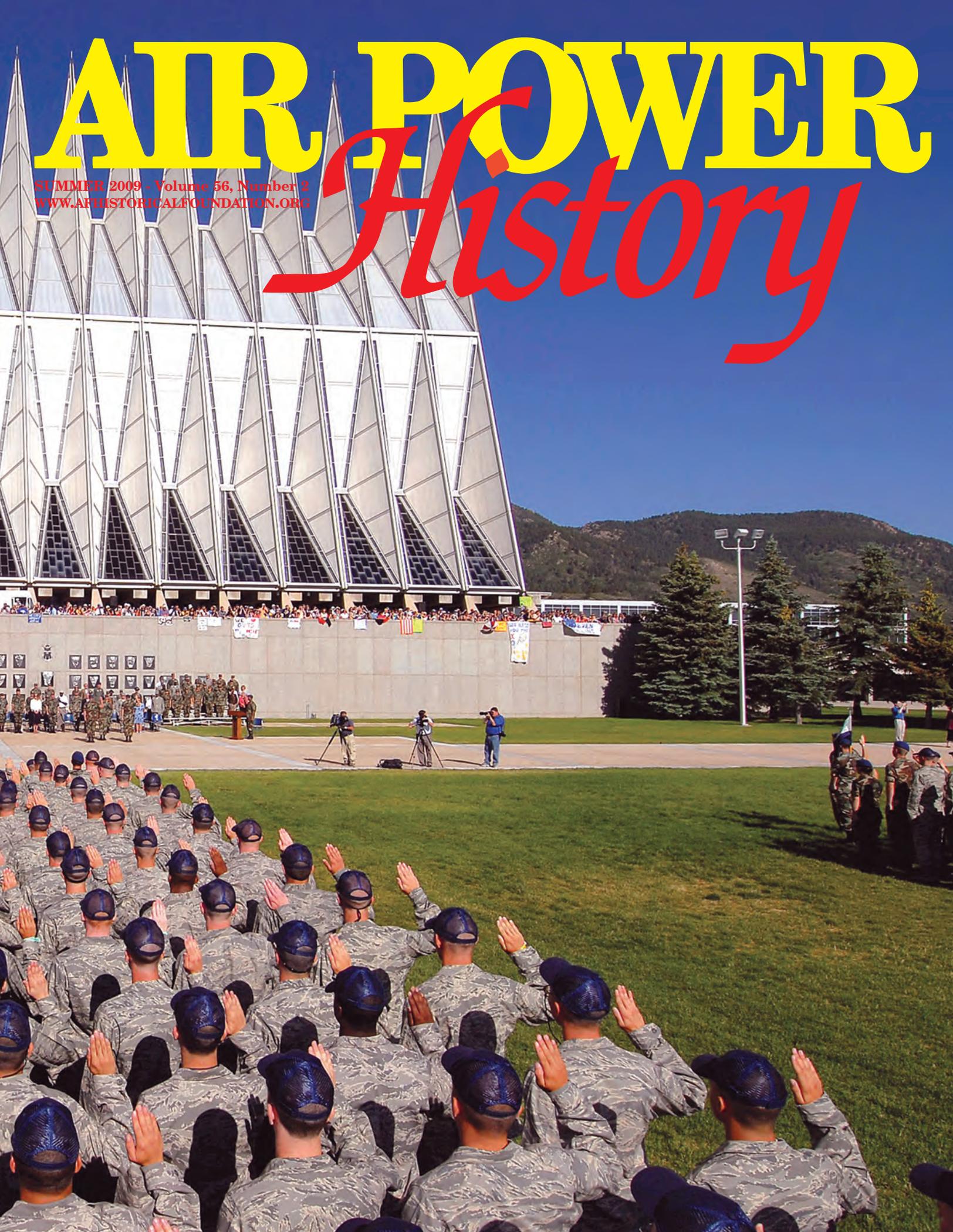


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Features

Racing Against Invasion: Engineering a Kamikaze “Cruise Missile” <i>Thomas S. Momiyama</i>	4
Technology Not Realized: AAF Radar Employment in the Early Pacific War <i>William M. Cahill</i>	14
The A-1C(M) Gunsight: A Case Study of Technological Innovation in the United States Air Force <i>Thomas Wildenberg</i>	28
Establishing the U.S. Air Force Academy: The Early Years <i>Phillip S. Meilinger</i>	38

Book Reviews

<i>From Berlin to Baghdad: America’s Search for Purpose in the Post-Cold War World</i> By Hal Brands. Reviewed by John R. Reese	48
<i>Rupert Red Two: A Fighter Pilot’s Life from Thunderbolts to Thunderchiefs</i> By Jack Broughton. Reviewed by Kenneth P. Werrell	48
<i>Velocity: Speed with Direction—The Professional Career of General J Jerome F. O’Malley</i> By Aloysius G. Casey and Patrick A. Casey. Reviewed by Stetson M. Siler	49
<i>Forgotten Wings: Gliders in Normandy and Southern France</i> By Philippe Esvelin. Reviewed by William E. Fischer, Jr.,	49
<i>To a Distant Day: The Rocket Pioneers</i> By Chris Gainor. Reviewed by Rick W. Sturdevant	50
<i>The Son Tay Raid: American POWs Were Not Forgotten</i> By John Gargus. Reviewed by Stu Tobias	50
<i>Finding Amelia: The True Story of the Earhart Disappearance</i> By Ric Gillespie. Reviewed by Scott Marquiss	51
<i>Rampant Raider: An A-4 Skyhawk Pilot in Vietnam</i> By Stephen R. Gray. Reviewed by Matt Basler	52
<i>Strategy for Victory: The Development of British Tactical Air Power, 1919-1943</i> By David Ian Hall. Reviewed by Stetson M. Siler	52
<i>The Nieuport 28: America’s First Fighter</i> By Theodore Hamady. Reviewed by Scott A. Willey	53
<i>We Flew, We Fell, We Lived: Stories from RCAF Prisoners of War and Evaders, 1939-1945</i> By Philip Lagrandeur. Reviewed by Steven A. Pomeroy	53
<i>Learning to Love the Bomb: Canada’s Nuclear Weapons during the Cold War</i> By Sean M. Maloney. Reviewed by Stéphane Lefebvre	54
<i>Air National Guard at 60: A History</i> By Susan Rosenfeld and Charles J. Gross. Reviewed by Curtis H. O’Sullivan	54
<i>War Wings: Films of the First World War</i> By Phillip W. Stewart. Reviewed by John F. O’Connell	55
<i>Airborne Forces at War: From Parachute Test Platoon to the 21st Century</i> By Robert K. Wright, Jr., & John T. Greenwood. Reviewed by Curtis H. O’Sullivan	55
<i>No Uncle Sam: The Forgotten of Bataan</i> By Anton F. Bilek. Reviewed by Scott A. Willey	56

Departments

Books Received	57
Foundation Notes	58
Letters, News, Reunions	61
History Mystery	64



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The Summer 2009 issue of *Air Power History*, features four articles. In the first, “Racing against Invasion: Engineering a Kamikaze ‘Cruise Missile,’” Thomas Momiyama unravels the mystery of a two-seat trainer for Japan’s World War II Ohka cruise missile. Why was a trainer model required? He consulted English-language sources, but found no answers. Meanwhile, Japanese sources recorded the missile’s developmental history solely “for the sake of the engineering record.” The author also explains why the term kamikaze does not mean suicide.

In the second article, “Technology Not Realized: Army Air Forces Radar Employment in the Pacific War,” William Cahill focuses on the near simultaneous Japanese attacks on Pearl Harbor and the Philippines in December 1941. At both places operational radars tracked the enemy raids. But whereas the surprise attack on Hawaii explains our failure there, we had several hours of warning before the assault on the Philippines. Why did we fail? What went wrong? And what lessons does this experience teach for the future?

Thomas Wildenberg, a frequent contributor to our journal, presents a case study on the A-1C(M) gunsight. In the article he examines the process of technological innovation from the perspective of the engineers who built and advocated the weapon system. Wildenberg also examines the gunsight’s performance in the Korean War and compares the reception that the new technology received from its users. Suffice it to say that veteran pilots and junior birdmen differed sharply in their verdicts.

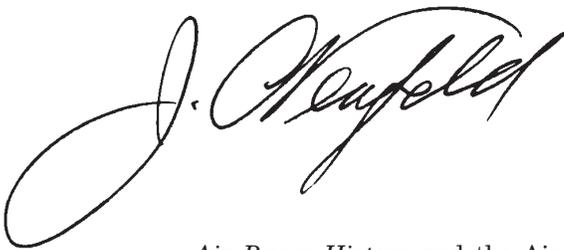
Finally, Phillip Meilinger, a retired Air Force colonel and a professional historian, who recently published a biography on Lt. Gen. Hubert Harman, writes about the early years of the establishment of the USAF Academy. He explores the rationale for a separate service school, identifies the proponents and opponents, and explains why it took so long before the campaign finally succeeded.

Many of our readers look forward to the book reviews. Sixteen books are reviewed. [See page 1.] We welcome readers’ comments on the reviews and Col. Scott Willey, USAF, (Ret.), the Book Review Editor, invites readers interested in writing reviews to contact him.

The Departments Section, features letters to the editor, news, upcoming symposia and reunions, and the ever-popular “History Mystery,” by the prolific Bob Dorr. In this issue the debate continues as Marshall Michel defends his controversial article on the P-51 Mustang: “The Most Important Aircraft in History?” [*Air Power History*, Vol. 55, No. 4, pages 46-57.] Col. Charlie Simpson USAF (Ret.) turns our attention to upcoming events aimed at marking the Fiftieth Anniversary of the USAF Atlas ICBM being placed on strategic alert. [See page 63.]

Finally, Col. Tom Bradley, USAF (Ret.) reports on the most recent Foundation activities. [See pages 58-60.]

We look forward to hearing from readers and welcome your letters. Please let us know what you think of the journal—articles, reviews, departments. How can we improve? Send comments to my e-mail: Jneufeld@comcast.net or write to: *Air Power History*, 11908 Gainsborough Rd., Potomac, MD 20854.



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Racing against Invasion: Engineering a Kamikaze "Cruise Missile"





Thomas S. Momiyama

(Overleaf) Ohka 22 powered by Tsu-11 "engine-jet" for cruise, on the World War II aircraft exhibit floor at NASM's Udvar-Hazy Center. Note the air intake for the rear-mounted engine. (NASM photo by Dane Penland.) (All photos provided by the author.)

IT WAS A RACE TO FEND OFF THE ALLIED INVASION, WHICH WOULD BE THE MOMENT OF CERTAIN DEATH FOR THE DETERMINED NATION TO FIGHT HONORABLY UNTIL THE LAST MAN

In the summer of 2007, I was a volunteer researcher at the Paul E. Garber Restoration Facility of the Smithsonian Institution's National Air and Space Museum (NASM), when a bomb-shaped aircraft featuring two cockpits was pulled out of storage for inspection on the hangar floor. Its unmistakable resemblance to the Imperial Japanese Navy's Ohka kamikaze aircraft piqued my interest. Curiously, the artifact bore an unusually brief description: "acquired from the Navy in 1974" and identified as "Kugisho MXY7-K2 Ohka 43B." I wondered why Japan would have built a two-seat trainer for kamikaze missions, especially since it already had used the single-seat MXY7-K1 trainer. And what did the 43B designation signify? Finding no satisfactory explanations on the Ohka in published English-language sources¹ or from experts like Robert Mikesh, former NASM senior curator and author of Japanese aircraft books, I set off on my own research. I dug into recently discovered Japanese writings as well as some rare wartime Kugisho and Aichi Aircraft engineering records found in NASM's special collection. My quest took me through the entire history of the kamikaze aircraft development from wartime demands to the deliberations, decisions, and design evolution by the Imperial Japanese Navy's Kugisho—the Air Technical Arsenal, equivalent to the U.S. Navy's Bureau of Aeronautics—headquartered at Yokosuka naval base.

In the process, I found that Japan's abrupt and unexpected "unconditional surrender" had left unfinished the Ohka "human bomb" development. However, this little-known project would go on to have intrinsic significance in air power history, beyond the accelerated development of the only combat-deployed Ohka Model 11. At war's end, the year-long Ohka development produced nine distinct variants of the manned aircraft bomb, from gliders to jets to assorted launching modes—all in various stages of design, engineering, test or production.

Different Perspectives

One of Japan's last wartime innovations acquired the nickname of "Baka" (a derogatory term "Fool" in Japanese) bomb among the Allied forces so targeted.² The very notion of a human bomb put the Ohka on the list of famous World War II aircraft. It also ensured that the Ohka would be well documented, analyzed, and judged for its short and limited war record, unorthodox systems specifications, and its rather dismal record of tactical effectiveness.

The Japanese perspective was from the decid-

edly losing side of the war. The fatalism had indeed given rise to the kamikaze warfare—an act of desperation even in the Japanese *Bushido* (the honor code of the *Samurai* warrior) tradition of extreme loyalty. Japan devoted all of its available technological resources to the war effort—knowing full well that it would be for naught. It was a race to fend off the Allied invasion, which would be the moment of certain death for the determined nation to fight honorably until the last man.

To the Western mind, the term kamikaze was perceived as an obsession for self-sacrifice. Webster's dictionary later defined kamikaze as "a Japanese air attack corps assigned to make a suicidal crash on a target." In fact, kamikaze is an alphabetical pronunciation of the Japanese Kanji (Chinese character) *Shimpu*, which literally translates to "Divine Wind" and refers to the sudden overnight storm that sank the Mongolian fleet threatening to invade Japan in 1281. When the Imperial military, after agonizing deliberations, decided to call for the last ditch, certain death tactics, they called it the *Tokko Tai*, meaning Special-Attack Force. To honor the patriotic sacrifice, *Shimpu* was attached as the salutary prefix to that force designation. Thus, *Shimpu Tokko Tai* means Divine-Wind Special-Attack Force. The Allies connected the prefix *Shimpu* to *kamikaze*, while the Japanese kept *Tokko* as spoken solemnly in wartime. The Japanese do not associate *Tokko* with the notion of suicide; in *Bushido*, suicide connotes atonement for a failure or a shameful act and therefore is a wrong descriptor in this case of patriotic sacrifice.³

It is interesting to note the late emergence of the Japanese accounts of the Ohka history, upon which this paper is based. This history was due, in part, to a marked reticence by the former Ohka project engineers to relate their decidedly somber chronicle. Their writings reflect their "painful experience" of shouldering the nation's fate and their responsibility for engineering the final weapon of the war that sent young pilots to their "*Hisshi-Hissho* (certain death in certain victory)." Rear Admiral Jun Okamura, an author and former Imperial Navy engineering officer wrote, "Each case of a young pilot's brave dive into the enemy ship hit deep in the guts of us engineers, as if a silent protest of the pilots against the minute power we and the nation could muster for them." He continued, "But I write, for the sake of the engineering record, about the Ohka as an aircraft whose designs encompassing application of several types of rockets and jets notched an epoch in our aviation engineering history." Okamura's engineering record covers the Ohka 11 model development

After serving in naval aviation for thirty-eight years, Thomas S. Momiyama retired as a member of the U.S. Senior Executive Service, last serving as director of Aircraft Research & Technology at the Naval Air Systems Command. He is a graduate of the Naval War College and Harvard Kennedy School of Government. Currently, he freelances as a technology and public policy advisor in aerospace community worldwide. He volunteers as a research and language specialist at the Smithsonian's National Air and Space Museum.



U.S. naval fighter gun-camera shots of Betty loaded with "winged gismo" Ohka. (National Archive collection.)

to the practically simultaneous evolution of the MXY7-K1 trainer, Ohka Models 21, 22, 33, 43, 43B and its trainer MXY7-K2 and 53.⁴

Project MXY7

In 1944, the Japanese Imperial Navy undertook a secret airplane project called MXY7. Eventually named Ohka (Cherry Blossom), it was a unique, manned-missile that marked Japan's last ditch thrust, i.e., kamikaze. In contrast to all the other aircraft types used for kamikaze missions, the Ohka was the Imperial Navy's only "keel-up" kamikaze weapon, designed from the start as a human-bomb aircraft.⁵ The Ohka, which was to be hastily mass-produced and its pilots solicited to volunteer for their final missions, would constitute the empire's final homeland defense, involving massive kamikaze attacks launched from coastal bases against the Allied invasion fleet.

However, the tide of the war turned too rapidly against Japan and only the original design model Ohka 11 and its single-seat trainer version were deployed before the war ended on August 15, 1945. The loss of an entire Ohka flight to enemy fighters on its inaugural mission triggered within the

Kugisho an immediate and major rethinking of the missile's basic design and operation. In due course, Ohkas scored powerful hits against the U.S. fleet, but their battle records constituted a rather small part of the known total of nearly 4,000 kamikaze pilots who perished while inflicting considerable critical damage in the final days of the Pacific war. Nonetheless, the Ohka 11s that were left in significant numbers at kamikaze corps bases in Kyushu and Okinawa now occupy prominent places in several of the world's air museums, including ones in Japan.

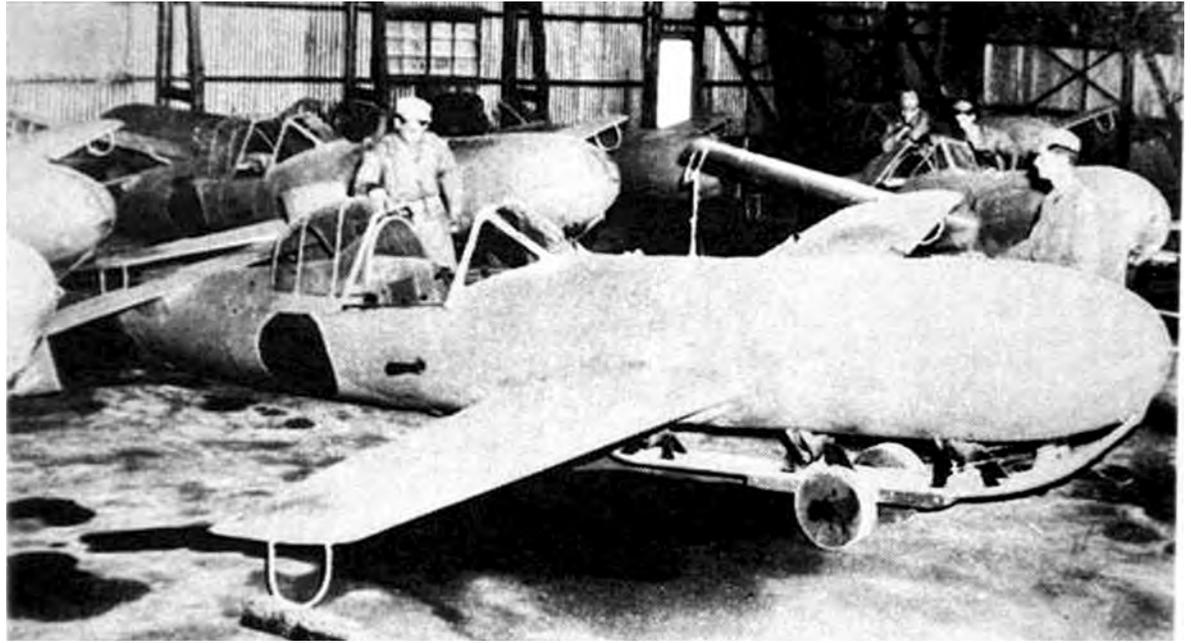
In early August 1944, Ensign Shoichi Ohta of the 405th Air Wing submitted his idea for a "human bomb" to the Naval Air Headquarters. Ohta had conceived a super-high-speed, small, single-seat, manned, high-explosive, glide-bomb type *Tokko* aircraft, to be captive-carried under the G4M2E Type 1 Land-based Attack-Bomber (code named Betty by the Allies), and released in the air at some distance from the enemy fleet for the final ramming dive. The distance depended on the altitude at release for the glide ratio of the winged bomb.

The human bomb idea disturbed some engineers in the Imperial Navy. In a meeting with Ohta, Lt. Comdr. Tadao Miki, a highly respected designer of advanced aircraft at the Kugisho, was incredulous. "What about the guidance system?" he asked. When Ohta replied, "A man would be on board." Miki declared "We will not produce such a thing!" But Kugisho chief Admiral Wada asked Miki for "technical advice." Miki's blunt prediction of the vulnerability of the slow Betty bomber carrying "that thing," prompted Wada to concede the need for massive fighter escort. When Miki again pressed Ohta, "But who is going to pilot it?" Ohta replied, "I will, of course." In the end, Wada sent the proposal up the chain. Dejected that the rationality of human life has been overtaken by the desperate war situation, Miki and his immediate boss, Commander Masao Yamana, left muttering, "Before this is over, we too will have to take a dive in that plane."⁶

The Imperial Naval Air Headquarters acted quickly and on August 16, 1944, assigned a secret code name, *Maru-Dai* ("Maru" meaning circle to indicate a code name and "Dai" being the first Chinese character of Ohta's name) to Kugisho for the kamikaze aircraft development. Besides its design, engineering, and prototyping capabilities for the navy's advanced aircraft concepts, Kugisho contained an aircraft manufacturing factory as well as the Yokosuka Air Wing, which served as the flight test unit. The design team of Yamana and Miki as project manager and chief designer, respectively, was "holed up" in a Kugisho dormitory room and initiated the design effort⁷ on the prototype designated MXY7 (M for special purpose aircraft; X denoted experimental in conjunction with Y for Yokosuka Kugisho; and 7 for seventh in the series).

By mid-August, a secret solicitation went out for pilots to volunteer to man the still-in-design *Tokko* aircraft. At the same time Kugisho, concerned about the anticipated difficulty of inexperi-

Ohka 11 (single-seat) trainer MXY7-K1s captured by U.S. forces. Note landing sled and wing-tip outrigger. (USN photo—Mikesh collection.)



**KUGISHO
PUSHED PRO-
DUCTION, ...
AND MANU-
FACTURED
155
OHKA 11s,
WITH PLANS
TO REACH
600 BY
MARCH 1945**

enced pilots flying high-performance glide bomb aircraft, initiated a parallel effort to develop a trainer prototype MXY7-K1, with return-landing capability. Kugisho's chief Wada kept under advisement designer Miki's concern about the tactical vulnerability of the mother-ship captive-carry operation and the consequential need for massive fighter escorts. In fact, this operational deficiency of the captive carriage would become the single driving factor in the major post-Model 11 evolution of the MXY7 system to faster mother ships and eventually led to ground launching of the aircraft.

On August 28, Commander Minoru Genda—the Imperial Navy's brain behind the Pearl Harbor attack, other major campaigns, and later the post-war Japan Air Self-Defense Force chief of staff—convened a meeting at naval headquarters at which the Ohka's performance, operation, and design requirements were specified.⁸

its armor-piercing warhead would occupy 80 percent of the payload

it would be of extremely high-speed design to penetrate enemy fighter cover

it was to be extremely small for ease of assembly and storage in narrow underground bunkers

it would be manufactured from easily obtainable materials

it would be of simple design for easy manufacturing in one-tenth the time required for a normal fighter (1,500 man-hours).

The specifications also projected a jet-powered model, with fuel capacity for one-way travel.

In early September 1944, within a month of design initiation, the prototype No. 1 of Ohka Model 11 was completed. The first airframe design and first engine type selected featured a cluster of three solid-fuel rockets. On October 23, the Ohka underwent a drop test. The test vehicle was unmanned, contained no explosives, and employed

a spring-loaded elevator control. Performance testing began November 20 and continued into 1945. The Ohka was still unmanned but carried a live bomb load that exploded on the sea surface. During this test phase, Ohka attained speeds of 250 knots in glide at 3,500 feet altitude (designed for 500 knots in terminal dive) and 350 knots with rockets fired (designed to fire in a burst to evade enemy fighters). Meantime, Kugisho pushed production, at its own as well as contractors' factories, and manufactured 155 Ohka 11s, with plans to reach 600 by March 1945.

Manned flight test would have to be made with an Ohka equipped with return-landing capability. Thus, the trainer MXY7-K1 took to the air on October 31, with Kugisho test pilot Chief Petty Officer Kazutoshi Nagano at the controls. The first manned Ohka flight was successful, with Nagano safely returning to Hyakurigahara, the first Ohka operating base northeast of Tokyo. The Ohka trainer MXY7-K1, whose development had been initiated almost simultaneously with the Model 11 in August 1944, had the same basic aerodynamic design as the Model 11. Differences included installation of the landing sled and wing-tip outriggers; adding flaps on the wings, to slow the landing speed to an acceptable 120 kts; replacing the bomb load and the booster rockets with two water ballast tanks simulating the design take-off weight and center of gravity position; and painted in trainer-aircraft orange. Landing such a high-speed glider would be too much of a challenge for many novice pilots even only for one check out flight per pilot. Thus, Zero fighters were used at high power setting in landing approach to train for the Ohka trainer flight. Some would-be kamikazes piloted opined, "I need only one Ohka flight and that would be my final flight."⁹

Forty-five MXY7-K1 trainers were manufactured and used from mid-November 1944, by No. 721 Air Wing, the first Ohka-flying *Shimpu Tokko*

Japanese Betty bomber loaded with Ohka 11. (Japanese Navy photo.)



Tai (Kamikaze Corps), to train the pilots for the *Tokko* mission. The 721st was given a specific unit identification of *Jinrai Butai* (“Divine-Thunder” Wing), as had become the custom to honor all *Tokko*-designated units by individual salutary names. The Ohka flight check-outs using the MXY7-K1 were not problem free. The captive carriage made the relative aircraft attitudes and aerodynamic forces between the Ohka and the mother ship very critical especially at separation. To balance those forces for safe separation, the water ballast tanks fore and aft of the cockpit in the -K1 had to be emptied, before landing, in proper sequence. One pilot lost his life when he made the mistake of emptying the front tank first thereby causing pitch up into a spin and crash. As training progressed, mother-ship airspeeds were adjusted until a safe launch could be made without water in the ballast tanks.¹⁰

Ohka Goes to War

On March 21, 1945, the first Ohka attack mission was launched from Kanoya base in Kyushu against a U.S. fleet reportedly including three carriers. The flight of 16 Ohka-carrying Betty’s were intercepted by about 50 U.S. Navy fleet defense fighters and, despite a Japanese 30-fighter escort force, 15 Ohka’s were confirmed shot down some 60 miles before the targets. Some Bettys released Ohka’s—obviously for naught, with an estimated 20-mile gliding range of the Ohka 11. American fighter pilots’ debriefing noted that the Betty bombers had flown much slower than normal and “all of them had been carrying some sort of winged gismo suspended beneath their hulls.”¹¹ The *Jinrai* wing lost 160 lives (15 Ohka pilots, 135 Betty crew and 10 escort fighter pilots) in that one mission¹²—an alarming vulnerability Kugisho’s Miki had warned of at the project’s inception.

Tactically, the Imperial Navy thereafter switched from a large sortie flight to single or small number flights in dawn and dusk conditions. The next nine Ohka *Tokko* missions were launched between April 1 and June 27. On April 12, Lieutenant Saburo Doi’s Ohka struck and sank the

destroyer USS *Mannert L. Abele* (DD-733), which had already shot down two of that Ohka kamikaze flight of eight. Doi’s Betty mother-ship returned to base with the record of the first success of the Ohka weapon system—reportedly sinking a battleship, until corrected in a cross-check with the post-war U.S. record. Credit for damaging another U.S. ship by other Ohka’s in the same battle was not identified.

Second Generation Ohka—Faster Mother Ship and Cruise Capability

Kugisho decided to replace the slow, 236-kts. Betty mother-ship with the faster 296-kts. P1Y Ginga (allied code named Frances). To improve the glide range of the Ohka, Kugisho replaced the momentary-burn rocket thrusts with the continuous thrust of the then emerging jet propulsion. Redesigning the captive carriage on Frances and installing a cruising jet engine resulted in halving the nose-mounted explosive from the Ohka 11’s 1,200kg to 600kg—judged still adequate. A progenitor of the jet engine, Campini-type, air-cooled gasoline-engine driven fan-jet (called an “engine-jet” by the Japanese): Tsu-11 Hatsukaze, which had produced 740kg static thrust¹³ was selected to extend Ohka’s range to about 70 miles. Lacking, however, the emergency acceleration capability under enemy fighter pursuit, as provided for the Ohka 11 with its three-rocket boost, one rocket was externally attached under the fuselage of the redesigned Ohka airframe for the same purpose. The Kugisho design team completed this new design Model 22¹⁴ within a month of design initiation (in April 1945) and the Kugisho factory manufactured 50 airframes. But due to the delay in Hitachi’s delivery of the Tsu-11 engines, the aircraft assembly for the flight test was delayed into June. Meanwhile, Kugisho assembled a test airframe for the new Frances-carriage design, but still with the Model 11’s three-rocket configuration.¹⁵ This was identified in several references as Model 21 (second airframe model with first engine type). There is no record of this test model being flown.

