow-moving strike force, CAP flights often used a “weave” pattern, with fighters swinging horizontally in relation to the strike formation. This practice enhanced visibility for spotting incoming MiGs, yet the movement also revealed a flight’s location to enemy radar. The large width of Linebacker formations forced escort flights to break into groups of two. Although the Navy found a two-plane formation to be superior against MiG forces, USAF crews lacked training for two-plane tactics, which hindered the combat effectiveness of these flights. If MiGs did penetrate the various CAP flights, they found the large, unwieldy strike formation quite vulnerable to attack.⁵²

The first month of Linebacker was a success for U.S. forces in terms of air-to-air combat, demonstrating an improvement from the stalemate position at the end of Rolling Thunder. But a close examination of the data revealed problems, especially for the Air Force. From May 10 to 31, 1972, F-4s claimed an overall 3.5:1 ratio against MiG fighters. But the difference between the two branches was striking. Air Force F-4s claimed nine kills for six losses, a 1.5:1 ratio, actually worse than the 2:1 they had experienced during the last few months of Rolling Thunder, which they had viewed as problematic. Navy Phantoms saw a significant improvement, claiming twelve MiGs without losing any F-4s.⁵³ Navy pilots tended to credit the

Top Gun school, although that interpretation overlooks the Navy’s use of communication jamming to gain an edge against the NVNAF and the fact that Navy planes encountered fewer MiGs overall—considerably less of the more dangerous MiG-21 Fishbeds. The Air Force’s lack of air-to-air training often receives the blame for the poor showing of its pilots. USAF did employ such training on a small, ad-hoc basis. But it focused on technological improvements such as the internal cannon, missile performance, and most importantly the Combat Tree equipment. These technical changes proved to be inadequate as USAF air-to-air efficacy declined at the opening of Linebacker.

An Old-Fashioned Butt Kicking

The situation soon grew worse. In June 1972, the NVNAF responded to its May losses, implementing several changes to their strategy, beginning by increasingly targeting chaff flights. Because these flights preceded Linebacker formations, they were more vulnerable. This effort was part of an overall strategy to coordinate SAMs and MiGs into a more unified defense system, as preventing the dispersal of chaff rendered SAM sites more effective. During Rolling Thunder, SAMs and MiGs did not attack simultaneously, as the missiles were as dangerous to North Vietnamese planes as to American ones. During Linebacker, this situ-



ation changed. Through strict GCI control and careful coordination, the NVNAF was able to use both defenses together without risking fratricide. MiG forces relied less on gun attacks, increasing the use of the more effective Atoll missiles. North Vietnamese pilots quickly discovered that the Navy had grown much more adept at air-to-air combat than the USAF, and therefore they concentrated their attacks on Air Force formations. Rumors circulated among American aircrews that Phuc Yen airfield displayed a large sign admonishing North Vietnamese pilots, “Rule One—don’t eat yellow snow. Rule two—don’t attack gray Phantoms,” gray indicating Navy planes as opposed to USAF’s green camouflage.⁵⁴ Most important, the North Vietnamese increased their surveillance efforts, intercepting American transmissions and attacking vulnerable flights. As one Air Force report stated, “It was quite obvious that the [North Vietnamese] monitored and reacted to U.S. low-fuel or ‘bingo’ calls [indicating pilots had only enough fuel for returning to base]. MiGs attempted on several occasions to engage U.S. aircraft after ‘bingo’ fuel calls were made.”⁵⁵

The problems with the Air Force’s fluid four formation grew more pronounced. One F-4 flight leader described a desire to use teams of two rather than four owing to increased problems keeping the larger flight together, stating, “I had to spend 90 percent of my time keeping somebody in the flight from getting shot down [and] could not go about the business of MiGCAP.”⁵⁶ In other cases, pilots adhered to an archaic, obsolete practice known as the “single shooter” policy, which meant that a wingman could not attack if the flight leader was attempting to shoot down a target, even if that wingman obtained full missile lock in an advantageous attack position.⁵⁷

The statistics from the summer months of 1972, demonstrate the dramatic reversal these changes in MiG tactics brought. In June and July, Air Force Phantoms claimed eight MiGs, with the Navy shooting down only three. While the Navy only lost one F-4 to MiGs, USAF lost thirteen.⁵⁸ The Navy could technically still claim their previous 3:1 ratio; the Air Force had sunk to its lowest ratio

during the war, 0.6:1. General Vogt described the period with a study in understatement, simply stating, “They really started getting to us.”⁵⁹ Colonel Russ Everts, an F-4 Pilot, expressed the problem more directly, stating, “For the first three months of Linebacker the MiGs gave U.S. an old fashioned butt kicking, pure and simple.”⁶⁰ For the first time in the war, the kill ratios clearly favored the North Vietnamese.

The success of the NVNAF was troubling for the Air Force, prompting General John D. Ryan, then Air Force Chief of Staff, to investigate the issue. He tasked several subordinates with issuing a twenty-five question written test on air combat basics and the systems of the F-4 to the pilots in Southeast Asia. The results were telling. Only ten percent of pilots passed the test, and the average score was forty percent. The startling results of the written test forced General William Momyer, who had previously resisted any alterations to training procedures, to accept the team’s recommendation for major changes to USAF training. Their main suggestion was the creation of an “Aggressor” squadron to simulate MiGs in air combat training. This new training system was in some ways an extension of the academic course on the Soviet fighters taught at the Nellis Fighter Weapons School by Major Roger Wells. In other ways, it was a variation of the Navy’s Top Gun training. The institution of the Aggressor squadron, approved by Ryan in summer 1972, brought dedicated air-to-air training and dissimilar air combat training (DACT refers to training in simulated combat against planes with different flight characteristics) back to the Air Force, heralding a huge shift in USAF policy and doctrine. However, these changes did not see fruition until the end of the war, and thU.S. they had no effect on air combat in Vietnam.⁶¹

The Most Effective Show We’ve Had: Project Teaball

Although USAF’s institutional training changes did not take effect until after the war, several factors combined in August 1972, to bring a significant shift that dramatically affected the air-to-air war. The summer’s heavy losses, increasing concern from General Vogt about the shortcomings of American GCI, and pressure from eager NSA analysts and Air Force pilots all overrode earlier concerns with sharing classified intelligence and pushed the issue higher up the chain of command than General Keegan could control. General John Ryan, the Air Force Chief of Staff, contacted the head of the NSA, Admiral Noel Gayler—himself a former Navy aviator—and requested the creation of an improved early warning system to alert pilots to approaching MiGs. Disco and the various other radar systems were simply unsatisfactory. With Ryan and Gayler’s approval, General Vogt worked with Delmar Lang and Lieutenant Colonel William Kirk to establish “Project Teaball” at Nakhom Phanom Air Force Base in Thailand in August 1972.⁶²

Teaball took the classified communications interceptions that Keegan had kept from pilots and combined them with other U.S. radar sources [See **Figures 2a** and **2b**]. These intercepted messages were the key to the Teaball

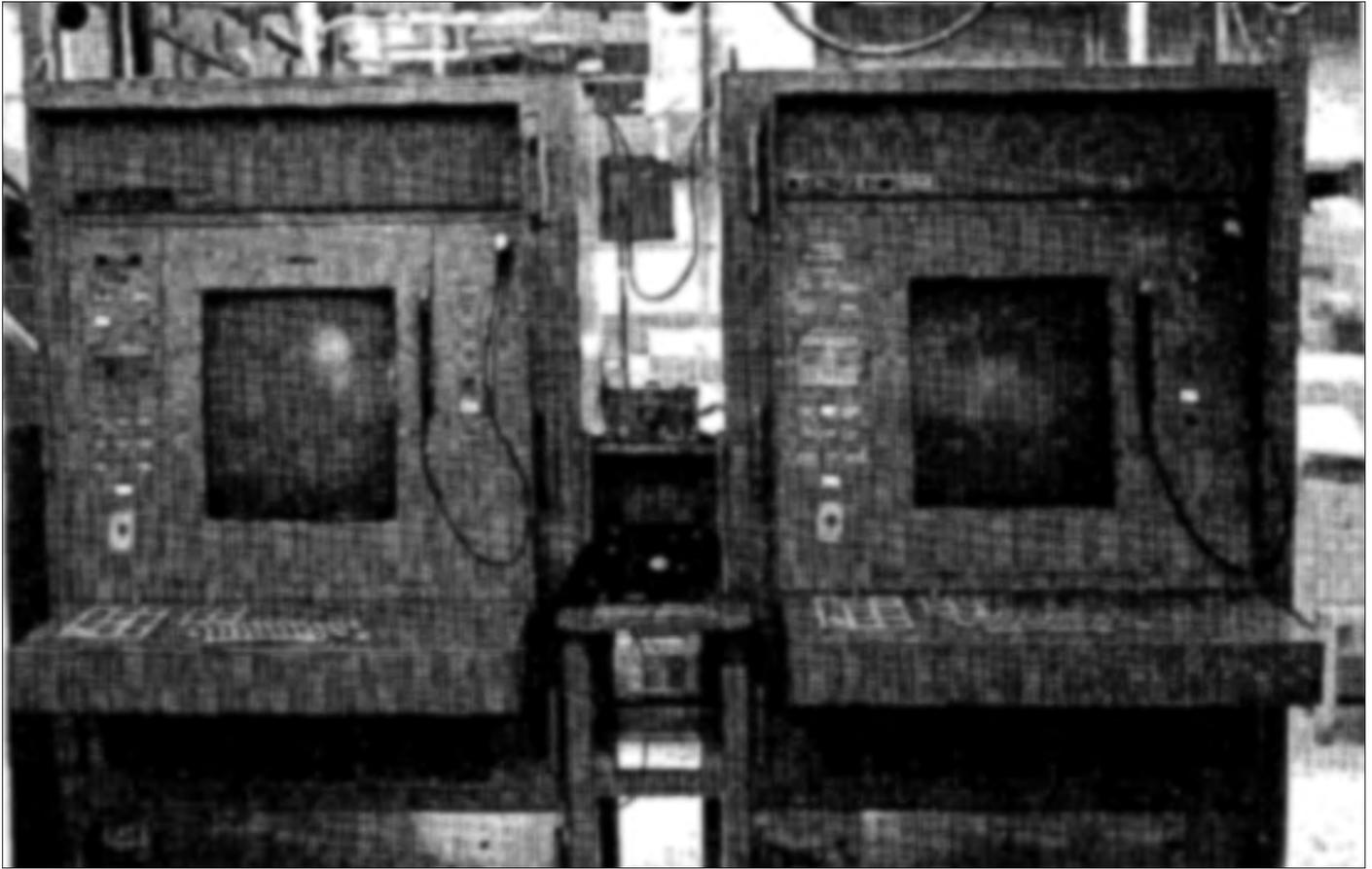


Figure 3 shows the operating consoles of the “Iron Horse” computer system.

system—they included the radio calls sent from North Vietnamese pilots to their ground controllers and vice versa, indicating precise locations and vectors for their MiGs. As one designer of the system described, “These fused data, if properly presented, could provide a U.S. weapons controller with basically the same air picture that was available to the North Vietnamese GCI controller, the U.S. giving the U.S. controller the capability to know the enemy’s intent as well as the exact location of his aircraft.”⁶³ The system’s backbone was a highly classified computer system known as “Iron Horse” that was able to take the vast amount of data from multiple sources and quickly synthesize it into a composite display showing a near real-time picture of the location of all friendly and enemy aircraft over North Vietnam. [See **Figure 3**] Teaball operators then sent this information directly to pilots via Ultra-High Frequency (UHF) radio signals relayed through a KC-135 aircraft code-named “Luzon.” Kirk and Lang were able to release classified material to pilots by removing information about the data’s source, giving pilots only pertinent warnings regarding nearby threats and their approach vectors. Despite Teaball’s obvious value, many aircrews still harbored a sense of betrayal towards the intelligence community. Kirk worked to build trust between the two groups and overcome “green door syndrome” by personally visiting every single wing in the theater to brief them on Teaball’s capabilities, the accuracy of its data, and the

methods he used to contact pilots directly. In order to make the information as understandable as possible, he passed the data to pilots in the same familiar format of Red Crown warnings. He instructed them to “pay attention when I call you on your discrete UHF channel.”⁶⁴ Finally, the U.S. had a large-scale GCI system with extended coverage. However, its implementation differed from the North Vietnamese GCI system. Teaball simply provided information to pilots, giving them early warning of MiG locations. Although the American ground controllers often suggested courses of action, individual pilots retained their freedom to handle threats at their own discretion.

Many aircrews still harbored a sense of betrayal towards the intelligence community

Teaball was successful and brought about a large shift in the air-to-air war. From the introduction of Teaball in August 1972, until the end of Linebacker operations in late October, Air Force F-4’s claimed twenty-one MiGs shot down for only six losses. Thirteen of those kills were a direct result of vectoring from Teaball.⁶⁵ Five of those losses occurred almost exclusively at times when Teaball was inoperative due to technical failure, demonstrating just how critical the system was to the American effort.⁶⁶ When ex-

aming only MiGCAP missions, American F-4s claimed eighteen kills with five losses, a nearly 6:1 ratio. Not only had the Air Force significantly improved, but it could boast a better ratio than the Navy, which claimed an even two kills and two lost Phantoms during the same period.⁶⁷ General Vogt extolled the significance of Teaball, saying

*This is the most effective show we've had during the entire war with the battle against the MiGs, over a sustained period. The answer was that we went into a much more sophisticated system for providing warning for the defending pilots. . . . This proved one thing—if you can show the American fighter pilot where [the enemy] is in sufficient time, he'll shoot him down. . . . Following the commencement of Teaball, American pilots enjoyed definite air superiority over North Vietnam.*⁶⁸

Vogt also singled out Teaball alone as the source of improvement, saying,

*With the advent of Teaball we dramatically reversed this [loss to victory ratio], and in August, September, and October [1972], . . . we were shooting down the enemy at rate of four-to-one. Same airplane, same environment, same situation, same tactics; largely [the] difference [was] Teaball. It was one of the most impressive developments we've had out here.*⁶⁹

Other experiments, such as improved missiles and upgraded aircraft, failed to produce the results of Project Teaball.

Pilots themselves testified to the dramatic effects of Teaball and to GCI systems in general. Describing the advantage given by early warning systems, one pilot stated, "A good GCI capability made the difference, and will in the future." Another echoed these sentiments, referring to the specific capabilities of Teaball, stating, "Computerized real-time intelligence will get more kills than all the fighter sweeps we can put together."⁷⁰ When asked what factors contributed most to the ability to maintain an offensive posture in air combat, pilots ranked "External Agencies" (GCI programs like Teaball and Red Crown) at the top of the list for the "Warning and Detection" category. When asked which warning and detection systems the USAF should develop for the future, those "external agencies" ranked second only to cockpit visibility.⁷¹

Beyond assisting in kills, Teaball was quite effective at preventing losses by warning pilots of approaching threats. Teaball provided other advantages, such as accurate visual recording of radar plots for later review and analysis. These recordings allowed aircrews and war planners to replay air engagements and learn from them, studying enemy tactics while evaluating and modifying their own. Because this information originated from radar and intercepted communications, it was accurate, not subject to potential alterations of a pilot's limited perception and memory. This data was useful for both operational planning and the training process. It was also invaluable for search and rescue efforts. Teaball data could pinpoint the location of downed aircrews, enabling rescue craft to arrive much

sooner than in earlier periods.⁷²

As crucial as Teaball was for reversing the heavy U.S. losses during the summer of 1972, it was not without problems—which is not surprising for an operation that was literally run from inside a van.⁷³ The most significant weakness of the system was the delay in information processing. Teaball pulled information from a wide variety of sources, then had to organize, contextualize, and integrate it into a form that was easily communicable and useful for pilots. The Iron Horse computer did the bulk of this work, but even with its help, there was an average delay of two minutes between receiving information and delivering it to pilots—a potentially life-threatening time span in a dog-fighting situation when each second counted. For this reason, Teaball's role was limited to providing early warning and allowing pilots to gain the initiative before a fight. Once actual combat began, most pilots relied on more timely information from Disco or Red Crown if in range.⁷⁴ In addition, the UHF radio relays suffered from frequent outages that prevented communication between Teaball analysts and pilots.⁷⁵ Communication problems existed on both ends of the line, as the F-4's radio was notoriously unreliable as well. Ritchie elaborated these problems, saying,

*Many times the information was there but there were radio relay problems, and just plain old radio problems, due to the fact that a lot of the equipment, particularly in the [Disco EC-]121s, is very old equipment. Equipment reliability is a tremendoU.S. problem. In fact, the UHF radio was the most serioU.S. problem in the LINEBACKER operation.*⁷⁶

These problems reveal the interconnected nature of technology during this period. Teaball's effectiveness was limited by the unreliability of other equipment. The Air Force was aware of these problems and took steps to improve their radios and other electronics with upgraded equipment.

The most significant weakness of the system was the delay in information processing

Teaball's introduction was not the only change in summer 1972. On July 10, the military held a conference in Saigon to analyze Linebacker missions in detail and determine methods to increase effectiveness. The response to this meeting was so positive that in August, the Air Force began holding daily debriefings in which aircrews analyzed and critiqued the previous day's missions. These meetings became known as "Linebacker Conferences." Each mission received detailed scrutiny and analysis in order to identify enemy tactics and potential weaknesses and adjust accordingly. The main contribution of these meetings was to institute a stricter enforcement of radio procedures, allowing for better and clearer communications overall. In a welcome display of inter-service cooperation, in August and September the Navy sent a group of F-8 Crusader pilots

with Top Gun training to fly simulated combat missions against USAF F-4 pilots. These flights revealed the vulnerability of Air Force Fluid Four formations and indicated a need for improvements in Air Force training practices. Such changes did not occur until after the war, yet some of USAF pilots involved in this rare example of DACT (training for air combat using planes with different characteristics) noted that they learned lessons that helped them in combat and assisted in shooting down MiG fighters.⁷⁷

Increased American success forced the NVNAF to scale back its operations, flying fewer missions and attempting to counter Teaball's tracking ability by turning off their IFF signals. However, eliminating those signals separated North Vietnamese pilots from their own GCI, their chief advantage to this point. The NVNAF attempted a number of other methods to nullify Teaball's advantages. The most common was deception—ground controllers sent messages pretending to be pilots, essentially creating "ghost MiGs." However, Teaball's operators could easily distinguish between these fake calls and authentic ones due to differences in the signal itself. The North Vietnamese also attempted to operate MiGs under radio silence, but they could not avoid alerting their own SAM operators of MiG locations so as to avoid fratricide, and Teaball operators easily intercepted these warnings and passed them to American pilots.⁷⁸

The NVNAF attempted a number of other methods to nullify Teaball's advantages

Although American pilots experienced significant success in air-to-air engagements, some MiGs did manage to penetrate U.S. escorts and attack Linebacker bombing formations using the same high-speed hit-and-run tactics as before. Most of these successful attacks occurred when Teaball experienced failure. U.S. planners attempted to hamper MiG effectiveness further by renewing attacks on airfields. On October 1, U.S. bombers destroyed five MiGs on the ground, damaging nine more.⁷⁹ The total MiG force at this time numbered approximately 150 fighters according to American intelligence.⁸⁰ However, North Vietnamese sources indicate that maintenance issues and a lack of parts took a heavier toll on the MiG fleet than did the bombing, and that the NVNAF possessed less than thirty-five operational fighters in June 1972. The small force was also losing the strict organization that had previously rendered it so powerful. Younger MiG pilots, invigorated by increasing patriotic zeal and hatred for their enemy, exhibited less discipline than had their predecessors. Many of them recklessly abandoned pre-planned tactics and instructions from their ground controllers, contributing to their heavy losses at the end of Linebacker. As North Vietnamese pilot Nguyen Nhat Chieu described this period, "Pilots died like green bamboo shoots in a storm."⁸¹ Just as the U.S. grew more organized in its approach through increases in post-mission analysis, tactics evaluations, and most important, the implementation of Teaball, the NVNAF was falling apart—in some cases literally, as MiGs

lay in the countryside, useless for want of repair.

All these elements contributed to the reversal that began in August, yet Teaball was clearly the defining factor, enhancing American air superiority more than any other single component. The data clearly suggests that when Teaball was active, the U.S. enjoyed overwhelming success, completely reversing the trend of June and July. The early warning system removed the chief advantage of the NVNAF: surprise. Improvements to tactics, changes in training procedures, and technological enhancements to aircraft and missiles all contributed to greater success in air-to-air performance for American aircrews. But in statistical terms, Teaball provided the most dramatic increase in air-to-air success, raising the Air Force from a negative ratio in June and July to an exchange rate exceeding 3:1 from August through October. The importance of Teaball is especially clear given the almost direct correspondence of success when Teaball was active, as opposed to failure when it was down. General Vogt described this relationship, noting, "When Teaball would break down on any given day . . . we lost airplanes. One very dramatic illustration: we had a marine aircraft up there . . . [that was] shot down at precisely the five minute period when Teaball was off the air!"⁸²

The Air Force estimated that Teaball saved the lives of at least twenty crew members and over forty million (1972) dollars worth of aircraft. Kirk went on to use the program as the backbone of a new set of tactics used in the command and control center in Boerfink, Germany. General Ryan was so impressed with the program that he ordered a detailed documentation of its procedures. These reports, made by the Thirteenth Air Force Technical Research Detachment, recommended that the Teaball concept be combined with Airborne Early Warning and Control (AWACS) systems, allowing it to "provide a degree of command and control never before achieved."⁸³

Teaball allowed for a dramatic increase in situational awareness—information and communication were key. Other training and technological improvements, without accurate information and clear communication, could only provide incidental changes in air-to-air performance. Such awareness allowed for a greater level of flexibility and enabled the technology and training improvements to be used to their fullest extent. Teaball thus constituted not simply an American version of North Vietnamese GCI, but a way to combine the various elements of American training and technology into a cohesive, working system. This system was highly effective and ensured American air superiority for the remainder of the campaign.

Caught in the Apocalypse: Linebacker II

Throughout October 1972, a series of negotiations in Paris finally resulted in a breakthrough. These peace talks concluded on October 21, and two days later, Nixon suspended all bombing of targets above the 20th parallel, effectively ending the Linebacker Campaign. However, Henry Kissinger's October 26 declaration that "We believe peace is at hand," proved to be premature, as events soon unfolded



The support of USAF Chief of Staff Gen. John D. Ryan (above left) and Seventh AF Commander Gen. John W. Vogt, was instrumental in Teaball's creation.

that required the year's bombing campaign be renamed "Linebacker I," to distinguish it from a renewal of strikes against the North. Ironically, it was the South Vietnamese government that refused to accept the peace proposal, prompting a resumption of negotiations and attacks. Limited B-52 strikes occurred on North Vietnamese targets in November in an attempt to persuade the Hanoi government to accept altered peace proposals. American frustration with the lack of progress in negotiations led to a new bombing campaign, simply named "Linebacker II," that began on December 18, 1972. The original plan called for only three days of strikes, yet continued impediments to the negotiation process extended the bombings to the 29th, earning the campaign the nickname "the eleven day war."⁸⁴

The goals and methods of Linebacker II differed from previous bombing efforts in its brutality. Earlier campaigns, modeled after the strategic bombing efforts of other wars, focused on reducing the enemy's ability to wage war by attacking supplies and the means of production. This goal was present in Linebacker II, but the new campaign's main objective was instead to intimidate and terrify the enemy—including civilians. Admiral Thomas A. Moorer, then Chairman of the Joint Chiefs, described the goals of the campaign to the commander of Strategic Air Command (SAC), saying, "I want the people of Hanoi to hear the bombs."⁸⁵ In order to maximize terror, the new plan consisted almost entirely of B-52 strikes. These massive

planes inflicted enormous damage due to their bomb capacity of 70,000 pounds—over four times the maximum load of the Phantom.⁸⁶ The psychological effect of these aircraft was well known. The Viet Cong Minister of Justice, Truong Nhu Tang, described a B-52 strike as being "caught in the Apocalypse. The terror was complete. One lost control of bodily functions as the mind screamed incomprehensible orders to get out."⁸⁷

Teaball allowed for a dramatic increase in situational awareness—information and communication were key

American planners knew that the lumbering B-52s were vulnerable to MiG strikes and took steps to reduce the danger. The bombers flew with similar support formations as in previous Linebacker missions, including chaff corridors, Wild Weasel SAM suppression, and large MiGCAP sorties. The most significant change in these strikes was the decision to fly them at night—partly to enhance the psychological effect, as night attacks seemed more disturbing than day strikes. But night strikes also limited the effectiveness of both North Vietnamese and U.S. fighters by taking away the ability to see their targets. Because both sides relied on radar and guided missiles, the night environment was a dangerous one. Daytime strikes

did still occur with similar formations as in previous Linebacker missions.⁸⁸ During these night attacks, SAMs proved to be a much more pressing threat to the B-52 force. In only eleven days, the North Vietnamese launched over 1,000 SAMs at U.S. bombing formations, tearing fifteen B-52s from the sky.⁸⁹

Teaball was ready for this renewed combat. Upon reviewing the operation shortly after it became operational, General Horace Wade, Vice Chief of Staff of the Air Force, was impressed enough with Teaball to recommend it move out of its van into a permanent facility at Nakhon Phanom. The transfer was completed on October 23, 1972, and stood ready to assist Linebacker II operations when they commenced in December.⁹⁰ Surprisingly, MiG flights rarely appeared. Few engagements took place, even considering the brief duration of the campaign. U.S. forces reported only twenty-six sightings of MiGs during these attacks. Analysts credited airfield strikes and intensive radar jamming for limiting the NVNAF's effectiveness. In addition, North Vietnamese GCI became almost useless as it depended on MiGs using their IFF transponders—but keeping these transponders active made the MiGs vulnerable to the increased number of Combat Tree equipped Phantoms. The constant hammering of strikes all night and day stretched the resources of the NVNAF and reduced the MiG threat.⁹¹ F-4 Phantoms claimed three destroyed MiGs for two losses. Almost all of these engagements occurred against Air Force planes, with the Navy claiming only one of these kills and suffering no lost F-4s. The B-52s proved to be capable of defending themselves to some degree, their gunners destroying three North Vietnamese fighters. Although SAMs wreaked havoc on the B-52 force, the U.S. maintains that MiGs destroyed only one B-52. North Vietnamese sources claim two additional unconfirmed B-52 kills, including one by a MiG kamikaze-style attack when pilot Vu Xuan Thieu crashed his fighter into one of the large bombers.⁹²

Teaball laid the foundation for the later role of Airborne Warning and Control Systems (AWACS)

As with other bombing campaigns, the true measure of air superiority was the ability of bombers to attack their targets freely. Although SAMs did initially prevent Linebacker II strikes from attacking their targets until the B-52s modified their tactics, the MiGs had little deterrent effect on these missions. The 1.5:1 kill ratio favoring the Phantom at first glance appears weak compared to the victories of the previous months. But the very small sample size of air-to-air engagements combined with the unique nature of the mission limits meaningful analysis of air combat during this brief campaign. The indication of effectiveness was the fact that U.S. bombing strikes—after adjusting tactics to handle the SAM threat—could freely attack their targets. MiGs did not pose a significant threat to this effort due to the combination of many factors, but the technological improvements in American radar-based weapons and

SIGINT clearly provided the largest contribution. The Air Force's enthusiasm and reliance on technology paid dividends. The increased situational awareness that pilots received from Combat Tree and Teaball proved its worth by rendering the MiGs impotent in Linebacker II.