The initial Ohka 22 in-flight tests—captive-carried but without launch separation—were

ON MARCH 21, 1945... 16 OHKA-CARRYING BETTY'S WERE INTERCEPTED BY ABOUT 50 U.S. NAVY FLEET DEFENSE FIGHTERS... 15 OHKA'S WERE CONFIRMED SHOT DOWN

Ohka 11 captured by U.S. forces at the end of the Pacific war. (USN photo—Mikesh collection.)

FINALLY ON AUGUST 12, 1945, KUGISHO WAS READY FOR THE FIRST FREE-FLIGHT TEST



AN INADVERTENT FIRING ... CAUSED THE OHKA TO SCRAPE ALONG THE BOTTOM OF THE MOTHER-SHIP... NAGANO WAS FATALLY INJURED

plagued with mishaps. The first flight attempt on July 22, 1945, to check out the Tsu-11 engine operation at altitude failed when aircraft No.1 inadvertently dropped off the mother-ship Frances on the take-off run. In the follow-on tests with aircraft No. 2, the Tsu-11 engine oil overheated, requiring oil cooler and air-cooling intake redesigns. The 722d Air Wing, established as the Ohka 22 flying *Tokko* corps at Konoike air base on the coast east of Tokyo, participated in the testing. But problems continued in the in-flight jet ignition of the Tsu-11 in a complex process of gasoline-engine warm-up while still on the ground with fuel fed from the mother ship, followed by a fuel tank switch and jet ignition in flight.

Finally on August 12, 1945, Kugisho was ready for the first free-flight test of the Ohka 22—planned with the pilot to bail out of the aircraft and land by parachute. Kugisho's Ohka project test pilot since the successful MXY7-K1 test flight Ensign Nagano manned the cockpit. Misfortunes of Ohka 22 persisted, however. Just at the time of separation from the mother ship, an inadvertent firing of the under-fuselage mounted boost rocket caused the Ohka to scrape along the bottom of the mother-ship, snatching the tail off the Ohka and sending it into a spin. Nagano bailed out but at a too low altitude for the parachute to open and was fatally injured. Three days later, on August 15, 1945, the war ended.

The Ohka 22—the bench mark for reaching the second-generation of the Ohka “missile” system with the cruise capability—never saw combat. The only Ohka 22 remaining, captured by U.S. forces after the war, has been restored and is exhibited in

the Smithsonian National Air and Space Museum's Udvar-Hazy Center in Chantilly, Virginia.

Into the Jet Age

Rolling back the clock, the Imperial Navy, dissatisfied with the progress of the Ohka 22 /Tsu-11 operation and Frances-carriage, considered yet another mother-ship option of the four-engine, long-range attack bomber G8N1 Renzan then still in the prototype stage. But a more concerted evolution in this phase was to upgrade the Ohka cruise engine to the still-in-prototype Ne-20 turbojet engine, built for Nakajima Kikka, Japan's first jet fighter. The jet engine sought to double the Ohka 22's range to 150 miles and increase its bomb weight to 800kg. The Model 33 (third airframe model; third engine type, i.e., turbojet) would have been a bona fide turbojet aircraft to follow the Kikka fighter whose prototype did fly—marking the Imperial Navy's technological advance into the “jet age.” Ohka 33 remained a design only, however, as the development of the G8N1 Renzan was cancelled. Notably also, the cancellation of the Model 33 ended the original captive-air-carriage concept of the MXY7/Ohka system. As an additional note, in the aftermath of the captive carriage problems, encompassing Betty, Ginga (Frances) and Renzan mother ships, Kugisho also studied a simpler airborne and release concept of towing the Ohka aloft. Design of the Ne-20 jet powered Model 53, also with long wings (but with releasable tips) for the proper flying quality in aero tow, did not go beyond the conceptual stage.



KUGISHO REALIZED THE SPECIAL CHALLENGE TO THE PILOT'S SKILL IN THE CATAPULT LAUNCHING

Third Generation Ohka: Surface-Launched Cruise Missile

Japanese published sources indicate that the Model 33 design study was turned into a study of catapult-launching of the Ohka from submarines—as perhaps learned from the already existing M6A1 Seiran special attack aircraft operating from the I-400 Class aircraft-carrier submarines.¹⁶ This design identified as Ohka Model 43 did not progress beyond the design consideration either.

That was because, as early as March 26, 1945 (immediately after the disastrous first combat mission of the Ohka), Kugisho had taken note of the healthy growth of the Ne-20 turbojet engine and began another study of a turbojet-powered, relatively simple, catapult-launch capable *Tokko* aircraft to attack the enemy fleet over the horizon from shore bases. Logically, this study was folded into the Ohka lineage along the turbojet-powered Model 33 turned 43 design and was pushed ahead with priority. This ground-based catapult launched Ohka 43B¹⁷ design entailed a larger wingspan needed for catapulting speeds, all metal construction, and wings folding to fit inside the bunker. The design also included in-flight release of wing tips for the final dive and consideration for removable-and-retractable landing sled for “redeploying (between bases), and possible training purposes.” Kugisho and Aichi Aircraft factories were gearing up for production with the plan to deploy in September 1945. But

with the Ohka 22 production still on its way and Ne-20 endurance-run difficulty being encountered, the Kugisho-Aichi design effort only reached a mock-up evaluation stage by the end of June and took another month to complete detailed design drawings. Thus no flyable Ohka 43B was built when the war ended in August.

Answer to Two-seat Kamikaze Trainer

When the ground-launched Model 43B was conceived, Kugisho realized the special challenge to the pilot's skill in the catapult launching, thus, the need for a ground-based catapult-launch to ensure a successful takeoff even for the one-time mission. Kugisho decided to develop a Model 43B-specific catapult-launch trainer: MXY7-K2. With a calculated efficiency, they chose to modify the Ohka 11-trainer MXY7-K1 glider fuselage to add a second cockpit in the front for the instructor pilot by replacing one of the water-ballast tanks. One booster rocket was added in the tail solely to augment catapult acceleration. New larger and flap-equipped wings were designed to complete the trainer. The catapult operation of the MXY7-K2 trainer—tracking the plan for the Ohka 43B then still under development—featured the aircraft mounted on a launching cradle strapped with two solid-fuel rockets (each with 1,500kg thrust for a four-second burn) and running on the 100-meter (328 feet) track.¹⁸

Late in June 1945, the MXY7-K2 made a suc-

Only two Ohka 43B-Trainer MXY7-K2s built, captured by U.S. forces after the war. (NASM collection.)



THE STORY OF THE OHKA IS NOT AN INTERRUPTED ACCOUNT, BUT OF A DESPERATE AND COMMITTED NATION AND ITS NAVY TO PURSUE AN INCREDIBLE AIR WARFARE CONCEPT

Successful catapult-launch test flight at the Takeyama (west of Yokosuka) Marine Corps airfield, with Navy pilot Captain Hiromitsu Ito at the controls and the Ohka project chief designer Miki in the trainee/observer seat. The flight was so successful that Miki and his pilot joked, “After the war, we should set this catapult launching on top of Mt. Hiei (overlooking the beautiful, renowned Lake Biwa near the old capital Kyoto) for sightseeing tours.”¹⁹ Ironically, it took the last desperate warfare need to produce a two-seat kamikaze system for the chief designer of the Ohka project to experience the flight warriors had taken to their end.

Only two MXY7-K2 prototypes were built and the only one left is the “two-seat kamikaze trainer” at NASM in Washington, D.C. Significantly, this (Ohka 43B-trainer) MXY7-K2, together with the only Ohka 22 in existence and also in the NASM collection, constitute the only artifacts remaining of the second generation Ohka. Although the MXY7-K2 does not display the late model Ohka trade mark of a cruise engine, it is probably the sole remaining catapult-launched and flown artifact of the “third” generation Ohka. This shows the move from the tactically deficient air-launched mode to the stand-alone surface-launch operation.

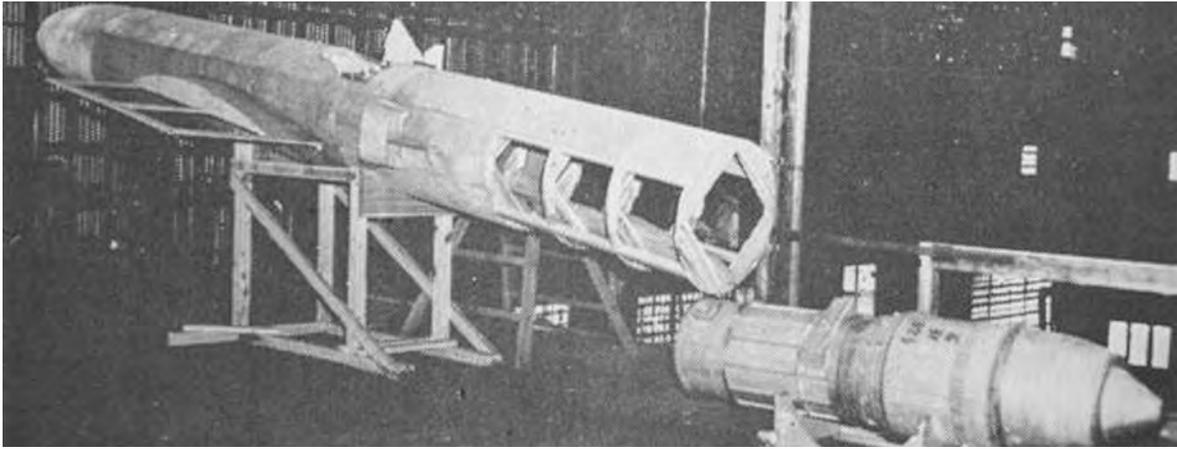
At War’s End

The end of the war came with some consequential incidents of Imperial Navy officers’ self reflection steeped in the *Bushido* code. Vice Admiral Takijiro Onishi, Commander of the First

Fleet, committed *Seppuku* (the Samurai’s way of ending his own life in atonement for his failure by taking the sword on himself) the day after the emperor’s surrender declaration. It was Onishi who had advised the Imperial Naval Headquarters that the overwhelmingly superior Allied fleet defense prevented effective Japanese navy strikes short of self-sacrificing ramming dives and thus engendered the *Tokko* assignment to practically all of the air wings. His last letter read: “To all the *Tokko* souls. Well fought. My deepest gratitude to you. You went, believing in the final victory which was not to be. With my own death I wish to pay gratitude to all the souls of my men and their families. To the young left behind, you are the treasure of the nation. Strive to take the spirit of *Tokko* into the coming time of normalcy, for preservation of the Japanese nation and peace to mankind of the world.”²⁰ Three days after the war, the originator of the Ohka concept now Lieutenant, j.g. Ohta—an air reconnaissance officer and non-pilot—manned a Zero fighter left at the Konoike Ohka air wing base and flew off into the Pacific and was never seen again.

The story of the Ohka is not an interrupted account, but of a desperate and committed nation and its navy to pursue an incredible air warfare concept. In a sense, it epitomizes how nations went to war, in hopefully the last era of the world wars. The diametric opposition between warring nations invariably escalates into seemingly deep-seated emotional heights. The character, determination, and dedication with which nations harness their

Mock up of the Model 43B fuselage with the mock up of the Ne-20 jet engine in the foreground. (Mikesh collection.)



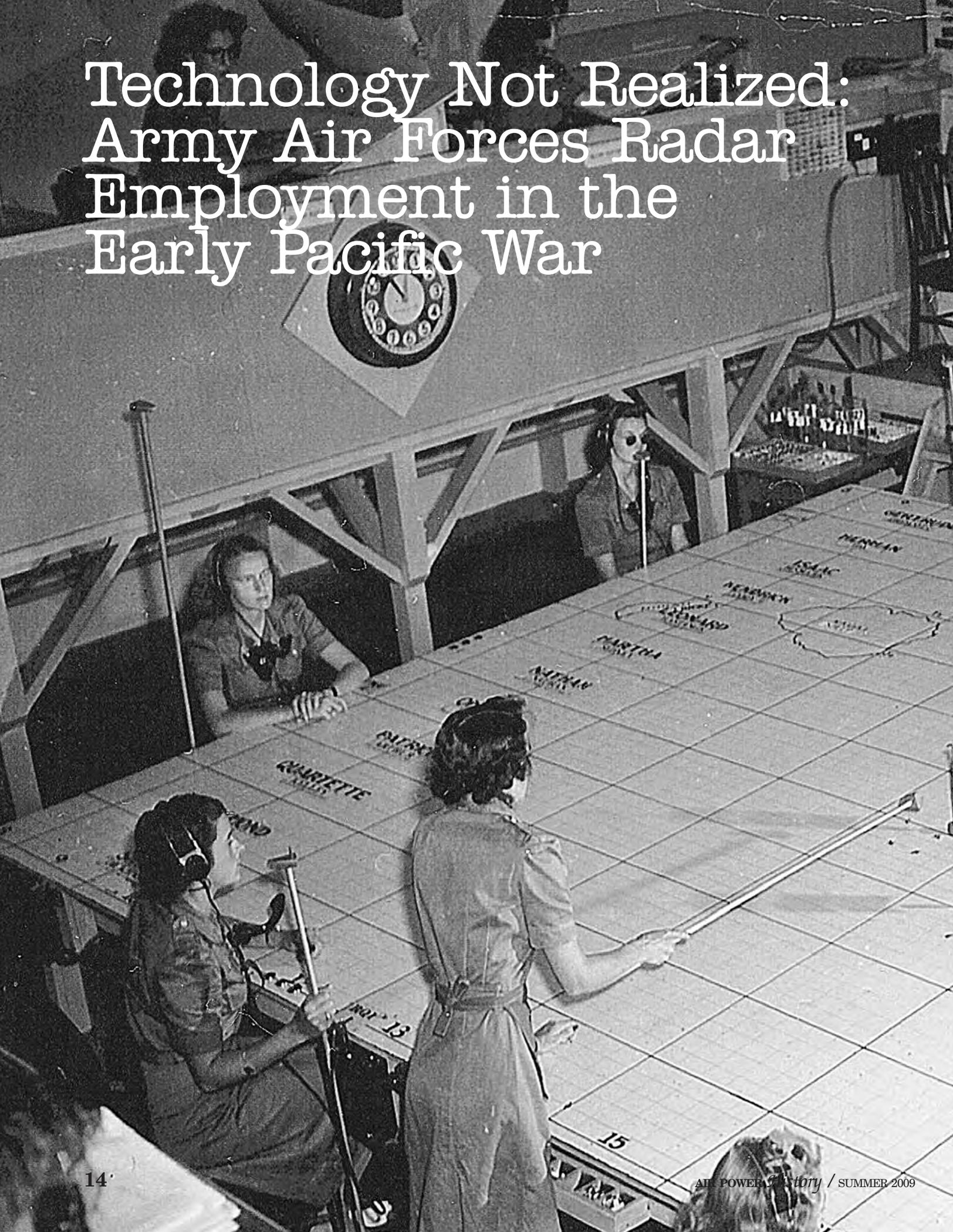
resources and powers to war are steeped in their own cultures, traditions and beliefs. However, while the instinctive patriotism and will to fight for one's homeland may be the same for each side, it takes different forms and directions that can affect even the tactics of warfare. For Japan it meant devising a human bomb to defend their

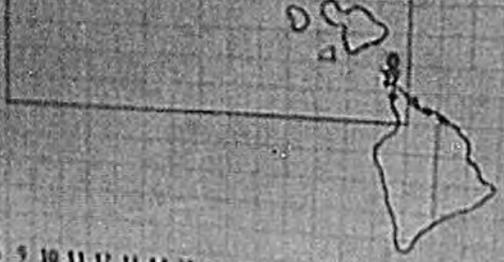
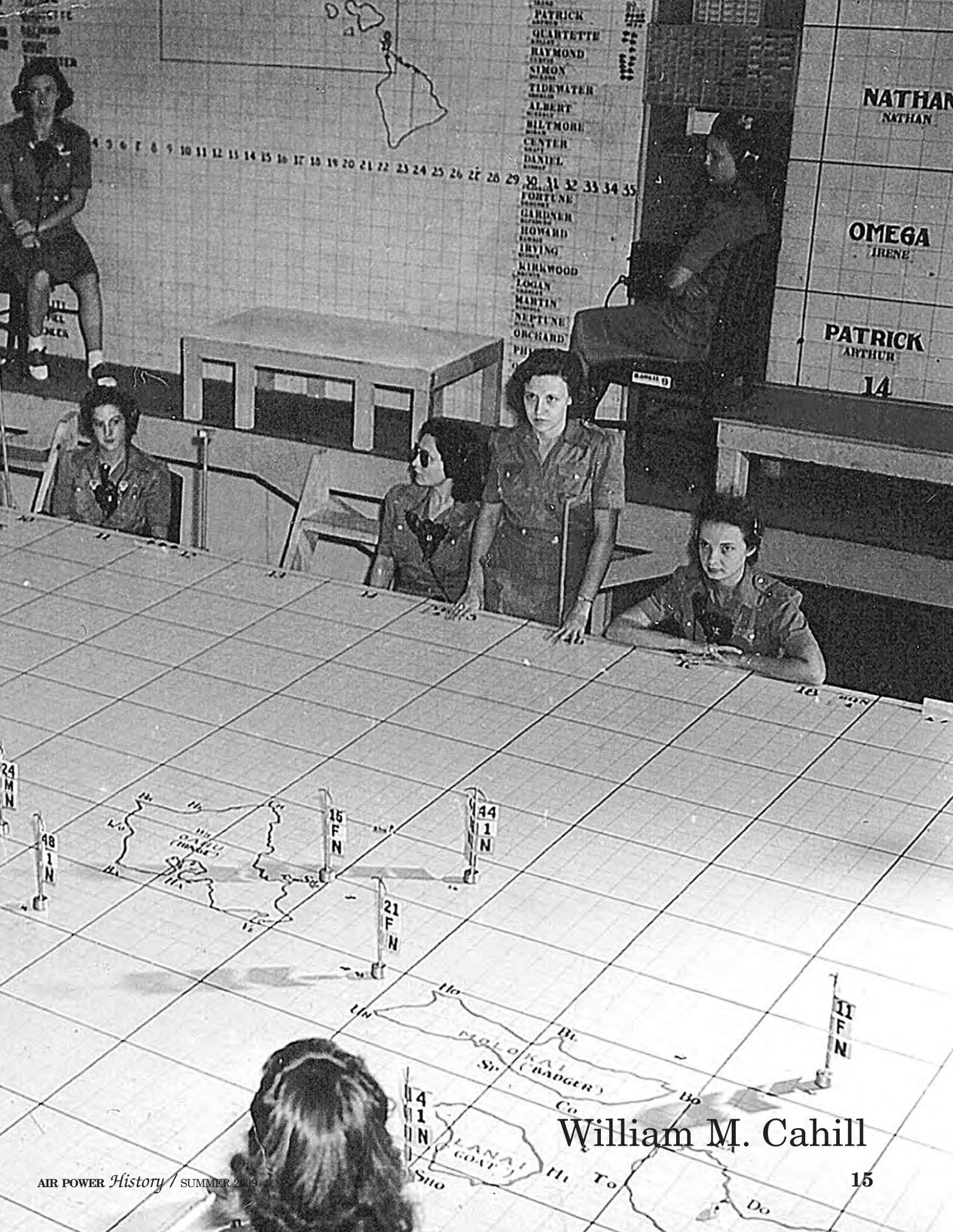
ancestors' land, symbolized by the Emperor. The Germans, too, engineered a manned V-1 missile, but stopped short of a "suicide" version.²¹ For the British it meant patriotic sacrifices for the "Royal Kingdom," Russians sacrificed for *Rodino* (the Motherland), and Americans fought for the "Flag of Our Fathers." ■

NOTES

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2. Mikesh Robert. *JAPANESE AIRCRAFT Code Names & Designations*. Atglen, Pa.: Schiffer Publishing, Ltd., 1993, pp. 165-81; Akimoto M., *All the Regular Formed Aircraft in Japanese Navy* (Japanese) Tokyo: Kantosha, 2001, pp. 6-7
3. Almost half a century later I had the privilege of meeting, in Washington, D.C., Kaoru Hasegawa, a kamikaze pilot who was shot down in his final dive but rescued from the sea by the crew of the American destroyer he was targeting. Mr. Hasegawa was on a personal mission to explain the meaning of kamikaze. He said "Everyone was going on *Tokko* mission—sooner or later. When I was called, my time had come." That was the accepted social psyche in the nation, whose homeland defense line had been pushed back to the same shoreline where, in 1281, the Mongols threatened invasion until the "Divine Wind" saved the empire.
4. Okamura J. and Iwatani E., *Aircraft of Japan—Navy Aircraft section* (Japanese) Tokyo: Shuppan-Kyodosha, 1960, pp. 233-48.
5. Watanabe Y., *Unknown Swords* (Japanese) Tokyo: Bungei-Shinju, 2002, pp. 449-50. The Imperial Japanese Army also developed a keel-up kamikaze aircraft—Ki-115 Tsurugi (Sword), but it was of one basic design, simpler and of lesser performance than Ohka; none was used in combat.
6. Naito H., *Thunder Gods—The Kamikaze Pilots Tell Their Story*. New York: Kodansha, 1989, pp. 32-36
7. Ikari Y., *Navy Kugisho (Part 2)* (Japanese) Tokyo: Koujinsha 1985, p. 151.
8. Torikai Y. *Tokko Weapons—Human Bomb "Ohka"* (Japanese) www.geocities.jp/torikai007/1045/kaiten.html, 5 of 13
9. Ikari, pp. 154-55.
10. Naito, p. 48. A "strobe camera" photo on this page shows the wind tunnel experiments of the Ohka dropping away, at various speeds, from the mother-ship Betty to determine the optimum speeds for safe launching.
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12. Osuo K., *Record of the Special Attack Corps (Navy Section)* (Japanese), Tokyo: Kojinsha, 2005, p. 71.
13. Ishizawa K., *Kugisho Special Attack Aircraft Ohka 22 Afterburner* (Japanese), Japan Aviation Journalist Association Puten News 85, Tokyo, 2007, pp. 1-6.
14. NASM Archives: *Captured Documents: 1st Naval Technical Depot MXY7, Ohka 22, Baka, Manual* (Japanese), 1945.
15. Nozawa M., *Encyclopedia of Japanese Aircraft, 1900-1945* (Aichi-Kugisho Section) (Japanese) Tokyo: Shuppan Kyodosha, 1981 edition, p. 203.
16. Momiyama, Thomas. *All and Nothing in Air & Space Magazine*, Washington, D.C.: Smithsonian Institution, November 2001, pp. 22-31.
17. Aichi-Kugisho report (by project leader Masao Yamana), March 5, 1945 (Japanese) "Ohka Model 43 – Ohka Model 33 Planning Summary" (from the collection of T. Watanabe of Aichi O.B.Club), pp. 2-29.
18. Nohara S., *The XPlanes of Imperial Japanese Army & Navy, 1924-45* (Japanese), Kugisho Special Attack Aircraft "Ohka" Models 22, 43 (1945); *Illustrated Warplane History—Series 8* Tokyo: Green Arrow Publishing Co., 2000, pp. 281-95.
19. Ikari, p. 161.
20. Kaneko T., *Record of Shimpu Tokko* (Japanese). Tokyo: Kojinsha, 2001, p. 238.
21. Aeronautical Staff of Aero Publishing, Inc., *KAMIKAZE, FZG-76 "REICHENBERG"*, NASM collection; Koku-Joho (AIREVIEW) Special Edition No. 88, *German Aircraft in WW II* (Japanese) Tokyo: Kantosha, 1958, pp. 70-73. To be technically correct in the history of the "piloted flying bomb," one must note that the German Luftwaffe did not go beyond the well-known test flight by Hanna Reitsch of the cockpit equipped V-1 cruise bomb. The piloted V-1s were FZG-76 Reichenberg I (training glider), II (single-seater with a pulse jet propulsion) and III ("suicide" version). Reichenberg I and II were ready to train a number of pilots, who were to be launched from captive air carriage — as in the original Ohka operation — then select and aim at the target, set controls, and bail out for parachute descent. But the project was cancelled by Hitler's ban against suicide missions.

Technology Not Realized: Army Air Forces Radar Employment in the Early Pacific War





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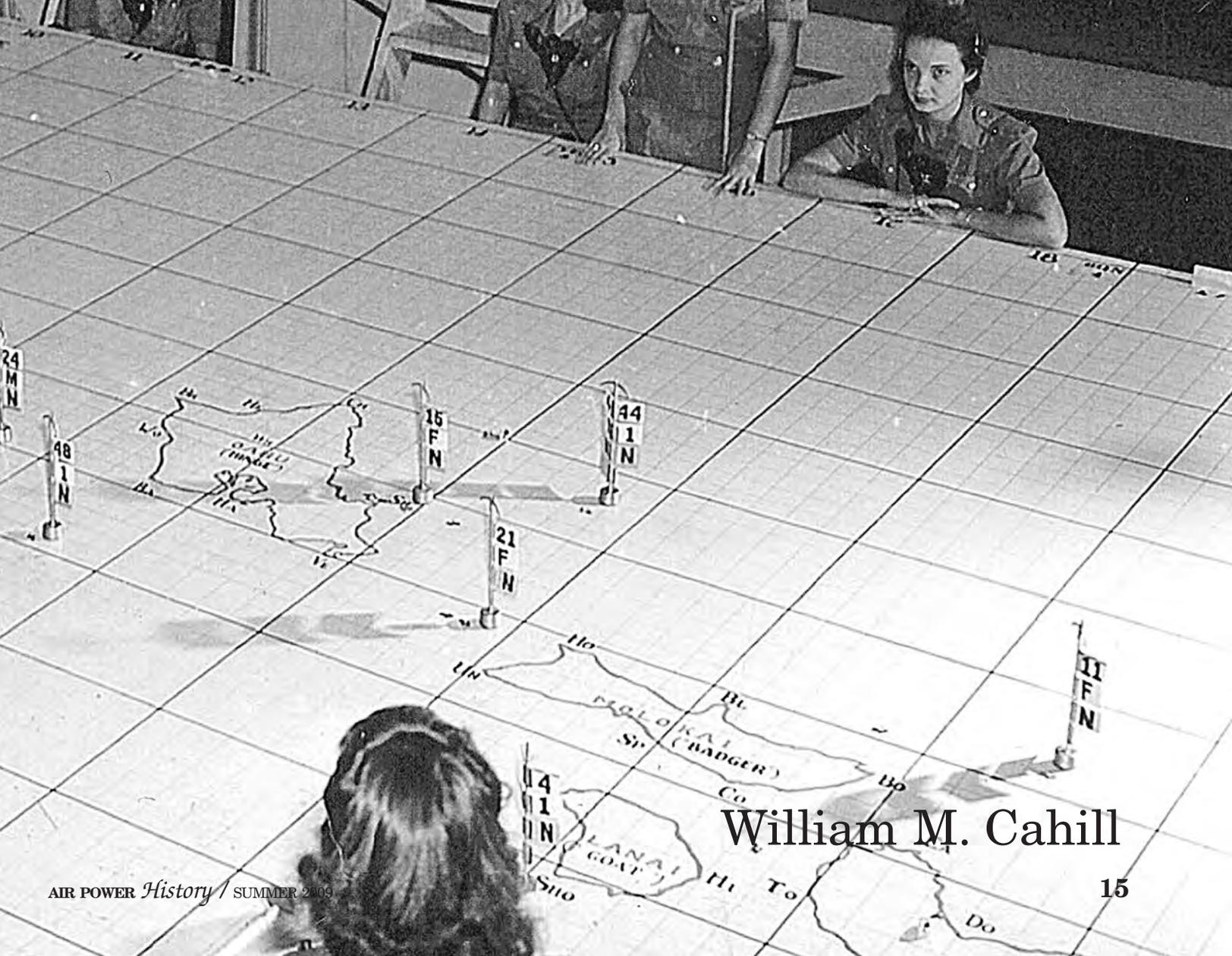
PATRICK
QUARTETTE
RAYMOND
SIMON
TIDEWATER
ALBERT
BILTMORE
CENTER
DANIEL
FORTUNE
GARDNER
HOWARD
IRVING
KIRKWOOD
LOGAN
MARTIN
NEPTUNE
ORCHARD
PHILIP

NATHAN
NATHAN

OMEGA
IRENE

PATRICK
ARTHUR

14



William M. Cahill

(Overleaf) December 1942, view of Hawaii's Information Center, located in a tunnel at Fort Shafter. In May 1942, this permanent facility replaced the temporary facility in Building 307 and depicts what a fully prepared air defense facility of the era should look like. (Signal Corps photo, National Archives.)

Japan's stunning employment of air power on the first day of the Pacific War, in 1941, is readily acknowledged by most; but its corollary—the failure of U.S. air power in the Philippines and Hawaii—is often overlooked. While this failure of American air power may be written off to the tactical—and operational—surprise achieved in Hawaii, this was hardly the case in the Philippines, where the U.S. Army Forces in the Far East (USAFFE) had many hours of warning. Both Hawaii and the Philippines had operational radar sets that tracked the incoming raids, yet Army Air Forces fighters failed to intercept the Japanese bombers. What went wrong? How did the technology that saved Britain in 1940 let America down?