By December 28, 1972, North Vietnam had exhausted its SAM supply and was little capable of defending itself from the B-52 raids. When Hanoi expressed its desire to renew serious negotiations, Nixon halted all bombing north of the 20th parallel. With the signing of final settlements on January 23, 1973, air-to-air combat in the Vietnam War drew to a close.⁹³

Conclusion

The typical narrative of air combat in Vietnam is that the Navy used the "correct" approach when creating the Top Gun program, and that the Air Force deserves criticism not only for its failure to produce a similar training program, but also for its blind adherence to technological chimeras. However, this simplistic story misses a few key factors. It ignores that the Navy also used technological improvements, including upgrades to their missiles and the jamming of enemy communications. It fails to note that the Navy engaged fewer MiGs during the Linebacker period, with almost no contact with the more advanced MiG-21 Fishbed, so perhaps a direct comparison of each service's kill counts is misleading.

Furthermore, this narrative fails to recognize that the Air Force saw a larger improvement in its effectiveness than did the Navy in the same period owing to the systems-based, technological approach of Project Teaball. As one of the project's designers noted, "The direct SIGINT support concept as employed by TEABALL in Vietnam wasn't new; it was just forgotten."⁹⁴ Such a systems approach does not fit well the popular, romantic image of fighter pilots locked in exciting, fast-paced dogfights. Nor does this technological solution lend itself to dramatic, star-studded Hollywood blockbusters. This persistent romanticism might be why the Top Gun narrative has endured so well. The most often cited work on the origins of Top Gun is Robert Wilcox's *Scream of Eagles: The Dramatic Account of the U.S. Navy's Top Gun Fighter Pilots and How They Took Back the Skies over Vietnam*. The subtitle alone supports this sense of romanticism, overriding other explanations for increased air combat success.

Top Gun was clearly an effective program, and its accomplishments should not be diminished. It worked, but Teaball worked better. The role performed by Teaball laid the foundation for the later role of Airborne Warning and Control Systems (AWACS) that has become a key element of American air power strategy. These conclusions suggest that the Air Force is not deserving of the criticism it often receives. In the final phase of the Vietnam War, the Air Force demonstrated that technological solutions can be effective. It exhibited a willingness to adapt, translating the Soviet GCI model into an American cultural context that emphasized individual initiative. Ultimately, the Air Force found that a less romantic solution was just as effective. ■

Marshall L. Michel, *Clashes: Air Combat Over North Vietnam 1965-1972* (Annapolis, MD: Naval Institute Press, 1997), 7, 277. Some estimates for the F-86 kill ratio are as high as 15:1, as in Earl H. Tilford, *Crosswinds: The Air Force's Setup in Vietnam* (College Station, TX: Texas A&M University Press, 1993), 15.

For air combat statistics in Vietnam, the most useful primary sources are the "Red Baron Reports," a series of studies of air-to-air encounters conducted by the Air Force during and shortly after the war (from 1967 to 1974). These reports were an attempt to reconstruct and analyze as many encounters as possible. Detailed statistics are included with each encounter, and many reports include interviews with the pilots involved. There are three of these reports, which I will refer to as Red Baron I, II, and III, and each consists of multiple volumes. Red Baron I is titled "Air-To-Air Encounters in Southeast Asia" (Arlington, VA: Institute for Defense Analyses Systems Evaluation Division, Weapons Systems Evaluation Group, October 1967 - February 1969). The second and third reports are titled "Project Red Baron II: Air To Air Encounters in Southeast Asia" (Nellis Air Force Base, NV: USAF Tactical Fighter Weapons Center, January 1973), and "Project Red Baron III: Air To Air Encounters in Southeast Asia" (Nellis Air Force Base, NV: USAF Tactical Fighter Weapons Center, June 1974). Availability of these sources is limited. Red Baron I is available at the Air Force Historical Research Agency (AFHRA) and has been published. Red Baron II and III were at one time declassified and available to scholars. After the closing of the Tactical Fighter Weapons Center at Nellis, the copies were transferred to Air Combat Command, where they are still under review for redaction as of the time of this writing. However, declassified copies made by scholars still exist, although they are not widely distributed.

Most of these statistics are verified in Michel and Tilford, and in other secondary sources such as: R. Frank Futrell et. al., *Aces and Aerial Victories: The United States Air Force in Southeast Asia, 1965-1973* (Maxwell AFB, AL: Albert F. Simpson Historical Research Center, Air University, 1976); Lou Drendel, ...*And Kill MiGs: Air to Air Combat in the Vietnam War* (Carrollton, TX: Squadron/Signal Publications, 1984); Walter J. Boyne, "The Teaball Tactic," *Air Force Magazine* 91 (July 2008), 67-70; and William Sayers, "The Red Baron Reports: What They Really Said." *Air Power History* 52 (Fall 2005): 4-13.

The only work to deal primarily with the Vietnamese perspective of the air war is Roger Boniface, *MiGs Over North Vietnam: The Vietnam People's Air Force in Combat, 1965-1975* (Mechanicsburg, PA: Stackpole Books, 2010), but this work is questionable. Boniface cites no specific documents or sources beyond oral interviews with North Vietnamese pilots. In most wars, nations tend to record statistics in their favor, but Boniface's work fails to line up with US sources in ways far beyond the expected level. Dates of battles, numbers of encounters, and kill counts (for both sides) do not match US records by a wide margin. I will occasionally make careful use of this source's less controversial claims when discussing the North Vietnamese Air Force, but its potential problems must be acknowledged.

2. Roger K. Wilcox, *Scream of Eagles: the Dramatic Account of the US Navy's Top Gun Fighter Pilots: How they Took Back the Skies over Vietnam* (New York, NY: Pocket Books, 1992), 99. See also Marshall L. Michel, "The Revolt of the Majors: How the Air Force Changed After Vietnam" (PhD. Diss., Auburn University, 2006), 97; Red Baron I, 17-18; Red Baron III, 15-20.

3. Red Baron II C-1—E-2, and Red Baron III, C-1—D-6.

4. Randy Cunningham, *Fox Two: The Story of America's First Ace in Vietnam* (Mesa, Ariz.: Champlin Fighter Museum, 1984), 96.

5. For example, see Richard P. Hallion's overview of the Vietnam era in *Storm Over Iraq: Air Power in the Gulf War* (Washington, D.C.: Smithsonian Institution Press, 1992), 31; and Benjamin S. Lambeth, *The Transformation of American Air Power* (Ithaca, NY: Cornell University Press, 2000), 48. Michel, *Clashes*,

277-8 does note other potential factors for the Navy's success, but he generally agrees that training was the key to success, and points out that many pilots assumed the Navy to have taken the "correct" approach as well.

6. Sayers, "The Red Baron Reports," pp. 4-13.

7. Red Baron III, C-1—D-6; Boyne, "The Teaball Tactic," p. 68.

8. The Air Force has been accused of an overreliance on technology by many works. For example, the service's pursuit of technology during World War II, specifically in the high degree of faith placed in the Norden bomb sight, is critiqued in Stephen L. McFarland, *America's Pursuit of Precision Bombing, 1910-1945* (Washington D.C.: Smithsonian Institution Press, 1995). For a mixed examination of the Air Force's technological development, see Jacob Neufeld et al., *Technology and the Air Force: A Retrospective Assessment* (Washington D.C.: Air Force History and Museums Program, 1997). Harsher assessments of the Air Force's technological culture include Kenneth P. Werrell, "Did USAF Technology Fail in Vietnam? Three Case Studies," *Airpower Journal* 12 (Spring 1998), pp. 87-99; and James W. Gibson, *The Perfect War: Technowar in Vietnam* (Boston, Mass.: Atlantic Monthly Press, 1986). The F-4 Phantom specifically is held up as a negative example of the Air Force's "technological exuberance" due to its reliance on long range weapons and radar that proved ineffective in the terrain and climate of Vietnam, in addition to other problems such as maneuverability and the lack of a gun, in Steven A. Fino, "Breaking the Trance: The Perils of Technological Exuberance in the US Air Force Entering Vietnam," *Journal of Military History* 77 (April 2013), pp. 625-55.

9. Michel, *Clashes*, pp. 190-1. I have not found corroboration of these events in other sources, and Michel does not cite a reference for these events.

10. Michel, *Clashes*, p. 193.

11. *Ibid.*, pp. 192-4.

12. Mark Clodfelter, *The Limits of Air Power: The American Bombing of North Vietnam* (New York, NY: The Free Press, 1989), p. 147.

13. *Ibid.*, pp. 85, 151.

14. Michel, *Clashes*, pp. 196-7.

15. Clodfelter, *The Limits of Air Power*, pp. 151-4; John T. Correll, *The Air Force in the Vietnam War* (Arlington, Vir.: Aerospace Education Foundation, 2004), p. 9.

16. Futrell et. al., *Aces and Aerial Victories*, p. 83.

17. Red Baron II C-1—E-2, & Red Baron III, C-1—D-6.

18. Quoted in Clodfelter, *The Limits of Air Power*, p. 157.

19. William W. Momyer, *Air Power in Three Wars* (Washington, D.C.: Office of Air Force History, 1985), pp. 32-3. See also Clodfelter, *The Limits of Air Power*, p. 158.

20. Michel, *Clashes*, pp. 196-7, 236.

21. Captain Richard S. Ritchie, United States Air Force Oral History Program, Interview #K239.0512-630, 11 Oct 72 and 30 Oct 72, pp. 1, 24-5. Ritchie was the only Air Force ace pilot during the Vietnam War. Hereafter cited as "Ritchie Interview."

22. Michel, *Clashes*, p. 194.

23. M. O. Beck, "The New Phantom Switchology," *USAF Fighter Weapons Review* (Summer 1973), pp. 26-7; Ritchie Interview, pp. 65-6; Anthony M. Thornborough, *USAF Phantoms: Tactics, Training and Weapons* (New York, NY: Arms and Armour Press, 1988), p. 17.

24. CAP (combat air patrol) forces took several forms, most commonly "Barrier CAP" (BARCAP, to fly around the far edges of a formation, on the lookout for enemy fighters) and "MiG CAP" (flying closer to the formation, but performing a similar role, that of spotting and engaging enemy fighters).

25. Momyer, *Air Power in Three Wars*, pp. 129-31.

26. Ritchie Interview, pp. 70-1; See also Michel *Clashes*, pp. 217-26.

27. Ritchie Interview, quoting General John Vogt, pp. 72-3.

28. *Ibid.*, p. 6.

29. Geesey, "Air-to-Air Engagements in SEA," p. 50.

30. Peter E. Davies, *USN F-4 Phantom II vs. VPAF MiG-17/19:*

Vietnam, 1965-73 (New York, NY: Osprey, 2009), p. 33.

31. Ritchie Interview, p. 3.

32. Ed Rasimus, *Palace Cobra: A Fighter Pilot in the Vietnam Air War* (New York, NY: St. Martin's Press, 2006), pp. 26-7; See also Geesey, "Air-to-Air Engagements in SEA," pp. 45-6.

33. Michel, *Clashes*, p. 190; See also Boniface, *MiGs Over North Vietnam*, pp. 73, 80, although Boniface contends that there were far fewer operational MiG fighters and far more pilots than US intelligence sources indicated. Boniface cites no specific North Vietnamese documents, relying on oral interviews only. He claims there were hundreds of pilots and few planes, and that most of these aircraft experienced maintenance problems that kept them on the ground. Ritchie, in his 1972 Interview, p. 74, contends that the opposite was the case: the approximately 150 MiG fighters suffered few maintenance issues, but a severe North Vietnamese pilot shortage seemed to keep them from being utilized.

34. Momyer, *Air Power in Three Wars*, pp. 150-5.

35. Michel, *Clashes*, p. 114.

36. Futrell et. al., *Aces and Aerial Victories*, p. 14; Momyer, *Air Power in Three Wars*, p. 155; Michel, *Clashes*, p. 226.

37. Ritchie Interview, pp. 74-5.

38. For a brief summary of the belief in a qualitative edge for NATO forces in the Cold War era, see Robert M. Citino, *Blitzkrieg to Desert Storm: The Evolution of Operational Warfare* (Lawrence, Kans.: The University Press of Kansas, 2004), pp. 229-33.

39. Quoted in M. F. Porter, "Linebacker: Overview of the First 120 Days," Project CHECO Report, 27 Sept 1973, p. 48.

40. Ritchie Interview, pp. 37, 8.

41. Thomas R. Johnson, *American Cryptology During the Cold War, 1945-1989, Book II: Centralization Wins, 1960-1972* (Fort Meade, Md.: Center for Cryptologic History, National Security Agency, 1995), p. 580.

42. Michel, *Clashes*, p. 115; See also Boyne, "The Teaball Tactic," p. 68.

43. For a fuller examination of this rationale, see Gilles Van Nederveen, "Wizardry for Air Campaigns: Signals Intelligence Support to the Cockpit," (Research paper for the College of Aerospace Doctrine, Research, and Education, Airpower Research Institute, Maxwell: 2001), pp. 2-3.

44. *Ibid.*, p. 24.

45. *Ibid.*

46. Ritchie Interview, p. 8.

47. Michel, *Clashes*, pp. 220-2.

48. Cunningham, *Fox Two*, pp. 116.

49. Red Baron II C-1—E-2, and Red Baron III, C-1—D-6. An overview of the encounter can be found in Michel, *Clashes*, pp. 212-7. Cunningham gives a vivid description of the Navy side of the battle in *Fox Two*, pp. 92-116. Other oral histories of these encounters can be found in Futrell et. al., *Aces and Aerial Victories*, 92-6; and in Drendel, *...And Kill MiGs*, pp. 64-7.

50. Quoted in Wilcox, *Scream of Eagles*, p. 198.

51. Geesey, "Air-to-Air Engagements in SEA," 28-35, quote on 35. See also Michel, *Clashes*, p. 207.

52. Michel, *Clashes*, pp. 223-4.

53. Red Baron II C-1—E-2, and Red Baron III, C-1—D-6.

54. Cunningham, *Fox Two*, p. 64.

55. Red Baron III, Vol. III, Section I, p. 30, quoted in Michel, *Clashes*, pp. 234-5.

56. Red Baron III, Vol. IV, p. 252, quoted in Michel, *Clashes*, p. 233.

57. Michel, *Clashes*, pp. 170-2, 233. The "single-shooter" policy was a remnant of fighter combat from an earlier era. In theory, it gave the flight leader maximum freedom by ensuring the other elements of a flight protected him. However, it rendered those other planes much more vulnerable and limited the effectiveness of a fighter group. The Air Force resisted changing to a more effective two-plane formation because such a grouping was associated with Navy tactics. Tradition and inter-service rivalry fueled USAF's conservatism as the "single shooter" policy remained in effect throughout the Vietnam War.

58. Red Baron III, C-1—D-6.

59. Quoted in Porter, "Linebacker: Overview of the First 120 Days," p. 46.

60. Quoted in Michel, "Revolt of the Majors," p. 145.

61. Michel, "Revolt of the Majors," pp. 146-52. For a full examination of this shift, see Brian D. Laslie, *The Air Force Way of War: US Tactics and Training after Vietnam* (Lexington: University Press of Kentucky, 2015), forthcoming at the time of this writing. Laslie explores similar themes in his dissertation, "Red Flag: How the Rise of 'Realistic Training' after Vietnam Changed the Air Force's Way of War, 1975-1999" (PhD diss., Kansas State University, 2013).

62. Johnson, *American Cryptology During the Cold War, 1945*, p. 580; Boyne, "The Teaball Tactic," p. 69; Nederveen, "Wizardry for Air Campaigns," p. 25. See also Calvin R. Johnson, "Linebacker Operations: September – December 1972" Project CHECO Report, 31 December 1978, p. 50.

63. Author redacted, "TEABALL: Some Personal Observations of SIGINT at War," *Cryptologic Quarterly* 9 (Winter 1991), p. 92.

64. Quoted in Boyne, "The Teaball Tactic," pp. 69-70. See also Nederveen, "Wizardry for Air Campaigns," pp. 25-6.

65. Johnson, *American Cryptology During the Cold War*, 580. See also Johnson, "Linebacker Operations," p. 52.

66. Sayers, "The Red Baron Reports," p. 12. See also Johnson, "Linebacker Operations," p. 52.

67. Red Baron III, Vol. 1, C-1—D-6.

68. Quoted in Porter, "Linebacker: Overview of the First 120 Days," pp. 46-7.

69. Quoted in Johnson, "Linebacker Operations," pp. 52-4.

70. Red Baron III, vol. III, C-29.

71. *Ibid.*, pp. 186, 191.

72. Nederveen, "Wizardry for Air Campaigns," pp. 28-9.

73. Johnson, *American Cryptology During the Cold War*, p. 579.

74. *Ibid.*, p. 31.

75. *Ibid.*, pp. 28-9.

76. Ritchie Interview, p. 8. Emphasis in original.

77. Michel, *Clashes*, pp. 253-4, 258-9; See also Clodfelter, *The Limits of Air Power*, pp. 165-6.

78. Author redacted, "TEABALL: Some Personal Observations," pp. 94-5.

79. Michel, *Clashes*, pp. 260-4.

80. Momyer, *Air Power in Three Wars*, p. 143.

81. Quoted in Boniface, *MiGs Over North Vietnam*, p. 107. For a discussion of increasing emotion and a loss of discipline, see p. 111.

82. Quoted in Porter, "Linebacker: Overview of the first 120 Days," p. 68.

83. Quoted in Author redacted, "TEABALL: Some Personal Observations," p. 96.

84. Clodfelter, *The Limits of Air Power*, p. 168-83.

85. From a letter, Brigadier General Harry Cordes to Brigadier General James R. McCarthy, n. d., quoted in Clodfelter, *The Limits of Air Power*, p. 184; See also Momyer, *Air Power in Three Wars*, pp. 33-4.

86. Specifications for the B-52 taken from the United States Air Force Web Site, "B-52 STRATOFORTRESS," posted May 5, 2013, accessed May 20, 2013, <http://www.af.mil/information/factsheets/factsheet.asp?id=83>.

87. Truong Nhu Tang, with David Chanoff and Doan Van Toai, *A Viet Cong Memoir* (New York, NY: Harcourt Brace Jovanovich, 1985), p. 168.

88. Momyer, *Air Power in Three Wars*, pp. 240-3; Michel, *Clashes*, pp. 273-4; Clodfelter, *The Limits of Air Power*, pp. 184-5.

89. Momyer, *Air Power in Three Wars*, p. 137.

90. Author redacted, "TEABALL: Some Personal Observations," 95.

91. Michel, *Clashes*, pp. 275-6.

92. Red Baron III, C-1—D-6. Boniface, *MiGs Over North Vietnam*, pp. 141, 145.

93. Clodfelter, *The Limits of Air Power*, pp. 188-9, 198-200.

94. Author redacted, "TEABALL: Some Personal Observations," p. 96.

Dealing with the Japanese Zero



Zero launches from an aircraft carrier.

John F. O'Connell

The Mitsubishi A6M Zero fighter was a very significant Japanese navy fighter aircraft of World War Two. However, its capabilities were not a complete surprise when the U.S. entered the war. Details of the Zero's performance were reported to Army and Navy Intelligence offices in Washington, D.C. by American Army and Navy Attachés well prior to December 1941.

In the Navy, published intelligence information disseminated to fleet aviators in intelligence bulletins spurred the development of a unique aerial defensive tactic to offset the capabilities of the superb new Imperial Japanese Navy carrier fighter.

The Mitsubishi A6M fighter first saw combat service over China in 1940.¹ It was later encountered by U. S. Army Air Forces (AAF) pilots during the Philippines defense campaign, and by Navy and Marine Corps pilots during the long naval and air attrition campaign in the Solomon Islands during late 1942. Fighter huts in the southwest Pacific theater frequently had large signs saying "Don't dogfight" to remind American fighter pilots, whether Navy or Marine or Army Air forces, of the superior handling characteristics of the Zero. A Marine Corps ace at Guadalcanal reportedly instructed new pilots "If you meet one Zero at medium altitude and medium speed, you are outnumbered: Get out of there!"

However, Navy carrier pilots had a recently developed defensive maneuver at hand to help deal with the Zero. That tactic stemmed from U.S. Naval Attaché reports from China and from Tokyo about the new fighter, before the Pearl Harbor attack brought the United States into the war. AAF pilots had a different tactic developed under General Claire Chennault's tutelage based upon his observations of aerial combat over China.

The A6M carrier fighter entered air combat in Chinese airspace in September 1940. Soon, reports about the new fighter were furnished to American Military and Naval Attachés in China based on information extracted from captured Japanese pilots by the Chinese.

U. S. Army intelligence had another source in China. General Claire Chennault, a retired Army Air Corps Captain, and an expert fighter pilot, had been privately employed by the Government of China to survey its Air Force and recommend measures to help it deal with Japanese air attacks.² During 1941, Chennault organized an American volunteer aerial group to help defend China's air space. With President Roosevelt's concurrence and encouragement Chennault recruited pilots from the U. S. Army, Navy and Marine Corps to fight for China. They were equipped with the Curtiss P-40B fighter aircraft, and formed the American Volunteer Group (AVG), soon nicknamed the "Flying Tigers".

Chennault was a keen student of aerial tactics and had taught the subject of pursuit aviation at the Air Corps Tactical School. He quickly realized the advantage the Japanese had in the new, extremely agile fighter aircraft, and



The Mitsubishi Zero had the advantage early in the war.

trained his AVG pilots to avoid “dog fighting” with them. Instead he insisted that they use the P-40’s superior diving speed from a higher attitude to “gun” Japanese aircraft as they dove through their formations and then climbed back to high altitude to maintain an advantage. The P-40B, like the F4F, had armor and self-sealing fuel tanks. It was equipped with six 303-caliber machine guns.³ Chennault’s careful analysis of agile Japanese Army and Navy fighters in combat over China allowed him to train his AVG pilots to maximize their aircraft advantages and minimize those of enemy aircraft. Those tactics were then successfully transferred to Army Air Force fighter pilots who used them to advantage in the Southwest Pacific Theater.

Captain John F. O’Connell, USN (Ret.) served from 1952 to 1982 in an aircraft carrier, an 8-inch gun cruiser, and in five diesel submarines including a troop transport submarine, a guided missile submarine, and three attack submarines, the last as commanding officer, all in the Pacific. He commanded Submarine Division 41 and Submarine Group Hawaii before serving as Defense and Naval Attaché in Tokyo. He was a legislative assistant to Senator Robert Dole after retirement from the Navy, and worked as Marketing Manager in Tokyo for the Patriot missile system which was acquired by the Japan Defense Agency for the Japanese Air Self Defense Force. He has published three books dealing with air power and two dealing with submarines keyed to their respective operational effectiveness during the 20th century.

As early as February 1941, Gen. George C. Marshall, U. S. Army Chief of Staff, provided accurate characteristics of the new Zero fighter to his air component commanders in Hawaii and the Philippine Islands. The last pre-war edition of the Army standard reference document on Japanese aircraft included details about the Zero.

In June 1940, A6M Zero fighters first became operational in the Imperial Japanese Navy (IJN) air arm and were assigned to the 12th Naval Air Group based at Wuhan, China. On September 13, 1940, a force of Zero fighters destroyed twenty-six Chinese Air Force fighters without loss to themselves. In early October 1940, Zero’s swept the skies over Chungking and Chengdu clear of Chinese fighters. Previously, Chinese fighters had taken a heavy toll of unescorted Japanese bombers.

In June 1940, A6M Zero fighters first became operational in the Imperial Japanese Navy air arm

About two and a half months later the Office of Naval Intelligence (ONI) received its first reports about the Zero from China. Data included its maximum speed, armament, and rate of climb

Some data about the Zero was also forthcoming from Japan. In January 1941, Lt. Stephen Jurika, USN, Assistant Naval Attaché in Tokyo, a naval aviator, attended a Japanese military air show at *Haneda* airport near Tokyo.



Zero pilots and crew members posed for a group photo.

A static display included a sparkling new Zero fighter. Jurika climbed into the cockpit and noted data listed on a nameplate. It included aircraft weight and horsepower. Jurika observed the landing gear, wing construction and other details. He reported all the information he had collected back to ONI, which sent his report to the Navy Bureau of Aeronautics (BuAer) for comment. BuAer's response was that the data must be in error, because the performance reported was too high for the aircraft weight.

In summer 1941, Jurika was detached from duty at the American Embassy in Tokyo and reported to ONI in Washington to assist in updating intelligence studies on Japan, before assignment to new aircraft carrier USS *Hornet* (CV 8). At ONI he found that the data he had collected was being incorporated into intelligence documents, but he was disappointed that during his entire time at ONI no one ever debriefed him about his Japanese tour.⁴

In May 1941, the Chinese recovered a relatively intact Zero fuselage from a crash landing near Chengdu. It provided data for a foreign technology report by American Attachés. A copy of that report was sent to ONI by the Assistant Naval Attaché at Peking, Capt. J. A. McHugh, USMC.

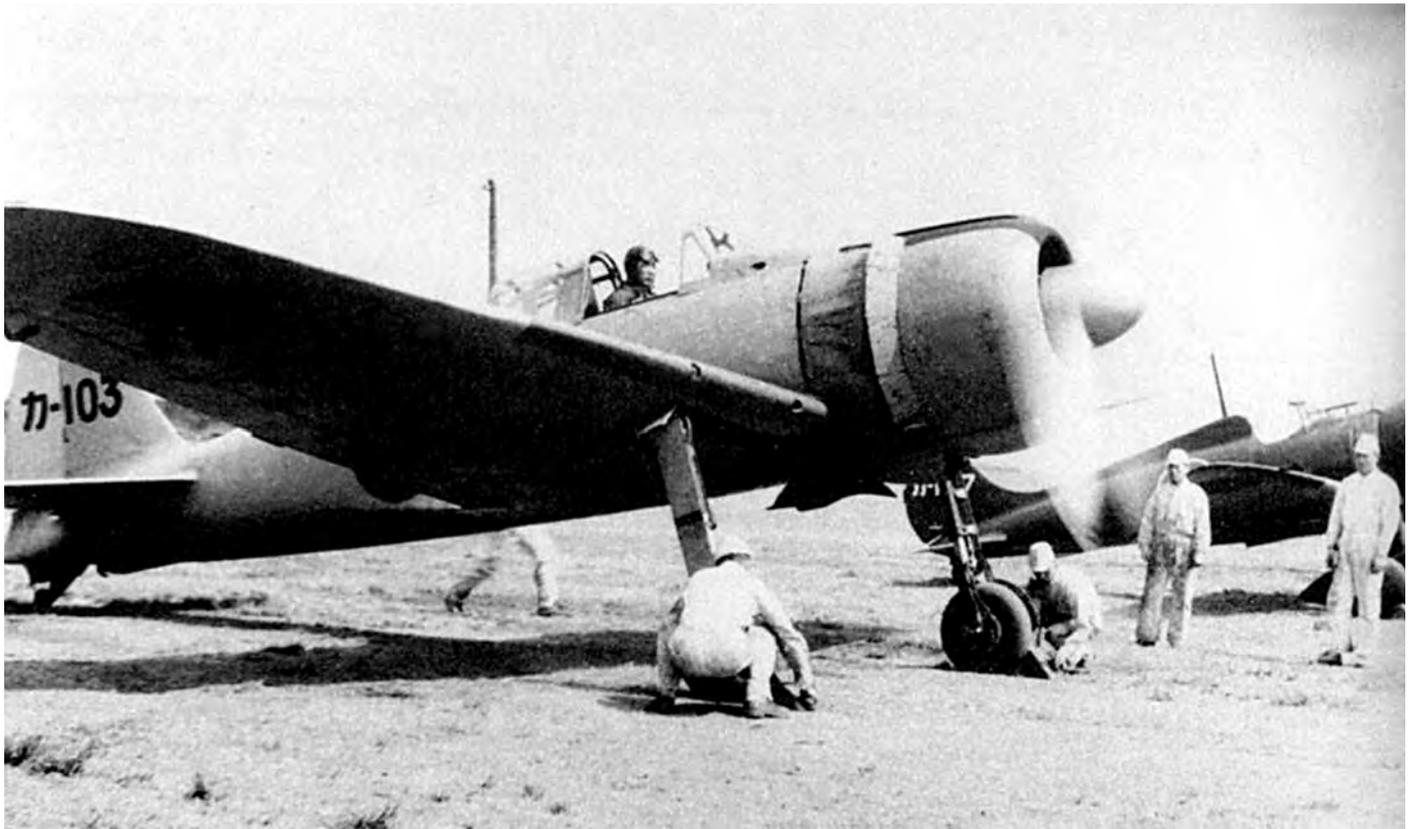
During 1941, well prior to the Pearl Harbor attack that pulled a reluctant United States into World War Two, ONI published information to the fleet in the form of intelli-

gence bulletins about the prospective enemy—Japan and its naval capabilities. This included information provided about the new A6M carrier fighter. Lcdr. John S. Thach, USN, later recalled that he based the design of his defensive tactic upon performance data on the Zero fighter that he first saw in spring 1941.⁵

He [Thach] finally came up with what he called the “beam defense position”

Lieutenant John S. (Jimmie) Thach was Commanding Officer of Fighting Squadron Three (VF-3) at North Island Naval Air Station, Coronado, California in spring 1941. VF-3 was equipped with the new F4F Grumman Wildcat fighter. The Wildcat had a maximum speed of about 319 mph. An ONI Intelligence Bulletin came across Thach's desk and he noted the advertised maximum speed of the Zero as 331 mph, 12 mph faster than the Wildcat. That concerned him and he decided to attempt to devise aerial tactical maneuvers that might compensate for the speed disadvantage.

Thach sat at his kitchen table in Coronado, California in the evenings and used wooden matchsticks to work out possible maneuvers to offset the speed differential. He fi-



Launching a Zero from a dirt runway.

nally came up with what he called the “beam defense position”. At the time Navy fighter squadrons (about twelve aircraft) flew in divisions of four aircraft, each composed of two sections of two fighters each. Thach worked out a formation in which wing men flew abeam of each other separated by some fifty yards. Each was tasked with checking his wing man’s rear area for attacking fighters. If one appeared, the pilot sighting it would turn in to the other U.S. fighter, a signal that he was under attack. The other fighter would then turn toward, bringing himself and the attacker across in front of the wing man, giving the wing man a deflection shot at the attacker.

The two aircraft would cross over, and then straighten out briefly and repeat the maneuver, constantly exchanging positions. If a Zero dove on a Wildcat and pulled in behind to shoot at it, the turning maneuvers would automatically bring the target Wildcat and the pursuing Zero directly in front of the second Wildcat. Thach termed the Wildcat under attack the “bait”, and the second Wildcat the “hook”. The same tactic would be used by a division of fighters, with the two sections maneuvering to crisscross. An enemy attack on one section automatically put the second section in an attack position on the beam of the attackers.

Although the Zero was well armed with two 20-mm cannon and three 13.2-mm machine guns; it was unarmored and lacked self-sealing fuel tanks. These features reduced its weight and provided superior agility but made

it very vulnerable to a burst of fire from six 50-cal. Wildcat machine guns.

After satisfying himself that the maneuver might work in theory using matchsticks for aircraft, Thach enlisted the assistance of a promising young pilot in his squadron to test the improvised tactic in the air. The man he selected was Ensign Edward O’Hare. O’Hare took charge of a section of pseudo Zeros (full speed Wildcats), and Thach led a section of Wildcats with restricted speed. The pseudo Zeros could use their full throttle, but the Wildcats were restricted to using only partial speed, marked on their throttle quadrants, mimicking the speed advantage the actual Zero had over the Wildcat.

The Zero was well armed...[but] it was unarmored and lacked self-sealing fuel tanks

The tactic worked. Back on the ground, O’Hare reported that whenever he had one Wildcat in his sights, he found himself being attacked by the other Wildcat and would have to break off his attack or risk being shot down.

In December 1941, Japanese Army and Navy forces moved south into Malaya, the Philippines and the Dutch East Indies. The Dutch Netherlands Air Force, the Royal Air Force, the Royal Australian Air Force and the American Army Air Forces, all quickly learned how potent a fighter



Zeros were effective launching from unimproved landing strips..

the Zero was. It soon overcame all aerial opposition. U.S. Navy fighter pilots first encountered it during the Battle of the Coral Sea in May 1942, and also found it formidable.

The first opportunity to test Thach's "beam defense position" tactic in combat came during the Battle of Midway in early June 1942. Lieutenant Commander Thach led Fighter Squadron Three (VF-3) operating from aircraft carrier *USS Yorktown* (CV 5), which had been damaged during the May 1942, Coral Sea battle, hastily repaired by Pearl Harbor Naval Shipyard, and hurried back into combat to defend against an amphibious invasion of Midway Island.

The first opportunity to test Thach's...tactic in combat came during the Battle of Midway

Thach led a six plane group of VF-3 fighters (Grumman F4F-4s) as escorts for dive bombers of Bombing Squadron Five (VB-5) and torpedo planes of Torpedo Squadron Three (VT-3) against the Japanese aircraft carrier task force.⁶ VF-3 had been rapidly patched together from parts of VF-3 and VF-42. As a result there had been little time to train pilots to use Thach's "beam defense position" tactic. When VF-3 flew aboard *Yorktown*, a landing accident resulted in the death of Thach's squadron executive officer. The loss of the number two man in the squadron did not help preparations for combat.

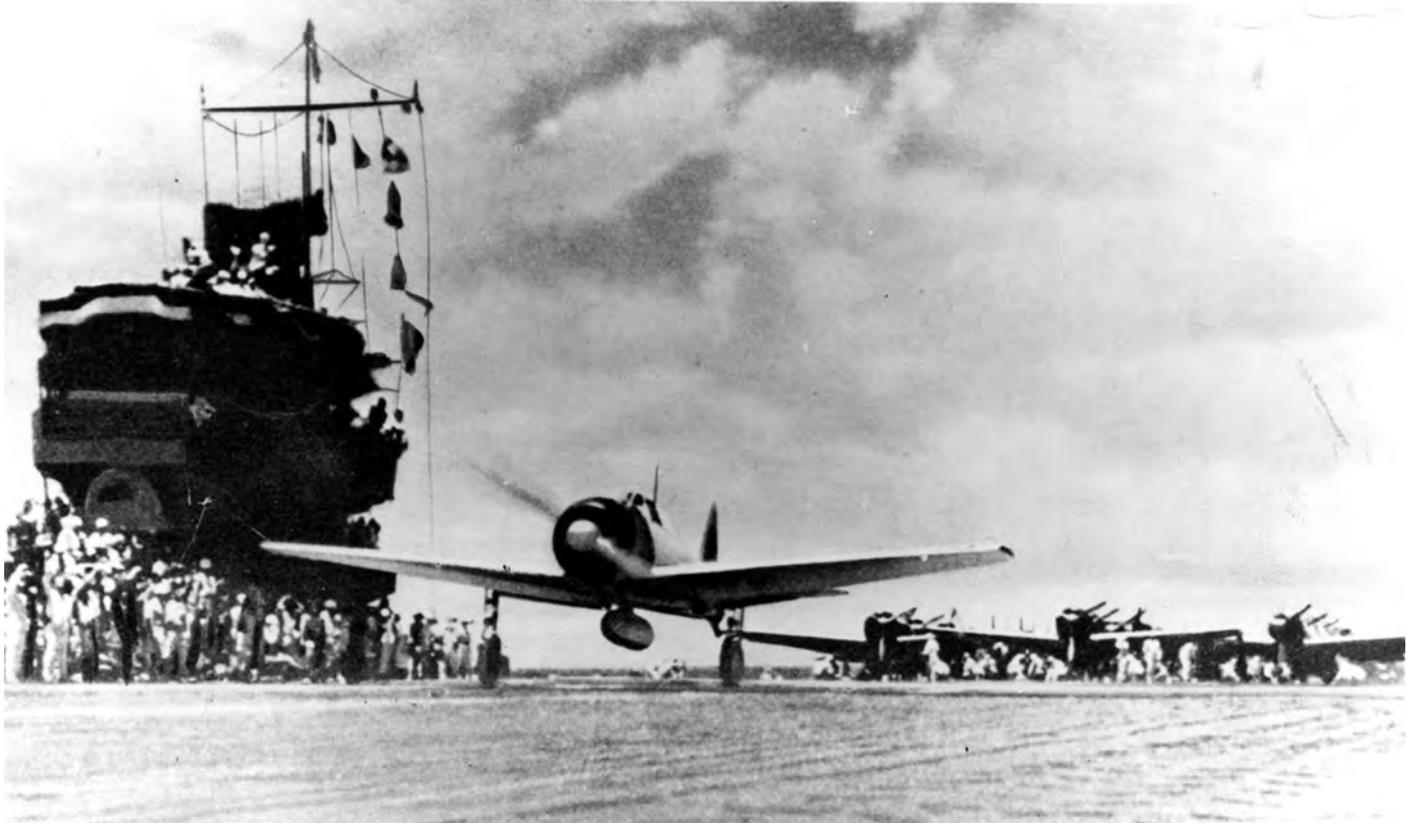
As the *Yorktown* air strike group approached the Japanese carrier battle force northwest of Midway Island, it was apparent that the Japanese were prepared and

ready to fight. A large number of Zeros, operating in a combat air patrol, pounced on Thach's fighters. Thach's six fighters were operating in one four-plane division and a separate section of two. One of Thach's division went down in flames immediately. Thach tried to coordinate with the separate section leader to begin a "beam defense position" weave but the other section leader's radio malfunctioned.

Thach then radioed his own wingman to move out to an abreast position as if he were a section leader and start weaving. Although startled, the wingman had had some instruction previously and complied. The third pilot, having been sternly instructed by Thach before the battle "to stay close", did just that and followed Thach's every move. The maneuver worked to confuse a Zero pilot who pulled out ahead of Thach, slowed and was promptly shot down by Thach. Thach and the other impromptu "section leader" continued weaving, thereby rendering continued Zero attacks harmless. Thach shot down two more Zeros and the other "section leader" shot down one.⁷

Thach...continued weaving, thereby rendering continued Zero attacks harmless

Word of the success of Thach's "beam defense position" against attacks by Zeros rapidly spread.⁸ Butch O'Hare, who had helped Thach develop the procedure, distinguished himself during the earlier battle of the Coral Sea by shooting down six Imperial Japanese Navy (IJN) bombers intent on attacking O'Hare's aircraft carrier.⁹ O'Hare was in a fighter squadron commanded by Lcdr.



Carrier-based Zeros saw a great deal of service..

Jimmy Flatley, another superb flier and leader. Flatley listened to O'Hare's arguments about the validity of the new tactic and adopted it. He named it the "Thach Weave".

With the entry into Navy and Marine Corps operational service of the F6F Grumman Hellcat fighter and the F4U Chance Vought Corsair fighter in late 1943, the Zero finally met its match. Jimmie Thach's *Weave* tactic had en-

abled the slower F4F Wildcat to survive. The two new U.S. carrier fighters would not have to rely solely upon that tactic but on their own superb handling characteristics. Two new AAF aircraft, the Lockheed P-38 Lightning and the Mitchell P-51 Mustang, brought similar advancements to the Pacific Theater. That said, the Zero was still a dangerous opponent when flown by an experienced IJN pilot. ■

NOTES

1. Technically the A6M fighter was referred to as the Zeke by Allied forces in their standard enemy aircraft nomenclature. The term Zero refers to the Japanese calendar year (2600) in which it entered service. I will use the term Zero throughout the paper.
2. Chennault had held a temporary rank of Major, but was retired as a permanent Captain in 1937 for medical reasons. He was recalled to service as a Colonel, and later promoted to Brigadier General and subsequently Major General while on active duty. He retired in 1945. On July 18, 1958 the United States Air Force awarded him the honorary grade of Lieutenant General. He died on July 27, 1958.
3. The P-40Bs that Chennault obtained for his AVG came from a batch originally intended for the RAF, hence had "British .303 calibre machine guns. Needless to say, that size ammunition was not compatible with American .30 caliber weapons. The plan was to install RAF radios in the aircraft after their arrival in the United Kingdom, so they had no radios at first.
4. Prados, John, *Combined Fleet Decoded*, Random House, New York, 1995, pp. 38 – 39. The author can sympathize with Lt. Jurika. After completing three years as Defense Attaché and Naval Attaché Tokyo (1978-1981), he spent a full year at the National

Defense University staff at Fort McNair before retiring, but was never debriefed by the Defense Intelligence Agency about his tour. Intelligence bureaucracy names may change but their habits seem eternal.

5. *Combined Fleet Decoded*, p. 45.

6. Naval air strike tactics of the time called for a coordinated attack by dive bombers, diving steeply from 10,000 – 12,000 feet, and torpedo planes low on the deck at 100 – 200 feet, both escorted by fighters. The dive bombers usually carried one 1,000 pound armor-piercing bomb apiece. Normally each strike type was comprised of a full squadron, twelve aircraft. In this case only a half squadron of fighters was available for protection.

7. John S. (Jimmy) Thach achieved four-star rank in the Navy, commanding U.S. Naval Forces Europe before he retired in May 1967. He died April 15, 1981.

8. Marine Brewster Buffalo (F2A-3) fighters operating from the airfield at Midway Island, using standard naval fighter tactics, were butchered by opposing Zero fighters who accompanied their strike aircraft.

9. For that action O'Hare was awarded the Congressional Medal of Honor.

The Bomber Offensive That Never Took Off: Italy's Regia Aeronautica in 1940



A. D. Harvey

Savoia-Marchetti S.79, the most numerous bomber type.

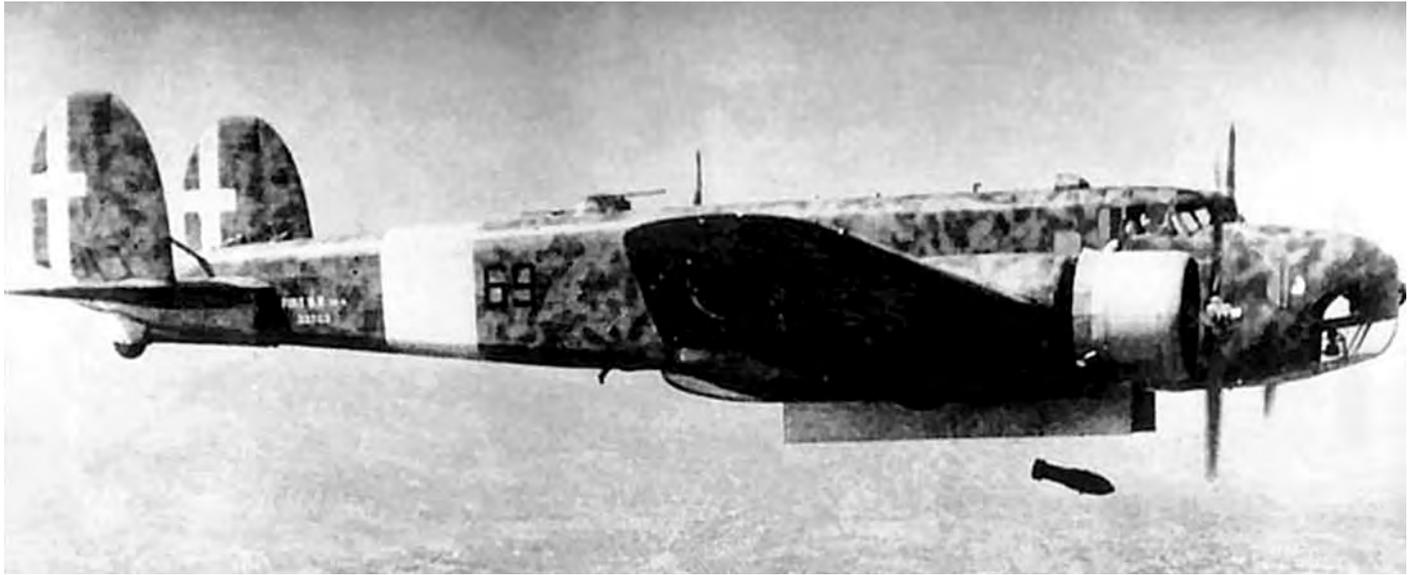
When Italy entered the war alongside Nazi Germany on June 10, 1940, the *Regia Aeronautica* had the third strongest force of multi-engined bombers in the world – amongst the belligerents the second strongest after Germany.¹ And whereas in most air forces fighter pilots were regarded as the aviators with the most glamour, in Italy it was the bombers that were considered the most glamorous branch of the service: Galeazzo Ciano, Mussolini's son-in-law and foreign minister, was also a lieutenant colonel commanding a bomber group and Mussolini's son Bruno was a squadron leader in the same unit. Italy's most modern fighter aircraft, still outnumbered in the *Regia Aeronautica* by older biplane models, were unaerodynamic, underpowered and perhaps underarmed compared to the fighter aircraft of the *Luftwaffe*, Royal Air Force and *Armée de l'Air*, but the greater part of the 783 bombers which the *Regia Aeronautica* had ready for immediate action in the Mediterranean theatre on June 11, despite the old-fashioned tri-motor configuration of most of them, were fully comparable in performance to those of Germany and Britain.² Yet by the end of the year this formidable aerial armada, though it had ranged from its European bases as far afield as Bahrain and Great Yarmouth, had failed to achieve – or even attempt – anything of real significance. This failure provides an important illustration of how unprepared, organizationally and intellectually, Italy's armed forces were for the ambitiously aggressive role that the Fascist regime had allotted to them.

Operational failure stemmed in part from a failure to impose any meaningful conceptual structure on Italy's strategic options. Hitler's war aims were chillingly straightforward. Britain and France had declared war on Germany, not the other way round, and Hitler's objective was to inflict on them a military defeat so crushing that they would be forced to acquiesce in the enslavement of Poland and (though he had not yet informed his military advisers of this) his intended invasion of Russia. The occupation of Denmark, Norway, Belgium and the Netherlands was merely a consequence of the embroilment with Britain and France: the issue of territorial acquisitions in Western Europe was entirely secondary. Mussolini's aim in taking Italy into the war was even simpler, but without focus:

Italy will not truly be an independent nation so long as she has Corsica, Bizerta, Malta as the bars of her Mediterranean prison and Gibraltar and Suez as the walls. . . .

Italy cannot remain neutral for the whole duration of the war without resigning her role, without disqualifying herself, without reducing herself to the level of a Switzerland multiplied by ten.³

What Mussolini aimed at was the domination of Southern Europe and the Mediterranean basin; but it was much more



The Fiat B. R. 20M, used in the raids on England.

than a matter of Tunisia and Malta, for these were nothing in comparison to Poland or Hitler's earlier acquisitions, Austria and western Czechoslovakia. To compete with Hitler as the presiding genius of a dominant power Mussolini needed territory to annex in Europe: and the obvious candidates were Yugoslavia and Greece. This meant that while Nazi Germany could seek a resolution of the current war on a single three-hundred mile front on the north-eastern borders of France, Fascist Italy had to face simultaneously west against France, east against Yugoslavia and Greece and south against the French in Tunisia and the British in Egypt.

Fascist Italy had to face simultaneously west against France, east... and south

The General Staffs of the Italian army, navy and air force had from June 1939 onwards prepared a war plan in accordance with Mussolini's views. The *Regia Aeronautica's* part of P.R.12, as this plan was designated, seemed at first sight reasonable, sensible and logical. It distinguished between two continental fronts, and a Mediterranean front to the south, rehearsed the territorial distribution and 'theatres of operation' of the four *squadre* (air fleets) in Italy and the four overseas air forces in other parts of the Mediterranean, and referred to these various commands'

Since 1990 A. D. Harvey has contributed more than a dozen articles on air warfare to publications such as Journal of Contemporary History, War in History, RUSI Journal, Air Power History, and BBC History Magazine. Various aspects of air warfare are also discussed in his two books Collision of Empires: Britain in Three World Wars 1793-1945 (1992) and Arnhem (2001). This extends his article in RUSI Journal v.154 no. 6, Dec. 2009.

need to 'act in strict conformity' and to the necessity of moving frontline units around in order to operate in overwhelming strength on one or other front.⁴ Authors like MacGregor Knox have suggested that the *Regia Aeronautica* was unduly influenced by the theories of Giulio Douhet regarding strategic air warfare and the independent employment of aviation against enemy centres of production and supply without reference to the operation of ground troops, but there is no indication of this in P.R.12.⁵ It is even possible that by the mid-1930s the Italians had begun to lose interest in Douhet: for a period the ideas of General Amedeo Mecozzi, a minor Great War fighter ace who had been campaigning for a specialized ground attack force since the 1920s, seemed to have more influence, though by 1937, Mecozzi had been relegated to the sidelines.⁶ It is clear at any rate that the *Regia Aeronautica* despite having been established as far back as 1923 (eleven years before the French *Armée de l'Air* and twelve years earlier than the *Luftwaffe*) had never really engaged with the possibility that, because of Italy's geographical position, it might not be required to act principally in conformity with the operations of the land army, as was almost bound to be the case with the *Armée de l'Air* and the *Luftwaffe* facing each other as they did across a few hundred miles of campaigning country. An organization of centralized 'commands' (e.g. Bomber Command, Fighter Command, Coastal Command), as in Britain's Royal Air Force, might have made more conceptual and organizational sense, though since only RAF Fighter Command can be said to have made successful use of its organizational autonomy in the second half of 1940 (and then more or less lost the plot in 1941), the territorially based structure of the *Regia Aeronautica* may be taken as an indication of lack of conceptual vision rather than in itself necessarily an organizational disadvantage.⁷ More relevant to the *Regia Aeronautica's* failure was the actual detail of the territorial distribution of combat units.



The Cant Z.1007bis, Italy's most modern bomber in 1940 (shown here in the single-fin version).