Early U.S. Army Air Defense Concepts

The U.S. Army's involvement with the concept of area air defense can be traced to the late 1920s. In the era of small Air Corps exercises and slow First World War-era bombers, point defense of targets, such as airfields, was relatively easy. This changed in the 1930s. During exercises in Ohio in 1931, Air Corps fighter aircraft achieved little success against "enemy" bombers reported by a ground observer net. Later, Capt. Claire Chennault, an instructor at the Air Corps Tactical School, devised a warning system based on the British experience in World War I. This rudimentary air defense system, using ground observers coupled with filter centers, improved plotting techniques, and better command and control, achieved success in the Air Corps' May 1933, maneuvers. Additional exercises in the late 1930s, laid the foundation for the Army's air defense doctrine that was in place in 1941.¹ This system, though, was limited by its sensors—volunteer civilians spread across the countryside.

SCR-270B antenna trailer and radar truck set up on a mountain top clearing at Morobe, New Guinea, Sept. 14, 1943. Radars of this type first saw service on Oahu and Luzon in late 1941. (Signal Corps photo, National Archives.)



America's primary air threat of the era was coming from offshore—where precious few observers lived and operated. Thankfully, technology was preparing to fill this gap with a new sensor—the radar set.

The U.S. Army and Radar

The Army's relationship with radar technology dates back to the early 1930s, through development activities at the Signal Corps Laboratories, located at Fort Monmouth, N.J. Despite concurrent experimental activity in Europe, American radar research was independent of outside influences. Though hampered by a lack of funds and personnel, a practical demonstration was possible within a few years. On December 14-15, 1936, a successful test of the technology was conducted. This test led to the construction of a hand-built prototype, which was presented to the Chief of the Signal Corps on May 18-19, 1937, followed by a demonstration to the Secretary of War Harry Woodring a week later.² The technology was well received and gave birth to a development program that led to the creation of the SCR-268 searchlight controlling radar.³ The Chief of the Air Corps Maj. Gen. Oscar Westover, who also attended the May demonstration and one on June 3, 1937, proposed an operational specification for a long-range early warning radar to meet Air Corps needs.⁴ Emphasis on the Air Corps requirement sent Fort Monmouth's staff back to the drawing board. By early 1939, both a mobile (soon designated SCR-270) and fixed (SCR-271) version of an early warning radar had been developed. An engineering model of the SCR-270 was tested in June 1939, and a November demonstration to the Secretary of War—involving two radars located at Twin Lights, N.J. and Meriden, Ct. was deemed a success.⁵ The Army established the 1st Aircraft Warning Company at Fort Monmouth on March 1, 1940, and soon thereafter took delivery of the initial production SCR-270A radar sets for operational testing.⁶

The SCR-270 Early Warning Radar

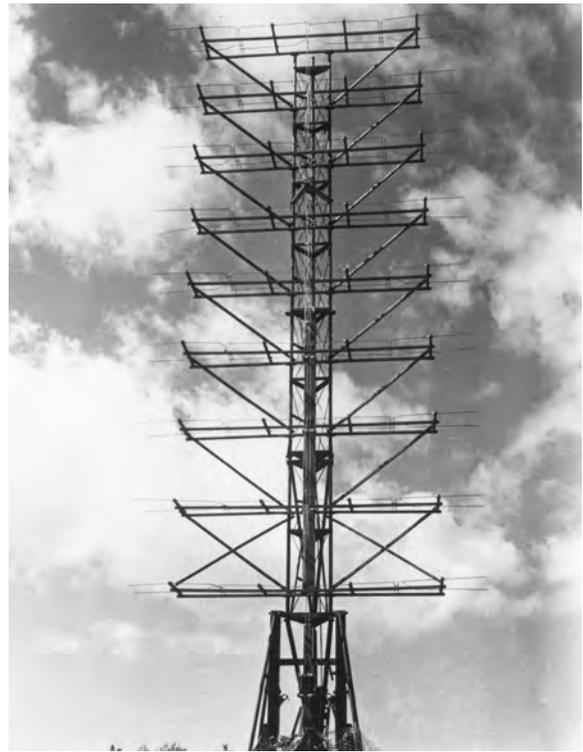
The Army adopted the SCR-270 in May 1940, and a contract for mass production was signed with Westinghouse in August.⁷ The SCR-270 was a long-range search radar intended to provide early warning of an approaching air raid; the SCR-270 came in many variants. The first two systems delivered were SCR-270s, followed by five improved SCR-270As that incorporated minor changes to the antenna mount. The variant in production at the

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(Above) The interior of the SCR-270B operations truck with an operator at the oscilloscope. Photo taken at radar site operated by the 565th Signal AW Co., Springbrook, Queensland, Australia, Oct 24, 1942. (Signal Corps photo, National Archives.)

(Right) Antenna of the SCR-270B radar that was operational at Opana on December 7th, 1941. (U.S. Army Museum of Hawaii.)



start of World War II was the SCR-270B, differing from its predecessor by having radar components moved from the antenna mount to the operations truck.⁸ The SCR-270B was a mobile radar that required four trucks for transport; two vehicles were dedicated to moving the radar antenna, one truck to housing the generator and a fourth truck to house the transmitter, receiver, and operator position.⁹ The SCR-270B had a nominal maximum range of 150 miles as marked on the oscilloscope display at the operator position, though the Army training manual for the system noted a maximum range against bombers at 10,000 feet as 80-120 miles and fighters as 50-75 miles. The radar operated within the Very High Frequency (VHF) band at 104-112 Megahertz, utilizing a 55-foot vertical broadside array antenna.¹⁰ Though the antenna was placed on a tower and the transmitter and receiver were emplaced in a building, the SCR-271 was essentially the same as the SCR-270 in operation.

The SCR-270B was operated by four persons. Two maintenance technicians supported the generators and electronics, while an operator worked the actual radar. The fourth man was a communication specialist who relayed targets tracked by the operator to a headquarters command post (called information centers in that era, filter centers in today's vernacular) via telephone or radio. The radar operator would manually rotate the antenna (via an antenna drive) across his assigned sector, a 360 degree scan taking about 90 seconds. Once the operator saw a return or "echo" on his five-inch "A" scope, he ceased his scan and rotated the antenna back and forth a few degrees until he determined the azimuth that gave the largest return.¹¹ The target azimuth was determined by reading three-inch high numbers painted on plates attached to the rotating antenna tower base.¹² Measurement of range was a little more complicated. Usually only 75 miles of the radar sweep was visible on the oscilloscope; a rotating knob allowed the oscilloscope to move back and forth across the entire 150-mile

range of the radar. To get the range of a radar return, the operator would use a rotating knob to move the display until the echo was lined up under a vertical line etched in the center of the screen. A range associated with the position of the now-centered echo could then be read out in a small window associated with the rotating control knob.¹³ The echo size grew with the number of aircraft, but it was not possible to identify the exact number of aircraft the radar was detecting. Finally, all radar returns were just that – raw energy reflected back from the skin of the target aircraft. The SCR-270 lacked an "identification friend or foe" or "IFF" transponder capability that enabled friendly aircraft to have a distinct response. While the Royal Air Force (RAF) had this function in their radars for the 1940 Battle of Britain, the Signal Corps was still developing an American IFF system in 1941.

Another limitation with the SCR-270 was its inability to provide altitude data for targets that were being tracked. This liability was noted from the beginning by Air Corps commander Gen. Henry H. "Hap" Arnold, but there was little that could be done about it. Arnold unsuccessfully tried to acquire the SCR-268 to provide altitude capability to radar sites, but these radars were already behind in their delivery schedules due to the priority assigned to SCR-270 development. The Signal Corps attempted to provide an interim altitude capability with modifications to their existing radars. Engineers tried to increase the range of the SCR-268 to make it a stand-alone, three-dimensional radar capable of ground-controlled intercept; they also explored making a height finder attachment for the SCR-270. Unfortunately, both ideas were limited by the existing designs and the need to field a radar as soon as possible.¹⁴ While the

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UNTIL 1942

development of the Army's first radar set was not easy, it was only half the battle. The deployment of the SCR-270 was another challenge that needed to be overcome.

On March 10, 1939, the Chief Signal Officer was instructed to prepare a comprehensive plan for the organization and operation of an Air Warning Service for the continental United States and select overseas locations. The final study was completed in February 1940, and provided for twenty-three radar sites supporting nine information centers.¹⁵ The first radar unit, the Signal Company, Air Warning, Panama, was formed in January 1940. In May 1940, it departed the U.S. and received two fixed-site SCR-271 radars in June. Located at Fort Sherman, Canal Zone, this building-mounted site became the first radar station in U.S. service.¹⁶ Unfortunately for the U.S., world events limited the Army's methodical approach to fielding this new technology.

The German *Blitzkrieg* against Poland, in September 1939, and its employment of air power sent a shockwave around the world. In November 1939, General Arnold asked the War Department to address the nation's lack of an air defense capability for the United States. On February 26, 1940, the War Department created the Air Defense Command under Brig. Gen. James Chaney. The Air Defense Command was chartered to conduct experiments in the northeastern United States to determine tactics for the integration of fighter aircraft, anti-aircraft artillery (AAA) and radar sensors.

Later that year, Arnold sent Chaney to England to gather information about the RAF's successful defense of Britain and to develop tactics, techniques and procedures for Army Air Corps air defense operations.¹⁷ The Plans Division of the Air Corps took Chaney's report and other data and issued their findings on October 30, 1940. Their plan called for a British-style air defense organization for both the Continental United States (CONUS) and America's possessions in Hawaii, the Canal Zone and the Philippines.¹⁸ Chaney's efforts also contributed to the opening of the Air Defense School at Mitchel Field, N.Y., in March 1941. Its short course provided an overview of the RAF's summer 1940 success and provided instruction in the emerging U.S. air defense system.¹⁹

In March 1941, the Army took a cue from the British, whose RAF controlled the air defense system that protected England, and transferred responsibility for the growing Air Warning Service network to the General Headquarters Air Force (GHQAF). This move aligned command and control of fighters and sensors under a single command.²⁰ A lot of things were changing, doctrinally, technologically and organizationally, as the U.S. rushed to incorporate lessons learned out of the first stages of World War II.

Radar Employment in Hawaii

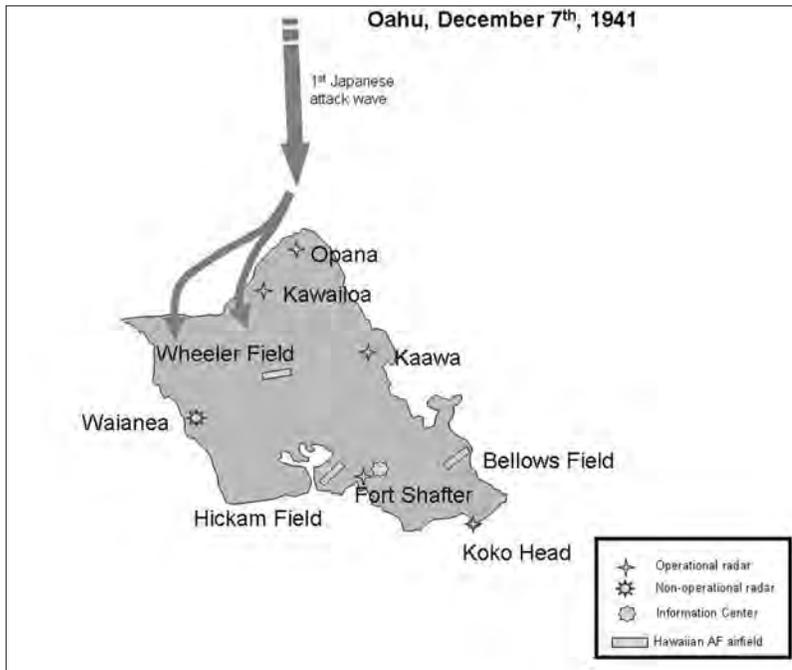
Even before the Chief Signal Officer completed his report on the Air Warning Service, the

Secretary of War proposed basing radar coverage in Hawaii. In a December 15, 1939, letter to the Commanding General of the Hawaii Department, the Secretary recommended exploring an Air Warning Service detachment that could warn of approaching enemy aircraft and alert Hawaiian defenses. Acting upon inputs received from the Office of the Chief Signal Officer, the letter recommended deployment of SCR-270/271 early warning radars to eight radar posts on six islands.²¹

Almost immediately the proposed plan for Hawaiian radar sites started to change. In February 1940, a Hawaiian Department board examined the islands with information from the Signal Corps on what was important for radar site location, mainly focused on line of sight and high terrain matters.²² On April 17, 1940, the Hawaiian Department recommended eight sites that were different from those of the December 15, 1939, memo; the locations for three fixed (SCR-271) and five mobile (SCR-270) radars were approved by the War Department on June 27, 1940. After reviewing their requirements, the Hawaiian Department requested equipment and funds for additional radar coverage and on May 28, 1941, the War Department authorized four additional sites.²³ Because of a bottleneck in production and the need to protect the CONUS, equipment for the additional authorized sites would not be delivered until 1942.²⁴ The Hawaiian Department's final plan for six fixed and four mobile sites with two radars in reserve was submitted to the War Department on October 8, 1941; the plan was not approved until December 8, 1941.²⁵

The constantly changing plans impaired the work of the Corps of Engineers, which had responsibility for building the radar sites. Even though their December 20, 1940, contract did not specify specific sites, they were building towards the April 17, 1940, plan of three fixed sites—Mt. Ka'ala, Oahu; Haleakala, Maui; and Kokee, Kauai.²⁶ The approved sites themselves presented construction problems. Mt. Ka'ala required a 7,000-foot cableway to gain access to the chosen radar location. The Haleakala site was on National Park property and got caught in a bureaucratic fight between the War Department and the Department of the Interior. Beyond site management, there were also issues of a more practical sort; questions continued to arise about the exact design for the foundation and buildings to house the SCR-271.²⁷

On August 14, 1940, the Signal Company, Aircraft Warning, Hawaii (SCAWH), was activated at Schofield Barracks, Hawaii, using personnel from the existing 11th Signal Company leavened with personnel from the 1st Aircraft Warning Company from Fort Monmouth. By spring 1941, the SCAWH had grown to 250 men and had about 340 men on strength on December 7, 1941.²⁸ The large influx of personnel into this new organization created a training challenge. While the cadre from Fort Monmouth had some training, the other personnel were new recruits, who lacked radars with which to train. They resorted to classes run by the



AS WAR APPROACHED, INTERCEPTOR COMMAND GAINED TEETH...BY DECEMBER THEIR SUBORDINATE SQUADRONS HAD 39 P-36As AND 99 P-40B/Cs

U.S. Navy and the University of Hawaii.²⁹ Unfortunately, many of the new recruits were three-year draftees sent to SCAWH without regard for Signal Corps education or qualification standards for radar operators. As a result, training slowed as men were weeded out and the course adjusted to meet the trainees at hand. By August 13, 1941, a year after forming, the SCAWH had only five qualified radar operators with 17 more in training—less than half of the 55 required for this position. A similar shortage existed with radar maintenance technicians.³⁰

The growing pains of introducing new technology soon collided with the organizational and doctrinal changes required to operate this new equipment. As the SCAWH was standing up and training personnel, the GHQAF (soon to be AAF) was tasked to take control of air defense. The Hawaiian Department saw the need to set up an Interceptor Command to provide the command and control framework over their emerging air defense capability. In March 1941, Lt. Gen. Walter Short, Hawaiian Department commander, directed his Signal Corps and AAF staff officers to travel to the U.S. and observe CONUS interceptor commands and air defense exercises scheduled for fall 1941.³¹ For the time being, the Hawaiian Interceptor Command was in name only as the Signal Corps trained radar personnel, the Engineer Corps built sites, and the AAF trained pilots and command post personnel. Once the Engineer Corps completed the fixed sites, the Signal Corps would have to set up and calibrate the SCR-271s. Until this occurred, General Short made the conscious decision to keep the radars under the Signal Corps, which he felt was also more proficient and could train new personnel faster.³²

In the interim, the Hawaiian Air Force took steps to get the Interceptor Command off the ground. In June 1941, a graduate from the Air

Defense School set up an initial Information Center in the base of the headquarters at Wheeler Field. The Hawaiian Air Force used this initial site to develop tactics and train personnel; after August, two SCR-270 radars that were used to train personnel at adjacent Schofield Barracks were tied into the system. An interim set-up was built in November 1941, atop Building 307 at Fort Shafter until a permanent bomb-proof shelter could be established.³³

Hawaii's Information Center was an ad-hoc affair compared to the well-organized facilities that were just then equipping the Interceptor Commands in the CONUS, but it was a start. Fort Shafter's Information Center was directed by the Controller, an AAF fighter pilot assigned to the center as his primary duty. A second fighter pilot was assigned as Pursuit Officer with the function of assisting the Controller in working with the air arm of the command. His primary job was to relay orders to subordinate fighter fields to launch alert fighter aircraft. Both the Controller and Pursuit Officer overlooked a large plotting board. The board was the heart of the Information Center and consisted of a large table with a map of the Hawaiian Islands overlaid with a series of grids. Five to six plotters translated information coming in from radar posts into arrow chits on the plotting board. Each plotter worked with an individual radar site via a direct tactical phone line. Aiding the plotters was a telephone exchange operator and a man to record the tracks for historical record.³⁴ In addition to the Pursuit Officer, liaison personnel were also assigned to represent Hawaii's Bomber Command, Coast Artillery's AAA (one for searchlights, one for guns), Hawaiian Department staff, and civil authorities (air raid warning). Requests were made on November 24 for a U.S. Navy liaison officer to provide input on Navy flight activity, but one had not been provided at the time of the attack.³⁵

A typical scenario would start with a radar post identifying a radar track which an operator would relay to his communications specialist. The communications specialist would convert the radars azimuth-range information into grid squares and pass the track on to the plotter via a dedicated tactical phone line. The Controller would watch the developing situation and, when fighters needed to be launched, would tell the Pursuit Officer how many aircraft to launch. He would call the appropriate squadron and have the requisite number of planes launched towards an agreed upon geographic initial point that equated to either one of the corners of Oahu or the center of the island. Once en-route, the Controller would direct the fighters on a collision course to intercept the enemy aircraft.³⁶ As war approached, Interceptor Command gained teeth in the form of the 15th and 18th Pursuit Groups at Wheeler Field; by December their subordinate squadrons had 39 P-36As and 99 P-40B/Cs assigned to them.

Now that Hawaii had the men and the organization for air defense, all they needed were the sensors. As soon as the Signal Corps accepted the

THE PURSUIT OFFICER ... WAS TOLD THAT A LARGE NUMBER OF AIRCRAFT WERE COMING TOWARDS OAHU...[HE] DISMISSED THE OPANA PLOT, ANTICIPATING THAT IT WAS AN INCOMING FLIGHT OF B-17s FROM CALIFORNIA

manufacturer's radars it sent the equipment to the San Francisco Port of Embarkation for shipment to the SCAWH. First to arrive for shipping was an SCR-271 on May 25, 1941; two additional sets followed on July 6. The fixed radars were followed a month later by the mobile sets with six SCR-270s arriving in San Francisco on August 2, 1941.³⁷ All radar sets had arrived in Hawaii before the end of August. While the SCR-270s were shipped ready to operate, the SCR-271s required a fixed facility with leveled concrete pad and erected antenna tower.³⁸

Once set up and tested, the radar sets were used to train the new personnel assigned to the SCAWH. Soon after they were rolled into an operational mission as tensions continued to mount in the Pacific. Though an attack against Hawaii was seen as unlikely by both Washington and the Hawaiian Department, General Short decided to hedge his bets and have the training done in the morning hours between 0400 and 0700. General Short believed these were the most dangerous hours for his command; if carrier aircraft were going to attack his department, they would do it at first light.³⁹

The SCR-270s were moved around to various locations on Oahu; while this aided training, it likely was also used to validate locations for permanent radars to learn how to set up the final radar sites. Soon radars were deployed to Schofield Barracks, Fort Shafter, Kaawa, Koko Head, Waianae, and Kawailoa. At the request of the Control Officer, the SCAWH expanded operation beyond the original three hours. While the initial schedule ran from 0400 to 1800, this was changed from 0400 to 1600. Personnel were trained, but the scarcity of tubes and fear of burning out other components led to scaled back operations. Soon radars were operating from 0400 to 1100, then staggered with three stations up from 1100 to 1300 and the other three operational from 1300 to 1600. The signal officer at Hawaii relayed his concerns regarding spares to the War Department who tried to increase funding for spares, but hit a brick wall with the Budget Advisory Committee. Hawaii would have to make do with what they had.⁴⁰

As operators became more proficient, the nascent Interceptor Command started to hold exercises to train their personnel and pilots in the operation of an integrated air defense system. The six SCR-270 radars were employed in a training exercise on September 27, 1941, successfully tracking two attacking waves of carrier aircraft. Detected at a range of 85 miles by radars at Waianae and Koko Head, the Navy aircraft were intercepted by Hawaiian Air Force fighters at a range of 25 miles.⁴¹ A follow-on exercise in November had similar results, raising expectations of what a fully operational Interceptor Command was capable of doing.

After the November exercise the pace picked up. An SCR-270 was moved from Schofield Barracks out to Opana on Oahu's North Shore. Starting November 27, 1941, the SCAWH assumed a new operating schedule for the radar sets. Radars would operate in a "tactical" or operational role

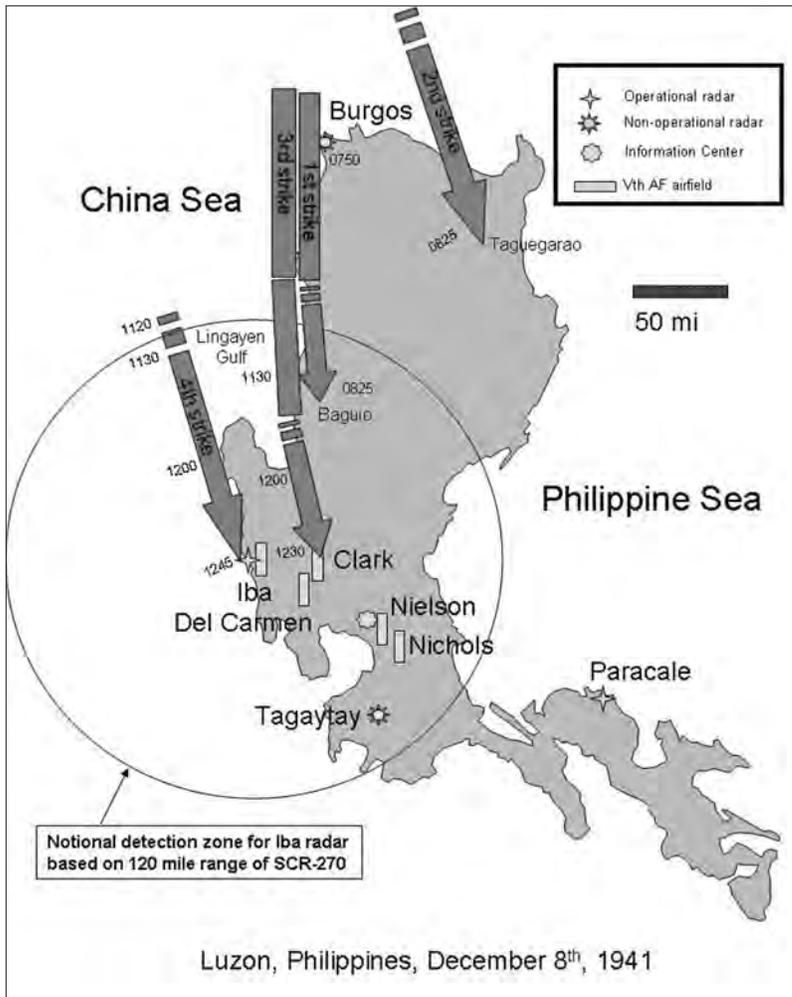
from 0400-0700 daily. Except for Sunday, operations continued with training from 0700-1100 while the afternoon period of 1200-1600 was set aside for maintenance. The Interceptor Command wanted to go to 24-hour operations at this time but was limited by a lack of trained personnel and a continued shortage of parts for the radars.⁴²

Date of Infamy - Pearl Harbor

The strategic picture in Hawaii on December 7 saw the Army postured against an internal threat. While war was in the offing, the Hawaiian Department was confident that the Japanese attack would fall elsewhere—the Philippines or somewhere far west from Oahu. The perceived threat they had to contend with was an internal threat from the Japanese-American population found in Hawaii. To protect against this threat, they ordered the air fleet—to include the fighters assigned to the Interceptor Command—concentrated on their respective airfields to minimize manpower required to guard against sabotage. Similar protective measures were in place for the AAA assigned to the Hawaiian Department. To guard against the unforeseen, airborne patrols covered the sea approaches to Hawaii and Aircraft Warning Service, Hawaii, was running its radars from 0400 to 0700 to cover any movement that may have slipped past the airborne screen. The morning of the 7th saw five radars in operation: Opana, Fort Shafter, Koko Head, Kaawa, and Kawailoa. The Waianea radar was not operational for unspecified reasons.⁴³

At approximately 0610 initial radar plots started coming in to the Information Center at Fort Shafter. The center was manned by a Pursuit Officer, a telephone exchange operator, and plotters but lacked a Controller. Intermittent flight activity around the islands continued for the next hour but nothing was deemed significant. By 0700 one track was plotted south of Kauai with a second south of Molokai, approximately 130 miles north of Oahu. The tracks did not appear to be developing into anything significant and the plotters were released for breakfast as their shift was over.⁴⁴ At 0702, the Opana radar site, still operating due to personnel wanting to get in additional training, noted a large radar return coming towards Oahu. After tracking the growing return for 10 minutes, at 0715 the communications specialist from the Opana radar site called the Information Center. Lt. Kermit Tyler, the Pursuit Officer assigned from 0400 to 0800, was told that a large number of aircraft were coming towards Oahu and was currently 137 miles out. Tyler dismissed the Opana plot, anticipating that it was an incoming flight of B-17s from California.⁴⁵

The Opana site continued to track the incoming aircraft until they got lost in the radar clutter surrounding Oahu, about 20 miles off the coast. The radar was then shut down and the crew departed for breakfast. After hearing and observing the attack at approximately 0810, Lieutenant Tyler had the telephone exchange operator recall the plotters.



AFTER HEARING AND OBSERVING THE ATTACK... LIEUTENANT TYLER HAD THE TELEPHONE EXCHANGE OPERATOR RECALL THE PLOTTERS

The Controller, Major Tindall, arrived between 0815 and 0820 and directed the radar sites to power up and track air activity.⁴⁶ There was no coordinated defense of the island as the Hawaiian Air Force was out of commission, with the Interceptor Command's two groups at Wheeler Field essentially destroyed in place. The command elements of the groups and squadrons were too busy trying to salvage equipment and save personnel, focusing their energies on local defense versus operating as a component of an integrated air defense. The majority of the dozen or so P-36 and P-40 aircraft that did take to the air acted in an uncoordinated manner, engaging targets visually acquired by the pursuit pilots. One exception appeared to be the two P-40s that launched out of Haleiwa Auxiliary Field at approximately 0830. Once airborne, Lieutenants Welch and Taylor were directed by the Information Center Controller towards the southern tip of the island and ended up engaging Japanese fighters strafing the Marine base at Ewa. Their four kills from this engagement provide a glimpse of what the Interceptor Command could have done had it been on a proper alert posture.⁴⁷

The first wartime employment of an air defense system by the United States was far from a success. Through chance more than anything else, the incoming Japanese strike was detected. What was lacking was a command structure that

had prepared its forces to deal with what they felt was an inconceivable scenario. Across the Pacific, a different mindset reigned.

Radar Employment in the Philippines

You could smell war in the air in Manila. New equipment and units arrived every day, field training was taking place, and new facilities were being built. This was the tip of the spear for the American military, and the personnel in the Philippines knew that the oncoming tidal wave of Imperial Japan could easily come crashing down on them. Unfortunately, the Philippines were approximately three months behind Hawaii in fielding a modern air warning service.