1^a *Squadra Aerea* in the north of Italy, with headquarters at Milan, was the most powerful, with four *stormi* of Fiat B.R. 20 twin-engined bombers and two of Cant Z.1007bis trimotors, the latter the most modern bomber in the *Regia Aeronautica*.⁸ Both these designs carried heavier bomb-loads than the Savoia-Marchetti S.79, which was the most numerous type of bomber—indeed, the most numerous type of aircraft—in *Regia Aeronautica* service; their concentration in the north of the country, opposite the most powerful of Italy's potential enemies, France, was an indication of the importance given to the probability of conflict in the west. On the other hand the extremely mountainous nature of the Franco-Italian border, from Mont Blanc in the north to the 2000-foot mountains just inland from the coast, meant that it was unlikely that a decisive land campaign could be carried through on that front, and the Italians were perfectly aware of the weakness of the French bomber arm, which meant that there could never be an all-out contest for aerial superiority across the Maritime Alps, especially when the *Armé de l'Air* needed to confront the greater strength of the *Luftwaffe* in the much more accessible countryside further north. In fact, during the two weeks of Franco-Italian hostilities in June 1940, the most serious French air raids, on Trapani and Palermo on June 22 and 23, 1940, which resulted in forty-five civilian fatalities, were flown from bases in North Africa.⁹

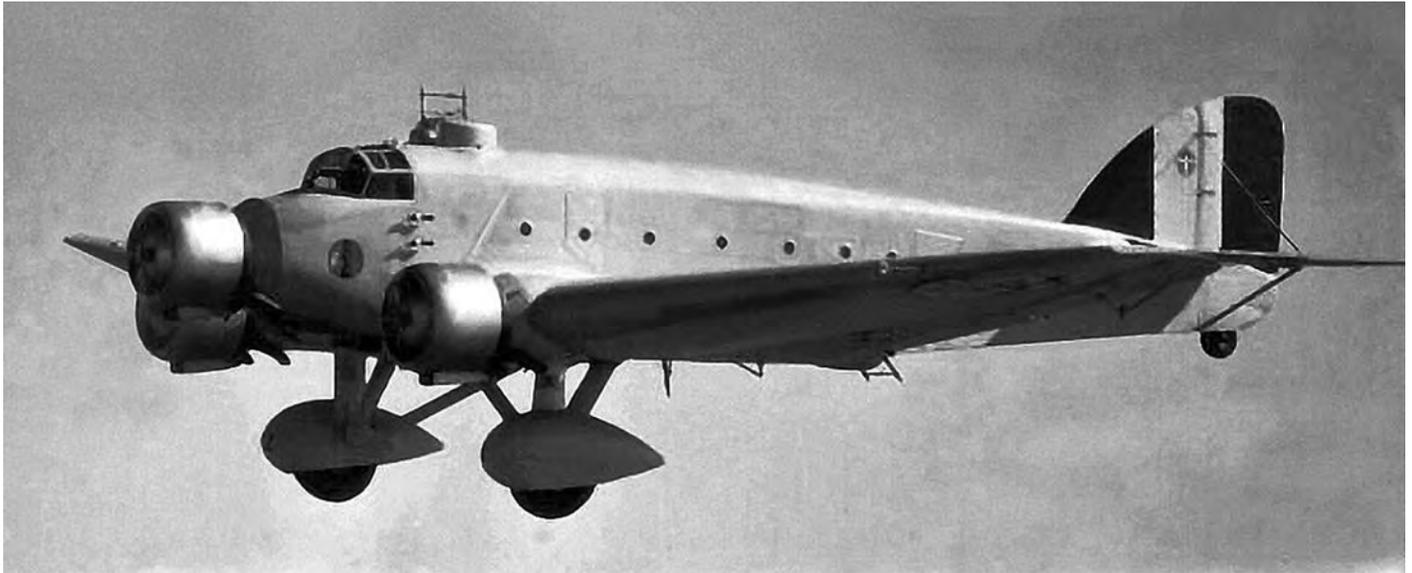
2^a *Squadra Aerea*, with its headquarters in Palermo and with five *stormi* of Savoia-Marchetti S.79s was at the other end of the country, opposite Tunisia and Malta and within practicable range of most of the coast of Italy's Libyan colonies.

3^a *Squadra Aerea*, with headquarters at Rome, had three *stormi* of S.79s, 4^a *Squadra Aerea*, with headquarters at Bari, on the heel of Italy, had a single *stormo* of Savoia-Marchetti S.81s, an out of date trimotor type with fixed undercarriage, mediocre range and a top speed of just over 200m.p.h., suitable only for night bombing or daylight op-

erations where there was no likelihood of interception. There were also single *stormi* of S.81s in the *Aeronautica dell'Albania* and in the *Aeronautica dell'Egeo*, based on Rhodes, at that time an Italian possession. *L'Aeronautica della Sardegna* had two *stormi* of S.79s. *L'Aeronautica della Libia* had four *stormi* of bombers, about two thirds of the planes S.79s, and the rest S.81s. (In Italian East Africa – Eritrea, Ethiopia and Somalia – there were a further 130 or so bombers, but only twelve of them were S.79s: most of them were Caproni Ca133 trimotors, which were capable of utilizing short airstrips but which with a top speed of 174 m.p.h. were only suitable for employment where there were no enemy warplanes.)

The error of these dispositions only became apparent...after the Germans occupied Paris

The error of these dispositions only became apparent to Italy's military leadership after the Germans occupied Paris and, with France about to drop out of the war, attention in Rome shifted to the problem of defeating Britain. On June 21, 1940 the *Stato Maggiore Generale*, the Armed Forces High Command, ordered that Alexandria, Britain's principal naval establishment in the Mediterranean and base for three battleships, should be bombed exclusively by aircraft flying from Sicily so that *l'Aeronautica della Libia* could concentrate on supporting army operations against Egypt. The *Stato Maggiore dell' Aeronautica* responded that the round trip from Sicily to Alexandria and back, nearly 2000 miles, could not be flown with a useful bombload.¹⁰ In fact the only major units capable of managing the distance, even with a negligible bombload, were the Cant Z.1007bis *stormi* in northern Italy. The *Stato Maggiore dell' Aeronautica* ordered instead that S.81s should bomb Alexandria from Rhodes. With the S.81's compara-



Savoia-Marchetti S.81 in pre-war markings: with a top speed of 211 m.p.h. this type was clearly out of date by 1940.

tively poor range, this left little margin for error in navigation or carburettor adjustment and one of the twelve S.81s sent out on the first mission, on the night of June 22-23, 1940, ran out of fuel on the return leg and ditched in the sea 45 miles short of home.¹¹ On June 25, at a Chiefs of Staff meeting, General Francisco Pricolo, the *Capo di Stato Maggiore dell'Aeronautica* proposed that S.79s, which had a longer range than the S.81, should be sent to Rhodes. Badoglio the *Capo di Stato Maggiore Generale*, agreed but warned, 'Alexandria comes second. At the moment what matters is to neutralize – sterilize as the *Duce* puts it – Malta and to act against Gibraltar.'¹² 41° Gruppo with the S.79, later re-equipped with the even longer-ranged Z.1007bis, was duly transferred to Rhodes, but as its main priority it was assigned to attack the oil refineries at Haifa, where the western end of the 585-mile oil pipeline from Mosul was located, and most of the nine raids on Alexandria carried out by the end of October were night missions by S.81s.¹³ Needless to say, like almost all small-scale night raids in 1940, they were quite ineffective.

With regard to Gibraltar...the Regia Aeronautica was able to pull a fairly startling rabbit out of its hat

With regard to Gibraltar, which was even further from peninsular Italy than Alexandria was from Sicily, the *Regia Aeronautica* was able to pull a fairly startling rabbit out of its hat. The Savoia-Marchetti S.82, a new type as yet available in very small numbers, was essentially an ultra-long-ranged transport aircraft, capable of carrying useful loads of a couple of tons, even a dismantled Fiat C.R. 42 fighter plane, non-stop from Europe to Italy's Empire in the Horn of Africa: but it also had a bomb bay. During the night of July 17-18, 1940 three of these lumbering trimotors, having taken off from Guidonia, north-east of Rome, each with

four and a half metric tonnes of petrol and two tonnes of bombs, struck at Gibraltar, killing three civilians and a Royal Artillery gunner: two of the aircraft, running low on fuel landed in Sardinia but the third made it back to Guidonia, fourteen hours after setting out: a round trip of 3,525 km. On a second raid on the night of August 20-21, one of the two S.82s which attacked Gibraltar dropped three bombs which exploded in the harbour, before being shot down by an anti-aircraft battery, and the other, seventy-five minutes later, succeeded only in setting fire to scrub and damaging a telephone pole and a water pipe.¹⁴

Even more astonishing and futile was the bombing of Bahrain in the small hours of October 19, 1940 by three S.82s that had flown from Rhodes and later landed in Eritrea after a 4,200 km tri-continental flight lasting nearly sixteen hours: the bombs fell in wasteland half a mile from a refinery but so incensed the local Arabs that the one and only Italian in Bahrain, a missionary priest, had to be deported by the British to Bombay for his own safety. An installation belonging to the California Arabian Standard Oil Co. at Dhahran in Saudi Arabia was also hit, and 'slight damage was done to an oil and water pipeline.' Since both Saudi Arabia and the United States were neutral in 1940, this cannot be considered a major contribution to winning the war.¹⁵

After the capitulation of France, the most enterprising redeployment of *Regia Aeronautica* units was the transfer of a force designated *Corpo Aereo Italiano (CAI)*, consisting of 80 bombers, mainly Fiat B.R. 20s from 1^a Squadra, and 98 fighters to Belgium. The idea was to assist the *Luftwaffe* in the final stages of the Battle of Britain. The *CAI* arrived, needless to say, just as the *Luftwaffe* was giving up on its attempts to overwhelm the Royal Air Force in daylight battles, and when, on November 11, 1940, a raiding force of nine B.R.20s and an escort of Fiat C.R.42 fighter biplanes was intercepted by two squadrons of Hawker Hurricanes east of Harwich, three B.R.20s and three C.R.42s were shot



The Savoia-Marchetti S.82, the long-ranged behemoth used in the raids on Gibraltar and Bahrain.

down, and most of the others returned home with bullet holes: two of the Hurricanes were hit by return fire but not seriously damaged. SUPERLATIVELY BRILLIANT DEEDS OF THE C.A.I. (*Brillantissime azioni del C.A.I.*) announced *Il Corriere della Sera* in a three-column headline on November 13.¹⁶ The one success of the *Corpo Aero Italiano* was to damage a Co-operative Wholesale Society canning factory in Lowestoft, killing three workers and injuring six others, on the night of November 29, 1940.¹⁷ It may also have been an Italian bomber which early the previous morning had wrecked several houses in Great Yarmouth, killed a housewife and seriously injured her husband.¹⁸ By this stage the *Regia Aeronautica* was hard-pressed in Albania, following a poorly planned invasion of Greece a month earlier, and the B.R.20s of the *Corpo Aereo Italiano* might have been of much more use there.

Another striking feature of Italian bomber operations in 1940 was the failure to utilize available numbers

Another striking feature of Italian bomber operations in 1940 was the failure to utilize available numbers of aircraft even in areas where major units were deployed. The Italians had pioneered the mass use of aircraft in the First World War, on May 23, 1917 employing no fewer than 109 assorted aircraft—including thirty-four Caproni trimotors—to bomb and strafe Austro-Hungarian positions in support of an offensive by the Italian Third Army.¹⁹ Between the wars Italo Balbo had made international headlines by leading a series of long-distance formation flights, culminating in the transit of twenty-four Macchi S.55 double-hulled flying boats from Italy to Chicago in seven legs, including a day-long crossing between Iceland and Labrador. In 1940, however, the largest single bombing attacks that the *Regia Aeronautica* put together seem to have

been a raid by 40 S.79s on Mersa Matruh from bases in Libya on September 22,—the British counted thirty-five Italian bombers—a raid by forty-three S.79s on the same target thirteen days later—the British counted twenty attackers—and a raid by thirty-eight S.79s in four groups which bombed Malta on the afternoon of June 11, 1940: an attack by fifty-five S.79s that morning was variously reported by Malt's anti-aircraft defences as consisting of ten, fifteen or 'about twenty planes' and one can only surmise that some of the raiders failed even to find the island.²⁰ In June of course the *Regia Aeronautica* units in Sicily also had the French in Tunisia to deal with, and on June 13, sent thirty-three S.79s to bomb aerodromes there: but the largest air raid on Malta in July, after the French had surrendered, consisted only of thirty S.79s. Considering that the *Regia Aeronautica* had 137 S.79s ready for action in Sicily on the day Italy entered the war, this very restrained level of activity is difficult to explain, especially when it is compared to the intensity of *Luftwaffe* attacks on Malta from January 1941 onwards.²¹ The *Regia Aeronautica*'s biggest effort in 1940 was on July 9, in the Naval Battle of Calabria (now generally referred to as the Battle of Punto Stilo) Shortly after the two battle fleets had broken off contact waves of Italian bombers began attacking the British fleet: during the course of almost four and a half hours 126 aircraft claimed to have attacked but the largest single formation according to the Italians consisted of twenty-two aircraft (according to the British only nine aircraft) and almost half the aircraft seem to have bombed the Italian fleet by mistake: anyway the British counted altogether only sixty attackers.²² After the war General Santoro, the *Sottocapo di Stato Maggiore dell'Aeronautica*, claimed that it was only possible to send out formations of reduced size because many of the pilots were insufficiently trained to be able to keep formation, but the trained crews could certainly have flown more missions than the four daylight and three night bombing raids on Malta in July 1940, and the



Cant 1007 *bis* (twin-tailed version), the type employed in the raids on Haifa: twin-tailed and single-tailed versions seem to have been used interchangeably.

four daylight and one night raid in August.²³ The Italians seem however to have satisfied themselves that they had indeed neutralized Malta—or sterilized it, in Mussolini’s phrase—as an offensive base, but this was not the case: Vickers Wellington bombers arrived in Malta late in October and carried out their first raid on Naples on the night of October 31 and November 1, and on the night of November 12, 1940, a few hours after the successful carrier-launched air strike against Taranto, which put three Italian battleships out of action, a Wellington seriously damaged the railway station at Brindisi.²⁴

Somewhat more energy was displayed by *41° Gruppo* at Rhodes, especially after it had re-equipped with the Cant Z.1007*bis*. In the five days September 5-9, two attacks were carried out on Haifa, one on Tel Aviv and one on shipping south of Crete, but the attacking formations comprised only half a dozen aircraft.²⁵

The attacks mounted by the *Luftwaffe* in the Battle of Britain and the Blitz were of course on a vastly larger scale: 348 bombers in the attack on London docks on September 7, 1940, and, by night, 449 bombers in the attack on Coventry on November 14. In China the Imperial Japanese Navy mounted raids involving up to one hundred twin-engined bombers; between August 9 and 20, 1940 for example, despite three days on which bad weather prohibited operations, there were five air raids with up to ninety bombers on Chongqing and two on Liuzhou, each one involving flights of about six hours over hostile country as compared to the ninety minutes or so needed to complete an attack on Malta.²⁶

Again, when the Vichy government decided to retaliate for the British attack on Dakar, fifty-nine twin-engined bombers of the *Armée de l’Air*, flying from bases in Morocco and Algeria, bombed Gibraltar in the afternoon of September 24, 1940, and eighty-three aircraft in a raid on the following day.²⁷

The British of course had given up the use of medium bomber formations in daylight, but by night operated on much the same scale and frequency as the Japanese did by day. RAF Bomber Command sent thirty-six Armstrong Whitworth Whitleys to bomb Turin on the night of June 11-12, 1940 but twenty-three of the aircraft were unable to gain sufficient altitude to cross the Alps in bad weather: Vickers Wellingtons and Handley Page Hampdens, somewhat shorter ranged, flew sixty-four other sorties that night. Two nights later the Royal Air Force’s bombers carried out 163 sorties. On the night of August 13-14, thirty-five Whitleys bombed Milan and Turin, while sixty-eight other bombers carried out other night missions. At this stage RAF Bomber Command normally attacked a number of different targets each night, but occasionally the experiment was made of concentrating on a single objective: on the night of September 23-24, 1940, 129 bombers were sent against Berlin, and on the night of December 16-17, 1940 134 were sent against Mannheim.²⁸ Neither Berlin nor Mannheim suffered much damage in these raids, but that was certainly not a matter of intention.

The British of course had given up the use of medium bomber formations in daylight

The principal justification the Italians had for not attacking in greater force was that they were aiming to destroy specific circumscribed targets: even the Governor of Gibraltar admitted, ‘Italians have tried to direct their attacks against military targets only.’²⁹ Ninety-eight civilians died in the forty-nine day and twenty-nine night raids on Malta carried out by the *Regia Aeronautica* between June 11, 1940, and January 15, 1941, compared to 112 civilians—mainly Jewish settlers—killed in a single raid on Tel



The FIAT C.R.42, shot down over eastern England in November 1940.

Aviv by six Cant Z.1107bis tri-motors from Rhodes on September 9, 1940.³⁰ But like other air forces in 1940, the *Regia Aeronautica* had difficulty in coming to terms with the inaccuracy of their air bombing; even the Royal Air Force was slow to adopt the formula that the more bombs one dropped, the more likely one was to hit something.

The raids on the oil refineries at Haifa by aircraft from Rhodes were perhaps the most successful of those carried out by the *Regia Aeronautica* in 1940, and the only ones that could be described as belonging to a Douhetian programme of strategic warfare. In an attack by ten Savoia-Marchetti S.79s of *41° Gruppo* on July 15, one full storage tank at the Shell plant sustained a direct hit and eventually four others caught fire. Two more were damaged by shrapnel and blast; an empty storage tank also received a direct hit and high tension electricity equipment was damaged, cutting off power. On July 24, a raid by twelve S.79s, as well killing forty-six people (mainly Arabs) destroyed the main office of the Shell plant, a store containing 40,000 tins of aviation spirit, and store of kerosene and lubricating oil. The breakwater at the Palestine Electricity Corporation's generating station also received a direct hit and a bomb that fell near the police vehicle reserve depot killed a constable and wounded three others. On September 21, *41° Gruppo*, now

re-equipped with the more powerful Cant Z.1107bis, hit a storage tank, which set on fire two neighbouring storage tanks, severely damaged a battery charging plant and power and signal cables on the railway, and the cooling water pumping station of the electricity generating station, and temporarily cut off power to the city. At the refinery pipelines were hit and ignited, and the fire spread to the pump house of the benzene acid washery; a chemical store containing 600 tons of sulphur received a direct hit, and the resultant fire also burnt out an adjacent building. Forty Arabs were killed, allegedly because they had ignored the air raid warning; numerous leaflets in Arabic were dropped.³¹

In each of these three raids the damage was principally caused by half a dozen bombs, mostly of 100kg. After the July 15, raid '83 bomb craters were counted.' In the July 24, raid '43 hits were observed': it seems likely that the twelve raiders were carrying five or six bombs each, that is at least sixty in total. In the September 21, raid, the Cant Z.1107bis aircraft with which *41° Gruppo* was now equipped probably carried eighteen 100kg bombs each, which with six bombers on the mission makes over a hundred bombs. Bearing in mind how extensive the Haifa refinery was, and the number of high structures contained within the perimeter, and the fact that, with the Cant



Italy's most numerous bomber in 1940, the Savoia-Marchetti S.79 .

Z.1007bis at least, the bombs left the bomb bay of each aircraft not one after the other, in a stick, but in salvos of three or six, the bombing does not seem to have been remarkably accurate. This was in spite of the fact that there was not only no fighter opposition, there was also very little anti-aircraft fire. Haifa was defended only by a handful of out-of-date 3-inch anti-aircraft guns, and the Italian bombers were flying at a height of 14,000 feet or more, which was about the 3-inch guns' effective ceiling. On July 15, thirteen 3-inch rounds were fired, on July 24, twenty-nine and on September 21, 151 rounds.³² This is to be compared to the 2354 rounds fired by the four 3.7-inch gun batteries on Gibraltar during the French attack (admittedly of longer duration) on September 25, 1940.³³

The Italians were not completely unaware of the inaccuracy of their bombing: General Santoro, the *Sottocapo di Stato Maggiore dell' Aeronautica*, blamed it on the shortage of adequately trained crews and the resultant reduction in the size of the attacking formations, which of course reduced the spread of their bombing patterns.³⁴ There was also the problem with pattern bombing that if the lead bomber mistook the target, the rest of the formation followed suit. This happened just after four o'clock in the afternoon of September 9, 1940: the six attacking Cant Z.1007bis trimotors, which were apparently supposed to bomb the port facilities at Jaffa, unloaded their bombs over a residential area four kilometres to the north-east (JAFFA WAREHOUSES IN FLAMES – *I depositi di Giaffa in fiamme*, trumpeted *Il Corriere della Sera* in a five column front-page headline, above an aerial photograph of vast columns of smoke boiling up from the burning dockyards, which a caption in smaller print identified as the docks in London following the *Luftwaffe's* attack on 7 September.³⁵) As in the First World War, Italy showed in the Second that when it came to small unit warfare there were in her

armed forces men of skill and enterprise; the one success in the bombing of Malta in 1940, the sinking of a 40,000 ton floating dock in the Grand Harbour, was the work of a single S.79 making an individual bombing run in the dark, and on three separate occasions S.79s operating from Libya managed the extremely tricky feat of hitting manoeuvring British cruisers with torpedoes; one notes however that Massimiliano Erasi; the pilot who launched one of the torpedoes that hit H.M.S. *Glasgow* on December 3, 1940, was also the man who put H.M.S. *Liverpool* out of action on October 14, while Carlo Emanuele Buscaglia, who launched the other torpedo that hit H.M.S. *Glasgow* in December was very probably the man responsible for hitting H.M.S. *Kent* just before midnight on September 17, so that the successes of these two pilots out of half a dozen flying with what was then Italy's only specialist torpedo-bomber squadrons by no means allay doubts regarding the general skill levels of *Regia Aeronautica* crews.³⁶

The *Regia Aeronautica's* efforts were not totally without effect of course – H.M.S. *Kent* and H.M.S. *Liverpool* were both out of action for a year. At Haifa following the two air raids in July 1940, the refineries reported 'local labour had been reduced by 80 per cent and . . . output of those workers who still turned up was only 25 per cent of normal owing to their apprehensions.'³⁷ One might however have expected more from the third largest bomber force in the world. It could be argued perhaps that RAF Bomber Command was not achieving much more during this period, but at least it was training itself for future successes. For the *Regia Aeronautica* however, without the industrial resources behind it that Bomber Command enjoyed, or an adequate air crew training programme, there were to be no future successes.³⁸ By 1941 it had become, relative to the *Luftwaffe* and RAF, a very minor factor in the World War. ■

1. At this stage the Soviet VVS had the largest number of bombers, possessing on 21 June 1941 no fewer than 8,400, mostly it seems SB-2 light bombers comparable to the Bristol Blenheim or Caproni Ca 313 but including at least 1,500 Ilyushin Il-4s, a type with similar performance to the Savoia-Marchetti S.79: Christer Bergström, *Barbarossa: the Air Battle July – Dec 1941* (Hersham, 2007) p. 131-2, Appendix 2. The *Luftwaffe* fielded 1,120 twin-engined bombers against France and the Low Countries in May 1940, and had more in Norway. The Japanese Navy and Army Air Forces had perhaps 600 multi-engined bombers between them, though the Japanese Navy had in addition an exceptionally strong force of single engine carrier-based bombers – aircraft carriers could not accommodate twin-engined bombers at this period – and the Army a large number of single-engined light bombers, out of date in concept but, in the case of the Mitsubishi Ki 51, of brand-new design. The Royal Air Force ranked fifth, followed at some distance by the U.S. Army Air Corps and France's *Armée de l'Air*.

2. Giuseppe Santoro, *L'Aeronautica Italiana nella Seconda Guerra Mondiale* (2 vols. Rome, 1957) vol. p. 88. A further 210 Cant Z.1007bis, Fiat B.R.20 and Savoia-Marchetti S.79 and S.81 bombers were with frontline units but were temporarily unserviceable.

Santoro, *Sottocapo di Stato Maggiore dell'Aeronautica* (Deputy Chief of Air Staff) during the war made very full use of the archival material available in Italy and is followed by all subsequent Italian authors writing about the *Regia Aeronautica*: slightly different figures were supplied by the Italian government to Britain's Royal Air Force in 1947 (e.g. 759 bombers ready for action) – see the National Archives Kew, London [TNA], AIR 20/6689 'Select documents on Air Operations 1940-1943 from the Italian Air Ministry Archives in Rome', p.23.

Cesare Gori, *Il Savoia Marchetti S.M. 79 nel Secondo Conflitto mondiale 1940-1943: con i Reparti di Bombardamento Terrestre, Ricognizione Strategica, Aviazione Sahariana* (Rome 2004) has a wonderful collection of photographs, mainly but not exclusively of the S.79.

Britain's Royal Air Force was actually quite interested in acquiring Italian Caproni Ca 311s and Ca 313 bombers in the spring of 1940, though admittedly only for training purposes: TNA, AIR 2/5982 – see especially minute by Air Vice Marshal Sholto Douglas, Assistant Chief of the Air Staff, 29 March 1940 – AIR 2/5983, AVIA 15/264 and AVIA 15/265.

It is quite true that Italian fighters were underpowered though this was not because of technical backwardness – the Fiat A. 80 engines powering the Fiat B.R.20 bomber were the first eighteen-cylinder twin-row radials to be used in a combat plane that was in serial production – but because the *Regia Aeronautica* failed to follow other air forces in the emphasis they gave to speed over manoeuvrability. As for the fighters being underarmed, the standard equipment of the Macchi M.C. 200 fighter was two 12.7 mm machine guns mounted about twenty inches apart above the engine with interrupter gear reducing their rate of fire to about 575 r.p.m each, and with ammunition for almost two thirds of a minute's firing (and a meter showing how much ammunition was left). The Royal Air Force's Hawker Hurricane I had eight 0.303-inch machine guns each firing at 1,200 r.p.m mounted in the wings, the two innermost machine guns being about four yards apart. There was ammunition for a quarter minute's firing – say five three second bursts to the M.C. 200's twelve or thirteen – and no meter. A three second burst put twice the weight of bullets into the air as a three second burst from an Italian fighter but unless the target was at exactly the distance (usually 250 yards) at which the guns were 'harmonized' the bullets were spread out,

and since they were one quarter the weight and with a smaller propellant charge behind them they had much less penetrative power than the Italian 12.7 mm ammunition.

3. *Opera Omnia di Benito Mussolini* (35 vols. Florence 1951-62) vol.29 p.365-6, 'Memoriale panoramico al re', 31 Mar 1940 cf. TNA FO 371/24943/R5872, Noel Charles to Viscount Halifax, 3 May 1940. See also MacGregor Knox, *Mussolini Unleashed 1939-41: Politics and Strategy in Fascist Italy's Last War* (Cambridge, 1982), though this gives a rather misleading account of the *Regia Aeronautica* p. 23-5.

4. Francesco Mattesini and Mario Cermelli, eds. *Le Direttive Tecnico-Operative di Superaereo* (2 vols. Rome 2002) vol. 1 pt 1, p.19-73, (plus four *studi operative* p. 74 – 136), summarized in Santoro, *Aeronautica Italiana* vol.1 p. 78-83. The original has '*stretta concomitanza*' but in English 'conformity' seems closer to the meaning than 'concomitance'

5. Knox, *Mussolini Unleashed*, p. 24

6. Thomas Hippler, *Bombing the People, Giulio Douhet and the Foundations of Air-Power Strategy* (Cambridge 2013) p. 217-48 and Giancarlo Garelo, *Il Breda 65 e l'aviazione d'assalto* (Rome 1980) pp. 7-13 and 21-4, for Mecozzi's ideas and influence, cf. A.D Harvey, 'The Royal Air Force and Close Support, 1918-1940,' *War in History* vol. 15 (2008), p.462-486 at p. 479. Mecozzi's *Scritti scelti sul potere aerea e l'aviazione d'assalto, 1920-1940*. ed. F. Botti was published in 2 volumes in 2006 by *il ufficio storico* of the *Aeronautica Militare*. For Douhet, see not only his *Il Dominio dell'Aria* (Turin, 1921, translated as *The Command of the Air* 1942) but also his article in *La Gazzetta del Popolo* of 12 December 1914 and his memo of 1916, printed in *Diario Critico di Guerra* (2 vols. Turin 1921) vol 2, p. 17. There is an extended discussion of his theories and the debate within Italian military circles in Hippler, *Bombing the People*, p.151-216.

7. It should however be acknowledged that the *Regia Aeronautica* had responded to the needs of conditions in overseas colonial territories to a much greater extent than the Royal Air Force and, especially, *L'Armée de l'Air*: A. D. Harvey, 'A Slow Start : Military Air Transport at the beginning of the Second World War', *Air Power History*. vol.62, no. 1 (Spring 2015) p. 6-15 at p. 9-10. On the other hand, because or despite retaining control of naval aviation the *Regia Aeronautica* had been backward in retaining flying boats and multi-engined floatplanes as combat aircraft operating in areas where they would encounter much faster land-based aircraft, and on 10 June 1940 deployed 199 Cant Z.501 flying boat bombers and 95 Cant Z. 506B tri-motor floatplanes – only 105 and 61 ready for action respectively. The French *aéronavale* had decided in 1939 to cancel a number of promising floatplanes projects and to concentrate on the employment of land planes over coastal waters: A.D Harvey, 'Floatplanes, Flying-boats and Oceanic Warfare, 1939-45', *Air Power History* vol. 57, no 4 (Winter 2010) , p 4-19 at p. 18, note 14.

8. A *stormo* (flock) was the largest formation in the *Regia Aeronautica* normally operating a single type of aircraft. *Stormi* were usually sub-divided into *gruppi* of twelve or more aircraft, each *gruppo* being sub-divided into two *squadriglie*.

9. Giorgio Bonacina, *Obiettivo: Italia* (Milan, 1970) p.47.

10. Santoro, *Aeronautica Italiana* vol.1 p.380, *Stamaga* n.1/685.

11. *Ibid* p.380-381, *Superaereo* 13/14437.

12. *Ibid* p.381.

13. *Ibid* p.382.

14. *Ibid* p.377; TNA, WO 176/155 Appendix A items 30B and 34.

15. Santoro, *Aeronautica Italiana* vol.1 p.388; British Library, London, India Office Records R/15/2/299, 'Administration Report of the Bahrain Agency and Trucial Coast for the Year 1940, p. 4; TNA, AIR 23/5312, telegram Air HQ Iraq 21 Oct. 1940.

16. John Foreman, *Battle of Britain: the Forgotten Months: November and December 1940* (New Maldon 1988) p.69-77; *Il Corriere della Sera*, 13 Nov. 1940 p.6a-c.
17. TNA, HO 199/81; *Lowestoft Journal* correspondence 19 and 26 October 1990. There are pictures of the damage in Ford Jenkins, *Lowestoft: Port War: 1939-1945* (Ipswich [1946]) p.38.
18. TNA, HO 199/71.
19. Manlio Molfese, *L'Aviazione da Ricognizione Italiana durante la Guerra Europea (Maggio 1915-Novembre 1918)* (Rome, 1925) p.42; Basilio Di Martino, *Ali Sulle Trincee: ricognizione tattica ed osservazione aerea nell'aviazione italiana durante la Grande Guerra* (Rome, 1999) p.113.
20. Santoro *Aeronautica Italiana* vol. 1, p.238 and 287; TNA, WO 106/2074, telegram Governor and C. in C. Malta to War Office 1229 hours, 11 June 1940, telephone report by Major G.S. Simpson of MI 3c, 1145 hours, 11 June 1940, telegram Governor and C. in C. Malta to War Office 1418 hours, 11 June 1940; WO 106/2072, Middle East Command Situation Report no. 20 and 21, 23 and 24 September, 1940 and RAF HQ Mid East Report 6 October 1940 – the two raids on Mersa Matruh killed nine soldiers and two Egyptian civilians and caused damage to buildings and vehicles..
21. TNA, CO 968/107/1. According to this summary there were 49 day and 29 night raids in the six months 11 June 1940 to 15 January 1941, in which 98 civilians were killed and 350 buildings destroyed or damaged, and 54 day and 88 night raids in the four and a half months 16 January to 31 May 1941 in which 197 civilians were killed and 1991 buildings damaged.
22. Santoro, *Aeronautica Italiana* vol. 1 p. 423-4. *La Marina Italiana nella Seconda Guerra Mondiale* (18 vols. Rome 1951-1966) vol. 4, (by R. Giuseppe Fioravanzo) p.138-9, Malcolm Muggeridge ed. *Ciano's Diary: 1939-1943* (London, 1947) p.276. TNA, ADM 53/112922, ships log of H.M.S. *Orion* 9 July 1940.
- Of the 126 attacking aircraft, 24 were damaged by anti-aircraft fire and one was shot down. General Santoro suggests this was by Italian A.A. fire. In the attack by Japanese bombers which sank the battleship H.M.S *Prince of Wales* and the battlecruiser H.M.S. *Repulse* on 10 December 1941 four out of 85 Japanese aircraft were shot down by A.A. fire and 28 damaged: twice the casualty rate of the Italian attack on 9 July 1940. Admittedly most of the Japanese aircraft pressed home their attacks at very low level because they were attacking with torpedoes, but on 9 July 1940 the British battle squadron, with three battleships and five cruisers and an aircraft carrier – and not counting the efforts of the destroyer screen – could put up almost three times the volume of heavy A.A. fire as the *Prince of Wales* and the *Repulse*, indicating that either the fire of the latter two ships was much more accurate or that the Italian bombers were much more careful to keep out of range.
- On 8 July 1940, the day previous to the battle of Punto Stilo, during the course of attacks by 72 aircraft, the cruiser H.M.S *Gloucester* received a direct hit on the bridge, killing the captain, a commander and two lieutenant commanders, two sub-lieutenants and eleven other crew members: next day the ship was 'straddled by 2 sticks of bombs' but that seems to have been the closest the Italian bombers came on 9 July TNA, ADM 53/112346, ship's log of H.M.S. *Gloucester*.
23. Santoro, *Aeronautica Italiana* vol. 1 p.239. Britain's Royal Air Force, incidentally, despite planning to have more than 1400 heavy bombers bristling with defensive armament operating by daylight by April 1941, decided in December 1939 that '24 aircraft is the maximum that can be employed against one target at any one time': TNA, AIR 14/129, 'Types of formation for Bombers', 8A 'Extract from minutes of Group Commanders Conference,' 16 December 1939, para 32. Only the Germans in 1940 were near to engaging with the air traffic control problem of forming up the kind of wing-strength formations utilized by the U.S.A.A.F in 1944.
24. Bonacina, *Obiettivo Italiana* p.67.
25. Santoro, *Aeronautica Italiana* vol. 1 p.387.
26. TNA, FO 371/27624/F981 Wing Commander J. Warburton (air attaché Chongqing) to Director of Intelligence, Air Ministry 1 Sept. 1940.
27. Christian-Jacques Ehrengardt and Christopher F. Shores, *L'Aviation de Vichy au Combat* (2 vols. Paris, 1985-7) p.51-2. These were the largest raids carried out by the French in 1940.
28. Martin Middlebrook and Colin Everitt, *The Bomber Command War Dairies – An Operational Reference Book, 1939-1945* (London, 1985) p.51, 52, 73, 85, 111.
29. TNA, WO 106/2074, Governor and C. in C. Malta to War Office, 22 July 1940.
30. *Palestine Post*, 11 September 1940, p.1a.
31. TNA, CO 323/1787/54 (and also CO 733/432/6), High Commissioner's telegrams 24 and 25 July and 24 September 1940, WO 106/ 2072 Middle East Command Situation Report no. 19 and 20, 22 and 23 September 1940. Situation Report no. 19 gives the casualties as 32 Arab dead and 68 injured.
32. *Ibid*.
33. TNA, WO 176/155 Appendix A, item 37. For the raids on Haifa as the only serious attempt by the Regia Aeronautica in 1940 to use aircraft along the lines recommended by Giulio Douhet cf. his *Diario Critico di Guerra* (2 vols. Turin 1921-2) vol.2 p.20-21: but note that only one gruppo was involved and it was often diverted to other targets.
34. Santoro, *Aeronautica Italiana* vol.1 p.239. Britain's Royal Air Force had investigated pattern bombing before the war: R.S. Capon, Deputy Director of Research and Development (Armament), who had pioneered a theoretical approach to pattern bombing in the early 1920s, reported that 'the probable number of hits obtained by individual attack will always be greater than in pattern bombing, whatever pattern is adopted': TNA, AIR 20/4149, p.1. 'Note on Pattern Bombing', September 1938 (also in AIR 2/2652 at 26c, but without the author being identified). In March 1940 Group Captain E.D. Davis, Bomber Command's Armament Officer concluded, 'in formation, success depends upon accurate station keeping, which I suggest is impracticable': AIR 14/979. In November 1942 a 19 page mathematical paper entitled 'The Principles of Pattern Bombing' obtained a wide (confidential) circulation,: AIR 20/12962. In 1944 it was standard practice for British-operated medium bombers (Mitchell's and Boston's – i.e. North American B-25s and Douglas A-20s) to bomb from an altitude of 6-13000 feet either on the leader of a 'box' of six or on the leader of a wave of three 'boxes', but by this stage of the war a principal consideration was to get all the aircraft over the target and out of flak range as quickly as possible: De Havilland Mosquito light bombers on the other hand would attack line astern at very low altitude and bomb individually, because at low altitude they would pass over the target's flak defences far more rapidly: AIR 37/16, Staff College lecture by Air Vice Marshal Basil Embry.
35. *Il Corriere della Sera*, 11 Sept 1940, p.1a-f.
36. Carlo Unia, *Storia degli Aerosiluranti Italiani*, (Rome, 1974) p.83-5.
37. TNA, CO 323/1787/54, High Commissioner's telegram 31 July 1940.
38. See generally Stephen Harvey, 'The Italian War Effort and the Strategic Bombing of Italy', *History* vol.70 (1985) p.32-45 passim.
- Even though Italian torpedo bombers might be partially exempted from the claim that the *Regia Aeronautica* had no success after 1940, it should be pointed out that of the 385 Allied merchant and naval vessels sunk by air attack in the Mediterranean between 11 June 1940 and 8 September 1943 only 36 were sunk by the *Regia Aeronautica*: the rest were sunk by the *Luftwaffe*: see Alberto Santoni, Francesco Mattesini, *La Partecipazione Tedesca alla Guerra Aeronavale nel Mediterraneo (1940-1945)* (Rome, 1980) p.597-8. To rub the point home, *Luftwaffe* Dornier Do 217s sank the Italian battleship *Roma* with radio guided bombs on 9 September 1943, while it was on its way to surrender.

Freeman Field Mutiny: Victory for Integration or Segregation?



Daniel Haulman

A slightly cropped image of part of a group of 101 African-American United States Army Air Forces officers of the 477th Bombardment Group (Medium) at Freeman Field, Indiana, about to board air transports to take them to Godman Field, Kentucky.

The “Freeman Field Mutiny” is usually depicted as a victory for integration over segregation. After all, more than 100 black officers risked their careers, and perhaps even their lives, to defy an order to sign a base regulation requiring segregated officers’ clubs, and the commander who issued that order and regulation was replaced. The incident is often hailed as a forerunner of the modern Civil Rights Movement, in which peaceful non-violent resistance resulted in the desegregation of facilities. The more immediate consequence of the Freeman Field incident, however, was more segregation. An organization with both black and white personnel was converted into one with only black personnel, and a base with both blacks and whites was converted into one with blacks only.

In April, 1945, one hundred and twenty black officers of the 477th Bombardment Group and associated organizations at Freeman Field, Indiana, were arrested, in two waves, for protesting the attempt of the group’s white commander, Colonel Robert R. Selway, Jr., to have two separate officers clubs, one restricted to whites only, and one for blacks only. The arrestees were eventually all exonerated, and the white commander of the group, who had attempted to enforce the segregation policy despite Army regulations, was replaced by another commander who threw out his predecessor’s policy. Eventually, the 477th Bombardment Group was reassigned to its former base, Godman Field, Kentucky, redesignated as the 477th Composite Group, and all of its white personnel were reassigned to other units at other bases. How did that happen?

The 477th Bombardment Group was the first black bombardment group in American military history. Like the 332nd Fighter Group, the first black fighter group, its pilots were trained at Tuskegee Army Air Field, and were thus eventually called Tuskegee Airmen. The group was first active as a white bombardment group in Florida in 1943, before it was a Tuskegee Airmen organization, and it was inactivated after only three months. When it was activated again, on January 15, 1944, at Selfridge Field, Michigan, it had a white commander, Colonel Selway, a West Point graduate who had commanded and helped train the black pilots of the 332nd Fighter Group at Selfridge before that group moved overseas. Top officers in the group were also white, but most of the group’s new personnel, during its second period of activation, were black. The group was designed to train 5-man black crews to fly B-25 twin engine medium bombers and prepare them to deploy overseas for combat. After the training was finished, the group was designed, like the 332nd Fighter Group, to become all black.

The 477th Bombardment group moved from Selfridge to Godman Field, Kentucky on May 6, 1944. Godman Field was next to Fort Knox. It had one officers’ club, but only black officers of the group attended that club. The white officers of the 477th went next door to the all-white Fort Knox officers club. After all, the Army Air Forces was still part of the



Col. Robert R. Selway, Jr., (wearing sunglasses) reviews some of his troops in 1944.

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Army, and the two bases were adjacent to each other. The group's white officers were used to attending a club without blacks, while the group's black officers were used to attending the only officers club at Godman Field.

When the 477th Bombardment Group moved from Godman Field to Freeman Field, Indiana, during the first week of March 1945, there was no other white base next door. Freeman Field was a larger base than Godman Field. It was large enough to hold all four bombardment squadrons assigned to the group, and also the 387th Air Service Group and a Replacement Crew Training Program. It had formerly been a white base, and there was only one officers club. The white officers of the 477th, who had used the all-white Fort Knox officers club when the group was stationed at Godman Field, wanted an officers' club of their own, while the black officers expected to use the only officers' club on base. Colonel Selway was eager to accommodate the white officers, partly because he was one of them. He had had some experience enforcing segregated facilities at Selfridge, for both the 332nd Fighter Group and later the 477th Bombardment Group. He established a policy of having two officers clubs at Freeman Field, one for trainers, who were almost all white, and for trainees, who were all black.

On March 7-9, several black officers of the 477th Bombardment Group entered the officers' club at Freeman Field that was assigned to "base and supervisory" personnel, and were told to leave. They were later called together



Pilots and officers of the 477th with their B-25.

and told that they were to use the other officers' club. For a time, they complied, and the policy of segregated officers clubs at Freeman Field prevailed.

More black personnel, assigned to the 115th and 118th Army Air Forces Base Units, arrived at Freeman Field on April 5. On the evening of the same day, thirty-six of them attempted to enter the white officers' club. Three of them pushed Assistant Base Provost Marshal out of the way and forced their way into the club, insisting they were base personnel. The next day, twenty-five additional black officers attempted to enter the officers' club reserved for white "base and supervisory" personnel. They and the thirty-six officers who attempted to enter the "white" club the day before, a total of sixty-one, were arrested in quarters and charged with disobeying an order of a superior officer, three of them also charged with using violence.

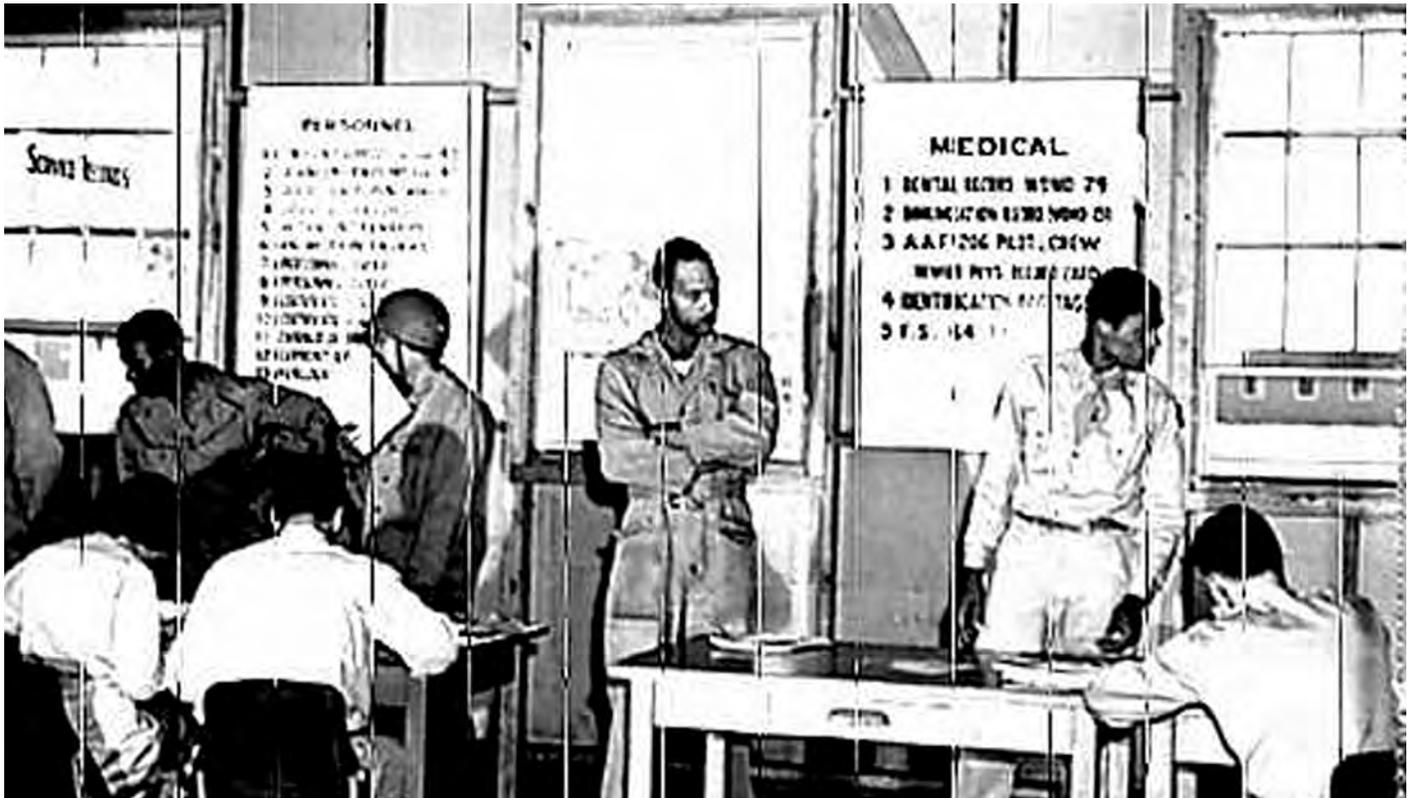
Colonel Selway, who was then commander of both the 477th Bombardment Group and Freeman Field, needed to fortify his legal position, because there were those who argued that Army Regulation 210-10 regarding officers clubs said nothing about separate clubs for blacks and whites, and even stated that an officer at a base was entitled to join the officers club on the base. On April 9, all but three of the sixty-one black officers who had been arrested were released. The other three were kept for court martial because of alleged use of violence. Selway then issued Base Regulation 85-2 spelling out which recreational facilities were for which groups of officers. He was careful to use non-racial terms, dividing the facilities between trainers (whites) and trainees (blacks). All officers were required to

sign the new regulation, acknowledging it, so that if they violated it later, they could be charged with disobeying an order.

On the evening of [April 5], thirty-six of them attempted to enter the white officers' club

At the time, there were about 400 black officers at Freeman Field. Most of them signed the segregation regulation, many of them stipulating their objections. One hundred one of the other black officers, members of the 477th Bombardment Group and the Army Air Forces Base Unit on the base, refused to sign. For insubordination, they were arrested. Forty-two of the 101 arrested in the second wave of arrests had been among the sixty-one who had been arrested earlier.

On April 13, the 101 black officers who had refused to sign Base Regulation 85-2 were flown in six C-47 airplanes to Godman Field, Kentucky, the old base of the 477th Fighter Group, and kept under arrest there. The news of the arrests of the black officers spread like wildfire in the black press, and the War Department came under scrutiny for inconsistent policy. Officers higher than Selway, some of them supporting of his segregationist policy, came under pressure to intervene in favor of the arrested officers. On April 23, Major General Frank O'D Hunter, commanding general of the First Air Force, reluctantly ordered release of the 101, but not without administrative reprimands by



Registration at Freeman Field, 1944.

Colonel Selway, black marks on their records that would haunt them for many years to come.

On April 26-27, the 477th Bombardment Group was moved back from Freeman Field to Godman Field. The group continued to have both black and white officers. The black officers would use the only officers club at Godman Field, and the white officers would use the white only officers club at Fort Knox, next door, as was the policy when the group was at Godman before. The officers' club issue was temporarily resolved.

On May 18, the War Department's McCloy Committee published its report on the Freeman Field incident. It determined that Selway's issue of the segregated officers' clubs base regulation on April 9, violated Army Regulation 210-10 and was therefore invalid. Selway knew then that his continued command of the 477th Bombardment Group was in jeopardy, and he had to wait only about another month for the other shoe to drop.

On June 21, 1945, Colonel Benjamin O. Davis, Jr., the black officer who had commanded the 332nd Fighter Group in combat before the war in Europe ended, the previous month, arrived at Godman Field to assume command of the 477th Bombardment Group, which on June 22, was redesignated as the 477th Composite Group, because a fighter squadron was assigned to it, and it already had a bombardment squadron. Colonel Selway was reassigned, along with all the other white officers of the group. The 477th became an all-black organization, and would remain so even after it moved to Lockbourne Field on March 13, 1946. Lockbourne Field, later Lockbourne Air Force Base

after the creation of the Department of the Air Force in September 1947, became the only all-black Air Force base in the Air Force, as Godman Field had been since Davis became commander. Like Godman in late 1945 and early 1946, Lockbourne became the only base in the service under a black commander.

Segregation remained the rule until the middle of 1949, when the [USAF] finally implemented ... E. O. 9981

The three black officers that were still being held, from the original sixty-one arrested, for allegedly using violence while attempting to enter the "white" officers club at Freeman Field in April, were court-martialed on July 2 and 3. The military court acquitted two of them, but convicted Lt. Roger C. Terry, a pilot who had trained at Tuskegee. The sentence was confinement to base for three months, and \$50 fine for each of those three months, for a total fine of \$150. It was a far lighter sentence than it could have been, but it plagued Terry for decades. In a sense, the conviction became a badge of courage, and Terry was eventually elected president of the Tuskegee Airmen Incorporated, partly because of his reputation for opposing segregation and risking his career in the name of justice.

In July 1947, the 477th Composite Group was inactivated, and the 332nd Fighter Group was activated in its place, at Lockbourne. The squadrons were reassigned to the 332nd Fighter Group, and an all-black fighter wing, the



Lieutenant Maurice D. Pompey, B-25 flight officer with the 477th during the Freeman Field Mutiny, but not one of the “mutineers.”

332nd Fighter Wing, was established and activated over the 332nd Fighter Group, at the same base. Lockbourne Air Force Base, the only all-black Air Force Base, was the home of the only all-black wing and the only all-black group, with the only all-black squadrons. Segregation remained the rule until the middle of 1949, when the Air Force finally implemented President Harry S. Truman’s Executive Order 9981, issued in 1948, that mandated the desegregation of all the military services.

One might say that the Freeman Field Mutiny resulted in not a victory for integration but a victory for segregation instead. The black and white 477th Bombardment Group, while not completely integrated, was transformed into the all-black 477th Composite Group, and it remained all-black until it was inactivated on 1 July 1947, when it was replaced by another all-black group, the 332nd Fighter Group. From June 21, 1945 until July 1, 1949, the black flying units were concentrated on only one base at a time, first Godman and then Lockbourne, and that base was all black. There was no question of whether or not blacks could use the officers’ club at either base, because there was only one officers’ club on the base, and all the base military personnel were black. Segregation seemed to have won.

But in a larger sense, the Freeman Field Mutiny contributed to the integration of the Air Force, because in 1949, all the all-black organizations at the only all-black Air Force Base were inactivated and their personnel were transferred to formerly all-white organizations. While the heroic resistance of those black officers who defied segregation at Freeman Field had to wait four years for the in-

tegration of the Air Force as a whole, the ultimate result was a victory for integration.

On August 12, 1995, more than fifty years after Roger C. Terry’s conviction in court martial, the Air Force set aside the verdict and exonerated him. At the same time, the Air Force removed the reprimands from the records of all the black officers who had received them, if they requested such removal. Some of the officers refused to request that the reprimands be removed, because they were proud to have suffered for the cause of freedom. The Freeman Field Mutiny demonstrated the lengths to which persons on both sides of the segregation/integration question would go for their cause. Although the early results were an apparent victory for segregation, the ultimate victory belonged to the advocates of racial equality and integration.