By mid-1940, the Philippine Department had recognized its vulnerability to the very real air threat from Japan that was just 200 miles away on the island of Formosa. By September, an interim air warning service had been established using military personnel and Philippine government employees acting as observers and reporting their sightings to a central information center. The entire service was not directed by a dedicated command but instead fell under the Philippine Department G-2 (intelligence branch). Recognizing this was inadequate to defend the islands against a modern air attack, department commander Maj. Gen. George Grunert requested radars, an Air Warning Service Company and any advice and plans on the subject from the War Department Adjutant General.⁴⁸ Failing to receive a response, in January 1941, Grunert asked the War Department about the status of his request for an Aircraft Warning Service Company, stating a requirement for five radar stations. In mid-January Washington approved, in principle, the deployment of the unit as part of the growth of forces for the Philippines. However, the rapid expansion of Air Warning Service units assigned to defend the U.S. delayed the formation and deployment of overseas units. Training of personnel at Fort Monmouth didn't start until April 15, due to the lack of housing at the installation and the projected unavailability of radars for the Philippines before late summer. The Signal Corps planned to supply one SCR-271 fixed radar and two SCR-270 mobile radars as soon as they became available.⁴⁹ These three radars were viewed as an interim "down payment" on a mid-January War Department Plans Division concept of operations that called for eight fixed and two mobile radars feeding to an information center.⁵⁰

To accompany the promised manpower and equipment, the sole guidance given to the Philippine Department on how to organize their air defenses was a copy of Brigadier General Chaney's report on Britain's air defense system and its tactics and procedures.⁵¹ Frustrated by a perceived lack of guidance, the air warning service personnel in Manila plowed on alone in building up the department's air defenses. Through spring and summer 1941, the Philippine Department's Air Warning Service transferred from the G-2 to the

Radar plotting section converting azimuth and range data to grid coordinates for passing to an information center. Photo taken September 1943, at a radar site operated by the 565th Signal Bn. AW near Morobe, New Guinea. (Signal Corps photo, National Archives.)



USAFFE HAD TO MAKE DO WITH WHAT WAS ON HAND UNTIL ALL THE RADAR SETS ARRIVED FROM THE STATES

Philippine Department Air Force, but was still a small organization of three officers and eleven enlisted men running a central information center that screened reports from hundreds of visual observers and tried to make some sense of their reporting.⁵²

The Signal Company, Aircraft Warning, Philippines (SCAWP) arrived in Manila on August 1, 1941, with 194 men and no radars.⁵³ On September 8, USAFFE, the new tactical organization in the Philippines, submitted a detailed plan for the development of an air warning service to protect the Philippines. The plan required thirteen radar sets to cover the island of Luzon, and soon construction work started on the Information Center and the first three radar stations. To operate the expanded system and augment the SCAWP, the War Department agreed to dispatch an Air Warning Service Battalion to the Philippines as soon as one became available. Even as the plan seemed to be moving forward, actual physical progress was maddeningly slow due to both a lack of War Department funds and the scarcity of construction personnel in the islands.⁵⁴

Behind schedule in just about every category, USAFFE still forged ahead with their nascent air defense system. In October 1941, an interim Information Center with its central plotting board was set up at Nielson Field. Unlike the situation in Hawaii, the SCAWP fell under the Far East Air Force (FEAF) of USAFFE as opposed to the Signal Corps.⁵⁵ Following close on the heels of the Information Center was the birth of the V Interceptor

Command (Provisional) on November 16, 1941.⁵⁶ A temporary headquarters was established near the Information Center at Nielson Field while permanent facilities for both organizations were built at Fort McKinley.⁵⁷

While the plan was to have multiple radars to provide the sensor portion of the Philippine air defense system, USAFFE had to make do with what was on hand until all the radar sets arrived from the States. Consequently, the primary “sensor” for the system continued to be a corps of Filipino ground observers linked to the Information Center at Nielson by Philippine Telephone System lines. Reported sightings were combined by Information Center personnel and plotted on a fifteen foot square table-mounted map of the Philippines.⁵⁸

Like Hawaii, the role of the facility at Nielson was not only to filter all the incoming reports; it was also to support the command and control element of the air defense. Once the V Interceptor Command Operations Officer decided to launch fighters, he could use commercial telephone lines, teletype or High Frequency radio communications systems to pass orders to his subordinate fighter squadrons. Once radar posts came on line they would utilize the same means, communicating via radio with a telephone as a back-up. The fighters of the V Interceptor Command fell under the 24th Pursuit Group (PG) and included the 20th Pursuit Squadron (PS) with P-40B aircraft at Clark Field, the 17th PS and 21st PS with P-40Es at Nichols Field, the 3d PS with P-40Es at Iba Field, and the

DECEMBER 8, 1941, FOUND THE V INTERCEPTOR COMMAND WITH ONE OPERATIONAL RADAR AT IBA, RUNNING 24 HOURS A DAY



1941 photo of M3 3 inch anti-aircraft artillery (AAA) guns of the 98th Coast Artillery Regiment set on a firing line for range practice near Kaneohe Bay, Hawaii. This type of AAA gun provided the majority of the AAA air defense for both Hawaii and the Philippines in December 1941. (Author's Collection.)

FIGHTERS AND THEIR CREWS WERE ON ALERT AND READY FOR AN ATTACK

34th PS with obsolescent P-35As at Del Carmen Field.⁵⁹ By December 7, 1941, the 24th PG had a total of 22 P-35As, 23 P-40Bs and 67 P-40Es on strength.

USAFFE's first SCR-270 arrived in early October, and was taken to Fort William McKinley for assembly. Once the radar was put together and tested, it was used to train personnel. By the end of October SCAWP moved the SCR-270 to Iba, a small airfield northwest of Clark Field on the west coast of Luzon. Here the radar continued to be used to train operators and also provide a venue to show other FEAF personnel what radar was and what it could do. By mid-November three more SCR-270 radars had arrived at Manila along with two SCR-271s. As construction of the permanent radar sites was moving at a slow pace, the crated fixed-site SCR-271s were put aside and SCAWP concentrated on the three SCR-270 mobile radars. Testing at Fort McKinley proved one of the new mobile radars could not be made to operate; fortunately the other two tested satisfactorily. One SCR-270 and a still-crated SCR-271 were loaded on a boat and shipped with personnel to Paracale, 125 miles southeast of Manila on the Philippine Sea. The Paracale SCR-270 was assembled by December 1 and the assigned personnel quickly put the system through its calibration tests.⁶⁰ Shortly after the Paracale radar deployed, the troublesome SCR-270 was shipped 45 miles south of Manila to Tagaytay Ridge. Unfortunately, the change in scenery did little to improve the operations of this set, though it did prove useful for training. The last SCR-270 was shipped out to Burgos Point on the north coast of Luzon on December 3, arriving in place on the night of December 6-7.⁶¹

As the radars were deployed, the air defense structure in the Philippines evolved. The radar at Iba gained a makeshift controller element as it lashed up with the radios of the 3d PS headquarters. This gave the radar at Iba the ability to direct activity off the west coast of Luzon using 3d PS pilots as controllers and utilizing the 3d PS air-ground communications to include UHF and HF

radios.⁶² Informal in nature, it provided good training for the Iba-based 3d PS pilots and was helpful in reacting to Japanese reconnaissance flights. While this deviation from the Hawaii command and control set-up was wise, the arrangement at Clark Field with the 24th PG Headquarters was not. The V Interceptor Command at Nielson delegated command and control of all fighters to the 24th PG Headquarters at Clark. To accomplish this mission, the 24th PG established a Communications Center with a plotting board placed at the center of the facility. The Information Center would highlight air tracks via teletype and the 24th PG Commander or designated representative would then scramble the appropriate squadron as they saw fit to intercept the hostile aircraft.⁶³ An SCR-197 HF radio provided communications to fighters patrolling within range of Clark and to other airfields.⁶⁴ This arrangement required the plotters at the Information Center to quickly merge and filter all reports to enable a "clean" picture to be relayed to Clark Field in a timely manner. Only routine training of the entire system would enable this additional step in the reporting chain to be seamless and provide the 24th PG Controller with the requisite practice to become proficient.

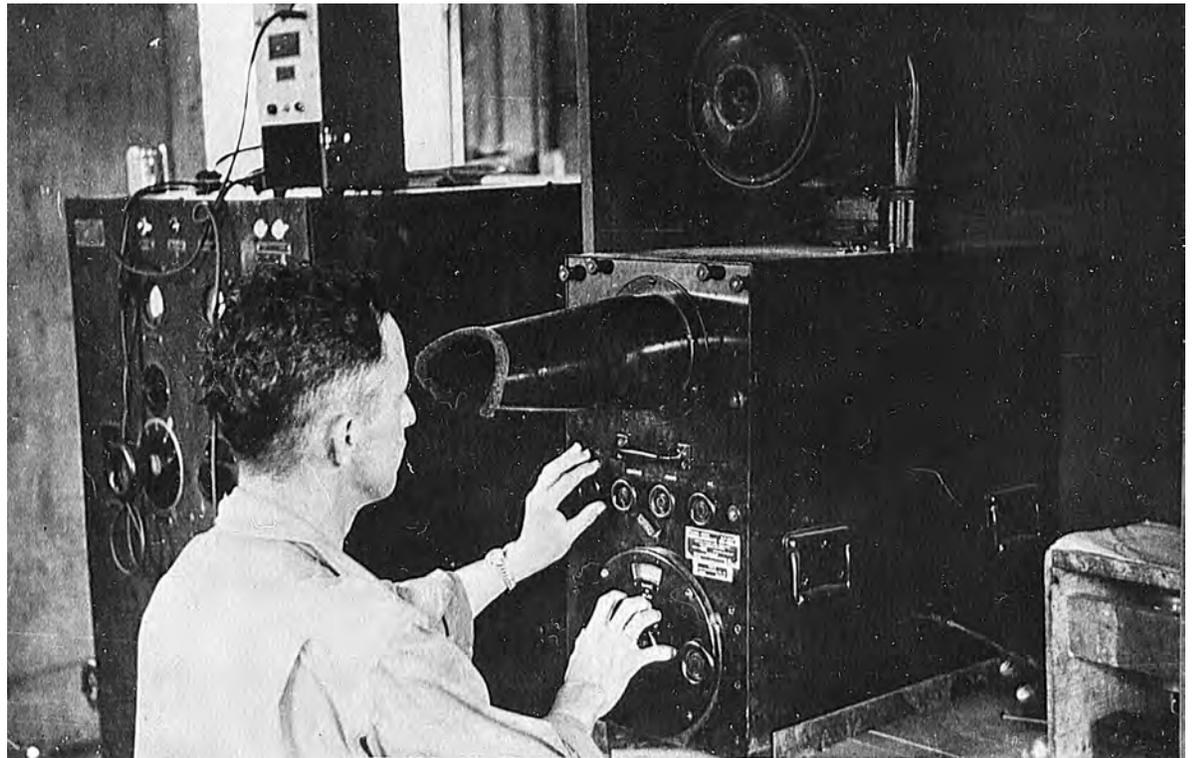
As the diplomatic rhetoric between the U.S. and Japan reached a crescendo in early December, the U.S. anticipated that an attack on the Philippines was likely. USAFFE was essentially on a war-time footing and was prepared to act accordingly, with all fighter aircraft on 24-hour alert and armed since November 15, the radar at Iba also went to 24-hour operations at the end of November.⁶⁵ Slowly the air warning service started to practice for the impending war. A couple of mock raids were carried out by a small number of B-17s, while P-40s were scrambled to intercept the incoming raiders. It was a case of too little too late as the practices were neither robust nor realistic enough to properly stress the system. In addition, the P-40Bs were proving ineffective in the role of interceptor.⁶⁶ As if to underscore the urgent seriousness of the situation, Japanese aircraft were sighted visually over the Philippines starting December 2, and on the nights of December 3 and 4, the radar at Iba tracked air activity north of Lingayen Gulf over the China Sea.⁶⁷ The storm was about to hit.

War Comes to the Far East

The morning of December 8, 1941, (the Philippines are across the International Date Line) found the V Interceptor Command with one operational radar at Iba, running 24 hours a day and providing coverage over the China Sea; one radar just coming on-line at Paracale that looked eastward over the Philippine Sea; a faulty radar used for training at Tagaytay Ridge; and a radar not yet functional at Burgos Point to cover the northern approaches. Fighters and their crews were on alert and ready for an attack.

The Philippines learned of the attack on

Operator working oscilloscope of what appears to be a building-mounted SCR-271 radar. Espiritu Santo, New Hebrides, May 1943. (Signal Corps Photo, National Archives)



AT 1120 THE RADAR AT IBA DETECTED A RAID OVER THE CHINA SEA AND AFTER IT WAS TRACKED FOR SEVEN MINUTES IT WAS RELAYED TO NIELSON FIELD

Hawaii at approximately 0300 on December 8, via the intercept of a commercial radio transmission. A few hours prior, the radar at Iba picked up a formation of aircraft approximately 100 miles offshore en-route to Manila Bay. P-40Es of the 3d Pursuit Squadron at Iba were scrambled to intercept the formation. To overcome communications problems encountered by the 3d PS during earlier interceptions, the controller at Iba used HF manual Morse to send enemy position and course data to the P-40E pilots.⁶⁸ Even with this assistance, the pilots were unable to make contact even though the controller showed their plots overlapping west of Manila Bay. The 3d PS flew their intercept at staggered altitudes to try to cover for the lack of altitude data from the SCR-270 but they were still unable to visually acquire the targets, two Japanese weather reconnaissance flights each containing two G3M bombers.⁶⁹

USAFFE received official confirmation of the state of war at 0530. Though the War Department plan called for a strike on Japanese airfields on Formosa, General MacArthur would not authorize the bombing mission. Around 0800, the Information Center reported a large formation of aircraft over Lingayen Gulf. V Bomber Command's B-17s at Clark Field were ordered airborne to avoid being destroyed on the ground and the 20th Pursuit Squadron also at Clark was launched to intercept the aircraft, assumed hostile bombers, north of Clark over Tarlac. The 17th Pursuit Squadron at Nichols Field was launched at the same time with the same intercept point—Tarlac—while the 34th PS was ordered airborne to provide cover over Clark Field. Both squadrons arrived overhead Tarlac but there were no bombers to be had—the enemy formation had swung to the north-

east and bombed Baguio, the Philippine summer capital, while a second strike had hit Tuguegarao.⁷⁰ At 1014, Gen. Douglas MacArthur called FEAF headquarters and finally authorized the attack on Formosa. The B-17s were recalled to refuel and arm for the strike while the 20th PS P-40Bs and the 17th PS P-40Es were recalled to Clark to refuel as well. By 1130 the fighter situation was as follows: 20th PS and 17th PS refueling at Clark; 21st PS on alert at Nichols; 3d PS on alert at Iba; and 34th PS on alert at Del Carmen.⁷¹

Events of the next few hours went into overdrive as the Japanese initiated their air campaign in earnest after morning weather delays. Starting about 1100, the Information Center at Nielson began relaying reports to the 24th PG Communications Center at Clark of aircraft flying over Luzon heading in a southerly direction. The reports included sightings from visual observers either reporting American aircraft or dual-reporting existing Japanese raids that were being tracked with Iba's radar; the end result was a numbing at Clark Field with respect to air raid reports from the Information Center. At 1120 the radar at Iba detected a raid over the China Sea and after it was tracked for seven minutes it was relayed to Nielson Field. The China Sea track was relayed to all FEAF units at 1130, prompting the 24th PG commander to order the 3d PS to patrol over Iba and intercept the bombers as they made landfall.⁷² At 1145 the Information Center issued another report, this time including a second raid that was detected by Iba heading south over Lingayen Gulf towards Clark. The 34th PS and 21st PS were ordered to cover Manila and Clark Field, respectively. The 34th PS did not receive their orders but the 21st PS did and launched to cover Clark Field. After the

21st PS pilots were airborne and winging north of Manila they were re-directed to patrol over Manila Bay between Cavite and Corregidor, positioning the squadron to intercept any Japanese raiders coming in from the west to attack Manila.

The Information Center continued to broadcast reports of activity off the west coast of Luzon progressing south. At 1210 the 24th PG ordered the refueled 17th PS to launch from Clark and patrol Manila Bay to intercept any fighters coming in from the west. At 1220 the V Interceptor Command, concerned that no action was taking place against the second raid which was progressing down the center of Luzon, ordered the 24th PG to launch fighters to intercept Japanese aircraft approaching Clark Field. The command and control at the 24th PG responded by radioing all airborne pursuit aircraft to head for Clark but did not order their last asset, the now-refueled 20th PS, into the air. The 20th PS only started to launch at 1235 when its commander visually identified the Japanese bomber formation over the field—only three P-40 aircraft got into the air before the field was inundated with bombs. Following a five-minute attack by bombers, Japanese fighters spent the next half hour working over Clark Field with strafing runs. The 34th PS, never receiving launch orders, took to the air on their own initiative about 1300 when they saw the smoke columns and AAA fire over Clark. Once airborne, the P-35As joined splintered flights of 3d and 21st PS fighters that had converged on Clark but had been unable to stop the destruction.⁷³

While Clark Field was getting worked over, another Japanese strike was approaching Iba. Detected by Iba's radar at 1120 as it tracked south, the data was relayed to Clark via the Information Center at 1130 and 1145. Apparently believing the Japanese were intent on attacking Manila, the 24th PG ordered the 3d Pursuit, launched at 1145 and patrolling over Iba, to shift to cover the capital instead. At 1230 personnel from the Iba radar site came up on their HF radio and called direct to Clark, reporting a large formation of aircraft approaching them from the west.⁷⁴ Ten minutes later, Iba was demolished by 53 Imperial Japanese Navy G4M Type 1 attack bombers then strafed by 51 escorting A6M fighters.⁷⁵

Pilots of the splintered 3d PS, after briefly patrolling over Manila, heard the 1220 call from the 24th PG to rally at Clark Field. Finding no Japanese targets over Clark, they returned to Iba and were in the landing pattern when the Japanese hit. The 12 P-40s of the 3d PS were too low to attempt to break up Japanese bomber formations but had minor success in preventing low level strafing runs by the escorting fighters. By the time the Japanese strikes were over on December 8, Clark Field infrastructure was smashed, 55 P-40s and 12 B-17s were lost, and the radar at Iba was out of commission.⁷⁶

The morning of December 9, found the V Interceptor Command dusting itself off from the attacks of the day before and trying to prepare for

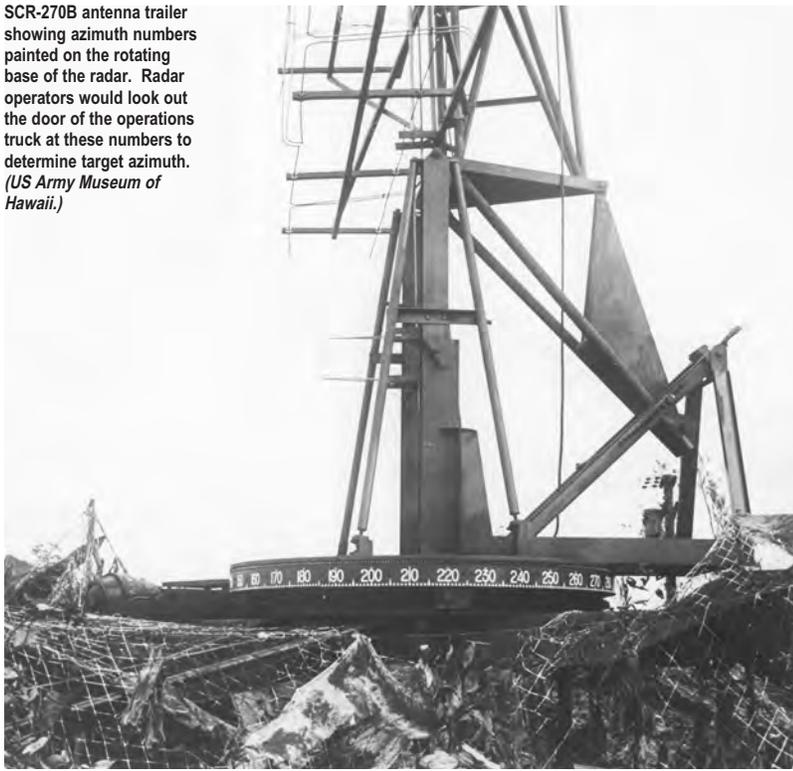
that day's onslaught. With the radar at Iba down, the Information Center relied on visual observers to find Japanese tracks coming in from the north and west—the radar at Paracale contributing little if anything to the fight. As usual at the start of a conflict, widely conflicting data, most of it false, were reported via the observer net. At 1115 on December 10, the Information Center received reports of a large Japanese formation heading south towards Manila. The 17th, 21st, and 34th Squadrons were scrambled to meet the threat but were overwhelmed by the large Japanese escort. By the end of December 10, the V Interceptor Command was down to 22 P-40s and eight P-35s. That evening, FEAF Commander General Brereton instructed the 24th Pursuit Group not to employ its aircraft except on specific orders—fighters were to be used primarily in the reconnaissance role. The air defense system of the Philippines was nearly dead as the fight devolved to point defense of specific targets with AAA.⁷⁷

Sixty-Seven Years On

Once again, we are embroiled in a global war where we are throwing new technology to the front—what can we learn from America's disastrous first attempts at integrating radar into air defense? The fight in the Pacific highlighted the interconnected nature of warfare. Many capabilities that we have today and those that were used in 1941 are really families of capabilities. As technology evolves, the individual weapons system becomes less important than the whole network capability. The P-40s at Clark and Iba, while not optimum in the interceptor role, were further inhibited because they were without an operational radar net, proper communications, and a command and control system that could process intelligence effectively. The same kinds of P-40 aircraft were able to inflict losses upon Japanese bombers over Burma when flown by more experienced pilots and integrated with a better air warning system. Many additional factors can be used to explain the successes of the American Volunteer Group, but the bottom line is they had more capabilities than either the Hawaiian Air Force or the Far East Air Force.

The English air defense experience is even more telling. By 1940, the RAF had two capable interceptors in the form of the Spitfire and Hurricane, but more importantly these aircraft were backed by an air defense system with radars and a trained command and control staff. England had been experimenting with radar since the mid-1930s—roughly the same period as the U.S. Deployed in September 1938, in response to the worsening political climate in Europe, the British air defense system had almost two years of operational employment to work out the bugs. The RAF held major exercises culminating in Bomber Command putting hundreds of sorties into the air in summer 1939 to stress the system. By the time the Luftwaffe attacked the following summer, England was ready.⁷⁸ In the case of defending her

SCR-270B antenna trailer showing azimuth numbers painted on the rotating base of the radar. Radar operators would look out the door of the operations truck at these numbers to determine target azimuth. (US Army Museum of Hawaii.)



Pacific possessions, America was too late in building a large-scale air defense system.

In 1941, America's armed forces were attempting to recover from more than twenty years of neglect; the AAF's nascent air defense capability was no different. Given finite resources and time, the War Department concentrated on protecting the Continental United States first. Overseas possessions such as Hawaii and the Philippines, though closer to the enemy, received a lower priority in personnel and equipment. This conscious decision to protect the homeland resulted in the late arrival of radars and the shipping of ill-trained recruits to overseas bases. The end result was that the Pacific territories, though equipped with relatively modern fighters, were lacking the other critical components to make up a complete air defense system—an integrated radar picture coupled with solid command and control and manned with trained personnel. Given more time, the Hawaiian Air Force and the Far East Air Force could have mounted a credible defense of their territory; instead, they were thrust into battle ill-trained and half-equipped and paid the price for their nation's decision to disregard the upkeep of her armed forces. ■

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The A-1C(M) Gunsight:
A Case Study of
Technological Innovation in
the United States Air Force





Thomas Wildenberg

(Overleaf) The F-86 Sabre was the U.S. Air Force's primary air superiority fighter in Korea. The E model shown here, entered service in May 1952 equipped with J-1 fire control system consisting of the A-1C(M) lead-computing gunsight and the AN/APG-30 ranging radar. (National Archives)

EARLY BIRDMEN PREFERRED TO FLY "BY THE SEAT OF THEIR PANTS"

The A-1C(M) lead-computing sight was the first fighter gunsight to employ radar ranging. It was widely used in Korea where it received a mixed reception by the F-86 pilots who depended upon it. Many of the younger, less experienced pilots found it a godsend, while the veterans, particularly some aces of World War II, considered it unreliable and much too complicated—particularly its radar. Nevertheless, the introduction of the A-1C gunsight was an important milestone in the development of sophisticated fire control equipment for air-to-air combat.

The story of the A-1C provides evidence of the importance of the heterogeneous engineer in developing new technology and the impact of "innovative departure" on the users of a new weapons system. It also provides insight into the non-technical problems that often arise when a new weapons system is introduced.

Ever since the early days of flight, seasoned pilots have often objected to the introduction of new flight instruments. The Wright brothers found it difficult to get their own student pilots to utilize such aids because of the negative connotation that the reliance on instruments elicited from the early birdmen who preferred to fly "by the seat of their pants."¹ Though the Sperry turn indicator had become standard equipment on most large aircraft by the mid-1920s, many pilots refused to rely on it.² Nor did most pilots trust the artificial horizon when it was first introduced a few years later. It took more than a decade before a majority of pilots had learned to trust these devices. The jet age brought new problems for pilots, especially with regard to air combat, which now took place at a pace much greater than ever. It also brought about a widespread reliance on radar and other electronic aids. As was the case in earlier years, the most experienced pilots proved to be the least receptive to the new technology.

Genesis of the A-1C(M) Lead Computing Gunsight

Lt. Col. Leighton I. Davis was nearing the end of his second tour of duty at the U.S. Military Academy at West Point, New York, in April, 1943, when he received orders to command a fighter-bomber group composed of North American A-36s that was about to deploy overseas. He flew to Alabama in advance to meet his new boss and to look over the A-36—the ground attack version of the P-51 Mustang. "I was amazed to see that they still had ring and bead sights in the middle of the

damn thing," exclaimed Leighton when he recalled the event in later years.³ It was the same sight used in the P-12s that he had flown in 1936. Nothing new had been added to assist the pilot in his main mission: gunnery and dive bombing.

After returning to West Point, Davis journeyed to Norfolk to meet with Dr. Charles S. Draper of the Massachusetts Institute of Technology (MIT) to discuss the possibility of adapting the Navy's Mark-14 gyroscopically-controlled gunsight (developed by Draper) to dive bombing and aerial gunnery.⁴ Davis knew about the work being done on gyroscopic sights having studied under Draper while completing his Master of Science degree in Aeronautical Engineering at MIT in 1940-1941. With input from Draper, Davis prepared a technical report on how a gyro computing gunsight could be used as a dive bombsight. His commanding officer, Col. John M. Weikert, who just happened to be a friend of Gen. Henry H. "Hap" Arnold, sent the report to Wright Field, Ohio, where it was analyzed by John E. Clemens. Davis's report must have been favorably endorsed by Wright Field, because Arnold, Commanding General of the U.S. Army Air Forces (AAF), had Davis's orders changed, sending him instead to the Armament Laboratory at Wright Field to work on a lead computing gunsight for dive bombers.⁵

The Education of an Engineering-Oriented Pilot

Leighton I. Davis was born in Sparta, Wisconsin, on February 20, 1910. He graduated from high school in Dawson County, Montana, in 1927 and entered the U. S. Military Academy in 1931. Davis graduated on June 12, 1935, and received a commission as a second lieutenant in the Corps of Engineers. Next, Lieutenant Davis was detailed to the Air Corps and sent to Randolph Field, Texas, for flight training. He proceeded to Kelly Field for advanced training in P-12s, earned his wings, and transferred to the Air Corps on October 1, 1936.⁶

Davis's first tactical assignment was as an engineering officer with the 6th Pursuit Squadron stationed in Hawaii. The squadron was equipped with the Boeing P-12, an open cockpit biplane with fixed landing gear that was the primary fighter in the Air Corps inventory in 1936. In addition to his flying and engineering duties, Davis was also assistant trial judge advocate, assistant athletic director, and assistant communications officer. The latter would later prove to have been a serendipitous assignment for the young officer, for it familiarized him with the cathode ray oscilloscope: a state-of-

THE MOST EXPERIENCED PILOTS PROVED TO BE THE LEAST RECEPTIVE TO THE NEW TECHNOLOGY

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1st Lt. Leighton I. Davis taken at the U.S. Military Academy while he was an instructor there in 1940. (U.S. Military Academy Archives)



**DRAPER
FOUNDED
THE INSTRUMENTATION
LABORATORY,
WHERE HE ...
EXTENDED
THE LAB'S
RESEARCH
TO
ALTIMETERS,
AIRSPEED
METERS,
MAGNETIC
COMPASSES,
AND OTHER
AIRCRAFT
INSTRUMENTS**

the-art electrical device that provided a picture of an electrical signal plotted against time. As assistant communications officer, Davis ran across a corporal who had brought his personal electrical equipment with him, including the oscilloscope. Davis doesn't tell us what the corporal had done as a civilian, but it is likely that the corporal had been involved in some sort of electronic endeavor before he was forced to join the Army to support himself. This situation was not uncommon during the Great Depression, when all sorts of people enlisted in the armed forces in search of a living.

"Tell me how all those radios and things work," Davis asked the corporal.

"Well, the best way is [to] build one," he replied.