Note on Sources: History of Freeman Field, Indiana, 1 March-15 June 1945 (AFHRA call number 283.28-6). Lineage and honors histories of the 477th Bombardment Group (later, 477th Composite Group) and the 332nd Fighter Group, in Maurer Maurer, *Air Force Combat Units of World War II* (Washington, DC: Office of Air Force History, 1983). Alan L. Gropman, *The Air Force Integrates, 1945-1964* (Washington, DC: Office of Air Force History, 1985). Lt. Col James C. Warren, *The Tuskegee Airmen Mutiny at Freeman Field* (Vacaville, CA: The Conyers Publishing Company, 2001). LeRoy F. Gillead, *The Tuskegee Aviation Experiment and Tuskegee Airmen, 1939-1949* (San Francisco, CA: Balm-Bomb in Gillead). ■

America's War for the Greater Middle East: A Military History. By Andrew J. Bacevich. New York: Random House, 2016. Notes. Maps. Photographs. Index. Pp xxii, 453. \$30.00 ISBN: 978-0-553-39393-4

Andrew Bacevich, a distinguished scholar and highly experienced soldier, addresses with his most recent book a subject of immense complexity. In essence, he has condensed nearly forty years of America's often ill-advised engagements in the "Greater" Middle East to explain why this country's policies there have been riddled with lack of vision and with failure.

His arguments are well worth examining and, for the most part, solidly anchored on considerable scholarship. In some cases, however, Bacevich stretches a point perhaps too far, marginalizing the difficulties facing a president confronted with challenging choices and conflicting demands on national security. Even his selection of a start point—1980's Operation Eagle Claw, better known as Desert One—is not without challenge, but understandable, because this can be considered the beginning of conflict without end for the United States in the greater Middle East.

Bacevich, whose arguments often appear to echo those of neo-isolationists and non-interventionists, hits on all the key points of America's greater Middle East initiatives: The Carter Doctrine; PDD 63; the Reagan Administration's ill-fated intervention in Beirut; Operation Praying Mantis (the short lived naval conflict with Iran); the Gulf of Sidra confrontations with Libya; the Gulf, Iraq, and Afghan wars; Somalia; the Bush Doctrine; the interventions in Kosovo, Libya, and Bosnia; and so forth. He supports his viewpoint with numerous examples of misguided or uninformed uses of force and miscalculations that have come back to haunt the United States. Bacevich's arguments make it clear that the US's considerable, however myopic, involvement in the Soviet-Afghan conflict backfired and created a hotbed of extremism that has in turn become a threat for this country. That is equally true for the ill-considered war of choice in Iraq. The Iraqi war has subsequently fed the fires of global terrorism and cost many American lives and those of hundreds of thousands of Iraqis as well. Bacevich also points to the disproportionately strong influence Israel has had on America's policies in the Middle East that may not be in the best interests of the United States.

Speaking of the US's propensity to reflexively use military force as a key instrument of policy, Bacevich informs the reader that, "Through violence the US has sought to end violence and impose order. Instead, within Iraq, US intervention had produced conditions conducive to further violence and further disorder—another persistent theme in America's War for the Greater Middle East." The quote captures, in essence, the central thesis of this thought-provoking and intellectually stimulating book.

Some readers may find Bacevich's relentlessly cynical

take on America's national security policies in the greater Middle East a bit too strong, and his unsparing criticisms of policy makers and many of the military's senior officers brutally frank. Having said that, this provocative book raises many questions about US national security policies. In recent presidential campaign debates the candidates have articulated national security policies of continued forward presence in the greater Middle East and, in some cases, use of force as a first choice. The arguments of this book should give pause to those same candidates poised to jump on the bandwagon of continued combat operations in the Middle East.

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History of Rocketry and Astronautics. AAS History Series, Volume 46. IAA History Symposia, Volume 34. By Marsha Freeman, Ed. San Diego: American Astronautical Society (AAS) Publications Office, 2016. Photographs. Illustrations. Indices. Pp. 376. \$95.00 ISBN 978-0-87703-627-2. Includes DVD supplement associated with this volume, consisting of interview with Professor Iván Almár—His Experiences and His Opinion on the Role of Astronautics in Hungary.

The Forty-Eighth History Symposium of the International Academy of Astronautics (IAA) occurred in conjunction with the Sixty-Fifth International Astronautical Congress (IAC) in Toronto, Canada, during September and October 2014. As with other volumes in the IAA history series, this volume includes chapters that were originally presented as symposium papers, covering a wide variety of topics related to rocketry and space flight. Editor Freeman has grouped the various presentations into four related parts:

Part I – Astronautical Pioneers: focuses on viewpoints of such well-known individuals as Werner von Braun, Krafft Ehricke, and Robert Goddard. The views of less familiar persons such as Hungarian Ivan Almar and Viking project scientist Gerald Soffen are also included.

Part II – Space Technology and Organizations: contains short overviews of specific contributions to astronautics from various nations and entities (Ukraine, France, Israel, and the AAS). This part contains a particularly interesting chapter on analogs between stimulation of American railroads and the potential for that in commercial space operations.

Part III – Canadian Contributions to Astronautics: concentrates on the aerospace history of the symposium's host nation and reviews the influence of Bruce Aikenhead, a Canadian space pioneer.

Part IV – Early Activities in the Search for Extraterrestrial Intelligence (SETI): highlights its evolution, Canadian contributions, and a historical perspective of

Messaging to Extraterrestrial Intelligence (METI).

While I found none of the chapters to be particularly comprehensive, to me the most interesting reading was found in “The Genealogy of Influence: Viking Mars Missions’ Impact on the Future,” by Rachel E. Tillman (Chapter 4); “Did the Germans Learn from Goddard? An Examination of Whether the Rocketry of R. H. Goddard Influenced German Pre-World War II Missile Development,” by Frank H. Winter (Chapter 5); “The Railroad and the Space Program Revisited: Historical Analogues and the Stimulation of Commercial Space Operations,” by Roger D. Launius (Chapter 10); and “Message to an Intelligent Civilization: A Historical Perspective,” by Stéphane Dumas (, Chapter 15).

I’m sure that historians more interested in the contributions to space exploration and astronautical development by individual pioneers and specific nations, particularly in the early days, will find thought-provoking reading in other chapters of this volume. However, most more casual readers of space history might find much of the volume somewhat tedious.

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The Complete Book of the SR-71: The Illustrated Profile of Every Aircraft, Crew, and Breakthrough of the World’s Fastest Stealth Jet. By Col. Richard A. Graham, USAF (Ret). Minneapolis: Zenith Press, 2015. Maps. Tables. Diagrams. Illustrations. Photographs. Appendixes. Bibliography. Index. Pp. 288. \$50.00. ISBN: 978-0-7603-4849-9

Some time ago, I reviewed Graham’s *The Complete Illustrated History of the Blackbird*. He had previously published three books about the Lockheed SR-71 Blackbird, and I was impressed that he was able to produce a fourth volume on the same subject that was interesting and informative without repeating information and stories he had published in the past. In this, his fifth volume on the legendary SR-71, Graham has once again succeeded in giving us a well-researched book that addresses many aspects of the airplane’s development and operations. The major criticism of this book is that, while it contains some new material, much of the content has appeared in his previous works.

Graham’s credentials are impeccable. A significant portion of his Air Force career was spent as a member of the SR-71 community, serving in just about every duty position associated with the airplane: pilot, instructor pilot, director of program integration at the Pentagon, and commander at both the squadron and wing levels. In addition to his personal experiences, his connections to the world of the SR-71 give him access to a wealth of other sources.

The story of the SR-71 began with the predecessor A-12. In 1957, the Central Intelligence Agency established a requirement for a spy plane that would operate at extremely high speed and altitude (Mach 3+; 80,000-90,000 feet) and incorporate radar-absorbing materials to give it stealth capabilities against Soviet radar systems. Convair (General Dynamics) and Lockheed were the two competing companies. Under the internal code name Archangel, Lockheed developed a dozen concept aircraft (Archangel 1 through Archangel 12) to meet this requirement. When the CIA chose Lockheed’s design over that of General Dynamics, the A-12 was born.

The A-12 made its first operational flight in May 1967. The 10-year development cycle is remarkable, considering the huge advances in capabilities over existing aircraft. Based at Kadena Air Base on Okinawa, the A-12 remained in operational service for just twelve months, flying approximately thirty intelligence-gathering missions over North Korea, North Vietnam, Cambodia, and Laos. Its most significant accomplishment came in January 1968, when it photographed the *USS Pueblo* in North Korean waters, providing the first confirmation that the North Koreans had seized the vessel (in a factual error, Graham states that the ship was returned to the United States; this is not the case).

Before the SR-71 evolved from the A-12, Lockheed was asked to pursue other designs. The most significant was the YF-12, which was intended to serve as an interceptor in defense of the US mainland. This aircraft first flew in August 1963, and conducted several successful test launches of the AIM-47 missile, but that was as far as the program went. Initially, the Air Force’s acquisition plans were scuttled by budget considerations, and eventually it was determined that the threat of manned aircraft attacking the continental United States was no longer considered significant, leading to termination of the YF-12.

The SR-71 made its first flight in December 1964, flew its first operational mission in March 1968, and ended its service in 1989. In discussing the birth of the SR-71, Graham could have done a better job of explaining exactly why the Air Force decided to reject the A-12 and ask Lockheed for a redesigned aircraft.

The book provides in-depth discussions of a wide range of topics, to include crew selection and training, maintenance requirements, and how the SR-71 operated at its two overseas bases, Kadena and RAF Mildenhall in England. Because of Graham’s up-close and personal involvement in the SR-71 program, the chapters on these subjects are the book’s strongest. Appendixes offer detailed information on air crews (to include photos), key documents from the SR-71 program history, and schematic drawings of the airplane.

For a library that has no books on the SR-71, this would be a good addition (along with Graham’s *SR-71: Stories, Tales, and Legends*). But for the reader who al-

ready has Graham's four previous SR-71 books, this is not one to add to the collection.

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Grim Reapers - French Escadrille 94 in World War I. By Jon Guttman. Indio CA: Aeronaut Books, 2016. Photographs. Illustrations. Appendices. Notes. Pp. 94. \$29.99 (paperback) ISBN-10: 193588140X

Escadrille 94 was, in many ways, representative of the World War I frontline French pursuit squadrons, or *escadrille de chasse*. Not as well-known as the famous "*Les Cigognes*," it and other less-well-known units still gave good accounts of themselves. This new work by noted First World War historian Jon Guttman addresses the details of its *aviateurs*, their machines, and their combat experiences with the "Hun" over the skies of France during some of the most difficult periods of the war.

The war in the air during this period was an intense struggle, often with uneven odds favoring one side or the other. The evolutionary development of aircraft designs, armaments, and tactics was an ongoing process, with men in machines playing out the role of survival of the fittest. The role of many of these front-line units has largely been passed over; this work helps fill that gap.

It's always a pleasure to pick up a work penned by Guttman, as the reader is sure to find it filled from cover to cover with historic details, quality photographs, and related notes that flesh out the subject at hand in the most complete manner. Aeronaut Books has succeeded in publishing a book that is of high quality in both its content and production. Guttman manages to provide the reader with a great deal of new material in his latest effort. Virtually every page has a photograph or aircraft profile along with a substantive caption whose content is as enlightening and detailed as the rest of the narrative. The meticulous color profiles drawn by Bob Pearson complement the work with that *je ne sais quoi* that takes it to another level of useful reference.

Guttman's wealth of knowledge on the subject is easily recognizable. It is a subject matter that has interested him for at least four decades, as the personal photographs of him with André Martenot de Cordoux of Escadrille 94 attest. This is a well-organized work that provides a treatment that other such front-line units deserve. For anyone interested in aviation in the first great aerial war, this book is one worth the read for all the right reasons.

Carl J. Bobrow, Museum Specialist, National Air and Space Museum



Camera Aloft: Edward Steichen in the Great War. By Von Hardesty. New York: Cambridge University Press, 2015. Photographs. Appendices. Notes. Index. Pp.194. \$99.00 ISBN: 0521820553

Edward Steichen's well-known photographs have populated the cultural landscape for decades. His peacetime photographic efforts, whether commercial or artistic, as well as those taken during World War II have all been well documented in books, compendia, and countless articles over the years. Yet, his endeavors during World War I are all but forgotten. This superb book by Von Hardesty goes a long way in rectifying that deficiency.

Prior to the First World War, Steichen, while living and working in France, became an internationally well-known and respected photographer. With the commencement of hostilities in Europe in 1914, he fled France with the German army on his heels, returning to the safety of America.

Perhaps it should come as no surprise that, at age 38, he volunteered to serve in the US military when the United States entered the conflict. Initially seeing his role in the war as a modern-day Mathew Brady, his duties quickly changed for a variety of reasons. Ultimately, Steichen's transfer to US Air Service (which was ill prepared for the scale of warfare that it would soon be engaged in) was fated to be a critically important one. As it happened, not only did Steichen have the technical sagacity to deal with some of the most difficult issues and policies facing the Air Service's Photographic Section, but also his ability to work tirelessly to improve the training and equipment needed gained him the respect of career officers in the upper echelons of the military. What is noteworthy is that he quickly rose through the officer-ranks, achieving the grade of lieutenant colonel and becoming the Chief of Air Photography in what would be the final and critical stages of the war. The cause and effect would impact the war and provide the much-needed photographic intelligence resources at a fateful time in the conflict.

Hardesty has provided the reader with a well-written account of those days as well as Steichen's accomplishments and the relationship of his efforts to the context of the war. The book provides a compelling look at the man, his efforts, and the importance of wartime aerial photography.

Carl Bobrow, Museum Specialist, National Air and Space Museum



Great Battles: Gallipoli. By Jenny Macleod. Oxford UK: Oxford University Press, 2015. Maps. Photographs. Bibliography. Index. Pp. xi, 247. \$29.95 Paperback ISBN: 978-0-19-964487-2

Macleod makes an excellent point early in her book before addressing the Gallipoli campaign: great or decisive battles that determine the outcome of a war—something that Clausewitz subscribed to as a consequence of his experiences during Napoleon’s campaigns—have become a thing of the past. Her point is well taken. Gallipoli was supposed to be the battle that took the Ottoman Empire out of the war. Instead it was just one more campaign that went nowhere. It was also a harbinger of future conflicts. Looking at more recent wars, the culminating battle in Vietnam never came for the US military, and the protracted war in Iraq began only after the prematurely celebrated fall of Baghdad.

This book is, despite its title, only secondarily about the First World War’s Gallipoli Campaign. The greater part of *Gallipoli* is actually about its subsequent impact on several countries from the political and social perspectives.

However, when speaking of Gallipoli, her focus on the battle is often at the strategic level—the failures of decisionmaking at Whitehall Street and on the War Council—and at the operational level, with its lack of both vision and battlefield agility by the admirals and generals. When Macleod does speak to tactical events, it is brief and only to illustrate the many failures of command within the allied forces. We learn just enough about the campaign at Gallipoli to know that it was a horrendous fiasco and then move on. She pauses long enough, however, to highlight the lack of in-depth planning, the inconsistencies in purposing the campaign, and the failures to recognize the improbability of success.

Macleod then addresses the lasting legacy of Gallipoli. Gallipoli has had near mythical qualities for Australia, and this book is as much about the centrality of the battle in the Anzac (Australian New Zealand Army Corps) legacy as it is about the actual battle. It was the Anzac experience at Gallipoli that became the basis for national consciousness in both Australia and New Zealand. Through this book, it becomes clear how Anzac Day (dated from April 25, 1915, the first day of Anzac landings at Gallipoli) has become the *de facto* national day of Australia, despite the existence of Australia Day. Thus, the remaining two thirds of the book is focused on the significance of the battle in the national psyches of Australia, New Zealand, Ireland (then a part of the British Empire), Britain, and Turkey, and forgetfulness about Gallipoli in France. This portion of the book is its strength.

When the First World War began it was possible for one to consider himself British while being from Ireland, Australia, or New Zealand. After the war, this sense of oneness was eroded and eventually gone. This book, then, is mostly about why the battle of Gallipoli played an important role in the shift toward national consciousness in those countries. This book should be read from that perspective and not as a history of the Gallipoli campaign itself.

Col John Cirafici, USAF (Ret.), Milford, Del.



Bombing Europe: The Illustrated Exploits of the Fifteenth Air Force. By Kevin A. Mahoney. Minneapolis MN: Zenith Press, 2015. Photographs. Notes. Bibliography. Index. Pp. 240. \$35.00 ISBN: 978-0-7603-4815-4

This highly readable, vividly illustrated account of the Fifteenth Air Force’s air war over Europe serves as a companion to Mahoney’s own in-depth, detailed *Fifteenth Air Force against the Axis: Combat Missions over Europe during World War II*. Drawn from such contemporary documents as Missing Air Crew Reports (MACR), mission reports, published group histories, secondary works, and such rapidly emerging internet sources as POW data files, this book relates, through the voices of combat crews, what it was like to fly heavy combat against the Luftwaffe during World War II. An experienced air-war historian, Mahoney also has authored *Formidable Enemies: The North Korean and Chinese Soldier in the Korean War*, and has been published in historical journals.

Bombing Europe is the theme, and the bombing itself and its results are presented in detail. Large, crisply restored photos of bombers flying in close formation, hitting targets, battling weather, contrails, flak, and the Luftwaffe pack the pages of this coffee-table sized volume. The narrative spares no details, including all the raw emotion of airmen in combat. There are no distractions or lulls here: no life on the bases, adventures on pass, musings on strategy, intricacies of aircraft markings, or dry statistics. This book is by and about combatants. There is plenty of action here, of bombs dropping; smoke billowing over burning, cratered targets; thick flak; planes on fire, exploding, or even disintegrating; and men parachuting. The photos surround the text. The overall effect is that you are in the bomber gazing through a waist window or ball turret sighting glass. The production values enhance the overall effect, with a riveted metal watermark lending a rugged effect to the pages. The thesis is well developed. Each facet of combat has its own chapter: dogfights, strafing, fighting the Luftwaffe, flak, ditching, special operations, reconnaissance, POW, war crimes against airmen, escape and evasion. Even non-combat losses are covered. Writing with knowledge of the Fifteenth’s operations over Germany, Mahoney knits together the air war the way that the crews experienced it. The overall effect is a visceral impression of men risking, and often losing, their lives.

Endnotes are specific and detailed. Likewise, the bibliography is quite complete. This work is a virtual primer in air war research. The index is keyed primarily to people and units and easily enables the reader to locate a particular action.

However, it appears there was a rush to make a deadline. Typos abound, although computerized typesetting may be the culprit. A few things weren’t caught in editing.

A ground crew counted 30,000 holes in a combat-damaged bomber? 3,000 may be more like it. It appears unlikely that a parachute opened in twenty feet. “Big Fence” is cited but not defined. B-17 and B-24 are transposed a few times. Marston matting is identified as “Matson” (a shipping line). The enemy’s “principal antiaircraft weapon” is identified as an “eighty-five” millimeter gun; this should have been “eighty-eight.” A few picture captions seemingly disagree with what is portrayed. For instance, a photo of a P-38 is indicated as in Italy, although the prewar markings on the aircraft, which is an early model, indicate it was taken stateside. B-17s are identified as in action over Anzio in late 1944, but Anzio was 1943 and the B-17s are early F models, unlikely to have been in combat in late 1944. These are minor distractions from the overall effect, however.

Those wanting further first-hand accounts of the Fifteenth’s air war will find them in Brandon Soale’s thorough *From Foggia to Freedom*. Bob Dorr’s *B-24 Liberator Units of the Fifteenth Air Force*; and Barrett Tillman’s *Forgotten Fifteenth: The Daring Airmen Who Crippled Hitler’s War Machine*. Those looking for details on units, aircraft, and personnel will find Schiffer’s highly detailed works on the Fifteenth helpful, including Hill and Beitling’s *B-24 Liberators of the 15th Air Force / 49th Bomb Wing in World War II*.

With the ready availability on the internet of information in great quantity and almost numbing detail—statistics, records, lists of almost anything associated with the air war—the reader with no direct knowledge of the World War II aerial campaign over Europe is at risk of losing focus on its real meaning. This book gives the uninitiated an introduction to the true impact and cost of war on the warriors who fought it. A unique addition to Fifteenth AF and World War II air war history, *Bombing Europe* is highly recommended.

Steve Agoratus, Hamilton, NJ



Pinpoint: How GPS Is Changing Technology, Culture, and Our Minds. By Greg Milner. New York: W. W. Norton & Company, 2016. Photographs. Notes. Index. Pp. xx, 316. \$27.95 ISBN: 978-0-393-08912-7

In 2010, freelance researcher and writer Greg Milner gained recognition as a National Book Critics Circle Award finalist for *Perfecting Sound Forever: An Aural History of Recorded Music*. He has scored another homerun with *Pinpoint*. His latest tome explores how humans, past and present, navigate physical space. The effort to explain differences in how Polynesian natives, in centuries past, successfully navigated between distant Pacific islands and how GPS-equipped, twenty-first century travelers manage to get from point A to point B draws Milner into the neu-

rosience of cognitive mapping. As the book’s title implies, his narrative journey about the age-old quest for knowing precisely where one is, relative to a desired destination, exposes GPS’s potentially negative, as well as positive, technological and cultural effects.

Pinpoint traces the military roots of GPS by combining information from previously published histories (e.g., Michael Rip and James Hasik’s *The Precision Revolution: GPS and the Future of Aerial Warfare* and Richard Easton and Eric Frazier’s *GPS Declassified: From Smart Bombs to Smartphones*) with interviews of Air Force officers who pioneered GPS. Milner explains how an Air Force quest in the 1960s for a better navigational subsystem in high-speed tactical aircraft, on one hand, and a Naval Space Surveillance (NAVSPASUR) system timing requirement, on the other, ultimately combined to foster the Air Force-managed, joint Global Positioning System program. Perhaps better than any previous author, Milner straddles the controversy over who should be credited as “father of GPS” by asserting that Air Force Colonel Brad Parkinson “wanted pinpoint weapons delivery” and Roger Easton of the Naval Research Laboratory “thrilled to the possibility of time transfer.”

Turning from the historical development of GPS as a military system to its civil and commercial impact, Milner takes a somewhat different tack than Hiawatha Bray, who focused on GPS-related privacy issues in *You Are Here: From the Compass to GPS, the History and Future of How We Find Ourselves*. Milner ponders how achievement of pinpoint accuracy in our era has led to a very different worldview from that of our European ancestors, not to mention ancient Polynesian navigators. Expanding on what Easton and Frazier mentioned in the last couple of pages in their volume, *Pinpoint* considers whether reliance on GPS is leading to physical changes in our brains. Milner thinks we might be “witnessing the mass narrowing of the human cognitive map—as a construct (a decrease in navigational ability), but possibly also on a more literal level, an actual reordering of our neurons.” What might this mean, when we know from modern geodesy that Earth, often slowly but sometimes radically, reshapes itself?

Pinpoint demonstrates Milner’s dedication to thorough research and his ability to blend information from primary and secondary sources into a compelling analysis. Nonetheless, his narrative contains a few flaws that should leave knowledgeable, perceptive readers cautious about taking everything he writes at face value. For example, one Amazon.com reviewer pointed out correctly that Milner claims a B-52 Stratofortress bomber can carry a “244-ton payload,” when experts know it can muster a 35-ton payload at best. Despite such a discrepancy in his writing, Milner deserves the highest praise for tackling a difficult topic and rendering it intelligible to the average reader.

Probably more than any other technological break-

throughs at the end of the last century, the Internet and GPS have transformed military, civil, and commercial activities around the world. They certainly have revolutionized social interaction, global finance, agricultural production, and a thousand other aspects of our interaction with other humans and with Earth itself. If for no other reason, Greg Milner's *Pinpoint*, along with the other three titles mentioned in this review, deserve reading and rereading.

Dr. Rick W. Sturdevant, Deputy Command Historian, HQ Air Force Space Command, Peterson AFB, Col.



Fighting Cockpits: In the Pilot's Seat of Great Military Aircraft from World War I to Today. By Donald Nijboer (Author), and Dan Patterson (Photographer). Minneapolis MN: Zenith Press, 2016. Photographs. Illustrations. Bibliography. Index. Pp. 224. \$40.00 ISBN: 0760349568

Nijboer is a best-selling aviation author, historian, documentary writer/producer, college instructor, and speaker. His articles have appeared in *Flight Journal*, *Aviation History*, and *Aeroplane Monthly*. He currently writes and produces aviation documentaries for *Aerocinema*.

Patterson is an accomplished photographer who has excelled in the fields of portraiture, architecture, and aviation. His work has been featured in twenty-three books. In 2003, he received the first annual Harry B. Combs Award from the National Aviation Hall of Fame for Excellence in the Preservation of Aviation History. Also, he has lectured widely on aviation.

Fighting Cockpits surveys the evolution of cockpit design and relates it to performance and operation of aircraft from the Nieuport 28 to the Lockheed-Martin F-35. From the onset, the cockpit was typically the last part of the aircraft to receive design attention. World War II showed some ergonomic and layout improvements. But, it wasn't until the later jet age, with the advent of complex systems and high pilot workloads, that more attention was focused on cockpit design. This evolution is shown through full-page photographs of over fifty cockpits, divided into four progressive chapters. Each chapter begins with a short overview of aircraft and cockpit improvements through the period including engineering highlights and operational impact. This is followed by pilot impressions of cockpit design and aircraft performance.

Chapter 1, World War I, covers the beginnings of airpower—virtually unknown and believed to play only a minor role in warfare—reconnaissance. When the war started, the combatants had merely 2000 pilots and 1000 aircraft. Bombers and pursuit aircraft were unknown. Cockpits contained a minimum of haphazardly placed instruments. By the end of the conflict, 150,000 aircraft had

been produced, with the additional roles of bomber, fighter, ground attack and maritime patrol.

Chapter 2, *Between the Wars*, describes the era of improved engine performance, better construction materials, and political ambition that drove ever-improving aircraft performance. The single wing improved visibility, but pilots cherished the open cockpit. High-altitude flight required cockpit enclosure; but cockpits were still cramped, disordered, and non-standardized.

Chapter 3, *World War II*, describes how more-powerful weapons necessitated installation of cockpit armor. Higher-altitude operations necessitated oxygen and even pressurization. The open cockpit era was over! Nevertheless, fully enclosed cockpits often limited visibility. Most cockpits were still disorganized and non-standard in layout. However the first ergonomic designs appeared with improved instrument positioning, easy to reach controls, molded canopies, improved electronics, and functional standardization. Rudimentary ejection seats appeared.

Chapter 4: *Cold War to the Present*, describes how the limitations of piston engines and old aerodynamic configurations were overcome. Cockpits shoehorned avionics displays, attack radar scopes, fire control systems, and tactical situation displays. Later, weapons system operators were added to fighter aircraft cockpits to handle increased pilot workloads. Side-mounted control sticks with hands-on controls, multi-function displays, direct voice input, and helmet-mounted displays have served to reduce overall pilot workload and increase operational efficacy.

I really like this book! The "Pilot Impressions" write-ups are a nice touch. They are at a high level but provide an adequate counterpoint to each aircraft's technical overview. The cockpit photographs are outstanding. However, while many instruments and controls are immediately recognizable, some are not. More labeled diagrams would be particularly helpful. The Ilyushin Sturmovik section contains one, but the diagram is in Russian! Overall, this book is particularly useful as a quick reference for specific aircraft and cockpit overviews. Historians and docents alike will find it a valuable addition to their book shelves.

Frank Willingham, docent, National Air and Space Museum's Udvar-Hazy Center



By Honor Bound: Two Navy SEALs, the Medal of Honor, and a Story of Extraordinary Courage. By Tom Norris and Mike Thornton with Dick Couch. New York: St. Martin's Press, 2016. Photographs. Index. Pp. xxx, 252. \$26.99 ISBN: 978-1-250-07059-3

This is the story of two US Navy Vietnam Medal of Honor recipients, Lieutenant Tom Norris and Petty Officer Mike Thornton. The main focus is the narrative that each

presents about his actions in the tumultuous battles which raged in northern South Vietnam in 1972. Both were thrust into unique and challenging situations and each, in his own way, overcame them to rescue others who would have otherwise died or have been captured by North Vietnamese forces.

In April of that year, Norris was serving on his second tour in the war and was posted to the Military Assistance Command Vietnam Studies and Observation Group as the primary American advisor to the Vietnamese Sea Commandos. The last SEAL teams had already departed Vietnam, and Norris's role was to help train Vietnamese SEAL equivalents. That changed abruptly in early April when the North Vietnamese unleashed their offensive into South Vietnam with a massive invasion through the DMZ, hell bent on capturing Quang Tri and possibly Hue. The US reacted with massive airpower, and in the midst of the invasion, a USAF EB-66, call sign Bat 21, was shot down. Only one crewmember got out. The story of this rescue has been described in Gerry Turley's *The Easter Offensive* and, in detail, in my book, *The Rescue of Bat 21*. Tom Norris was called upon to join the recovery effort for the survivor and two more airmen shot down in several unsuccessful conventional rescue efforts. Here, Norris presents a detailed narrative of his actions in leading the effort which led to the rescue of two of the three isolated Americans. It is a riveting and compelling tale of absolute steadfastness and bravery in the face of incredible odds.

Several months later, Norris participated in a mission to reconnoiter a naval base being used by the North Vietnamese at the mouth of the Cua Viet River, a few miles south of the DMZ. Three Sea Commandos and Mike Thornton were with him. Here, Thornton describes insertion of the small team across the beach at night, relying on stealth as their main weapon. Unfortunately, they were inserted a few miles farther north and were engaged by enemy forces. In the ensuing fight, Norris was severely wounded. Thornton extracted him and directed a retreat as the team fled into the water. There he kept Norris and the team afloat until a recovery boat could pick them up. As the admiral said in *The Bridges at Toko-ri*, "Where do we get such men?"

Co-author Couch was not involved in these missions. However, he was also a career SEAL, has life-long relationships with Norris and Thornton, and is a well-published and well-regarded author of books on SEAL and special operations activities. His self-described role in this work is to "serve as narrator and help them tell their story." That he eloquently does by allowing the reader to see that Tom and Mike "both know the Gift of Honor." Well done! It is a compelling read and a great piece of history.

Col Darrel Whitcomb, USAFR (Ret), air power historian, Fairfax, Virginia.



The Big Book of X-Bombers and X-Fighters: USAF Jet-Powered Experimental Aircraft and Their Propulsive Systems. By Steve Pace. Minneapolis MN: Quarto Publishing Group, 2016. Photographs. Illustrations. Bibliography. Appendix. Index. Pp.360. \$40.00 ISBN 9780760349502

Despite its awkward title, this book presents an excellent coverage of the subject beginning with the Army Air Force's first jet (XP-59A), through the F-35, and touches (if only briefly) on drones and proposed fighters and bombers of the future. It is extremely well presented on heavy, glossy paper in large format (9.3 by 10.9 inches). The book is profusely illustrated with large and clear photos and drawings, 150 in color and 150 in black and white. The text is also impressive, as it not only treats a large number of aircraft but also is very detailed. Information that is included is aircraft serial numbers, names of the test pilots, data on contracts, dates of significant flights, and data on the numerous aircraft variants. Along with aircraft that made it into the air, Pace covers many of the paper designs that did not. Over 90 aircraft are included. A particular strength is one chapter on jet engines.

It must be noted that the result is not a smooth narrative but, rather, a volume more suitable to consult or browse. Some may be frustrated by Pace's decision to stick closely to his theme. This dictated stopping short of the operational side of the story, thus making it difficult for the reader to judge whether these specific efforts were successes, disappointments, or failures. But this would be a much different book; to add such material would result in either a much, much longer book or a much less detailed one. I would also alert the reader to the fact that, at points, the prose is sometimes flowery and over written. And while there is a bibliography, the book lacks citations.

In balance, this is an outstanding book on this usually neglected subject. It is a valuable contribution that is notable for its detailed text and exceptional illustrations. The serious student will want this for reference, while the casual reader will enjoy the wide, in-depth, and interesting coverage and certainly the wonderful illustrations. In short, this is a delight and highly recommended.

Kenneth P. Werrell, Christiansburg, Virginia.



An Untaken Road: Strategy, Technology, and the Hidden History of America's Mobile ICBMs. By Steven A. Pomeroy. Annapolis, Maryland: Naval Institute Press, 2016. Illustrations. Endnotes. Bibliography. Index. Pp. xiv, 290. \$44.95 ISBN: 978-1-61251-973-9

In an unusual situation, two eminent historians submitted reviews for this important book. Both are presented here.

Steven Pomeroy, formerly an associate professor at the US Air Force Academy and once an Air Force missileer, deserves the highest praise for taking time to revise and update his decade-old doctoral dissertation for publication. Now, in *An Untaken Road*, readers have easier access to the result of his commendable research efforts, his analytical skills, and his practiced compositional talent. His weaving, across chapter titles and within the narrative itself, of a metaphorical thread derived from Robert Frost's poem "The Road Not Taken" adds literary flare to a very technical history of paths contemplated, sometimes partially taken, and ultimately abandoned.

Beginning with a chapter that sets the theoretical framework for the analytical history that follows, Pomeroy proceeds to guide readers on a detailed tour of concepts and plans related to mobile ICBMs from Atlas and Titan during the 1950s and early 1960s toward Minuteman in the 1960s and onward to the MX, or Peacekeeper, in the 1970s and 1980s. Beyond multiple types of rail-based systems, he detours to point out concepts for air-launched and underwater systems. Pomeroy reminds us that the United States, for a half century, has had a mobile SLBM capability in Navy submarines. He discusses its intersection with the issue of deploying mobile ICBMs. Finally, he explains clearly the intertwined, changeable relationships among military, political, economic, environmental, technological, and other factors that ultimately doomed deployment of any kind of mobile ICBM system.

As an Air Force officer and graduate student in history at Auburn University, Pomeroy had relatively easy access to the Air Force Historical Research Agency (AFHRA) and Air University Library at Maxwell AFB, Alabama, where one finds substantial source material directly related to the history of mobile ICBMs. He made superb use of these collections, taking noteworthy advantage of the AFHRA's ability to declassify many formerly secret documents. *An Untaken Road* evidences a balanced reliance on primary and secondary sources. Perusal of his citations for official briefings, government and contractor reports, presidential papers, personal letters, books, articles, online sources, and more might cause even the most knowledgeable reader to wonder whether Pomeroy left any significant sources uninvestigated.

Although he tends to blur the distinction between parallel and concurrent development of early ICBMs under General Bernard Schriever's leadership in the 1950s, Pomeroy astutely emphasizes Schriever's mantra that missile designs and basing modes are intimately interrelated. Other military officers, senior defense civilians, and political leaders failed to appreciate that a rocket built for launching from a static platform likely would not withstand the additional stresses and strains associated with mobility. Beyond that, they often overlooked early in the decision-making process how costly mobile ICBMs might be compared to silo-based missiles. Consequently, the Air Force expended considerable money, manpower, and other

resources on mobile-basing programs, none of which ever came to fruition.

In 2016, as Air Force planners examine aging, silo-based Minuteman IIIs and contemplate a Ground Based Strategic Defense system to replace them, a careful reading of *An Untaken Road* might prove beneficial. Knowing what failed to happen in the past, and why, might shed as much light on the way ahead as knowing what *did* happen and why. Regardless of whether current planners take this advice, Pomeroy's book belongs on the shelves of scholars whose specializations range from technology or military strategy to domestic politics or international affairs.

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

In *An Untaken Road*, Steven Pomeroy argues that during the 1950s and 60s, the mobile Intercontinental Ballistic Missile (ICBM) "was a feasible technology capable of solving an American strategic problem, namely deploying a secure second-strike force." He cites three reasons for the decision to *not* pursue this technology: (1) Air Force-Navy bureaucratic rivalry that favored mobile, sea-based missiles; (2) successful Air Force silo-based Minuteman ICBMs; and (3) changes in political, economic, and social context that undermined public support. Pomeroy frames his argument in the language and thinking behind organizational change and military innovation that makes his work more than a simple history of ICBM development. He incorporates concepts from Steven P. Rosen, Terry Pierce, Alex Roland, and Williamson Murray among others. Specifically, he adapts Thomas Hughes' five-phase model of technological innovation to produce four developmental phases suitable for military technology: (1) invention and development; (2) transfer and diffusion; (3) bureaucratic security; and (4) stability. Pomeroy diligently applies this construct to the case of mobile ICBMs. He cites numerous detailed examples that illustrate the intellectual and technical process. In the end, Pomeroy concludes that the case of mobile ICBM reinforces an observation first made by historian Melvin Kranzberg: "although technology might be a prime element in many public issues, nontechnical factors take precedence in technology-policy decisions."

Pomeroy's book represents an intellectual *tour de force*. His work combines a history of famous, but understudied, ICBM development; a study of technological adaptation and diffusion; an analysis of civil-military affairs and interservice rivalry; and a case study of military innovation. Those interested in the history of ideas and military thought will appreciate his concise explanations and skillful weaving of intellectual arguments. Likewise, strategists will like his exploration of the interplay between technology and strategy. Finally, those who love planes, trains, and rockets will enjoy his detailed accounts

of the details of ICBMs ranging from propellants to alert operations.

Pomeroy lauds General Bernard Schriever as his tale's formal hero for bringing the world's most potent weapons system from concept to operation in seven years. Pomeroy deftly explains the technological challenges, innovative solutions, and bureaucratic effectiveness of Schriever's quest to bring ICBMs into the Strategic Air Command's nuclear arsenal. Moreover, his unsung heroes include the Air Force, Navy, and civilian staff officers who prepared countless professional briefings, research projects, point papers, and reams of factual information to support the myriad mobile ICBM proposals and basing options. Patiently, Pomeroy explains multiple land, air, and sea-based ICBM schemes including train-based launchers; enormous missile transport vehicles; rail-linked, super-hard pods; underwater silos; air-dropped missiles; and the reasons for their rejection by policymakers. In doing so, Pomeroy also demonstrates the adage, "the devil's in the details." Nevertheless, with advances in Soviet ICBM capabilities, each successive presidential administration revives similar schemes and resurrects yet another bureaucratic cycle.

Drawing from his unique background as an Air Force missileer, an Auburn University Ph.D. in the history of technology, and nearly a decade of teaching military and strategic studies at the US Air Force Academy, Pomeroy fuses an eclectic and fascinating account of American ICBM development, including an "untaken road." This is a remarkable book and a must-read for air, space, and cyber professionals that will also benefit others interested in defense, security affairs, and technological innovation.

Dr. John T. Farquhar, Lt Col, USAF (Ret), Associate Professor, Department of Military and Strategic Studies, US Air Force Academy



Through the Valley: My Captivity in Vietnam. By William Reeder Jr. Annapolis MD: Naval Institute Press, 2016. Maps. Appendix. Notes. Index. Pp. 238. \$29.95 ISBN: 9781591145868

I admire people who fly helicopters. Sometimes I conjure up images of helicopter pilots going into battle while hanging from umbrellas like Mary Poppins, completely vulnerable to everyone and everything aimed at ruining their day. Reeder perpetuates that image with his account of flying AH-1G Cobras in Vietnam and Laos during 1972. In *Through the Valley*, he describes the ultimate bad day and what followed when North Vietnamese Army (NVA) soldiers shot him down and later took him prisoner.

Reeder has a good story to tell and knows how to tell it. A forty-year delay in writing his memoir did not dimin-

ish its impact. He served two tours in Vietnam—his second mostly as a prisoner. One ordeal he survived ranks alongside the Bataan Death March. At the start, while Reeder walked with other prisoners, NVA guards shot stragglers. Reeder completed the major portion of his forced march solo with one guard.

His journey is part of the long second part of the book. The opening part covers his flying as a platoon commander for the 361st Aerial Weapons Company Pink Panthers at Camp Holloway outside of Pleiku. A short third part deals with his post-war life on active duty and in retirement. Actually, the book is more than Reeder's story, because he relates events pertinent to everyone he met. Jim Thompson, the longest-held POW in American history, is one of his favorite topic. Reeder concludes the book by updating the status of fellow flyers, soldiers, and prisoners.

The Pink Panthers were part of MACV Studies and Observation Group, which helped to slip Army reconnaissance teams in and out of Laos on classified missions. The NVA Easter Offensive diverted the Panthers' routine to flying in-country ARVN support missions. The intensity and breadth of the NVA offensive surprised Reeder: "Three months before, most of us thought we'd won." Some accounts of NVA successes were new to me. At the same time, he tells excellent stories about the effectiveness of Cobra firepower during counterattacks.

In a fight for the Special Forces camp at Ben Het, the NVA shot off the tail rotor of Reeder's Cobra, causing it to crash. It wasn't the first time Reeder had been shot down. During his first tour, he ejected from an OV-1 Mohawk and outran NVA pursuers. This second time, seriously injured and after three days of evasion, Reeder was captured by the NVA. His survival defies all reason. Numerous untended internal and external injuries crippled him. He suffered massive infections in wounds and contracted three types of malaria. For months, he ate only rice. Barefoot, he walked most of the way from northeast Cambodia to Hanoi. If that weren't enough, along the way he endured near misses by bombs from F-4s and B-52s.

Overall, his determination to live through any ordeal was exemplary. His mind absolutely controlled his body. With certain death awaiting him, he compelled himself to remain alive in hope of someday seeing his two children again. And like magic, at the very worst times, a fellow prisoner or guard performed an act of kindness that sustained his life. He remembers all of them.

After 154 days of travel and temporary imprisonment in bamboo cages, he reached Hanoi and joined fellow POWs in what he calls "the company of heroes."

In the post-war world, two marriages ended in divorce, and he underwent extensive surgery and other medical treatments to correct physical problems brought on by his crash and the mistreatment that followed. Once more, his resiliency saved him, and he found happiness with a third wife and two more children. Both he and his wife retired

as Army colonels.

Henry Zeybel, Austin, Texas.



WASP of the Ferry Command: Women Pilots, Uncommon Deeds. By Sarah Byrn Rickman. Denton TX: University of North Texas Press, 2016. Photographs. Notes. Bibliography. Index. Pp. xvii, 440. \$29.95 (\$23.95 e-book) ISBN (hardcover): 978-1-57441-673-4; ISBN (e-book): 978-1-57441-642-8

With the third volume in her trilogy on the Army Air Forces' civilian women pilots of World War II, Rickman has confirmed her status as one of the foremost experts on these amazing flyers. Previously she wrote *The Originals*, the story of the nation's very first group of women aviators serving the military in World War II. She followed with *Nancy Love and the WASP Ferry Pilots of World War II*. After that effort, she received the Seventh Annual Combs Gates Award from the National Aviation Hall of Fame. A former newspaper editor, she began her book-writing career with *Flight from Fear*, a novel based on these women.

In this volume, she presents a detailed history of the flyers who helped enable Ferry Command deliver aircraft fresh from the factory to domestic operational locations, modification centers, or overseas embarkation ports. Obviously quite familiar with the wealth of information in the archives at the University of North Texas in Denton, she relies extensively on oral-history interviews supported by documents culled from government and secondary sources.

For the most part, she proceeds in chronological order, intertwining the operational and bureaucratic needs of the Army Air Forces with anecdotes from the women themselves. While the "originals" were exceptionally well qualified based on their civilian experience before the war, their numbers were inadequate to completely meet Ferry Command's needs. To limit reliance on male pilots as much as possible and increase the number of women available, the command established its own training program.

Initially, the women focused on delivering training aircraft. As the demand for moving fighters increased, Ferry Command established a pursuit transition school that proved to be very successful. Lurking in the background, however, were two unavoidable issues. The first was the turf battle between Nancy Love and Jacqueline Cochran. Love had helped started the WASP (women's air service pilots) program under the guidance of C. R. Smith and William Tunner. Cochran had the ear of Army Air Forces commander "Hap" Arnold and wanted total control of all women pilots. She challenged the patience of all involved. To her credit, Rickman treats Cochran in a reasonably fair manner, though it's clear her sympathy lies with Love.

The second issue, of course, was whether it was appropriate to "militarize" the women.

Overall, this work offers a fitting tribute to a true band of pioneers. However, because it targets a general adult audience with, most likely, a limited knowledge of World War II aviation, the aircraft mentioned do not get the attention they deserve. At a minimum, an appendix briefly describing each model would be appropriate as would a chapter on a male pilot's progression through the Army Air Forces training program. An explanation of the need for primary, basic, and advance training aircraft would be helpful to a general audience. Overall, however, this is a good book.

Steven D. Ellis, Lt Col, USAFR, docent, Museum of Flight, Seattle WA



Aviators and the Academy: Early Aeronautics in Canada. By Jonathan B. Scotland and Edward P. Soye. New Castle DE: Oak Knoll Books, 2009. Photographs. Bibliography. Pp.105. \$20.00 ISBN: 9780772761156

In 2015, the Thomas Fisher Rare Book Library of the University of Toronto presented a unique exhibition of World War I aviation objects, documents, books and ephemera embodying the Canadian aviation experience.

Ed Soye and Jon Scotland, the curators of this exhibition, also produced this well-illustrated catalogue to accompany the event. It is obvious from reading this work that they have spent a great deal of investigative energy unearthing the Canadian aviation experience during World War I. This research includes the involvement and efforts of pilots, engineers, mechanics, and designers during that time.

This work, which is derived from their larger study, focuses on a different aspect than most First World War histories. It begins with the Canadian 1919 Victory Year celebrations, which included William Barker, one of the leading Canadian aces of the war and holder of the Victory Cross, flying a Fokker D.VII at the first Canadian National Exhibition. The overarching story that unfolds is an interesting look at Canadian aviation history—one that is interwoven with the British Empire and the Dominion's aviation legacy. It contains numerous contemporary photographs, images, and documents. Perhaps one of the most evocative images in the book is of Barker sitting in the remnant fuselage of his Snipe with what can best be described as a 1000-mile stare.

The subject of the War Trophy Collection and the fate of the 100 aircraft in it figures prominently in this work. Those that managed to survive the scrap heap are central to what amounts to some of the most unique collections to be found in the world. How and why this all came to be is an interesting story that involves national identity, re-

membrance and commemoration. YouTube has a site that offers a ten minute tour of the exhibition:
<https://www.youtube.com/watch?v=qLuSF2SCNyI>

Carl J. Bobrow, Museum Specialist, National Air and Space Museum



Luftwaffe Bomber Aces: Men, Machines, Methods. By Mike Spick. Barnsley, UK: Frontline Books, 2001. Photographs. Illustrations. Maps. Tables. Appendix. Bibliography. Index. Pp. 239. \$19.95 paperback ISBN: 1848328621

The Spanish Civil War provided an environment for testing Germany's *Luftwaffe* bomber tactics prior to World War II. During the subsequent invasion of Poland, the *Luftwaffe* refined the tactics into the Blitzkrieg concept of warfare—attack by speeding armor supported by air power. In *Luftwaffe Bomber Aces*, Spick recalls those events to set the stage for analyzing the *Luftwaffe*'s employment of bombers in the war. The Ju 87 Stuka often fills a starring role in his narrative, but Spick calls the Ju 88 “without doubt the most versatile German aircraft of the war.”

The book follows World War II from the German point of view: The Storm Clouds Gather; Blitzkrieg; Anti-Shipping Operations (1939-40); Victory in the West; Assault on England (1940-41); Campaign in the South; War in the East (1941-44); The Strategic War at Sea; Western Front (1941-44); and Last Stand in the West.

Author of more than forty books on military aviation, Spick writes history in a straightforward style that is enjoyable and easy to read. He uses cause-effect reasoning to record how *Luftwaffe* bombers often developed tactics through trial and error. Mission results were ineffective as often as they were effective, but losses did not discourage German bomber pilots. Even when “flown out,” some pilots continued to fly “until they exhausted their physical and mental resources, and died in action.”

The book's closing chapters are devoted to a selective group of bomber and Stuka aces—men who distinguished themselves in combat. In this case, “ace” had no relationship to the number of aerial victories. Instead, ace status was determined by an award system based on well-defined achievements in the field, and the system applied to all three services. Spick recounts the exploits of 48 flyers, such as Hans-Ulrich Rudel, who performed superhero feats.

When he tells stories of bombing missions, Spick includes aircraft flight characteristics, to help the reader appreciate the flyers' dilemmas. He compares the differences between level (high and low) bombing and dive-bombing to clarify the *Luftwaffe*'s choice of aircraft and tactics. First-hand narratives give a keen appreciation of what it

felt like to dive-bomb, face attack by fighters, or brave a barrage of anti-aircraft artillery.

Spick dissects *Luftwaffe* bomber operations in detail from theater to theater. In recreating the Battle of Britain, for example, he spells out the ploys and countermeasures used by both sides. Because this was the first battle fought entirely in the air, innovations in the use of radio beams, decoy targets, and marking targets constantly evolved. Unsustainable daily losses caused the *Luftwaffe* to revise tactics drastically. Midway through the battle, the Stuka stood down and did not see action again until needed for support of Panzer units in the invasion of the Soviet Union.

Early problems faced by the *Luftwaffe* included faulty intelligence, poor liaison between air and ground forces, misidentification of targets (which caused losses to friendly fire), and resupply difficulties among rapidly advancing forces. No surprise in that group.

Spick argues that the *Luftwaffe*'s failure to develop a long-range strategic bomber resulted in major disadvantages across every theater of operation. In the Battle of the Atlantic, limited-range bombers did not adequately support U-boat operations. The Battle of Britain would have been more decisive if larger bombers had been available to deliver heavier loads. During the invasion of the Soviet Union, short-range dive-bombers interdicted railroad supply lines, but they could not reach industrial centers to destroy arms factories. Distant attacks on the Suez Canal failed because the weight of extra fuel tanks needed on mid-range aircraft reduced bomb loads to near insignificance. Such raids became symbolic more than destructive.

The studio-quality photographs of pilots and airplanes complement the text, and the diagrams and maps enhance understanding of aircraft formations and bombing tactics. Overall, a good book.

Henry Zeybel, Lt Col, USAF (Ret), Austin TX



Fokker Design & Development to 1919. By Michael Tate. Self Published, Lulu Press, Michael Tate BSc, 2016. Photographs. Appendices. Bibliography. Pp.332, \$36.77

The Fokker story has been told, retold, and reinterpreted ever since the very first, 1931 book “Flying Dutchman” was published. This new work looks at that story through the lens of an engineer. Tate, applying his professional engineering background, has sought to make sense of the convoluted history and technological developments surrounding Fokker's aircraft from the time of his first efforts to those culminating at the war's end.

This is not a biography, though there is an element of biographic narrative within. How could there not be with a dynamic individual such as Anthony Fokker central to

the story? The strength of Tate's work is moving beyond the man and taking a detailed look at the development and design of aircraft credited to Fokker. Make no mistake. These designs were a team effort with some well-known names appearing throughout the narrative. Who they were and what they did in the context of the design development is intriguing. Not surprisingly, some well-known pilots left their mark on Fokker's concepts. This makes sense for several reasons: Fokker was a pilot first and foremost, and he understood and knew that courting pilots for their knowledge and influence would help his designs as well as enable him to gain insights into his competitors' aircraft.

The development of Fokker aircraft, from intuitive wing designs to those scrutinized for their essential engineering and aerodynamic qualities, is the subject of Tate's work. He successfully takes the reader on a ride through the background history of aerofoil design and implementation by the Fokker team. The combination of cantilever and "thick wing" is one of the most intriguing aspects of story. The engineering forensics carried out by Tate in this book probably come as close to a reasonable explanation as any of how and why the process came into existence the way it did.

The book is divided into twelve chapters. One look and the reader quickly perceives the approach Tate took in defining the structure with an engineer's eye. Such chapter topics as Airframes, Engines, Cantilever Wing, Aerofoil & Aerodynamics exemplify the approach. Tate has devoted chapters to failures and to Reinhold Platz as well as Fokker Works personnel, all of which make for a qualitative effort in uncovering the Fokker story. The book is decently illustrated, although they are printed on matte paper. The most important are Tate's wing-form illustrations which, in themselves, contribute as much to the body of knowledge on World War I aerodynamic development as does the overall book itself.