So, Davis scrounged up some parts from a local repair shop and built an RF-tuner, plus a hi-fi push-pull triode circuit. He had a lot of fun building the equipment, which was then hooked up to the oscilloscope in order to show Davis how the various circuits worked.⁷

After two years in Hawaii, Davis received orders to attend the Air Corps Tactical School at Maxwell Field, Alabama. His orders were changed after someone in charge of assignments discovered that Davis had achieved good grades in the mechanics course at West Point, making him the ideal candidate to replace Maj. John Weikert, who had been teaching the course.⁸ Air activities were on the rise at West Point and Weikert, the senior Air Corps officer at the Academy, was slated to take command of Steward Field where the cadets received training and indoctrination in aviation.⁹ In January 1939, Davis returned to the U.S. Military Academy, as an instructor in the Department of Natural and Experimental Philosophy, which was then responsible for teaching such basic engineering subjects as statics, kinetics, kinematics, hydraulics, elementary thermodynamics, and aerodynamics.

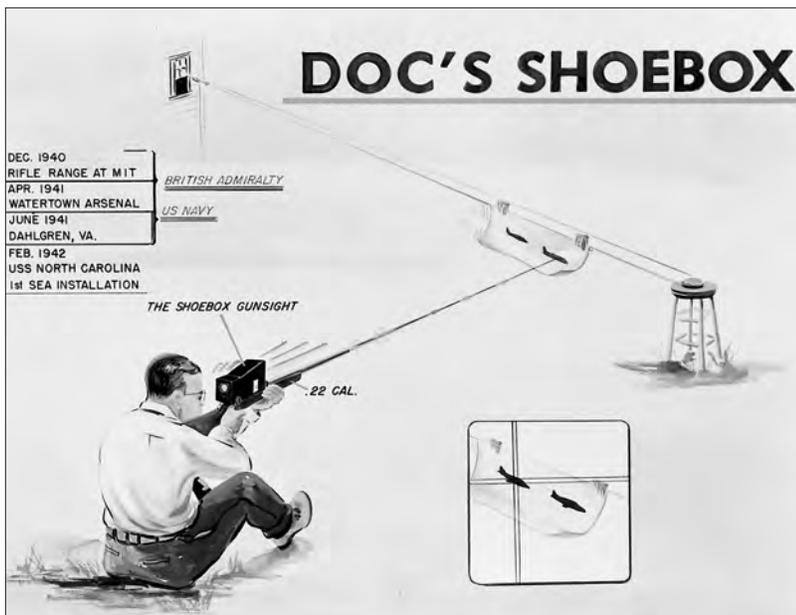
Davis's teaching duties involved the thermodynamics laboratory where a variety of engines—

diesel, gasoline, and steam—were used to demonstrate the fundamental principles of thermodynamics. The steam engines had engine indicator diagrams that could trace out the pressure-volume relationship occurring inside their steam cylinders. The indicator was a mechanical device that would not work in an internal combustion engine because of the faster moving pistons. From the experiments he had conducted in Hawaii, Davis knew that an oscilloscope could be used to plot the physical parameters taking place during high-speed phenomena such as occurred within the cylinder of an internal combustion engine. After talking it over with the other instructors, Davis decided to visit the Dumont Laboratories, one of the leading companies in the oscilloscope business.¹⁰ Dumont, which was located in Passaic, New Jersey, was only a few hours drive from West Point.

Because Davis was on the staff at the U.S. Military Academy, he was able to get in and talk to Dumont's chief engineer. The engineer was not able to help with Davis's problem, but he knew about the work being done on a crystal pickup by the Radio Corporation of America (RCA). He suggested that Davis talk to them. So, Davis drove to Camden, New Jersey, where the RCA research and development laboratory was located. Once again he managed to wangle his way in and talk to the engineers. They had a pickup, but it was too sensitive and more of a vibration pickup than a pressure sensor. The RCA engineers suggested that Davis contact the Sperry Gyroscope Company, where a researcher—who worked under Dr. Draper—had developed an electromagnetic pickup.¹¹ The "pickup" they were referring to was part of the detonation indicator for internal combustion engines that Draper had developed at the MIT Instrumentation Laboratory.¹²

Draper, who was born in Missouri on October 2, 1901, first came to MIT as student in 1922. He graduated four years later with a bachelor's degree in electrochemical engineering. Draper continued his studies at MIT, earning a Master of Science degree in 1928. He then began work as a research assistant in Charles F. Taylor's aeronautical engine lab and became involved in studies of the internal combustion engine that led to the development of the MIT "Knockmeter." In 1934, Draper founded the Instrumentation Laboratory, where he and a small team of graduate students and assistants, extended the lab's research to altimeters, airspeed meters, magnetic compasses, and other aircraft instruments, while continuing to work on the problem of measuring detonation or "knock." The latter led to a patent for a device called the detonation indicator that could be used with aircraft to prevent engine damage. The patent was signed over to the Sperry Gyroscope Company, which had put up money to develop it.¹³

The Sperry engineer that the RCA folks had referred to was Joseph H. Lancor. Davis contacted Lancor through Frederick W. Castle, a former Air Corps pilot, who was employed at Sperry as assistant to the president.¹⁴ The following is Davis's rec-



Davis arranged for Draper to use the Watertown arsenal that day and was present when Draper used the Shoebox against the moving target. (The Charles Stark Draper Laboratory, Inc. All rights reserved. Reprinted with permission.)

ollection of what transpired when he finally met Lancor:

We sat down and talked about the problem [of plotting the cylinder parameters in real time]. He pulled out of the desk a little metal thing about the size of a spark plug, which was the pickup that you screw into the cylinder head if you have an extra spark plug hole like in aircraft engines where you have two spark plugs. Or otherwise you make an adapter, and then drill a hole and fit it in the place to get at the pressure inside the cylinder head. He says, "Well, this puts out a signal which is rate of change or pressure. You've got to integrate it, make an integrating circuit, in order to get what you want, which is pressure-time. Then you have to have a representation of volume, of course. Why don't you see what you can do with it." He handed the thing to me, and so I took it back up to West Point and talked with the electrical engineering instructors trying to figure out what an integrating circuit was.¹⁵

Davis borrowed an amplifier and an oscilloscope from the electrical engineering department. He began fooling around with the equipment in the thermodynamics laboratory until he got it to work. Davis made photographs of the oscilloscope traces and sent them to Joe Lancor. Lancor forwarded them to Draper, at MIT, where they were enthusiastically received. In June, Draper came down from Boston to take a look at Davis's setup. He spent a week with Davis as his house guest, while they made changes to the circuits, took pictures, and worked on a joint paper that would later be published in the *Journal of the Institute of Aeronautical Sciences* titled, "Electromagnetic Engine Indicators." It was co-authored with Joe Lancor.¹⁶

This activity led to Davis's assignment to MIT for a year of graduate study in aeronautical engineering under Draper. It also brought him in contact with Draper's early work on a gyroscopic gunsight. Draper's involvement in the gyroscopic gun-

sight emerged from his interests in gyroscopic flight indicators and his long-term association with the Sperry Gyroscope Company. He had been consulting on aircraft instruments for Sperry for several years and had close contacts with Chief Engineer Preston Bassett, President Reginald Gillmor, and Director of Research Hugo Willis.¹⁷ During this period, Sperry was actively involved in the development of fire control systems for the military. After war broke out in 1939, Draper began to build a device to compute lead angles for tank guns by adapting a gyroscopic turn indicator he had developed. In June 1940, Draper, with funding provided by the Sperry Gyroscope Company, turned his attention to antiaircraft fire control.¹⁸

Draper's development work on the antiaircraft gunsight, which lab personnel nicknamed "Doc's shoebox," coincided with Davis studies at MIT during the 1940-1941 academic year.¹⁹ In April 1940, Davis arranged for "Doc" to make use of the facilities at the Watertown Arsenal in Massachusetts, to test the "little black box that "Doc" had mounted on a .22-caliber rifle.²⁰ Draper used this engineering model—it had mechanical indices directly coupled to the gyro gimbal frame—to shoot at a moving target traveling along a wire.²¹ Davis, who was present that day, picked up the fundamentals that would later lead to the development of the A-1C.²² The black box, with the moving cross hairs, evolved into the famous Mark 14 naval gunsight for 20mm antiaircraft guns and was later incorporated into the Mark 51 director for the 40mm Bofors gun.

Davis received his master's degree from MIT in the spring of 1941, and returned to West Point as a mathematics instructor. When the United States entered the war, he was director of the ground school and was kept on for another year. As described earlier, he was nearing the end of his second tour when he received orders to command the A-36 group, which ultimately led to the idea for a new gunsight.

Initial Development Work of the A-1 Gunsight

After getting his orders changed, Davis was assigned as Project Engineer, Bombing Branch, Engineering Division at Wright Field. That summer, a Mark 14 sight was modified and mounted on an A-24 dive bomber.²³ Good results were obtained and a contract was let with MIT to develop an experimental computing sight that could be used to direct gunfire, rockets and bombs from fighter aircraft.²⁴

The first experimental model completed by the lab computed only the dive bomb solution.²⁵ Designated as the A-1 sight, it was installed in a P-38 and tested by Davis in early summer 1944, on the bombing range at Grenier Field, New Hampshire.²⁶ Davis dropped dozens of bombs as he struggled to overcome the problem of tracking stability and solution time. As Davis discovered, the sight was unable to provide a proper solution to the ballistic problem on steep dives, causing a condition that Draper had previously termed "tracking insta-

DRAPER'S DEVELOPMENT WORK ON THE ANTI-AIRCRAFT GUNSIGHT, ... NICKNAMED "DOC'S SHOEBOX," COINCIDED WITH DAVIS STUDIES AT MIT



Cockpit photograph of North American F-86A Sabre taken on July 26, 1950, showing cockpit instruments and A-1C(M) gunsight. The A-1C(M) was added to the second production run of F-86s. (National Archives)

THE TESTS CLEARLY DEMONSTRATED THAT THE A-1 WAS SUPERIOR TO THE FIGHTER SIGHTS THEN IN USE

bility.” The phenomenon occurs whenever the rate of change of the lead angle changes faster than the motion of the sight line. At steep dive angles that Davis was attempting, the P-38 had minimal directional stability making it very difficult for the pilot to keep the sight’s crosshairs on target long enough to establish an accurate bombing solution. The answer was to decrease the dive angle.

Flight testing of the second experimental sight, which could be used for both bombing and gunnery, was conducted that summer at Eglin Field, Florida. The tests clearly demonstrated that the A-1 was superior to the fighter sights then in use.²⁷ The A-1 could compute leads accurately at ranges up to 2,000 yards and solve bombing problems up to an altitude of 10,000 feet, at dive angles between 15 and 60 degrees.

Postwar Engineering and the Development of the A-1C(M)

World War II ended before the new sight could be placed into production. After the end of hostilities in August 1945, the AAF authorized the installation of A-1 sights in the Republic P-84 jet fighter then under development. Additional funds for the A-1 project were approved for test flights in P-80A aircraft. The purpose of the tests was to determine what modifications to the sight would be necessary and how well it would operate with a ranging radar.²⁸

By then, Davis was no longer directly involved with the project, having been promoted to technical executive of the Armament Laboratory. He took over the lab in 1946. In the following year, he was awarded an oak leaf cluster to the Legion of Merit (which he had received for his work on the development of the electronic pressure sensor) for developing the A-1 gunsight. Davis spent the next twenty years in a variety of research and development positions within the Air Force. He retired in

1968, with the rank of major general and died in 1995.

In March 1948, the Air Force decided that both the F-84 and F-86 would be equipped with the newest version of the A-1 sight, the B model, which was considered to be the most accurate lead computing sight available to the Air Force.²⁹ Its radar set could lock-on a target at 5,400 feet range. The pilot then checked visually to ensure that he was locked on to the proper target (if not, he pressed a target rejection switch and maneuvered until the radar locked onto the target desired) and “caged” the sight’s gyros by pressing a button on the control stick grip. After placing the reticle dot on the target and releasing the caging button, the pilot had to keep the reticle on target for one-half to one second (the time needed by the sight to solve the ballistic problem) before opening fire in one-second bursts.³⁰

Due to ground clutter, manual range was utilized when either the radar was inoperative or the aircraft was below 5,000 feet. Manual ranging was stadiametrically set by entering the target’s wingspan on the sight head target span wheel and rotating the range control on the throttle grip until the reticle contracted to its minimum diameter. As in radar ranging, the pilot pressed the electrical caging button and maneuvered the aircraft so that the reticle dot—called the pippin—was on target. He established a smooth track and, when the target’s wingspan filled the ranging circle, uncaged the gyros, waited a split second (one solution time), and began firing. If the computing or radar circuits of the sight were inoperative, the pilot could cage the sight mechanically with a lever on the sight head and use the fixed reticle for rule-of-thumb gunnery.³¹

During the fall of 1948, preliminary firing tests in F-84 and F-86 aircraft, revealed a problem that persisted throughout the life of the A-1 sight program—reticle jitter. Whenever the pilot pressed the firing button, the vibration of the guns either drove the sight reticle entirely from view or caused it to oscillate so rapidly that it became an orange blur.³²

Flight tests to determine the best method of reducing reticle vibration to an acceptable level began at Muroc [later Edwards] AFB, California, in January 1949. The Sperry Gyroscope Company, which had been contracted to manufacture the first ninety-four A-1B sights, came up with a “fix” consisting of stainless steel stiffeners for the sight head mounting brackets. This reduced vibration considerably, but did not totally cure the problem.

That April, Sperry Gyroscope and the AC Spark Plug Company, which also built the A-1B sight, both agreed to produce 551 A-1C sights, with improved computing features, for the F-86A, F-86D, and F-94 aircraft. Full-scale production was scheduled to begin in August 1950, but the Air Force suspended deliveries of all A-1C sights until some method was found to make the sights more usable in the field. After a short period of review, the Air Materiel Command (AMC) authorized Sperry to modify thirty-five A-1C sights by provid-

GABRESKI DID NOT LIKE THE A-1C SIGHT. HE OFTEN CLAIMED THAT HE "COULD DO BETTER WITH A PIECE OF CHEWING GUM IN THE WINDSHIELD"

development of the Jenkins Range Limiter. The limiter consisted of a range selector switch and a sensing device that prevented the radar range signal from exceeding the value selected by the pilot. This selector switch allowed the pilot to select his maximum desirable firing range before initiating the attack. When the radar indicated a range in excess of the selected value, the selected value was fed to the computer limiting the time of flight input so that the sight was less sensitive. When the radar range equaled or was less than the selected range, the radar value was fed to the computer. A change in reticle configuration simultaneously occurred, indicating to the pilot that he had reached the range selected to begin firing.⁴⁴

Despite these fixes, the Air Force debated whether or not to retain the J-1 fire control system, described by some as 200-pound "luxury gadgets."⁴⁵ There was a wide divergence of opinion within the fighter pilot community as to the value of such a complex system. In summer 1952, Gen. Hoyt Vandenberg, the Air Force Chief of Staff, queried a group of fourteen veteran Sabre pilots, whose combat tours had coincided with the first combat use of the A-1 sight, when its performance was marginal at best. (This was before Project Jaybird was implemented in April 1952, to rectify the sight's logistics problems.) The pilots recommended that the A-1C(M)s be replaced with a manual ranging gyro-computing sight similar to the K-14 or K-18. General Vandenberg directed both the Air Proving Ground Command and the FEAF to evaluate the two types of sights.⁴⁶

Accordingly, the Fifth Air Force convened a seminar of aces from the 4th and 51st Wings on September 11, 1952. All of the current aces—mostly younger pilots who had arrived in Korea after the veterans had rotated home—agreed that the automatic features of the A-1 gunsight should be retained. They recognized that most MiG kills were obtained from low deflection shots, but all of the pilots attributed this to the short-range guns on the Sabre. With improved armament (the T-160 20mm cannon was about to be introduced) they predicted, deflection shots would become more usual. It was true, they said, that superior pilots would probably do well with a Mark 18 sight, but in any future conflict they foresaw that the burden of air combat would fall upon younger pilots who would have neither the experience nor the training that would make them superior gunners.

While the Fifth Air Force seminar was convened, the Air Proving Ground Command began to assemble a team of veteran pilots—six of whom were veteran aces who had flown in Korea—to conduct a comparison test of the two sights at Eglin AFB.⁴⁷ The effectiveness of the two sighting systems was to be determined, in part, by a series of camera gunnery passes using six F-86Es: three equipped with the K-14 sights and three with the new A-4 sight. The latter was substituted for the A-1C, which was no longer in production. The general procedure was for the target to maintain 0.8 Mach at 35,000 feet altitude and the attacking aircraft to

make moderately high side approaches. The target would take moderate evasive action as the attacking aircraft neared the anticipated firing range.

Col. Francis S. "Gabby" Gabreski, considered by many to be a "fighter pilot's pilot," was the senior member of the team.⁴⁸ He was flamboyant, heroic, and had been the leading U.S. fighter ace in the European Theatre during World War II. In June 1951, Gabreski, then in command of the 56th Fighter Interceptor Wing, was posted to Korea. He flew 123 missions in the F-86E and was credited with an additional 6 1/2 MiGs, making him one of only six U.S. Air Force pilots to have achieved the distinction of becoming an ace in both conflicts.

But Gabreski has been chastised for ignoring his wingmen. He flew the fastest aircraft available and would not respond when wingmen could not keep up.⁴⁹ He was also criticized for a lack of discipline among his off-duty pilots, and for allegedly encouraging exaggerated kill claims.

Gabreski did not like the A-1C sight. He often claimed that he "could do better with a piece of chewing gum in the windshield," which he may have used in place of the A-1C on more than one occasion.⁵⁰ He came to Eglin to prove that the K-14 would show much better results.⁵¹ During the flying portion of the project, Gabreski, using the K-14, was paired against Col. James K. Johnson, using the A-4. Johnson, called "Rabbit" because of his quickness as a pilot, was one of the test pilots chosen to replace two of the original test team selectees who had not arrived in time for the fly off. He had yet to fly in Korea where he would become a double ace, but he was an experienced combat veteran of World War II.

Before taking off, Johnson asked Gabreski where he wanted the pipper to be. He had to badger the unresponsive ace for an answer. Gabreski finally said, "Just put the pipper on the cockpit!"⁵² Johnson was an extremely smooth pilot who made good use of the A-4. When the gun camera films came back, almost every frame showed Johnson's pipper right on Gabreski's cockpit.

When Gabreski's turn came to be the attacker he told Johnson to "hold it" so that he could bore sight the camera that was rigged through the K-14. As soon as he was lined up on Johnson's tail he triggered the gun camera and radioed "fights on." When Gabreski's film was developed Johnson's tail pipe was in the center of the first few frames, after that, all you saw was sky, because Gabreski was not able to get in another shot at Johnson once he started to maneuver defensively.⁵³

After the tests were completed, Gabreski's team of veteran pilots still wanted to "do away with the radar ranging and the intricate, highly complicated electronic equipment."⁵⁴ The commander of the Air Proving Ground Command, Maj. Gen. Patrick W. Timberlake, was not persuaded by the team's recommendation to remove the APG-30 from the existing F-86Es. A second report based on a comprehensive analysis of in theater gun film showed otherwise.⁵⁵ "Extensive analysis of combat gun camera file," he wrote in his summarization of

The A-36 was a ground attack version of the North American P-51 Mustang fighter. It was armed with six .50-caliber machine guns and had racks on each wing for one 500-lb bomb. The A-36 was used during World War II in North Africa and Italy. (National Archives)



the two project reports, “establishes the fact that despite popular opinion to the contrary, the bulk of the firing in combat is conducted at ranges and angles off in excess of 1,500 feet and 10°. Furthermore, pilots with two or more “kills” during their tour showed *no* firing under 1,200 feet in the film available for assessment.”⁵⁶ Under these conditions, the Air Proving Ground Command’s analysis showed that the kill probability using the A-4 sight with radar ranging was twice that attained with either the A-4 or K-14 with manual ranging.

The Air Proving Ground Command’s conclusion was in keeping with the views espoused by the Fifth Air Force, whose commanders believed that the fourteen aces queried by General Vandenberg were probably not well-trained in the use of the radar ranging gunsight and had served in Korea when the gunsight reliability problem was at its worst. Those who had some training with the sight or familiarity with radar were less critical and saw its value.⁵⁷

Although AMC later concluded that the decision to introduce the A-1C had been somewhat premature, its use in Korea provided the U.S. Air Force with invaluable experience on the practical problems of radar based fire control systems for air-to-air combat.

The A-1C(M) as an Example of Technological Change within the Military

As a case study of a new weapons system, the development and introduction of the A-1C(M) gunsight supports two widely held theories about innovation that are often discussed in discourses on new technology and the military. The first, and perhaps the most obvious, is the concept of the “heterogeneous engineer.” The heterogeneous engineer is a visionary; the sort of person who understands the technology of an innovation as well as the social, political, and cultural ramifications that go along with it.⁵⁸ He is usually the project champion, sometimes referred to as the innovation advocate.⁵⁹ In addition to technical acumen, the heterogeneous engineer must be capable of building social networks. To be successful he has to gain the support

of his superiors and motivate them to provide the resources needed to fulfil the project’s goals. General Davis clearly played this role in the case of the A-1C(M). A gifted engineer and an experienced fighter pilot, he had both the technical and cultural knowledge needed to develop a new gunsight. In addition, he had the respect and support within the Air Force and the scientific community enabling him to obtain the resources necessary for the A-1C development program.

The second theory supported by the case study of the A-1C(M) is what Ronald J. Kurth called innovative departure, which he describes as a “radical departure from the technology supporting existing weapons systems.”⁶⁰ Innovative departures are of particular interest to those seeking to promote technological change because they threaten to replace or render obsolete the technology upon which a way of life has grown. Because they can alter the status quo between or within career groups, they can be quite disruptive. In the case of the A-1C, the older, more veteran air aces had the most to lose. As an elite fraternity within the Air Force, their status depended upon their skill in downing enemy aircraft—skills that took many missions and combat encounters with the enemy to perfect. In the hands of a pilot trained to use it, however, a properly functioning A-1C(M) with its radar ranging gunsight made it easier for a skillful pilot (a good stick) with less combat experience to make a “kill.” This was exemplified by the experience of 2d Lt. Robert F. Low, who became the seventeenth and most junior air ace on June 15, 1952, just six months out of flight school. Low’s success and the reasons behind it were chronicled by aviation historian Robert Dorr: “unlike older pilots, who had to change with the advent of new technologies, Low had no trouble learning how to use the A-4 automatic gunsight on the F-86E and later Sabres.”⁶¹

As with all technologies, technical change, and social change are intertwined. It is hoped that the example of the A-1C provides the Air Force community with a better understanding of the problems and obstacles inherent in developing any new technology. ■

THE HETEROGENEOUS ENGINEER IS A VISIONARY; ...WHO UNDERSTANDS THE TECHNOLOGY...AS WELL AS THE SOCIAL, POLITICAL, AND CULTURAL RAMIFICATIONS

NOTES

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30. Airborne Armament Vol. III, pp. 389, 394-95.
31. *Ibid.*, p. 395-96.
32. *Ibid.*, p. 396.
33. *Ibid.*, p. 397.
34. The antenna horn was placed in the upper lip of the nose intake, underneath a dark-colored dielectric covering.
35. Airborne Armament Vol. III, p. 399.
36. "United States Air Force Operations in the Korean Conflict 1 November 1950-30 June 1952," USAF Historical Study No. 72, Historical Division, Air University, 1953, p. 119.
37. "United States Air Force Operations in the Korean Conflict 1 July 1952-27 July 1953," USAF Historical Study No. 127, Historical Division, Air University, 1956, p. 65.
38. Frank P. Robison, Jr., telephone interview conducted by the author, Oct. 10, 2008. Robison flew 13 missions as Gabreski's wingman in Korea and was the armament officer for the 336th Fighter Squadron.
39. Kenneth P. Werrel, *Sabres over MiG Alley: The F-86 and the Battle for Air Superiority in Korea* (Naval Institute Press, 2005), p. 28.
40. The F-86E was equipped with the J-1 fire control system consisting of the A-1C(M) sight and the improved AN/APG-30A ranging radar.
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48. Werrel, *Sabres Over MiG Alley*, p. 188.
49. Robison interview; Werrel, *Sabres Over MiG Alley*, p. 188.
50. Davis Interview, p. 26; "I just stick a piece of chewing gum on my windscreen and use that as a sight," Werrel, *Sabres Over MiG Alley*, p. 30. [Note: The K-14 had a fixed pipper on the gun line in addition to the disturbed reticule showing lead. If you ignored the disturbed reticule, it was just a typical reflecting sight.]
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Establishing the U.S. Air Force Academy: The Early Years



Phillip S. Meilinger

(Overleaf) Cadets march past the chapel at the U.S. Air Force Academy in Colorado Springs, Colo., (U.S. Air Force photo/Staff Sgt. Desiree N. Palacios)

**AMERICAN
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Almost from the beginning of military aviation, American airmen dreamed of having a service independent from land and sea control, and also of a military school, an air academy, that would educate young men on the unique features of air power and how it should be employed. Achieving independence and establishing such an academy would take several decades. It was not until 1947 that the Air Force became a separate service, and not until 1954 that the Air Force Academy was finally established. In June 1959—fifty years ago this month—the first group of young officers graduated from that Academy. The path to that event was protracted and twisting.

At the end of World War I, Lt. Col. A. J. Hanlon wrote: “As the Military and Naval Academies are the backbone of the Army and Navy, so must the Aeronautical Academy be the backbone of the Air Service.”¹ Many others voiced similar opinions over the next several decades, but it would be nearly forty years before these visions became a reality.

The main reason for this long gestation was simple: airmen first had to justify the need for a separate Air Force. They had to prove air power was vitally important while also holding the potential of being strategically decisive, thus meriting independence from surface-officer control. Once that was done, they could rationalize the need to train and educate air-minded officers to populate that Air Force. Until these events occurred, officers trained at West Point, Annapolis, ROTC, and other commissioning sources were adequate for the air arm.²

The move towards a separate Air Force was inexorable. As aircraft became ever more capable following World War I, the air arm achieved greater autonomy. In 1921, the Air Service was officially established within the Army as a combat branch. In 1926, the Air Corps Act gave the air arm greater authority to run its own affairs as well as an increased budget. The General Headquarters (GHQ) Air Force of 1935 was a further step toward independence. World War II brought the Army Air Forces (AAF), commanded by a five-star airman, and virtual autonomy. This global conflict made clear to all but the most inveterate opponents of change that air power had earned its place as a coequal branch of the armed services. The Air Force became a reality on September 18, 1947. Step one achieved.

The following month, a congressman from Texas introduced legislation to establish an air academy, to be located at Randolph Field outside San Antonio. A flurry of similar bills followed, introduced by congressmen and senators from all over the country—most stipulating that the new air

academy be located in *their* state or district.³ Air Force leaders were ambivalent about these legislative efforts. There were a host of critical issues that needed to be addressed by the new service; an air academy was but one of many. In addition, Air Force Secretary Stuart Symington informed Defense Secretary James Forrestal that if the Army and Navy would allocate one-third of their academy graduating classes each year to the Air Force, a new air academy might not even be necessary! Also, the Air Force was reluctant to embrace any bill that tied an academy to a specific site. The exact location and even purpose of an air academy—notably, should it include flight training—were not yet obvious, so Symington thought it was premature to commit to specifics.⁴ Obviously, the Air Force did not yet know what it wanted.

Nonetheless, the positive actions in Congress spurred the Air Force in early 1948 to prepare legislative language that called for an air academy that would be a four-year program, located at Randolph, and that would award an accredited baccalaureate degree. There was no mention of flight training.⁵ On June 1, the Air Force forwarded its hastily prepared bill to the Bureau of the Budget for review, approval, and submission to Congress. The director, Frank Pace, declined to forward the proposal, stating that it was incomplete. Pace instead called for a “thorough study to be made of the functions which such an Academy is expected to perform . . . and of the organization, size, and type of training required.”⁶

Pace’s dash of cold water contained wisdom. Despite its emerging eagerness to move forward on an academy, Symington’s musings made clear the Air Force had not really thought the matter through. Decisions regarding the size, function, duration and mission of an air academy were not obvious, with several suggestions made over the years. For example, Gen. Henry H. “Hap” Arnold—the wartime head of the AAF—had called for a joint, two-year school that would inculcate basic ideas on scholarship, discipline, and common military customs and courtesies. He saw this period as useful for instilling a sense of teamwork and helping to combat the debilitating interservice parochialism he had so often witnessed. Students would then separate and attend service-specific academies for two more years to learn the details of their profession. All would graduate with diplomas and commissions.⁷

Other senior airmen had different ideas. General Carl Spaatz, Arnold’s successor and first Air Force chief of staff, thought that prospective officers should first attend two years at a civilian

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Gen. Hoyt S. Vandenberg, the second Air Force chief of staff, was one of the youngest Americans to rise to four-star rank. (U.S. Air Force photo)

SHOULD AN AIR ACADEMY INCLUDE FLIGHT TRAINING IN ITS CURRICULUM

university. An air academy would then serve as a two-year finishing school that would award a commission. Others pushed for a four-year military school like West Point.⁸

To clear the air, in mid-1948 the Air Force chief of staff, General Hoyt Vandenberg, convened a board at Air University that was chaired by his vice chief of staff, General Muir Fairchild. This Fairchild Board was composed of several high-ranking Air Force generals as well as the superintendent of West Point. The Board was directed to address two fundamental questions: first, should an air academy include flight training in its curriculum. Second, should the air academy be a four-year military school like West Point and Annapolis, or should it be a composite school that entailed two years at a civilian university or even a combined academy followed by two or three years at a military school.⁹ Both of these were important questions that inspired debate.

For six hours on August 9, 1948, the Fairchild Board discussed these questions and concluded that flight training should not be included, but, in an eight-to-five vote, stated that the Air Force should adopt a composite plan for its academy. Vandenberg concurred with the recommendation for no flight training because of the severe negative impact it would have on the academic program. A full-up flight training program was simply too intense and time-consuming to allow for a quality

baccalaureate degree to be earned concurrently. On the other hand, Vandenberg rejected the proposal for a composite academy scheme. He stated that the plans for establishing an Air Force Academy would be based upon a four-year course of instruction “generally along the lines of the present service academies.”¹⁰ Obviously, Vandenberg, himself a 1923 graduate of the Military Academy, thought such a program was a positive influence on aspiring young officer candidates.

Vandenberg then directed Air University at Maxwell AFB in Alabama to follow up and establish the Air Force Academy Planning Board to thoroughly study the entire question of an academy. The results of this effort were impressive.

The Planning Board consisted of four groups that examined specific issues: site and building construction, legislative affairs and the matter of an interim academy, administration and organization, and, most importantly, curriculum. The standing members of these groups were officers, but they were assisted by a large group of very distinguished civilians and military advisors.¹¹

The Planning Board’s report, published in January 1949, stated the problem clearly. During the late war the officer corps of the AAF had grown from 1,600 to over 385,000. Many of those commissioned were not college graduates, and the result was “an increasing number of officers who do not measure up to the standards of education required for the execution of their duties at the highest peak of efficiency.” In late 1948 only 41 percent of regular Air Force officers were college graduates, compared to 72 percent in the Army and 75 percent in the Navy. Moreover, only 10 percent of Air Force officers were Academy graduates, compared to 30 percent in the Army and 38 percent in the Navy. The solution was to have more college, and preferably Academy, graduates. West Point and Annapolis could not, however, provide enough officers for the Air Force. In addition—and this was crucial—Air Force officers needed to be educated and trained as *airmen*, not as transplanted soldiers or sailors. In other words, if the entire rationale for separate schools for the Army and Navy was that their unique operating mediums required unique expertise for their officer corps, than those same arguments provided the justification for specially-educated airmen.¹² The logical solution was an Air Force Academy to provide the required number of regular air officers.

The Board proposed a curriculum that would be “student-centered” and would foster creative thought; there would be little emphasis on “rote” learning. Classes would average twenty students, with an overall student-to-faculty ratio of ten-to-one. The faculty would consist of both military officers and civilians.¹³ It also recommended that the Air Force begin an “upgrading program” that would send selected officers to civilian universities to obtain advanced degrees. This would begin to form a pool of qualified officers who could be tapped for academy teaching assignments at a later date.¹⁴

The actual course of study was detailed at



Air Force Academy cadets racing to the end of the Assault Course.

PRESIDENT HARRY TRUMAN—WAS NOT IN FAVOR OF A NEW ACADEMY

length. The faculty would be divided into three divisions: humanities, sciences, and military studies. The Board listed every course to be taught, the course objectives of each, the method of instruction and grading practices, and even suggested textbooks. It was a very thorough job.¹⁵

It is difficult to underestimate the importance of the Planning Board Study. The rationale used for the formation of an air academy, to include the necessity for a cadre of officers specially educated with an air-focused viewpoint, combined with the argument as to why continuing the practice of siphoning off a percentage of West Point and Annapolis graduates each year would not be satisfactory, were to become standard Air Force talking points for the next several years. In addition, the call for a quality faculty and a plan for how to assure it for the long term, as well as the detailed examination of a notional curriculum for a four-year academy, were seminal. It is no exaggeration to say that these proposals would become the focus of the extended debate over an Air Force Academy for the next decade.

At the same time, it should also be noted how conservative these proposals were. The Planning Board looked to the West Point model and used it extensively. Consequently, it recommended that the curriculum was to be fixed for all cadets regardless of ability or prior college experience. As at the Military Academy, disparities in student knowledge and abilities would be addressed by “sectioning”: brighter cadets would be grouped into higher class sections, and less gifted cadets would be gathered in the lower sections. The better instructors would be assigned to the lower sections where their expertise was most needed. Also as at West Point, there would be no electives and no academic majors. There was, seemingly, a bit more emphasis given to the humanities and social sciences in the Planning Board’s proposal, but not enough to shift the overall preponderance of academic focus from mathematics, science, and engineering—39 percent

of the curriculum would be mathematics/science based, and 34 percent would cover humanities and social sciences. The remainder would be military studies.¹⁶

As for other aspects of cadet life, once again the similarities to West Point were more remarkable than the differences. Classes would be conducted six days per week; athletics, drill, and tactical training would occupy a cadet’s after-class time. Commissioned officers, termed tactical officers as on the Hudson, would be assigned to each air cadet squadron. An Honor Code would be imposed on cadets to inculcate the proper aspects of ethical conduct.

It was immediately clear, however, that not just an air academy was at stake. In the post-war era there were on-going discussions of service academy education in general, prompting Defense Secretary James Forrestal to appoint a board headed by Robert L. Stearns, president of the University of Colorado, and retired General Dwight Eisenhower—then president of Columbia University.

The Stearns-Eisenhower Board met with dozens of witnesses and its report emphasized the need for service academies.¹⁷ It rejected various plans calling for a single joint academy or a composite scheme; rather, the Board wanted each service to have its own academy. It concluded that “an Air Force Academy should be established without delay.”¹⁸

These boards had been useful, but nothing could actually be done about establishing an air academy until Congress passed the required legislation and appropriated the necessary funds. Congressional action proved to be an enormous hurdle.

Any air academy legislation needed first to pass muster with Representative Carl Vinson, chairman of the powerful House Armed Services Committee. If he was favorably inclined, he would hold committee hearings on the subject. If the committee voted favorably, the issue would move to the entire House. If a vote there was positive, then the Senate would have to debate and approve the bill. Finally, the president would have to sign the bill into law. Vinson would eventually become a supporter of the academy idea, but even his powers were limited. The White House—specifically President Harry Truman—was not in favor of a new academy, so little momentum could be generated in Congress. In addition, Frank Pace at the Budget Bureau was still not satisfied that the Air Force had done all its homework regarding an academy proposal. Although the Planning Board Study had clarified a number of key issues, Pace wrote that the Air Force plan “will raise questions as to location, cost, size of cadet corps, curriculum and its relationship to curriculum of the other academies which cannot be answered in enough detail to insure favorable consideration by this Congress.”¹⁹ How much would the academy cost? The Air Force had come up with several estimates over the previous two years, ranging in price from \$65 million to \$153 million.²⁰ That’s quite a range. These cost estimates were important because the



Lt. Gen. Hubert Harmon.
(Photo courtesy of the author.)

VANDENBERG ALSO APPOINTED A SPECIAL ASSISTANT FOR AIR ACADEMY MATTERS: GENERAL HARMON

Air Force was arguing that a new air academy would be cheaper than expanding the size of West Point and Annapolis so they could provide the required number of officers to the Air Force.

In addition to cost estimates, Pace made it clear that location was also a critical issue. How could he, or Congress, agree to legislation for an Air Force Academy when the Air Force had not yet decided where it would be located?

The Air Force had given some thought to the issue; in fact, the Air University Planning Board had looked specifically at Randolph Field as the academy's location, but was this the *best* site for an academy?

This question prompted General Vandenberg to appoint a Site Selection Board on November 25, 1949. The president of the board would be retired General Carl Spaatz. Other members included Lt. Gen. Hubert Harmon, retired Brig. Gen. Harold L. Clark, an engineer, and Dr. Bruce Hopper from Harvard University.

At the same time, Vandenberg also appointed a Special Assistant for Air Academy matters: General Harmon, who was also on the Site Selection Board. Harmon was an interesting choice. A 1915 graduate of West Point—the same class as Eisenhower, Omar Bradley and a host of others “who the stars fell on,” he had served almost his entire career in the air arm. Although he had briefly com-

manded the Thirteenth Air Force in the Solomons during 1944, his forte was planning, administration, and personnel issues. In late 1949 he was serving as the U.S. air representative to the United Nations. This turned out to be a do-nothing job, and to keep him busy, Vandenberg gave him the air academy responsibilities. It was a portentous choice.

Harmon kept his responsibilities at the United Nations, but after December 1949 his primary focus would be the academy. He established an office in the Pentagon where he and four others were assigned; there was also a small satellite office at Bolling AFB, Washington, D.C., on the other side of the Potomac River that consisted of several others. For the next five years, these small offices would be the focus of all air academy planning. Harmon became involved with all aspects of the academy issue and would display tenacity and flexibility in the quest to push the required legislation through Congress. He never wavered from the goal—to gain an Air Force Academy—but the paths to that objective could be many and varied. He never gave up, though the struggle was long and frustrating.

Harmon, like many others in the Air Force, erroneously assumed that Congress would act quickly in 1950. He thought an academy would be authorized by June, with an interim site opening the following summer. He, therefore, proposed that the academy should begin with all four classes in place: the freshmen would be 200 civilians selected by the process specified in the enabling legislation. Upper classes would consist of cadets and midshipmen borrowed from West Point and Annapolis.²¹ The question of who would comprise the initial upper classes of a new air academy would be hotly debated over the next five years. Over time, Harmon would change his mind on this issue, eventually deciding to use junior Air Force officers brought in to serve as “surrogate upperclassmen.”

Harmon and his team also began revising the curriculum that had been proposed by the Planning Board, while still holding firm to its basic thrust. There would be a total of 218 semester hours, 88 in the sciences (40.4 percent), 84 in the social sciences and humanities (38.5 percent), and 46 in military training (21.1 percent).²² In comparison, the Planning Board had called for a curriculum of 39 percent science, 34 percent social sciences and humanities, and 27 percent military training.²³ Over the next four years, the curriculum advisers at Bolling AFB continued to refine the program, even drawing up detailed lesson plans and faculty notes for every course.²⁴ In addition, they received much help from Air University; numerous students at the Air War College wrote their theses on various aspects of the proposed air academy.²⁵

Harmon remained an advocate of what he termed “a balanced curriculum.” Later he would argue that “Since modern air warfare touches all facets of national life, it is vital that air leaders possess also a sound knowledge of the political, economic and social factors. Thus, while the air officer



W. Stuart Symington, first Secretary of the Air Force and Gen. Carl Spaatz, first Air Force Chief of Staff at a press conference

**JUNE 1950,
THE KOREAN
WAR BROKE
OUT—THAT
FURTHER
DISTRACTED
CONGRESS
AND THE AIR
FORCE FROM
ACADEMY
CONCERNS**

must possess as a minimum a considerable technical skill in air matters, he must also be broadly educated in the social sciences and the humanities.²⁶

By January 1954, the curriculum was ready to present to others. That month Harmon briefed his Senior Advisory Board—retired generals and old friends Toey Spaatz, Bill Streett, and Conger Pratt.²⁷ Harmon thought the proposed air academy curriculum was unique—no college or university in the country could boast of such a balance that emphasized both the sciences and humanities, while at the same time including a significant airmanship component. He was convinced that the new beginning to be offered by the Air Force Academy was a blessing, allowing the staff to start fresh without the crushing conformity of tradition, excessive political guidance, or instructor whims.

Curriculum issues, though crucial, quickly took a back seat to two other major issues: the attempt to get appropriate legislation through a recalcitrant Congress, and the selection of the academy site. It was apparent that the two were tied together, but it was believed—erroneously as it turned out—that site selection would have to precede enabling legislation.

The Site Selection Board began its efforts in late 1949. After announcing plans and requesting inputs from Congress and communities across the nation, proposals flooded in, and all together, 354 potential sites were nominated.

Winnowing this large number followed a multi-step process. First, the Army's Corps of Engineers would screen the sites and eliminate those obviously unsuitable. Next, architectural engineers would survey the remaining locations. It was hoped these preliminary inspections would be completed by the spring of 1950, narrowing the list to ten sites. The Site Board would then visit those ten sites and submit a final recommendation by mid May. This schedule was dealt a fatal blow when Secretary Symington told Spaatz that flight training *should* be included in the air academy curriculum—this had not initially been a requirement. This new criterion, which had profound implications for the size, location, weather and topographical features of a proposed site, meant that the Board would need to start over.²⁸

Worse, at the end of June 1950, the Korean War broke out—a totally unexpected event that

further distracted Congress and the Air Force from academy concerns.²⁹ Despite this, the Site Selection Board pressed on. In August 1950, it came up with a list of forty-eight potential sites, which was soon whittled down to twenty-nine.³⁰ In November and December the Board visited these sites, but was then told, because of the precarious situation in Korea, to “sit tight” and do nothing for several months. The Board finally convened in May 1951, to discuss its findings. After two days, the members concluded that no one site fulfilled all their desires, but of the seven named as finalists, their first choice was Colorado Springs. Because the legislative imbroglio had still not been resolved, however, no announcement was made. Harmon took the Board's final report and locked it in his safe. It would remain there for the next three years.³¹

Harmon, the Special Assistant, was growing frustrated with all the delay. He wrote strong letters to Vandenberg and Symington, with little effect. He considered bypassing both Congress and the Budget Bureau, both of whom continued to put obstacles in his way. Nothing seemed to work. The Korean War continued to drag along indecisively and this meant that Congress was not inclined to deal with “non-essential” defense issues. Worse, in August 1951, a huge cheating scandal was uncovered at West Point, leading to the expulsion of ninety cadets. This event made Congress even less willing to begin discussing the need for another academy. Congress recessed on October 1, 1951, without taking action on an air academy bill.

Although airmen hoped 1952 would be a better year, this proved not to be the case. The Truman administration's plans to enact universal military training met with hostility in the House. And it was an election year. All of these factors led Chairman Vinson to believe that an academy bill would stand little chance of success. Rather than have the bill defeated, he elected not to bring it up for a vote that year.

The Republicans won the 1952 elections, so Vinson would be turning over the gavel to Congressman Dewey Short. Even so, Vinson promised to do everything he could to help push the academy legislation through in the coming year.³²

The New Year dawned with a degree of optimism. There would be a new Congress, eager to tackle problems and get things done. More importantly, there would be a new president—Dwight Eisenhower.

To educate the new administration, General Harmon briefed the new Air Force secretary, Harold Talbott, who was “enthusiastically in support” of the project and told him to brief the new Defense secretary, Charles Wilson, to gain his support as well.³³ Harmon did so, and then advised Talbott that the key to the academy process rested with the president. Although several appointments had been made to brief President Eisenhower, all had been cancelled. Harmon suggested that Talbott get together with Wilson and the new Budget director, and the three of them secure Eisenhower's support. If that were done, he felt confident Congress

President Dwight D. Eisenhower signs the Air Force Academy bill into law. (Photo courtesy of the author.)



THE PRESIDENT INTERVENED PERSONALLY TO APPOINT HARMON TO THE POSITION OF SUPERINTENDENT PRESUMPTIVE SENT A STRONG AND UNMISTAKABLE SIGNAL TO CONGRESS

would move smartly.³⁴

Eisenhower's support was indeed crucial. But because the president had not expressed his opinion on the question of an air academy—at least not since taking office—Chairman Short would not act. Word from the White House was necessary.³⁵ Finally, in response to a question about an air academy at a press conference on 19 March 1953, Eisenhower responded: “I think we ought to have an Air Academy. I was on a board some years ago [Stearns-Eisenhower], and I thought it was all settled that we were to have an Air Academy. I think we should.”³⁶

Harmon and the Air Force went forth with new hope. This appeared to be the decisive signal that would finally set wheels in motion on the Hill. They were wrong again. For nearly one month the proposed legislation remained bottled up in the Pentagon. The green eyeshade folks there were still troubled by cost estimates. For its part, Congress was too busy with items of a higher priority. Even so, Talbott hoped that favorable legislation would be passed in early 1954. If so, construction could begin at the permanent site in January 1955, to be completed in two years. In the meantime, the first 1,000 cadets would complete their first two years of education at an unnamed interim site, and in 1957 would move to the new permanent site.³⁷

After five years of dashed hopes and faulty estimates, dreams of an Air Force Academy finally moved beyond wishful thinking. Harmon, who had retired the previous year, was recalled to active duty the following day, and then retired again when it became clear legislation would not pass in 1953, was again recalled to active duty a third time on

November 8, 1953, based on assurances that the logjam would break in the New Year. This time, Hubert Harmon was recalled to active duty by President Eisenhower himself.

It is difficult to exaggerate the importance of this move. The fact that the President intervened personally to appoint Harmon to the position of superintendent presumptive sent a strong and unmistakable signal to Congress. Eisenhower wanted an air academy, and he wanted it now.

As promised, soon after the first of the year Chairman Short announced hearings in his Military Affairs Committee for mid-January 1954. On the appointed day, brief statements were made by representatives from the Defense Department and the other services, all stating that they supported the new air academy. The assistant secretary of defense for manpower and personnel, John Hannah, proved an impressive figure. Before his appointment he had been the president of Michigan State University. He told the Committee that, frankly, he had thought another academy unnecessary. His long career in education led him to believe that civilian institutions could do the job just as well, at lower cost. Since arriving at the Pentagon, however, his daily contact with outstanding generals and admirals, who were Academy graduates, and his own visits to West Point and Annapolis had convinced him to change his mind. He now believed the academies were essential, and that an Air Force Academy was essential. The academies, said Hannah: “instill in their students and in their graduates a loyalty to the service, a loyalty to the Government, and appreciation for ethics and integrity, to a degree beyond what we



Cadets on parade.

300 CADETS WOULD ENTER THE ACADEMY IN JULY 1955

do in our civilian universities.” It was a powerful presentation.³⁸

Secretary Talbott then gave a justification for the need for an air academy. General Harmon followed on 14 January. He began by noting that in their plans—which had been on-going for six years—the Air Force looked “quite naturally” to the other service academies, but especially to West Point. As a result, the laws pertaining to the Military Academy were seen as most applicable to the air academy. He also made clear, however, that the air academy would be unique: “we have been hampered by no established customs or traditions, no preconceived ideas, no vested interests.” The new school would be four years in duration and offer a baccalaureate degree. It would be commanded by a superintendent, whose two main assistants would be a dean of faculty and a commandant of cadets. Pay and allowances for air cadets would be the same as those for West Point cadets and Annapolis midshipmen. Harmon’s vision for this new academy was austere yet elegant: “we propose to establish and enforce the highest standards of loyalty, integrity, and patriotism, and to motivate our cadets to a lifetime of service in the Armed Forces.”³⁹

Although the model used was West Point, the air academy would not be a carbon copy. There would be considerably less emphasis on infantry drill, for instance; instead: “Our mission is to train for the Air Force.” Harmon wanted his air cadets to be “air-faring men in the fullest sense; air-minded and thoroughly indoctrinated in all aspects of air operations.” To help ensure this result, cadets would work in and around aircraft, spend their time in actual hangars and shops, and, of course, they would fly during all four years.⁴⁰

The flying training program outlined by Harmon was substantial. During the first year at the academy, cadets would be given local orientation flights and would also spend considerable time on the flight line. In the second phase, cadets would take an aircraft observer’s course. On completion, all cadets would be fully qualified in aerial navigation and aerial bombing. In their senior year, cadets would also be given preliminary training as pilots—50 hours in the air and a further 150 on the ground. Those who showed the requisite aptitude would, upon graduation, be sent to regular Air Force flying schools to win their wings.⁴¹

Turning to the academic program, Harmon stated that the current curriculum had been first laid out in 1948 (the Planning Board Study), but had been constantly revised and adjusted. It provided for a broad education that stressed both the social sciences and the technical sciences. The advanced technical courses would emphasize aviation matters: thermodynamics, jet propulsion, aerodynamics, and aircraft design. Harmon stated that the academy would not produce aeronautical engineers, but he believed that the grounding received by cadets would allow them later to earn a master’s degree in aeronautical engineering at a civilian university.⁴²

As to timing, Harmon told the Committee that assuming the legislation was soon passed, the first class of around 300 cadets would enter the academy in July 1955, with the next class of perhaps 324 entering the following summer. Both of these classes would be taught at the as-yet-unnamed interim site. He hoped that the permanent site, also unnamed, would be ready in the summer of 1957 and would then house the first three classes of cadets. Who would instruct them in military affairs and leadership? All talk of importing upperclassmen from West Point and Annapolis went over the side: Air Force officers, fresh out of flying school, would serve as surrogate upperclassmen.⁴³

Most questions from the Committee centered on the permanent site to be selected and the flying program. The legislation stated that the Air Force secretary would appoint a new committee to select a site; if its recommendation was unanimous, that would be the winner. If there was a split decision, the final determination would be made by the secretary. The congressmen questioned Talbott and Harmon closely on this issue—hoping for hints as to where the academy would be sited—but the two men refused to say anything about the results of the previous Spaatz Board other than to note the

identity of the finalists—which was already a matter of public record. (Later, another board was appointed, and it too selected Colorado Springs as the permanent site.)

Harmon and others met with the Senate Armed Services Committee staff the following month. There were no major problems noted or anticipated, and on February 18, the Senate hearings began. Assistant Secretary Hannah led-off this time, giving another powerful statement. Army and Navy statements were read into the record, and Secretary Talbott gave his testimony—largely the same as he had given before the House. Harmon then offered a prepared statement to be entered into the record. Subsequent questions centered largely on the permanent site to be determined.⁴⁴

The Senate passed its version on 8 March, and at the end of the month the House and Senate staff members met to reconcile their minor differences. The House re-voted and passed the bill on 25 March; the Senate voted “yea” four days later. On 1 April 1954, President Dwight Eisenhower signed the bill, now Public Law 325. The Air Force Academy was a reality.

It was an important day that had been a long time coming. For decades the Academy had been a dream, and for over six years, since Air Force independence, it had been an eagerly sought and fought for goal. This extended battle was well summed by the Academy’s official history, which characterized this period as one of “enthusiasm, gloom and despair—but never lethargy.”⁴⁵

Now the hard work would actually begin. ■

NOTES

1. M. Hamlin Cannon and Henry S. Fellerman, “Quest for an Air Force Academy,” USAF Academy Historical Study, 1974, p. 10.
2. It was also the case, however, that many equated educating airmen with training men to fly. It was no coincidence that the flying school at Randolph Field between the wars was referred to as “The West Point of the Air”—as if the two types of schools, one for training and one for educating, were analogous.
3. Cannon and Fellerman, “Quest,” pp. 90-91.
4. *Ibid.*, pp. 89-93; ltr., W.S. Symington to P.J. Kilday, Nov. 24, 1947, Air Force Academy archives (AFA), Record Group (RG) 103, Appendix (A) 1, Box (B) 1, File (F) 4.
5. Cannon and Fellerman, “Quest,” p. 97.
6. Ltr., F. Pace to W.S. Symington, Jun. 24, 1948, AFA, RG 103, A1, B2, F11.
7. Cannon and Fellerman, “Quest,” p. 72.
8. Lt. Col. Edgar A. Holt, M. Hamlin Cannon, and Carlos R. Allen, Jr., “History of the United States Air Force Academy, 27 July 1954-12 June 1956,” VII vols., USAF Academy Historical Study, Aug. 1, 1957, pp.1, 12-13, 27; memo, CSAF to SECAF, Oct. 8, 1947, “AFA Official History,” IV, Document (D) 174.
9. Ltr., CSAF to DCS/P, Aug. 2, 1948, AFA, RG 102, Microfilm Cartridge (MC) 302.
10. Copy of letter from Vandenberg contained in Air Force Planning Board, “A Plan for an Air Force Academy,” III vols., Air University, Jan. 1949, I, iii. [Hereinafter, “Planning Board Study.”] See also Cannon and Fellerman, “Quest,” pp. 107-08.
11. “Planning Board Study,” I, xii-xiii. Of note, one of the Board’s members was Col Robert M. Stillman, later to be the Air Force Academy’s first commandant of cadets.
12. *Ibid.*, I, pp. 4-5.
13. *Ibid.*, I, pp. 47-51.
14. *Ibid.*, I, pp. 53-55.
15. *Ibid.* These courses are outlined in the first volume of the Report, but given in detail in volume two.
16. “Planning Board Study,” I, pp. 13-15.
17. *Ibid.*, p. 3.
18. *Ibid.*, pp. 4, 6.
19. Ltr., F. Pace to W.S. Symington, Jul. 11, 1949, “AFA Official History,” IV, D138. Pace’s letter strongly implied that he was satisfied with the Air Force proposal; he just did not think that Congress would be.
20. Ltr., Brig Gen J.B. Newman to Lt. Gen. Hubert R. Harmon (HRH), Feb. 17, 1950, “AFA Official History,” IV, D120.
21. Memo, HRH to CSAF, January 20, 1950, AFA, RG 103, MC 303.
22. “AFA Official History,” I, pp. 461-62; Interview with Col Arthur J. Boudreau, by Maj. E.A. Holt, October 10-11, 1956, “AFA Official History,” III, D1, p. 13.
23. “Planning Board Study,” I, pp. 13-15.
24. “AFA Official History,” I, p. 463. These detailed syllabi are in AFA, RG 103, MC 304 and 305.
25. There are over a dozen of these theses located in AFA, RG 103, MC 304.
26. Woodyard, pp. 29-30.
27. “AFA Official History,” I, pp. 465-66. Harmon and Spaatz had become quite close after World War II. Harmon wrote his wife in 1954: “Tooev has helped me immeasurably”—he was responsible for getting him promoted to permanent brigadier and major general, the assignment to the UN that earned him a third star, and “who now says I must be the first Superintendent.” Ltr., HRH to RMH, January 29, 1954, HRHC, A4, B11, F14.
28. Boudreau Interview, pp. 9-10.
29. Ltr., HRH to B.D. Wood, Sept. 5, 1950, Harmon Papers, AFA, B3, F1.
30. Memo, HRH to CSAF, Oct. 31, 1950, AFA, RG 103, A1, B2, F12.
31. “AFA Official History,” I, pp. 336-37; MFR, OSAF, Jan. 24, 1951, AFA, RG 101, MC 300.
32. MFR, HRH, Dec. 23, 1952, AFA, RG 101, MC 301.
33. MFR, HRH, Feb. 6, 1953, AFA, RG 101, MC 301.
34. Memo, HRH to VCSAF, March 13, 1953, AFA, RG 101, MC 301; MFR, Col R.E. Masters, February 2, 1953, “AFA Official History,” IV, D80.
35. Memo, Maj. Gen. R.E.L. Eaton to CSAF, Feb. 2, 1953, AFA, RG 101, MC 301.
36. *Public Papers of the Presidents of the United States: Dwight D. Eisenhower, 1953* (Washington D.C.: GPO, 1960), p. 31; MFR, HRH, March 25, 1953, AFA, RG 101, MC 301.
37. MFR, HRH, Oct. 21, 1953, AFA, RG 103, MC 303.
38. U.S. Congress, House, hearings before the Armed Services Committee, *To Provide for the Establishment of a United States Air Force Academy*, 83d Congress, 1st session (Washington D.C.: GPO, 1954), pp. 14-15.
39. *Ibid.*, pp. 65-66.
40. *Ibid.*
41. *Ibid.*, pp. 67-68.
42. *Ibid.*, pp. 66-67.
43. *Ibid.*, p. 69.
44. U.S. Congress, Senate, hearings before the Armed Services Committee, *An Act to Provide for the Establishment of a United States Air Force Academy and for Other Purposes*, 83d Congress, 2d session (Washington D.C.: GPO, 1954), pp. 35-56.
45. Cannon and Fellerman, “Quest,” p. iii.

From Berlin to Baghdad: America's Search for Purpose in the Post-Cold War World. By Hal Brands. Lexington: The University Press of Kentucky, 2008. Notes. Index. Bibliography. Pp. vii, 416. \$45.00 ISBN 0-8131-2462-9

The story is familiar. America's Cold War conflict with the worldwide forces of communism gave meaning and purpose to its role as a great power. During this contest, the United States' policy of containment and the domestic political consensus that sustained it provided clarity, coherence, and focus in the exercise of great power. Ultimately, the West's victory in the Cold War left the United States with neither purpose nor focus and in search of a worthy successor to containment. Hal Brands, a doctoral student at Yale University, picks up the story in describing this search from the fall of the Berlin Wall in the first Bush administration through the fall of Baghdad and beyond in the second. The result is a compelling case study that explores two questions essential to understanding the future of U.S. foreign policy.