Carl J. Bobrow, Museum Specialist, National Air and Space Museum



The Eastern Front Air War 1941 - 1945 (Images of War) – Rare Photographs from Wartime Archives.

By Anthony Tucker-Jones. Barnsley, UK: Pen and Sword Military Books, 2016. Photographs. Pp. 144. \$24.95. ISBN: 978-1473861626

Tucker-Jones is a former defense intelligence officer and a widely published expert on regional conflicts, counter-terrorism, and armored and aerial warfare. He has authored over twenty books and is a security and terrorism correspondent for *intersec: The Journal of International Security*.

His latest book contains a selection of over 150 photo-

graphs from the Scott Pick World War II Russian Front Original Photo Collection. They provide a remarkable and often grim visualization of many aspects of the war on the Eastern Front between 1941 and 1945. Most of these black-and-white wartime photographs have never been published.

Between October 1940 and February 1942, the Soviet Air Force (and much of its aircraft industry) was subject to a massive purge by Stalin. He believed anti-Soviet activities, including spying, sabotage, and pro-German undertakings, had been fomented in its officer and executive ranks. In addition, while the Soviets claimed to have the world's largest air force, seventy-five percent of the Soviet aircraft allocated to its western frontier bases were outmoded and inferior in performance to German aircraft. The Germans also believed, at the time, that the actual strength of the Soviet air force was thirty percent less than the authorized establishment. This helped to set the stage for *Unternehmen Barbarossa*, the June 1941, invasion of Soviet territory, by almost four million men along an 1800-mile front. This was the largest invasion force in the history of warfare. By the end of the first week of fighting, the Soviets had lost more than 1100 aircraft, mostly on the ground. By September, they had lost over 4000 planes.

Despite early progress through the western Soviet Union, the German advance was slowed at Stalingrad, Dem'yansk, and Moscow by heroic sacrifices of men and machinery and, eventually, the Russian winter. This gave the Soviets the time needed to relocate factories from the west to east of the Urals, beyond the range of German medium bombers. Recovery was slow at first, but thanks to Allied re-supply of modern aircraft and much-needed rail engines and equipment, the Soviets began to produce war machinery at a pace that could not be duplicated by German industry. At the end of the war, Soviet aircraft production had exceeded that of Germany by more than thirty percent. By 1944, allied bombing of Germany had forced the Luftwaffe to withdraw a staggering amount of its fighter force from the Eastern Front to protect its homeland. This left the Wehrmacht to face massive Soviet forces, without much-needed fighter support.

Tucker-Jones' book progresses through ten quick chapters. Each has a short overview detailing key characteristics of the chosen periods and descriptions of involved aircraft types and numbers, from both sides. This is followed by photographs of aircraft (many having been shot down) and personnel.

I liked this book! It provides a good understanding of the forces leading to the invasion of the Soviet Union in 1941, the initial onslaught, and the remarkable recovery that followed as the Soviet aviation industry and air force, aided by the United States and its allies, turned the tide against the Luftwaffe by 1944. It is a quick read and also a good reference to a large air battlefield of World War II that has not received a lot of attention. The pictures are of

good quality and well captioned. It's a good addition to the historian's bookshelf.

Frank Willingham, docent, National Air and Space Museum's Udvar-Hazy Center



Storming the City: U.S. Military Performance in Urban Warfare from World War II to Vietnam. By Alec Wahlman. Denton TX: University of North Texas Press 2015. Maps. Photographs. Tables. Notes. Glossary. Bibliography. Index. Pp. xvi, 368. \$29.95. ISBN: 978-1-57441-619-0

With a Ph.D. in military history from the University of Leeds, Wahlman is highly qualified to write a book such as this. For 14 years, he was an analyst at the Institute for Defense Analyses focusing on irregular and urban warfare. In *Storming the City*, he answers a three-part question: When the need arose to fight in urban terrain in the mid-twentieth century, how effective were US forces? How did that performance change from World War II to Vietnam? And why? Wahlman predicated his findings on four battles: Aachen and Manila in World War II, Seoul in the Korean War, and Hue in the Vietnam War.

Wahlman makes it easy to compare the battles by describing each in the same format: Operational Context; The Foe; The Assault; Command, Control, and Communication; Intelligence and Reconnaissance; Firepower and Survivability; Mobility and Counter-Mobility; Logistics; and Dealing with the Population.

In these four victories fought in three wars over three decades, both the Army and Marines were ill prepared for urban warfare. Aachen and Manila were primarily Army operations, and Seoul and Hue belonged mostly to the Marines. Throughout the entire time, field manuals for both services presented little information on how to capture a city, and training for fighting house-to-house was minimal.

Wahlman concluded that America's success resulted from "transferable competence" and "battlefield adaptation." Transferable competence included quality leadership within small units; heavy firepower with adequate logistical support; coordinated effort between infantry, armor, artillery, engineers, and air support; previous combat experience; and the design of American armored vehicles. Except for the last point, the other conclusions appeared to be self-evident traits required for any successful operation. Battlefield adaptation was the ability of leaders to alter tactics based on a particular environment. Each battle area offered different problems. The greatest difference between urban and field combat was the shortening of lines of sight in the city. The resultant confined battle space often affected factors such as rules of engagement and population control. This type of adaptation was not unique to urban warfare; it had been required in ear-

lier engagements such as hedgerow and forest fighting.

Wahlman's research claims to undermine two myths about urban warfare. First, the attacking force's traditional three-to-one manpower advantage was proved unnecessary. Americans had only a three-to-two advantage in Manila, and at Aachen the Germans outnumbered Americans by three-to-one. The second myth was that urban fighting is an infantry job. Wahlman challenges the myth by saying "infantry is most effective when part of a combined arms team," which is a spinoff from his transferable competence. Basically, a combined force is more likely to maintain a methodical advance with fewer losses.

Despite winning the four engagements, American tactical performance gradually grew less effective. At Hue, Americans failed to isolate the city. Therefore, throughout three weeks of fighting, North Vietnamese Army (NVA) forces inside Hue continued to receive reinforcements of men and supplies by night. Furthermore, American intelligence failed to recognize the size of the NVA force and the complexity of the Hue Citadel. The precise location of enemy positions inside Hue was largely discovered through contact. Prolonged fighting permitted the Communists to establish their own government within the city and to execute Hue's administrative personnel.

In closing, Wahlman looks at urban warfare since Hue and into the future. Population migration into urban areas favors opponents of the United States and emphasizes the vulnerability of unsecured supply lines for forces attacking a city. Situations like those found at Fallujah might easily bog down an attacker and slow the tempo of combat. Furthermore, as shown at Mogadishu, urban confrontations could reduce the effectiveness of superior technology. In such cases, the price tag increases steeply.

In preparation for future needs, the Army has built urban warfare training complexes and has published an associated field manual. Adaptation is still considered as crucial to success in this area. Technologies offer new avenues for tactics, but in many cases the enemy has access to the same or counter equipment. Advances in sensors, protective equipment, and offensive capabilities notwithstanding, urban warfare is and will continue to be a nasty, difficult business. The expansion of cities and construction of more complex structures complicates the problem.

Poor maps are the book's major flaw. The maps are too small and lack contrast, which make them nearly impossible to read. Better maps would enhance the reader's understanding of maneuvers at the battle sites.

As an airman, I was left with a desire to know more about urban warfare. I would have appreciated a deeper discussion about American involvements since Hue, such as the invasion of Panama City. Perhaps that will be part of another book.

Henry Zeybel, Lt Col, USAF (Ret), Austin TX



Spying through a Glass Darkly: American Espionage Against the Soviet Union, 1945-1946. By David Alvarez and Eduard Mark. University Press of Kansas: 2016. Index: Pp. 337-344. Bibliography 329-336. \$34.95. ISBN 9780700621927 (cloth); ISBN 970700621972 (ebook).

As Dr. Eduard Mark's branch chief at the Air Force History and Museums Program in Washington D.C. during the last years of his life, he often spoke to me of his work with David Alvarez on a book about American espionage against the Soviet Union during the two years following World War II. Dr. Mark did a lot of research in Eastern European archives using his own resources. He was dedicated to seeing this book through to publication. Yet, it was the work and determination of David Alvarez that brought this book to fruition following Dr. Mark's untimely death in 2009. For his effort David Alvarez must be recognized for his superb effort.

Following World War II, the allied powers concentrated on demobilization, denazifying and demilitarizing their specific German zones as well as bringing some semblance of economic order to these war torn areas. In addition, they worked to transfer German scientific expertise both through documents and by convincing German scientists to immigrate to the United States. So as well as maintaining their own zones of interest in Germany the allies including the U.S. attempted to retain sufficient staff to perform spy missions. There was a huge effort in the U.S. government to reduce costs and bring the soldiers home, including intelligence officers, thereby stripping the Office of Strategic Services (OSS) and the Strategic Service Unit (SSU) of sufficient manpower to carry out adequate spy missions. And because of these multiple tasks there was not an immediate effort to concentrate on spying in the Soviet Union.

The Soviets, on the other hand, like the Americans stole scientists and dismantled German Industries as part of their self proclaimed reparations efforts and sent the parts back to the Soviet Union. Further, under the power of the Red Army, the Soviet Union worked to establish and thereby control communist regimes in many of the conquered countries circumventing the agreements that had been made with their allies at the Yalta (Feb., 1945) and Potsdam (July, 1945) conferences. Because of the many atrocities of the Red Army and the severe methodologies employed by communist party in their attempts to assume control of these countries, they were met by uncooperative populations causing the Soviets to employ even more oppressive tactics to gain their ends.

The U.S., because of the above issues including staffing shortages, was slow to react and to fully appreciate the true meaning of the Soviet National Front strategy which attempted to assume control of the governments of the occupied countries such as Czechoslovakia, Poland, Hungary and Austria to name a few.

The book is replete with accounts of many attempts to establish entry points (spies) into these countries by the Strategic Services Unit (SSU), the offshoot of the Office of Strategic Services (OSS) which was disbanded in September 1945, by President Harry S. Truman. There is a plethora of code names for operations dealing with both spying and counter intelligence with both sides religiously attempting to hoodwink the other. Some of the operations proved more successful than others. The authors point out that the majority of these efforts by the SSU ended in failure largely because of the lack of staff as well as acquiring agents with experience since most of the cogent staff of the OSS and the SSU as noted had left their organization and departed stateside following the war. And as the authors point out, it took a while for the United States to recognize the true intentions of the Soviets in exerting their control over these Eastern European areas.

Another impediment to the success of the U.S. spy effort was the political infighting among the various departments as to who would control the spy mission. The Navy, Army and the Army Air Forces had their own operations and were unwilling to share all their information with other agencies while the State Department wanted their piece of the action as did the FBI which often pointed to its successful spy efforts in South America during World War II. All of this internal squabbling and vying for the lead position prolonged the establishment of a single viable agency that would control the U.S. spy mission. Very often the European stations felt themselves unattended and even abandoned by Washington headquarters. They were at times essentially on their own.

At least for this reader, this book ought to have included a glossary of terms as a quick reference for the early organizations as well as for the many code-named spying operations. However, the authors masterfully bring to light a forgotten period of American Intelligence history and portray the gradual initiation of U.S. spy actions against the Soviet Union. David Alvarez and Eduard Mark set out to present the espionage mission of the U.S. against the Soviet Union following World War II and they succeeded. Although the chaotic times that produced myriad of equally hectic tasks and impediments for U.S. Intelligence gathering efforts, there was much accomplished in two very short years. And as the authors point out, the information assembled regarding the Soviet Union no matter how sparse could have influenced the opinion of President Truman about the real goals of the Soviet Union and may have provided the catalyst for the President's support to establish the Central Intelligence Agency in September 1947.

Dr. George M. Watson, Jr., Retired Senior Historian, Air Force History and Museums Program.



Books to Review

Busha—EAA Oshkosh: The Best AirVenture Photography. 224p.
Erickson—History of Rocketry and Astronautics, Vol 45. 270p

History Mystery Answer



In 1949, Captain James Gallagher along with a crew of thirteen, flew a B-50A (46-010) named “Lucky Lady II” 23,452 miles in 94 hours and 1 minute (February 26 to March 2, 1949). They took off and landed from Carswell Air Force Base, Texas. To accomplish the flight, “Lucky Lady II” was supported by eight KB-29 tankers. Fuel was transferred via a hose extended from the KB-29 that flew in front of and above “Lucky Lady II. The entire aircrew were awarded the Distinguished Flying Cross and were awarded the National Aeronautic Associations’ Mackay Trophy for the outstanding flight of the year.

“Lucky Lady II” was not the first or last “Lucky Lady” to circumnavigate the Globe. In July 1948, B-29 “Lucky Lady I” and “Gas Gobbler” flew around the world in fourteen days. Eight years after Lucky Lady II’s flight, a B-52B named “Lucky Lady III” accompanied by two other B-52Bs flew 24,325 miles around the world in just over 45 hours. To read more about the flight of the Lucky Ladies as well as declassified SAC documents go to:

<http://www.afhso.af.mil/topics/factsheets/factsheet.asp?id=15233>

<http://www.secretsdeclassified.af.mil/topflightdocuments/stategaircommand/index.asp>

Coming Up



Compiled by
George W. Cully

registration and other event information, see the Association's website at www.lha.org/2016-symposium-registration/.

October 25-27, 2016

The **American Astronautical Society** will present its 9th Wernher von Braun Memorial Symposium at the Charger Union Theater on the campus of the University of Alabama in Huntsville, Alabama. This year's theme is "Exploring the Universe and Maintaining U.S. Leadership in Space." For further particulars, see the Society's website at <https://aas.org/>

November 3-6, 2016

The **History of Science Society** will hold its annual meeting at the Westin Peachtree Plaza in Atlanta, Georgia. For registration and additional details, see the Society's website at hsonline.org/meetings/2016-hss-annual-meeting/#cfp.

November 17-19, 2016

The **National World War II Museum** will host its latest International Conference on WWII at the Museum in New Orleans, Louisiana. This year's theme is "1946: Year Zero, Triumph and Tragedy." For more details, see the Museum's website at www.ww2conference.com/splash/.

November 29-December 1, 2016

The **Association of Old Crows** will hold its annual meeting at the Marriott Marquis DC and Convention Center in Washington, DC. For additional info, ping a Crow at www.crows.org/conventions/conventions.html.

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

aerobatic champion Tom Poberezny—at the Hall's Learning Center co-located with the National Museum of the United States Air Force in Dayton, Ohio. For additional information, see the Hall's website at www.nationalaviation.org/.

October 1-2, 2016

The **National Museum of the United States Air Force** will host its WWI Dawn Patrol Rendezvous to commemorate the 100th anniversary of WWI in Europe. For details, see the Museum's website at www.nationalmuseum.af.mil/Upcoming/WWIDawnPatrol.aspx.

October 3-5, 2016

The **Association of the United States Army** will hold its annual meeting and exhibition at the Walter E. Washington Convention Center in Washington, D.C. Over 600 exhibitors are expected to attend. For more information, see the Association's website at <http://ausameetings.org/2016annualmeeting/>.

October 12-16, 2016

The **Oral History Association** will hold its annual meeting at the Renaissance Hotel Long Beach in Long Beach, California. The theme this year is "OHA@50: Traditions, Transitions and Technologies from the Field." For further details, see the Association's website at www.oralhistory.org/annual-meeting/.

October 21-22, 2016

The **World War One Historical Association** will hold its annual symposium at the MacArthur Memorial in Norfolk, Virginia. This year's theme is "1916: Sex, Planes, and Disasters!" and the program includes a tour of the Military Aviation Museum in nearby Virginia Beach. For

September 21-24, 2016
The **Society of Experimental Test Pilots** will hold its 60th annual Symposium and Banquet at the Grand Californian Hotel in Anaheim, California. For more details as they become available, see the Society's website at www.setp.org/annual-symposium-banquet/60th-annual-symposium-banquet-info.html. October 3-5, 2016

September 22-25, 2016

The **Mars Society** will convene its 19th annual International Mars Society Convention at the Catholic University of America in Washington, D.C. For additional details, see the Society's website at <http://www.marssociety.org/home/news/?post=two-months-until-2016-mars-society-convention>.

September 27-30, 2016

The **Aircraft Engine Historical Society** will hold its annual meeting in Dayton, Ohio. For more details, see the Society's website at www.enginehistory.org.

September 28-30, 2016

The **League of World War I Aviation Historians** will hold its "Centennial of Aviation Warfare - Part II" at the National Museum of the United States Air Force in Dayton, Ohio. For more details, see the League's website at www.overthefront.com.

October 1, 2016

The **National Aviation Hall of Fame** will induct its 54th group of honorees—astronaut Captain Robert Crippen, USN; fighter ace and Vietnam War POW Colonel George "Bud" Day, USAF; NASA Mission Control Center director Christopher "Chris" Kraft; and aircraft; and

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:

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Editor's Note

The Rest of the Story.....

Gen. William Y. Smith (USAF, Ret.) was honored with an obituary in *Air Power History* in the electronic Spring 2016, issue, and the printed Summer 2016 issue. But, while the story listed all of his assignments in chronological order, it failed to capture the spirit of the man. He deserved a fuller tribute, including his historical impact on the USAF and national defense policy. For example, during the 1962 Cuban Missile Crisis, he served as special assistant to Gen. Maxwell Taylor and simultaneously worked with McGeorge Bundy, President Kennedy's National Security Advisor. Subsequently, Gen. Smith was invited to help negotiate the 1963 Limited Nuclear Test Ban Treaty with the Soviet Union. In 1975, he was named assistant to the Chairman of the JCS. At the time, the position of Vice Chairman did not exist, so in fact, "Bill" filled both positions. He held that position under Gen. George S. Brown and Gen. David C. Jones. Yet another oversight in the *Air Power History* piece were "Bill's" combat medals and decorations, principally, the Silver Star, the Distinguished Flying Cross, the Purple Heart, the Defense Distinguished Service Medal with oak leaf cluster, and the Air Medal with three oak leaf clusters. Inexplicably, his 33-year civilian career was also omitted. After retiring from military service, he was named a scholar at the Woodrow Wilson International Center. Next, after serving as a board member for three years at the Institute for Defense Analyses (IDA), he served as President for five years. "Bill" Smith co-authored Operation Anadyr, a book on the Cuban Missile Crisis, with the former commander of the Warsaw Pact. He participated in several international conferences on that crisis conducted by Brown University. And he participated in several oral history interviews on deterrence and nuclear arms control. From the 1990s until his death, he was a board member of the George Washington University's National Security Archive, where he worked to safely expedite the release of previously classified government documents to benefit scholars and the general public. Finally, his persona as a scholar and historian, in addition to his combat valor and administrative abilities, made him the logical choice for president of the Air Force Historical Foundation.

In Memoriam

Robert Foster Phillips

(November 3, 1924-May 1, 2016)

Mr. Robert F. Phillips, a retired army and air force historian and a veteran of both World War II and the Korean War, died on 1 May 2016 at his home in Burke, Virginia following a long illness.

He was born in Sioux Falls, South Dakota where he attended local schools and was drafted immediately after high school and sent to Europe as a combat medic with the 110th Infantry Regiment of the 28th Infantry Division. Phillips was wounded in the Battle of the Siegfried Line in Germany in September 1944 and following recuperation in England he returned to his former unit in December 1944 just in time to endure the Battle of the Bulge. Tasked to hold the line, his organization was hit hard with only 750 soldiers out of 3,100 making it back to Bastogne. The remnants of his Division transferred to French control, fighting in the Alsace campaign until February 1945 then returning under U.S. control fighting until V-E Day. Phillips remained in Europe as part of the occupation forces until sent stateside to process out of the Army in November that year.

Using his GI Bill he then earned a B.A. degree from the University of Oregon and deciding on a military career, he enlisted in the Army in April 1950. Two months later he was among the first general replacements sent to Korea. One week before departing he married his fiancé, Marjorie Griffeth from Eugene Oregon, a union which produced two children, Kathryn and Mark.

In Korea he was assigned to Company I, 21st Infantry Regiment, 24th Division. His unit was attacked on September 8, 1950 in the vicinity of Kyongsu, South Korea where he and his platoon leader who was subsequently killed defended a strategic hill holding off an enemy attack until he was rescued by a U. S. machine gun and tank. For his heroic actions Phillips was recommended for the Silver Star which he would receive some 50 years later at a special ceremony held at Ft. McNair in Washington, D.C. on 13 February 2001. The citation would in part read for his "utter disregard for his own personal safety and his cool display of marksmanship while exposed to concentrated enemy fire."

Phillips was later evacuated to Japan because of a severe ear infection and in August 1951 sent to Ft. Riley, Kansas as Regimental Supply Sergeant for the 10th



Infantry Division. Two years following the Korean War he inquired about the status of his Silver Star and was informed that the paper work had been lost and that the time limit for resubmitting had expired. These limits were removed in the late 1990s and through Bob's persistence he was able to locate his former company commander who successfully completed the application.

Phillips mustered out of the Army in April 1953 returning to the University of Oregon earning an MA in 1956. He next went to Washington, D.C. where he became an historian for the Office of the U.S. Army Chief of Military History where he remained for several years before transferring to the Office of Air Force History. In that latter capacity he held several positions including Chief Historian at the Office of Aerospace Research, Chief Historian of the 17th Air Force in Germany before returning stateside in 1976 to serve as Deputy Chief Historian at Headquarters Air Force Systems Command at Andrews Air Force Base in Maryland.

Phillips retired in 1986 following a thirty year civil service career. Following his retirement from the Air Force History program he completed his book *To Save Bastogne*, a history of his unit at the Battle of the Bulge. In addition, he remained active in several veterans' organizations including some in France.

Robert F. Phillips was respected and well liked by many. I believe that the best complement that I heard about Robert was expressed by Martin Blumenson, the esteemed historian and author of the *Patton Papers*. Martin said that "Bob" Phillips was one of the nicest men that he ever had the privilege of knowing. Many others would agree.

George M. Watson, Jr., Ph.D. Senior Air Force Historian -Retired.

Reunions

60th Aerial Delivery Sep 20-22, 2016, Marion, OH. Contact: Peggy Schoen
3930 Dunbar Rd,
Prospect, OH 43342
740-360-4767
pdschoen2@yahoo.com

86th Fighter-Bomber Group WWII Assn Oct 19-23, 2016, Ft. Walton Beach, FL. Contact: Dallas Lowe
P.O. 313
Shalimar, FL 32579
fighterbomberpilot@yahoo.com

91st Bomb Group Oct 14-17, 2016, Charleston, SC. Contact: Mick Hanou
607 Blossom Ct,
Pleasanton, CA
925-425-3220
mhanou@comcast.net
www.91stbombgroup.com/

339th Fighter Group Oct 25-31, 2016 Fairborn, OH. Contact: William Clark Jr.
200 River Ridge Dr,
Waco, TX 76705
254-799-7163
jclark14@hotmail.com

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

433rd Fighter Interceptor Squadron Oct 13-16, 2016, Fairborn, OH. Contact: Charles Bobosky
661 Beech Ave,
Youngstown, OH 44512
330-758-4275
ck661@zoominternet.net

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

623rd Airborne Control & Warning. Sep. 18-22, 2016, Dayton, Ohio. Contact: Sherry Mills
P.O. Box 25806,
Colorado Springs, CO 80906
719-380-1412
sherry@acompletereunion.com

821st Security Police - Ellsworth AFB, SD Sep 30 - Oct 2, 2016, Dayton, OH Contact: Al Seguin
2021 Renford Pointe,
Marietta, GA 30062
770-578-6881
aaseguin@yahoo.com

6314th Sec Police Sqdn (Osan 1968-69) Sep 30 - Oct 2, 2016, Fairborn, OH Contact: Vincent Darcangelo
719 Patricia Ave,
Hermitage, PA 16148
724-981-3429
darcangelo@roadrunner.com

6593th Test Squadron (Special) & 6594th Test Group Aerial Recovery Specialist "DOR". Oct 6, 2016, Fairborn, OH. Contact: Frank Adams
9 Creekdale Cove,
Sherwood, AK 72120
501-413-9774
adamsfl@sbcglobal.net

AC-119 Gunship Assn. Sep 28-Oct 1, 2017, Fairborn, Ohio. Contact: Ron Julian
4919 Appaloosa Trail,
Fairborn, OH 45324
937-546-3219
ac.119.2017@gmail.com

Ranch Hands Veterans Assn. Oct 6-9, 2016, Fairborn, Ohio. Contact: Dick Wagner
8260 Bryn Manor Ln,
Germantown, TN 38139
901-754-1967
cowboy6869@att.net

Classes

PTC-56M. Oct 19-22, 2016, Fairborn, Ohio. Contact: John Mitchell
11713 Decade Ct,
Reston, VA 20191
703-264-9609
mitchelljf@yahoo.com

PTC-65C. Sep 27-30, 2016, Dayton/Fairborn, Ohio. Contact: Jim Folsom
447 Navajo West,
Lake Quivira, KS 66217
913-268-6104
folsom447@att.net

UPT Class 67C (Webb AFB). Oct 20-23, 2016, Fairborn, Ohio. Contact: Mike Trahan
1014 Lansing St,
West Orange, TX 77630
409-920-8680
mtrahan33@gmail.com

UPT Class 72-01 (Laughlin AFB) Sep 29 - Oct 2, 2016, Fairborn, OH Contact: Tim Bellury
120 Sandy Lake Circle,
Fayetteville, GA 30214
678-817-1966
bellury@earthlink.net

List provided by:

Rob Bardua
National Museum of the U.S. Air Force
Public Affairs Division
1100 Spaatz Street
WPAFB, OH 45433-7102
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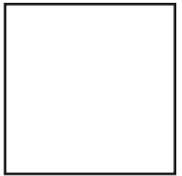
We have new email as well.
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angelabear@afhistory.org
For advertising questions
ed@afhistory.org



March 2016, marked the 70th Anniversary of Strategic Air Command's establishment. From its very humble beginnings, SAC grew into a Global airpower. As a Global power, SAC aircrew set many distance records. What SAC aircraft was the first to fly non-stop the world? What was the nose art on the aircraft? For the true SAC warriors, where did the aircraft take off and land?



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