First, what has emerged to take the place of Cold War containment and consensus in American foreign policy? The short answer is nothing, so far, although the nation's foreign policy establishment has interviewed a number of candidates. The George H.W. Bush team posited a "singular vision" of a New World Order which, Brands tells us, "seemed promising as a new American mission," but foundered when "Bush's pragmatic inclinations eventually caught up to his idealistic rhetoric." Enter Bill Clinton and his advisors who experimented with assertive multilateralism and settled upon enlargement of "the world's free community of market democracies" as the guiding principle for American diplomacy. Brands devotes most of his work to Clinton's failed attempt to get diplomatic and political traction with enlargement as an operating concept. In the end, the administration eschewed what National Security Advisor Sandy Berger called "bumper sticker diplomacy" and gave up on finding a replacement for containment.

This leads Brands and his readers to a question that perplexed Clinton and his foreign policy team during his second term: is today's world too complex and diverse for simple, coherent approaches to foreign policy? Together they answered "Yes" and embraced flexibility in dealing with diversity, with the result that "flexibility turned into contradiction, diversity to distraction" as American foreign policy drifted toward a new century. The terrifying and seemingly clarifying events of September 11, 2001, offered a different

answer to George Bush and his advisors. Combating terrorism and preventing the spread of weapons of mass destruction came together in the "terrorism-WMD nexus" to provide coherence and focus in a proactive foreign policy and a wider national security strategy based on pre-emption rather than containment. Brands believes that "on a conceptual plane, at least, Bush's strategy represented a return to the focus and clarity that had been absent [from U.S. policy] for more than a decade." But Bush's return to simplicity had its own disadvantages and discontents; Brands' exposition and analysis of these alone are worth the price of the book.

In the end, Brands comes down squarely in the middle in answering the two central questions of his study. "As the American experience suggests," he argues, "this quest for an all-encompassing doctrine is probably quixotic; the very expansiveness of U.S. goals makes unlikely that there is a single comprehensive thread binding all of Washington's aims. Nonetheless, the necessity of comprehensibility remains, as strategists must identify some method of organizing and structuring foreign policy."

This is an ambitious book. Brands' scholarship is first rate; he has mastered an impressive collection of archival and other sources to energetically engage the central foreign policy questions of our time. In some respects, however, he has been limited by the sources and traditions in diplomatic history which focus his study on the thoughts and actions of the shakers and movers in American foreign policy. Thus, this work is less about "America's search for purpose" and more about a relatively small elite's effort to craft a rational strategy for an irrational world. And readers of *Air Power History* will probably note Brands' general neglect of the Pentagon's role in formulating foreign policy and national security strategy. Indeed the increasing militarization of American foreign relations is a Cold War phenomenon that has accelerated in this new century. Perhaps this is work for another day, work that Brands is well-equipped to tackle.

It is still too early to tell whether the terrorism-WMD nexus will produce a lasting successor to containment. But Brands' study suggests that the search for clarity, coherence, and focus will continue; and his analysis provides instructive insights and cautions for seekers. *From Berlin to Baghdad* should be required reading in the current administration.

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Rupert Red Two: A Fighter Pilot's Life from Thunderbolts to Thunderchiefs. By Jack Broughton. St. Paul, Minn.: Zenith Press, 2007. Photographs. Pp. 352. \$26.95 ISBN: 0-7603-3217-7

Rupert Red Two joins *Thud Ridge* (1969) and *Going Downtown* (1988) to complete Jack Broughton's trilogy that centers on USAF F-105 operations in the Vietnam War. In this prequel, Broughton covers his life from flying training as a West Point cadet in 1945 through his flying career. He flew P-47s in Europe immediately following World War II, went on to fly F-80s and F-84s in the Korean War, led the Thunderbird USAF aerobatic team between 1954 and 1957, held training positions, and then commanded an F-106 squadron. He briefly relates his Vietnam service in F-105s—obviously in less detail than in his prior books that focus on Vietnam—and concludes by relating his flying career after retirement.

Broughton writes in clear, vivid, uninhibited language. He names names of not only his many classmates, friends, and peers lost in accidents and combat, but also those who performed in less-than-exemplary fashion. His outspoken style and clear stance are visible throughout, perhaps highlighted in his explanation of the high F-105 loss rate in Vietnam in which he charges that, "we were poorly utilized, we were hopelessly misdirected and restricted, and we were woefully misused by a chain of stagnant high-level civilian and military leadership that didn't have the balls to fight the war that they ineptly micromanaged." Another example is his damning and well-described experience with the F-106 ejection seat in a chapter aptly entitled, "The Killer Seat."

For all of the book's positive features (and there are many), Broughton slights some areas. For example, while he discusses his Korean War service in fighter bombers, he does not mention why he did not get into the "glory" fighter of the conflict, the F-86. Likewise, in describing fighter-pilot life, he neglects the rough edges, such as those made public in the "Tail Hook" scandal. A third area that deserves treatment is the rivalry within the fighter community between those who flew air superiority, fighter bomber, and interceptor fighters. As Broughton flew the latter two types, his views would have been welcome. But these are mere quibbles.

Rupert Red Two is notable for delivering illuminating and interesting insights written in clear, outspoken language into the aircraft Broughton flew and the air force in which he served. The resulting narrative is candid with kudos and criti-

cisms of both men and machines. He is especially effective in expressing the thrill of flying along with its “hairy moments” and associated dangers. I believe (albeit as a non-fighter pilot) that Broughton captures the mystique of fighter pilots and the sheer joy of flying as well as any, far better than most, and probably as well as can be rendered on the printed page. In very personal and direct terms, Broughton projects the “feel” of flying. But he is not a romantic as he makes clear that inattention, bad luck, poor design, questionable leadership, and nasty weather can easily get you into trouble and sometimes get you killed. If you liked Broughton’s other books, or just want a fast moving account of flying AAF/USAF fighters in the 1940s through the 1960s, *Rupert Red Two* is an excellent choice.

Kenneth P. Werrell, Christiansburg, Virginia



Velocity: Speed with Direction. The Professional Career of General Jerome F. O’Malley. By Aloysius G. Casey and Patrick A. Casey. Maxwell AFB, Ala.: Air University Press, 2007. Photographs. Diagrams. Maps. Appendix. Index. Pp. 261 Paperback. ISBN: 1-58566-169-5

Lt. Gen. Al Casey grew up in small-town Pennsylvania as a neighbor of the O’Malleys and a classmate of Jerry O’Malley. His coauthor is his son, Patrick. This close relationship between author and subject is a dual-edged sword. Clearly he knew General O’Malley well from an early age and for the rest of his life, and he frequently cites himself as a primary source of memories and anecdotes from O’Malley’s life. It seems possible that this close relationship has also led to a slanted or incomplete view of General O’Malley’s life and accomplishments.

This exists in Chapter 10, dealing with the 1972 incident involving Gen. John Lavelle. Lavelle was Commander, Seventh Air Force, and was relieved of command and forced to retire at a lower grade for disregarding the standing rules of engagement (ROE) during operations in North Vietnam. Arguments over Lavelle’s culpability for his interpretation of the ROE, and the ensuing falsification of combat reports, have raged for years. This book introduces new information, some of which was published in the February 2007 *Air Force Magazine* by the same authors. This new evidence consists of high-level declassified messages as well as tapes

from President Nixon’s Oval Office that contribute to the point-of-view that Lavelle had high-level authorization to conduct raids as he did.

Lavelle testified before Congress that he had no knowledge of false reports, but as the commander, he accepted responsibility for the actions of his subordinates. During this period, O’Malley was a colonel and vice commander of the 432d Tactical Reconnaissance Wing, which flew many of the missions in question. In *To Hanoi and Back*, Wayne Thompson contends that a “dual reporting” scheme that included both the invented data that would justify using force in accordance with the ROEs, and the actual information from the raids, had been set up between Maj. Gen. Alton Slay, the Seventh’s deputy for operations, and Col. Charles Gabriel, the 432d commander. Another source—*An Affair to Remember*, by Patrick Tower—which relies extensively on testimony to Congress, claims that O’Malley was aware of the false reporting. Tower devotes a great deal of time discussing the high-level messages, Lavelle’s culpability in violating the ROEs, and President Nixon’s opinion that Lavelle was unfairly treated by the Air Force in terms of disciplinary action. However, the matters of false reporting of combat records and O’Malley’s actions aren’t even mentioned. As the book describes the Lavelle Affair the only ominous cloud hanging over O’Malley’s career and any potential role that he may have played deserves to be explored.

The book is a thorough and interesting chronological account of O’Malley’s life and career. The author’s long and close association with O’Malley enables Casey to illustrate O’Malley’s character and style. Included is an extensive discussion of the role and influence of Diane O’Malley, who was also killed in the 1985 CT-39 crash that claimed her husband’s life. It’s no wonder that the General and Mrs. Jerome F. O’Malley Award was established to recognize “the wing commander and spouse whose contributions to the Nation, the Air Force, and the local community best exemplify the highest ideals and positive leadership of a military couple in a key Air Force position.”

Unfortunately, the book suffers from poor editing. It is far below expected Air University standards. In addition to typos, there are other blunders such as recording that O’Malley attended Squadron Officer School in both September 1956, and the summer of 1957, (and the footnote referring to his training report doesn’t help, as the dates are wrong); misidentifying the 432d Tactical Reconnaissance Wing as the 432d Tactical Fighter Wing; saying Ronald Reagan was elected President in 1979; and

listing O’Malley as the USAF Chief of Staff in 1982. Each of these may be minor, but the accumulation of these errors becomes distracting.

Despite some negative points, I recommend this book for the picture it paints of O’Malley—the man—and of the Air Force during the period he served. It should also be studied by anyone interested in the new information provided on the Lavelle affair.

Col. Stetson M. Siler, USAF, (Ret.)



Forgotten Wings: Gliders in Normandy and Southern France. By Philippe Esvelin. Bayeux, France: Heimdal, 2006. Maps. Tables. Diagrams. Illustrations. Photographs. Bibliography. Pp. viii, 176. \$42.95 ISBN: 2-84048-246-0

For those who have seen the “Band of Brothers” miniseries, few can forget the feelings of terror and chaos as heavily-laden USAAF troop carriers arrived over Normandy during the D-Day invasion of *Fortress Europa*. On that fateful day, C-47 crew chief Joe Fitzsimmons remembers seeing “tracer bullets coming dangerously close.... All of a sudden, I heard little ‘ping-ping-ping’ noises, meaning that we had been hit.... I was under the astrodome to keep the Waco in sight, as I was the one who had to give the glider the signal to release.... I don’t know what had happened, but when I went back up, the Waco was no longer there. When we got back to . . . base, we realized that there were still 3 or 4 feet of rope attached to the tail of the plane.” This intriguing snippet is one of several first-hand accounts by American and German combatants as well as by French civilians included in *Forgotten Wings*, a fascinating book about the development and execution of American glider operations in France during World War II.

Forgotten Wings is organized chronologically into three sections: 1) pre-war American program implementation, glider production, and stateside aircrew training; 2) Operation Neptune (the assault phase of Operation Overlord) glider operations; and 3) glider actions supporting Operation Dragoon, the invasion of southern France. While military glider programs have long been overshadowed by the stunning progress of powered flight’s first century, gliding paved the way for the success of powered flight. Gliding’s importance, especially in building air mindedness and nationalism in interwar Germany, is well defined in Peter Fritsche’s *A Nation of Fliers*. Yet, Esvelin notes the lack of U.S.

military interest in gliders, with program implementation not sanctioned until March 1941. Nonetheless, by war's end, sixteen companies had manufactured nearly 14,000 Waco CG-4A gliders, with the Ford Motor Company leading the way. The metal-framed wood and canvas gliders could lift a total load of 3,750 pounds, usually two pilots and 13 combat-equipped troops. Some gliders carried jeeps or small artillery pieces. Once in England, the USAAF also incorporated use of the larger British Airspeed AS 51 Horsa gliders.

Esvelin admits that the book is not exhaustive. It does, however, include much previously unpublished material, much of it provided by aging glider warriors. These aviators also helped establish the Silent Wings Museum in Lubbock, Texas. While the narrative reads a bit awkwardly at times, the diversity of supplementals is stunning. Tables; maps; historical and contemporary photographs of people, places, and artifacts; and first-hand accounts help tell the story of the men involved in this largely ignored, dangerous, but successful supplement to the airborne and seaborne invasions of France. Lists of the pilots lost in the two French glider operations, as well as a near comprehensive roll call of glider crews for those missions, ensure that their exploits will not be eclipsed.

Forgotten Wings is a nicely appointed volume that should find itself on the reference shelves and tabletops of scholars, military aviation buffs, and the general public. Something new will come to light every time the volume is opened. Clearly, the "G" on glider pilots' wings stood for "Guts."

William E. Fischer, Jr., Westland High School, Galloway, Ohio



To a Distant Day: The Rocket Pioneers. By Chris Gainor. Lincoln and London: University of Nebraska Press, 2008. Photographs. Bibliography. Index. Pp. xxvi, 236. \$29.95 ISBN: 0-8032-2209-0

The University of Nebraska Press has added a third title to its "Outward Odyssey—A People's History of Spaceflight" series. *To a Distant Day* joins the two volumes—*Into That Silent Sea* and *In the Shadow of the Moon*—by Francis French and Colin Burgess that appeared in 2007. Gainor's book takes readers back to a time before the American and Soviet human spaceflight programs of the 1960s on which French and Burgess focused. This was a time when theoreticians, scientists, and engineers strove to transform visionary con-

cepts of space travel into realistic means of sending astronauts and cosmonauts into orbit and bringing them back safely to Earth. In fact, some historians might regard the book's subtitle—*The Rocket Pioneers*—as descriptively too limited, because those early rocketeers were really "the spaceflight pioneers."

Anyone interested in the history of rocketry can find a multitude of books and articles on the subject, enough to satiate even the most ravenous intellect. Gainor's synthesis, however, presents the basic story in an engaging, easy-to-read style. From the classic triumvirate of Konstantin Tsiolkovsky, Hermann Oberth, and Robert Goddard, to the equally familiar pair of Sergei Korolev and Wernher von Braun, he broadens the canvas to include such individuals as Yuri Kondratyuk, Friedrich Tsander, David Lasser, Philip Cleator, Robert Esnault-Pelterie, Frank Malina, and Tsien Hsue-shen. Seasoned space historians easily can identify missing names but, as a short survey aimed toward a general, relatively uninformed audience, the book is remarkably thorough. Beyond the development of rocket technology, Gainor's narrative covers the origin and early evolution of American and Soviet satellite programs, space medicine, and piloted spacecraft designs.

Given the publisher's probable restrictions on length and Gainor's intentional reliance on secondary sources, readers should expect to find occasional omissions or oversights. He mentions Goddard's team working on jet-assisted takeoff (JATO) units for the U.S. Navy during World War II, for example, but fails to note that an all-Navy team led by Robert Truax accomplished equally important breakthroughs on JATO technology during the same period. Similarly, he touts Hubertus Strughold's role in space medicine without naming USAF Maj. Gen. Harry G. Armstrong, for whom Strughold worked after 1945, and who founded the world's first Department of Space Medicine. The Corona reconnaissance satellite program receives attention without any reference to the Galactic and Radiation Background (GRAB) satellite, launched two months before the first successful Corona satellite to provide the first signals intelligence from space. Alluding to people and events such as these in a sentence or two would not have added unduly to the length of Gainor's book.

He also might have dedicated a few more lines to fleshing out his list of sources, because readers seeking additional information on specific pioneers or topics likely will turn to it for guidance. Although published in 1960, Shirley

Thomas's eight-volume biographical study *Men of Space* has stood the test of time and should have been on the list. Gainor discusses the Echo 1 satellite in his narrative, but he fails to cite Donald Elder's superb history titled *Out from Behind the Eight-Ball* (1995). Similarly, he missed James Killian's *Sputnik, Scientists, and Eisenhower* (1977) and Roy Houchin's *U.S. Hypersonic Research and Development* (2006) on the Dyna-Soar project. Despite his apparent unfamiliarity with, or neglect of, these and other especially pertinent titles, Gainor deserves commendation for the excellent sources he has supplied.

To a Distant Day opens new dimensions for the "Outward Odyssey" series. The man-in-space focus of its final two chapters furnishes a wonderfully smooth transition into the story French and Burgess tell in the other extant volumes, but Gainor creates the potential for even more. He points the way toward future tomes covering such topical areas as post-Apollo human spaceflight programs, earth-orbiting and interplanetary robotic spacecraft, evolution of space medicine, and development of space law. Hopefully, University of Nebraska Press will see fit to continue expanding the series in these directions.

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



The Son Tay Raid: American POWs Were Not Forgotten. By John Gargus. College Station: Texas A&M University Press, 2007. Illustrations. Appendix. Glossary. Notes. Bibliography. Index. \$29.95. Pp. 332 ISBN: 13:978-1-58544-622-3-10-1-58544-622-X

If ever there was a military operation so well planned and executed, that ended in total frustration and anger, Son Tay is it. Maj. John Gargus, who was a participating aircrew member, rates the best documented account about the raid was Ben Schemmer's in 1976. But Gargus' work is also outstanding. He says, "It was the rescue mission that will trouble the minds of the raiders for the rest of our lives. We embarked on it with such high expectations. We hoped to become heralded heroes of a protracted war that was beginning to wear down the nation's patience. Surely we could reverse this trend by bringing home some of our imprisoned colleagues, who had never given up on their soldierly duties and had not stopped resisting the enemy." The shocking and bold plan to rescue American prisoners of war from North

Vietnam required a unique, specially trained, joint military task force and required approval from President Nixon. The prisoner of war camp selected for this rescue was near Son Tay, 23 miles west of Hanoi.

In May 1970, a small group of intelligence officials at the Air Force's field activities group at Ft. Belvoir, Virginia, concluded from reconnaissance photos and other pieces of information that there was a prisoner of war camp near Son Tay. Thus began discussions about and planning of a major rescue effort. A feasibility concept was presented to the Joint Chiefs of Staff on July 10, 1970. They quickly and enthusiastically endorsed it. The job was handed to USAF Brig. Gen. Leroy J. Manor, whose deputy, Army Special Forces Col. Arthur D. "Bull" Simons, would engineer the ground portion of the POW rescue mission.

Simons would make sure the rescue operation would have the best possible commanders to train and lead the troops. Almost all of the troops would have to come from available Green Berets at Ft. Bragg, North Carolina. The force would consist of 82 enlisted men and 15 officers. General Manor headed up the Air Force side of the operation. It was his job to select Air Force personnel and aircraft to fill the mission. Navy personnel and aircraft came later as planning progressed. Code names for the various components of the mission were numerous and classified.

Green Berets, aircrew, C-130s, helicopters, and other personnel arrived from bases in the U.S. as well as in Europe. Training for the mission—mostly at night—went well at Eglin AFB, Florida, and its Hurlburt Field facility and included every contingency planners could think of. Staff members held a steady flow of classified briefings. Naval Task Force 77 was to participate under the command of RAdm. James D. Ramage on the USS *Oriskany*.

The raid was planned for November 21, 1970, but was moved up a day because of weather forecasts. All Air Force assets came into the theater from Japan to Thailand. All Navy assets were on station within Yankee station. The operation flowed smoothly and according to plan for the most part only to wind up in total frustration: "negative items" was the coded message that announced cells were empty. The prisoners were gone when the force arrived. Frustration was quickly followed by anger. For a time after the return to bases, team members would not talk to one another. If the North Vietnamese had learned about the raid, nobody has ever said.

Gargus spares no details. The back of

the book lists all the participants and provides other critical information as well. I recommend this book to anyone interested in one of the best executed, but frustrating raids in history.

Stu Tobias, Indianapolis, Indiana



Finding Amelia: The True Story of the Earhart Disappearance. By Ric Gillespie. Annapolis, Md.: Naval Institute Press, 2006. Maps. Illustrations. Photographs. Notes. Index. Pp.xiv, 276 and DVD. \$28.95 ISBN: 1-59114-319-5

Amelia Earhart, the lady when you think of an aviatrix, earned her wings in 1921. She was thrust into aviation stardom in 1928 after becoming the first woman to fly across the Atlantic (albeit only as a passenger). For the next decade her manager/husband, George Putnam (GP), planned and executed longer and more dangerous flights, keeping her in the news constantly. But her most famous flight—one along the Earth's equator—became the one she never finished.

In January 1985, Gillespie formed TIGAR (The International Group of Aircraft Recovery) to search for historic aircraft lost world wide. Its first investigation sought the *White Dove* that carried Charles Nungesser and François Coli across the Atlantic two weeks before Lindbergh's historic flight. Gillespie believes *White Dove* crossed the ocean successfully but crashed in Newfoundland. Numerous expeditions to find it have failed. In 1989, TIGAR began looking for Earhart's famed Lockheed Electra. After studying radio logs from the Coast Guard cutter *Itasca* that provided navigational aid to Earhart, TIGAR believes she landed on Nikumaroro Island (Gardner Island in the 1930s) in the Phoenix Islands, some 300 miles southeast of her target destination, Howland Island. TIGAR has searched Nikumaroro exhaustively eight times with limited results.

From the beginning, this book captured my interest. Gillespie opens by describing Amelia and GP's long months of planning. The Department of the Interior, Works Progress Administration (WPA), and Coast Guard all assisted. Amelia asked President Roosevelt to authorize construction of an airfield halfway between New Guinea and Hawaii. In early 1937, WPA workers constructed three runways on Howland (administered by Interior). Stationed nearby, *Itasca* supplied navigation assistance for the long flight from New Guinea. Some information presented in this section was new to me: a

history of Howland Island and the fact that Amelia started her flight without some navigation details and radio frequencies having been sent to *Itasca*.

Gillespie describes Amelia's crash on Oahu, the aircraft repair, and planning a second attempt flying in the opposite direction. One bright spot is a brief biography of Amelia's navigator, Fred Noonan. The true nature of TIGAR's eighteen years of research is presented here for the first time.

The final two-thirds of the book details the massive search. Once the Electra was presumed down, *Itasca* contacted headquarters and steamed northeast of the island to begin the search. Later, the battleship USS *Colorado* arrived with a search aircraft. The aircraft carrier USS *Lexington* joined in as well. Of interest is the behind-the-scenes dialogue between GP and the Coast Guard and Navy. Readers will wonder why Amelia had not done a better job of providing the Coast Guard with the frequencies she was going to be using, why she had continued to make personal appearances in the months leading to flight, and why she wasn't better skilled in communications. Gillespie also discussed the radio messages from the doomed aircraft—some hoaxes and some real—heard by various people across the Pacific.

The DVD included contains thousands of pages of documents, including radio messages; ship logs; maps; and letters. It, alone, is worth the price of the book.

Over the years, three primary scenarios of what happened to Amelia have been posited: 1) the Japanese forced her down and she ultimately died in their captivity, 2) she was still alive as late as 1970 living under an assumed name somewhere in the world, and 3) she crashed and died upon impact or while awaiting rescue. Not surprisingly, Gillespie accepts the third.

Of aviation history's vast cast of characters, I find Amelia Earhart the most fascinating. Having read many books, seen many documentaries, and discussed her life and disappearance with many experts; I know about TIGAR and Ric Gillespie. I was disappointed with two aspects of the book. First, there is no mention of the Nikumaroro expeditions and what was found there. After one early expedition, Gillespie held a news conference where he showed several pieces of evidence including aircraft wreckage and a sole of a woman's shoe. He confidently stated, "Amelia Earhart has been found!" Analysis of the metal determined that it bore no identifying numbers of any kind so it could not be linked to her airplane, and the sole was from a shoe two sizes too small. My

second disappointment was the critical, one-sentence reviews of many recent Earhart biographies that have enjoyed very favorable reviews by others. But, despite these, I highly recommend the book. It is a great read!

Scott Marquiss, Docent, National Air and Space Museum



Rampant Raider: An A-4 Skyhawk Pilot in Vietnam. By Stephen R. Gray. Annapolis, Md.: Naval Institute Press, 2007. Maps. Photographs. Index. Pp. ix, 284. \$32.50. ISBN: 1-59114-342-0.

Small and nimble, the A-4 Skyhawk proved itself to be a very sturdy and capable combat aircraft in the violent skies over North Vietnam. In *Rampant Raider*, author Stephen Gray straps the reader in for a wild and harrowing journey through the life and times of an A-4 pilot during the Johnson Administration.

After flying more than 250 combat missions and logging more than 300 carrier landings, Gray left the U.S. Navy and began a career as an airline pilot, accumulating more than 24,000 flight hours. Motivated by “very little reality and a lot of fantasy” written about Vietnam, he decided to set the record straight, offering a first-hand perspective of the air war.

Narrative in form, the book delivers the goods on flying the A-4 in Vietnam. Gray bombards the reader with heart-wrenching stories of strike missions, carrier life, and friends lost. His writing style leaves the reader wanting more and unable to put the book down. As he tells of dodging surface-to-air missiles, rescuing downed buddies or flying a crippled jet back to the carrier, Gray is able to put the reader into the A-4 cockpit with him. Whether attacking the famous Thanh Hoa bridge or experiencing the sheer terror of exploding flak, the reader will be enamored with Gray’s account.

Not leaving any stone unturned, Gray also explains the various roles of different personnel on an aircraft carrier and how they work with each other to accomplish the mission. Describing how the munitions personnel loaded each bomb by hand or how the Landing Signals Officer (LSO) critiqued each and every landing, Gray wonderfully illustrates the many intricacies of daily carrier life.

He begins his story with a detailed account of his early training prior to becoming a naval aviator. Despite the title, more than half of the book covers basic

military training, pilot training, and Gray’s early career prior to deploying to Vietnam. Furthermore, Gray writes about only one of his two combat cruises, leaving his readers hungry for more of his action-packed combat stories. If the experiences on his second trip to Vietnam were half as riveting as the first, readers would eagerly look forward to a second volume.

Gray’s memoir is more than a simple rehashing of old war stories. He effectively integrates social and political commentary to make his tale even more fascinating. The reader becomes just as frustrated about the vast number of limitations imposed upon aviators during the Johnson Administration. Despite these restrictions, Gray writes that, “orders were orders, and we were sworn to obey.”

With *Rampant Raider*, Gray offers a simple, yet powerful first-hand account of flying the A-4 in combat. However, the reader also comes away filled with all the emotions that Gray experienced himself. While his account is more popular history than scholarly, *Rampant Raider* is still a valuable resource for anyone researching the air war in Vietnam.

Capt. Matt Basler, Instructor, U.S. Air Force Academy



Strategy for Victory: The Development of British Tactical Air Power, 1919-1943. By David Ian Hall. Westport, Ct.: Praeger Security International, 2008. Illustrations. Photographs. Maps. Notes. Appendix. Bibliography. Index. Pp. xvii, 241. \$125.00 ISBN: 978-0-275-97767-2

This book expands on Hall’s doctoral dissertation. It tells the story, from the British point-of-view, of the Royal Air Force’s (RAF) development of its doctrine, organization, and operational procedures during the interwar period and the early days of World War II.

The RAF had been a separate service from the waning days of the First World War, but it had to endure battles with the Army for limited resources available in the interwar years. Even after the outbreak of World War II, there were repeated arguments between the services on the proper role of air power. In a parallel fashion to ideas in the U.S., the soldiers tried to hold out for assignment of squadrons subordinate to and under the operational control of ground formations, even to the point of repeatedly advocating an air corps that would be part of the Army. The airmen tried to make the case that the soldiers’

ideas on the role of air power were limited and short-sighted. The flexibility of air power allowed a much broader effect to be achieved than just through close air support, which they argued was the least efficient manner of employing air power, especially when organized into “penny packets” tied to individual ground formations.

Despite these familiar sounding points of contention, the RAF and the British Army had not developed doctrine and operational procedures for cooperating in a combat theater. Operations in France in 1940, and early in the North African campaign weren’t successful and led to louder Army arguments for air units to be organic to the Army. The contention was finally settled in the North African desert. Innovations by Air Chief Marshall Arthur Tedder and Air Marshall Arthur Coningham and enlightened leadership by Gen. Bernard Montgomery eventually led to a system that was highly successful and employed for the rest of the war. Tedder and Coningham worked out procedures where all air power was under the command of an airman who worked side-by-side with the ground force commander, as an equal, to employ a joint effort against the enemy. When Montgomery took over command of the British 8th Army in the North African desert in August 1942, he, unlike his predecessors, understood the arguments being made by the RAF and worked effectively with the airmen to implement a plan that used the strong points of each of the services’ capabilities to achieve a more devastating effect.

The book briefly covers the final push in the desert after the Americans entered the war in North Africa in Operation TORCH in November 1942. The U.S. Army Air Forces were still strongly influenced by the idea of strategic bombardment that had been developed by the Air Corps Tactical School between the wars. Based on prevailing U.S. Army doctrine, the U.S. organization for the employment of airpower immediately after TORCH included subordinating air units to ground force commanders. Operations in the Northwest desert were chaotic in late 1942; and Eisenhower, influenced by Tedder, finally opted for a command structure placing an airman in charge of all air operations. The Americans quickly learned from the British experiences and, before the Germans had surrendered in North Africa on May 13, 1943, had in place a combined British-American system for employment of tactical airpower.

This book is well written and easy to read. It is of particular interest to Americans interested in the experiences of the British in developing tactical air power while Americans were still feeling their

way. The book's high cost might make this a book better borrowed from the library.

Col. Stetson M. Siler, USAF (Ret.)



The Nieuport 28: America's First Fighter. By Theodore Hamady. Atglen, Pa.: Schiffer Military History, 2008. Maps. Tables. Diagrams. Illustrations. Photographs. Notes. Appendices. Bibliography. Index. Pp. 277. \$59.95. ISBN: 0-7643-2933-3

I'll cut to the chase quickly: Ted Hamady's *Nieuport 28* is the finest book ever written on America's first true combat aircraft. I plan to cull all other material in my library dealing with this fighter. There is no reason to keep it, because Hamady covered everything the historian or modeler could want to know about the Nieuport.

For nearly two decades, Hamady has been a volunteer research historian at the National Air and Space Museum. When the museum restored its Nieuport, Hamady did much of the research that led to one of the world's finest restorations. He knows his subject. The extensive documentary research and interviews with many survivors who were involved with the Nieuport and its Army Air Service use during 1918 are reflected throughout the book.

I can't think of anything that has been left out. Hamady starts with a superbly detailed account of the first kills made by U.S.-trained pilots on April 14, 1918. Most readers are probably familiar with the kills made by Lieutenants Alan Winslow and Douglas Campbell. Included is a beautiful diagram of the flight paths of the two American fighters and their German adversaries. From that introduction, Hamady proceeds with an excellent summary of the air portion of the First World War up through the U.S. entry in 1917.

When the U.S. declared war, the U.S. "air force" was essentially non-existent. France ended up providing the majority of the Army's combat types: first the Nieuport 28 and then the SPAD XIII. Hamady details the story of the development of the Model 28 and the procurement by the U.S. for use by its fledgling air arm. Only the U.S. Army flew the Nieuport 28 in combat, and the reader will fully understand the reasons for that. Chapter Four covers the entire four months that the Nieuport 28 was in combat. Four months, and then the SPAD XIII entered service and became, by far, the more famous and

celebrated of the two aircraft.

The interesting question about the supposed inferiority of the Nieuport compared to the SPAD is covered in the best part of the book, Chapter Five, which provides an unprecedented analysis of the former's combat role. It turns out that some of the negative press about the earlier fighter was probably unwarranted—and this is not a modern view, but is shown through contemporary correspondence and activities.

After the war, many Nieuports served in the new movie industry. The postwar model 28A was brought home by the Army to serve in the U.S. Both the 28 and 28A served in Hollywood and with various civilian fliers. Other Nieuports served with the U.S. Navy and the Swiss and Argentinians. Hamady well covers today's survivors, led by a detailed discussion and pictorial of the restoration of NASM's example. But every one of the known aircraft (about 20 of them) is covered.

After his main narrative, Hamady provides six appendices on flying and designing the Nieuport 28, its characteristics and specifications, and a discussion of the one big weakness of the model: its upper wing. There is a massive table covering every known Nieuport 28/28A produced, and the appendices conclude with a number of outstanding two-view profiles on all of the camouflage schemes and users.

In short, Schiffer's usual high quality paper and photos are combined with nearly flawless grammar, spelling, photo captions, and editing. The book is expensive, but it is worth every penny.

Col. Scott A. Willey, USAF (Ret.), NASM Docent and Volunteer, APH Book Review Editor



We Flew, We Fell, We Lived: Stories from RCAF Prisoners of War and Evaders, 1939-1945. By Philip Lagrandeur. St. Catharines, Ontario: Vanwell Publishing. 2006. Maps. Tables. Illustrations. Photographs. Appendices. Bibliography. Pp. 396. \$24.95 Paperback ISBN: 1-55125-10-8

Philip Lagrandeur, a Canadian high-school teacher of military history and social studies, wrote this book as a tribute to former Royal Canadian Air Force (RCAF) prisoners of war (POWs, known as Krieges) and evaders in World War II Germany. Serendipity kindled his interest. In 1998, he learned he had an Australian relative who was a pilot shot down over

Germany in late 1941. Shortly afterwards, he read a newspaper article on the Great Escape (the famous 1944 breakout of seventy-six allied officers from Luft Stalag III that resulted in Hitler's order to execute fifty escapees). He then contacted Gordon King, a Canadian participant. Surprisingly, King not only knew Lagrandeur's relative but also roomed with him in Stalag III. Now hooked, he set out to provide the Canadian perspective on life in German POW camps.

Lagrandeur conducted multiple oral-history interviews with thirteen surviving RCAF members. He reviewed personal memoirs, recollections, POW diaries, documents from the Department of National Defence's Directorate of History, secondary sources, and on-line sources. He integrated these into a readable account of POW life. As "Jimmy" James, the thirty-ninth man out during the Great Escape commented in his foreword, the book is well researched and comprehensive without redundancy.

It would have been easy to provide simply a book that compiled prisoner experiences, but the author furnished something more useful. A glossary of POW terminology and German vocabulary appears before the introduction, as does a table of World War II Commonwealth and present-day Canadian Forces ranks, an inclusion helpful to us Yanks. The twenty-three-page introduction provides the background needed to understand and appreciate the stories of these men. It includes a list of the camps that housed Canadians and concisely explains prisoner processing, camp administration, organization, life, and escape activities. The introduction and book are well illustrated. Of greatest interest are the sketches from POW diaries. In addition, Lagrandeur included photographs covertly taken by POWs while in camp. These alone are worth the price of purchase.

The thematic organization supports the narrative. In the first part, readers use the introductory background to contextualize tales of POW experiences. Lagrandeur grouped Kriege tales by camp, thereby providing multiple perspectives of life in a given Stalag. The Great Escape receives twenty pages, and an additional twelve pages describe the standard German processing and interrogation of new POWs from capture, through processing, and on into a Luft Stalag. Because of the introduction's thoroughness, a reader can open the book anywhere and read without feeling lost.

The book's second part, far shorter, deals with evaders and those who languished in non-Luftwaffe camps, including concentration camps. These experiences

not only demonstrate German violations of the Geneva Conventions but crimes against humanity. A comparison of these survivor's experiences with those of the Luft Stalags is informative, although Lagrandeur certainly does not suggest life in a Stalag was as pleasant as *Hogan's Heroes*.

A third section discussing the forced marches that migrated POWs to new camps at war's end and subsequent liberation by Soviet and Western armies. Three appendices on the Geneva Convention, War Claims Commission Report, and a short study on which Bomber Command planes provided aircrew with the highest survival rate round out the book. This last appendix seems strange until one realizes that all of Lagrandeur's oral history sources flew for Bomber Command. He does not explain why this is so. Nonetheless, Lagrandeur provides the Canadian POW experience, but their experiences were similar to all prisoner airmen from the Western allies. Further discussion on what made the Canadian perspective unique from, say, the American or British ones would enrich the text. Maddeningly, the book lacks an index and footnotes; but frankly, the illustrations and general narrative help make up for this.

Shortly after reading *We Flew*, I had the pleasure of meeting Squadron Leader George Sweanor, RCAF, retired. Sweanor, a former Krieger, knew many of the characters in this book. His discussion of his experiences and assistance in the Great Escape confirmed the accuracy of Lagrandeur's narrative. In addition, the book is consistent with narratives and exhibits in various Canadian museums. Those interested in Krieger life and military professionalism under difficult circumstances, particularly Canadian readers, will find moving between the depths of irony to some hilarious moments contained within the book rather enjoyable.

Lt. Col. Steven A. Pomeroy, USAF, PhD, Deputy Department Head, Military Strategic Studies, U.S. Air Force Academy



Learning to Love the Bomb: Canada's Nuclear Weapons during the Cold War. By Sean M. Maloney. Washington, D.C.: Potomac Books, 2007. Maps. Tables. Diagrams. Photographs. Notes. Appendices. Bibliography. Index. Pp. xxvi, 472. \$29.95 ISBN: 1-57488-616-0

This is history at its best. Leaving no archival and other primary sources unturned, Maloney has written the new

reference standard on Canada's national security policy for the period 1948-1968, which coincides with the peak of Canada's influence in the world. In telling the story of Canada's nuclear strategy, he convincingly shows that Canada has not always been irrelevant or simply a neutral peacemaker when it came to military use in world affairs.

That Canada had access to nuclear weapons (defensive tactical weapons as well as offensive theatre weapons) and supported the U.S. and NATO nuclear weapons infrastructure (e.g., storage, dispersal, communications, and early warning facilities) during the Cold War is not well understood by just about everyone. Maloney fills this gap in a very comprehensive manner. In doing so, he shows that Canada's decisions to access nuclear weaponry were consistent with its national interest (necessity to work within an alliance or coalition, and maintaining forward security and relative military autonomy) and thus commensurate with the roles it had undertaken to play in the defense of North America and its NATO allies. Without these decisions, Maloney argues, Canada would not have had the influence it had on its enemies and allies or in the furtherance of non-security interests. These decisions, however, did not come about easily, especially under Prime Minister Diefenbaker's government (1957-1963). Maloney details the political and bureaucratic infighting that plagued this administration and which affected Canada's reputation with its U.S. and NATO allies. Diefenbaker's personality-driven style, his vulnerability to domestic politics, and over-sensitivity to criticism unnecessarily delayed NORAD and nuclear agreements and prevented Canada from meeting its defense commitments head on (e.g., by deliberately blocking acceptance of the nuclear agreements during the Berlin Crisis in 1961, and not allowing a formal alert of Canadian forces in 1962 during the Cuban Missile Crisis).

While the 1963 demise of Diefenbaker's conservative government and its replacement by Pearson's liberal government resolved a host of lingering nuclear issues (minus nuclear anti-submarine warfare), thus allowing Canada to finally meet the bulk of its commitments, it also laid the groundwork for successive liberal governments to denuclearize Canadian forces and consequently significantly reduce Canada's influence within NATO (Canada's 1 Air Division in Allied Command Europe lost its nuclear strike role in 1971, and the following year the U.S. removed the nuclear capability from Canadian soil, with exception of the Genie anti-aircraft rockets removed in 1984).

While Canada "saw no need for an independent nuclear weapons program," in the 1950s and 1960s it was flexible and responsive enough to adapt to the new realities imposed by the advent of nuclear weapons in a way that would be congruent with its national interests (for example, as Maloney argues, "if Canada did not negotiate an integrated air defense arrangement [NORAD], the United States would [have been] forced to plan for its air defense as though Canada did not exist," thus affecting Canada's sovereignty).

Overall, this book is rich in its understanding of the processes, personalities and factors that affected Canada's nuclear decisions, and which gave Canada added influence during the Cold War. It is well researched, technically proficient, and highly recommended to Cold War historians, defense analysts, and policy officials.

Mr. Stéphane Lefebvre is Section Head Strategic Analysis at Defence R&D Canada's Centre for Operational Research and Analysis.



Air National Guard at 60: A History. By Susan Rosenfeld and Charles J. Gross. Arlington, Va.: ANG History Office, 2007. Photographs. Maps. Pp. ii, 73. \$11.00. Paperback. ISBN: 978-0-16-079501-5 www.bookstore.gpo.gov

In limited space, this monograph has crammed a fair amount of history and a good deal of operational detail on the employment of the Air National Guard. It is well illustrated by outstanding photographs. Less attention is given to prosaic matters such as recruitment, ground support, and to the ever-present problem of maintaining flying proficiency—especially when transitioning to a completely different class of aircraft (not just a higher letter in the same series).

During the past sixty years, the Air Guard has been a valuable resource both to the U.S. Air Force and to the states from which it is drawn—showing the continuing strength of our Federal Citizen-in-Arms concept. The story of the organized militia in the air starts in the balloons of the Civil War; then individual Guardsmen in propelled flight in World War I; and, finally, authorized units in the troop list of the National Defense Act of 1920.

That Act provided for twenty-nine observation squadrons, one for each of the eighteen infantry divisions and the nine corps but maybe not for all of the four Guard cavalry divisions whose organization was never completed. These squadrons

(and those in the Organized Reserve) received infusions of qualified pilots through the Aviation Cadet program. Shortly before the mobilization of 1940, those eighteen squadrons were detached and became “separate” units. They served well throughout the Second World War and also provided a pool of skills for the tremendous expansion of the Army Air Forces.

However, the loss of observation capability within divisions left a void, and we saw the creation of what later became known as Army Aviation. Flight detachments were established at various levels (though primarily with field artillery battalions) of light “grasshopper” planes (L-4s and L-5s) for direct fire adjustment, observation, liaison, and reconnaissance.

In 1946, the Air Troop List for the Guard was seventy-two fighter and twelve light bomber squadrons. I was in the J-5 (planning) Cell of the California State Headquarters when we were advised that we’d grown from the 115th Observation Squadron to the 61st and 62d Fighter Wings and a separate Aircraft Control and Warning Group. There was an abundance of pilots from the four services anxious to fly and get flight pay but not many qualified in the aircraft we were receiving and in the right locations. Personnel for the staff and for the ground vacancies posed special problems. There were about seventy military World War II flying fields in California, but there was competition for their continued use.

When the independent U.S. Air Force was established the next year, there was initially a move to sever the connection with the states and make air a strictly Federal force—as the Navy had done with the Naval Militia. Soon, however, there was an appreciation of the state structure and the Congressional support received because of the connection, and the Air Force was soon far ahead of the hide-bound Army in giving support to the Air Guard and using its capabilities as part of a total force. Somewhat related to this was some resistance we received in requiring new officers to join the National Guard Association and the State Association. There was a certain disdain for the “political” tag attached to the Guard, requiring command “education” to show the necessity of a strong lobby.

This monograph gives a good account of the changing missions of the Air National Guard with an emphasis on how a combination of full-time and volunteer personnel has permitted the execution of what are, essentially, active duty assignments in a changing environment. Adequate attention is given to the role in support of civil authorities (such as natural disasters), and there is a look to the future.

A letter that came with my copy explained why there are no source notes, index, or bibliography. I would have wished for more maps showing the earlier involvement of the Air Guard. Overall, however, this is an excellent summary, and I would encourage the authors to expand it to a full-length book.

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War Wings: Films of the First World War. By Phillip W. Stewart. Crestville, Fl.: PMS Press, 2008. Appendices. Index. \$24.95. Paperback ISBN: 0-97932434-5

I wasn’t sure quite what to expect when I volunteered to do a review of this book. Actually, I was harking back to boyhood memories of *Dawn Patrol* with Errol Flynn and David Niven. However, this book is a marvelous piece of work about a very different version of World War I in the air. The films are not Hollywood writers’ imaginings of air combat and dashing aviators’ adventures in French bars and bistros when not on duty. All the films listed are black and white documentary films made during or just after World War I. Many were produced by the Army Signal Corps which was tasked to record the American war effort. Some were produced by the French or German military services during the same time period. The films referenced are located in the National Archives and Records Administration facility in College Park, Maryland.

The author breaks down the films by category. First are the “A” list films—those that are primarily aviation oriented. Second is the “B” list—those films that deal primarily with other aspects of the military effort but contain some aviation material. Within the “A” list, Stewart further breaks down the films by major categories: Training, Construction of Aircraft, Overseas Movement, the American Expeditionary Force (AEF) in France, Other Combatants, and Post Armistice activities. Within these groupings, he lists each film and provides the researcher with the film’s name, which organization produced it, the number of reels and overall length in minutes, and catalog numbers. He then proceeds to break each reel down in sequence subsequently listing the activity displayed and providing the researcher a clue as to whether the shots are long or medium range shots or close ups.

I emphasize the word “researcher” because this book is not one for the ordinary *Air Power History* reader interested in aviation activities. Rather, the book provides specific pointers to serious researchers to help them locate relevant motion picture material about U.S. military and naval aviation activities during the First World War. It reminds us that we fought that war in the air with French, British, and Italian aircraft. Only American-built DH-4s saw combat and they were license-produced to the original British de Havilland design and specifications. They were powered by American-designed and built “Liberty” engines.

The appendices are quite good. Appendix No. 2 is a useful chronology of U.S. military aviation during the war. Appendix No. 3 is a reproduction of Brig. Gen. William Mitchell’s article “The American Air Service in the World War,” originally published in August 1919.

Capt. John F. O’Connell, USN (Ret.)



Airborne Forces at War: From Parachute Test Platoon to the 21st Century. By Robert K. Wright, Jr., and John T. Greenwood. Annapolis, Md.: Naval Institute Press, 2007 [in association with Association of the United States Army]. Maps. Illustrations. Photographs. Bibliography. Index. Pp. ix, 214. \$39.95 ISBN: 1-59114-028-3

This is a very well illustrated survey of the airborne forces of the United States Army from birth to 2007. It is table-top in size (9 in x 11 in), which is not the most convenient for casual reading, but it’s well worth the effort. The illustrations and maps help to bring it alive. There are scattered “boxes” which give fascinating information about such things as insignia, equipment, nicknames, and battle cries. From editing, proofreading, and reviewing, I have a fairly sharp eye and found this amazingly free of annoying glitches. In a few places, I might have used a different arrangement or emphasis, but that’s somewhat a matter of individual preference. A great deal of ground is covered in 214 pages (considering the space given to visual material) and, for those who want more on any part, there is a somewhat limited bibliography. The absence of notes could frustrate or challenge a serious researcher, but this really isn’t that kind of book.

The research done by the two authors is impressive. The format is a combination of the highlights of airborne combat

actions and the developments and improvements in between. For the serious student, the latter can be more significant—though less exciting. The book ends with an overview of the past and future.

There are a number of units (in the past and present) with the capability of arriving from the air, but some are only mentioned here—helicopter-borne air assault outfits, special operations forces, and the 1st Special Service Force of World War II are among the examples—but space won't allow more.

For anyone with an interest in vertical arrival, this can be a useful book. It pulls together much valuable detail and does so in a readable style that will also appeal to general readers who want an action-filled story.

It will take another work to untangle the jumble of unit designations from the Regular Army, World War I National Army, National Guard, Organized Reserve, and World War II Army of the United States. Somewhere in the archives, the rationale for these must be buried.

Brig. Gen. Curtis Hooper O'Sullivan, Air National Guard (Ret.), Salida, California



No Uncle Sam: The Forgotten of Bataan. By Anton F. Bilek. Kent, Ohio: The Kent State University Press, 2003. Maps. Photographs. Index. Pp. xvii, 260. \$29.00 ISBN: 0-87338-768-2

Tony Bilek was a twenty-two-year-old Air Corps maintainer assigned to Clark Field outside Manila when the Japanese attacked on December 9, 1941. Along with

thousands of other U.S. troops, he moved onto the Bataan Peninsula as the situation deteriorated. Bilek worked on several battered P-40s at Bataan Field near the southern end of the peninsula. There were persistent rumors about a relief convoy that was on its way from the U.S. that would arrive any day with troops and supplies. These faded away forever when Bataan was surrendered on April 9, 1942.

The resulting Death March is well documented but is one of those historical atrocities that needs to be read about again and again, lest we forget what the more than 75,000 captives had to endure. Bilek well describes the robberies, murders, beatings, and deprivations suffered. Only about 55,000 were still alive when the POWs reached Camp O'Donnell some 95 miles north. Camp conditions were appalling—as they were everywhere Bilek was incarcerated for the duration of the war.

The survivors (fewer every day) remained at O'Donnell until June when they were trucked to a new camp at Cabanatuan, the camp made famous by the movie, "The Great Raid." Cabanatuan was divided into Sick Side and Well Side. The level of care was deplorable in both, but Bilek was on Sick Side until July 1943, suffering from beriberi. His duties there were less strenuous than those imposed on Well Side prisoners. He nearly died on several occasions; this was one of them.

When his condition had improved, he moved over to Well Side and stayed there for another year. Labor consisted of back-breaking work in the fields. Then came the opportunity to volunteer (yes, volunteer) to move to Japan. Scuttlebutt had it that conditions were far better in the Home Islands—how could they be much worse?

Bilek did volunteer and moved to Kyushu aboard what became known as the "Hell Ships." In his case, it was the *Mati-Mati Maru* for a trip that took from July 4 until September 2, 1944, in appalling conditions of filth, heat, attack, breakdowns, and poor rations.

What lay ahead was ten months of service in the coal mines. Again, brutality and terrible working conditions were the order of the day. Bilek suffered a horrible injury to his hands but managed to survive the ordeal. For much of the time in the mines, there was a new hope—B-29s flying overhead. They signaled the inevitable end that came one day in August 1945, when the guards disappeared. The former prisoners were on their own for several days until U.S. forces found them, fed and ministered to them, and quickly shipped them home.

What sustained Tony Bilek? When the last China Clipper flight arrived in Manila on December 7, 1941, he got a letter from his girl "Marie" back home. He managed to keep it all those years, reading and re-reading it until the ink and paper were nearly gone. As the ship approached San Francisco, Tony Bilek learned that "Marie" had married another man several years before. The letter went into the ocean just outside the Golden Gate. But he was finally home to pick up the pieces of a shattered life.

This is an excellent story, very well told by one of the valiant few left from Bataan.

Col. Scott A. Willey, USAF (Ret.), Book Review Editor



PROSPECTIVE REVIEWERS

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

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

Books Received

- Althoff, William F. *Forgotten Weapon: U.S. Navy Airships and the U-Boat War*. Annapolis, Md.: Naval Institute Press, 2009. Maps. Photographs. Notes. Bibliography. Index. Pp. x, 3410. \$49.95 ISBN: 978-1-59114-010-8
- Appleman, Roy E. *Disaster in Korea: The Chinese Confront MacArthur*. College Station: Texas A&M University Press, 2009. [Second Printing, © 1989] Maps. Tables. Illustrations. Photographs. Notes. Bibliography. Index. Pp. xvi, 456. Paperback \$34.95 ISBN: 978-160344128-5
- Breffort, Dominique. [color plates by Andre Jouineau] *Boeing 707/KC-135 and their civil and military derivatives: From the 'Dash 80' to the E-8 J-STARS*. Paris: Histoire & Collections., 2008. Diagrams. Illustrations. Photographs. Pp. 240. \$59.95 ISBN: 978-2952-638159
- Friedman, Norman. *Network-Centric Warfare: How Navies Learned to Fight Smarter through Three World Wars*. Annapolis, Md.: Naval Institute Press, 2009. Photographs. Notes. Index. Pp. xv, 360. \$32.95 ISBN: 978-1-59114-286-7
- Harder, Robert O. *Flying from the Black Hole: The B-52 Navigator-Bombardiers of Vietnam*. Annapolis, Md.: Naval Institute Press, 2008. Photographs. Notes. Bibliography. Index. Pp. 301. \$34.95 ISBN: 978-1-59114-359-8
- Hobbs, David. *A Century of Carrier Aviation: The Evolution of Ships and Airborne Aircraft*. Annapolis, Md.: Naval Institute Press, 2009. Photographs. Notes. Bibliography. Index. Pp. xi, 304. \$69.95 ISBN: 978-1-59114940-8
- Hounsfield, Christopher, Comp. *Trailblazers: Test Pilots in Action*. Barnsley, South Yorkshire: Pen and Sword Aviation, 2008. Photographs. Index. Pp. xv, 240. £20.00 ISBN: 978-184415748-2
- Liepack, Otfried G., Editor. *History of Rocketry and Astronautics: Proceedings of the Thirty-Fourth History Symposium of the International Academy of Astronautics, Rio de Janeiro, Brazil, 2000. [AAS History Series, Volume 30, Donald C. Elder, Series Editor.]* San Diego, Calif.: American Aeronautical Society, 2009. Tables. Diagrams. Illustrations. Photographs. Notes. Appendices. Pp. xii, 328. Paperback \$60.00 ISBN: 978-0-87703-550-3
- Meilinger, Phillip S. *Hubert R. Harmon: Airman, Officer, Father of the Air Force Academy*. Golden, Colo.: Fulcrum Group, 2009. Photographs. Notes. Appendices. Glossary. Bibliography. Index. Pp. xxvii, 371. \$35.00 ISBN: 978-1-56373-184-6
- Michel, Christopher P. and Terry Howell. *The Military Advantage: The Military.com Guide to Military and Veterans Benefits*. Annapolis, Md.: Naval Institute Press, 2009. Appendices. Index. Pp. x, 385. \$21.95 ISBN: 978-1-59114-499-1
- Murphy, Robert M. *No Better Place to Die: The Battle for La Fiere Bridge - Ste. Mere-Eglise, June 1944. Philadelphia and Newbury, UK: Casemate Publishers, 2009*. Maps. Photographs. Appendices. Index. Pp. 272. \$32.95 ISBN: 978-1-935149-08-8
- Pons, Gregory. *9th Air Force: American Tactical Aviation in the ETO, 1942-1945*. [Trans by Philippe Charbonnier and Gregory Pons]. Paris: Histoire & Collections, 2008. Illustrations. Photographs. Pp. 191. \$59.95 ISBN: 978-2-35250-077-3
- Reitsch, Hannah. *The Sky My Kingdom: Memoirs of the Famous German Woman World War II Test Pilot*. Philadelphia: Casemate, 2009. Tables. Diagrams. Illustrations. Photographs. Pp. 265. \$29.95 ISBN: 978-1-032033-97-7
- Strebe, Amy Goodpaster. *Flying for her Country: The American and Soviet Women Military Pilots of World War II*. Washington, D.C.: Potomac Books, 2009. Photographs. Notes. Appendices. Glossary. Bibliography. Index. Pp. xvii, 109 Paperback. \$15.95 ISBN: 978-1-59797-266-6
- Tilford, Earl H., Jr. *Crosswinds: The Air Force Setup in Vietnam*. College Station: Texas A&M University Press, 2009. [new edition]. Maps. Notes. Bibliography. Index. Pp. 252. Paperback \$24.95 ISBN: 978-1-160344126-1
- Werrell, Kenneth P. *Death from the Heavens: A History of Strategic Bombing*. Annapolis, Md.: Naval Institute Press, 2008. Photographs. Notes. Index. Pp. xi, 334. \$49.95 ISBN: 978-1-59114940-8
- Wilson, Jim. *Launch Pad UK: Britain and the Cuban Missile Crisis*. Barnsley, Douth Yorkshire, UK: Pen & Sword Aviation, 2008. Diagrams. Illustrations. Photographs. Appendices. Bibliography. Index. Pp. 200. \$39.99 ISBN: 978-1-84415-799-0



The Executive Director's Message

Your Foundation continues to work on better ways to fulfill its mission of promoting the preservation and appreciation of the history and heritage of the United States Air Force and its predecessors.

Membership Renewal. We are working to improve our membership renewal processes. We intend to get our renewal reminders out earlier in the cycle, and to be a little more persistent in asking rather than just letting members go without additional reminders.

Symposium, October 8, 2009. Second, we are continuing to plan and prepare for another in our series of biennial symposia. This event, with the theme *The Balkans Air Campaigns in the 1990s and Their Influence Since 2001*, will be held on Thursday, October 8, at the Sheraton Crystal City Hotel in Arlington, Virginia. General Norton A. Schwartz, Chief of Staff, USAF, has been confirmed as the guest speaker for our awards banquet that evening.

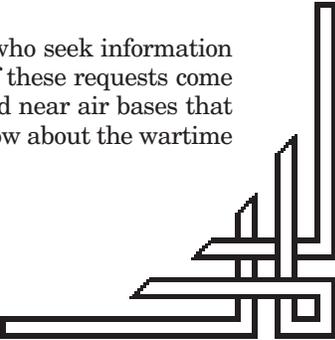
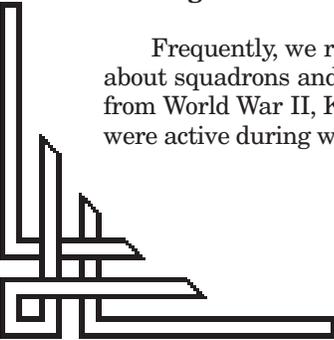
Two panels that day will include presentations on the air campaigns in Bosnia in 1995, and in Kosovo in 1999, and air operations since 2001. Our morning keynote speaker will be Dr. Ben Lambeth, an authority on the Kosovo campaign. The morning panel will consider air operations in Bosnia and Kosovo (combat, combat support, preparation for combat, and lessons learned), encompassing all aspects of air warfare (training, logistics, intelligence, etc). Following an afternoon keynote address by Dr. John Nagl, a specialist in and practitioner of counterinsurgency warfare, our afternoon panel will include presentations on the effects of the Balkans campaigns on air warfare since 2001.

We will wrap up the day with an awards banquet, during which we will present our third annual General Carl "Tooney" Spaatz Award and our third annual Maj Gen I. B. Holley Award, both given in recognition of sustained, superior contributions to the nation and the Air Force during a lifetime of service. Please save the date and plan to participate.

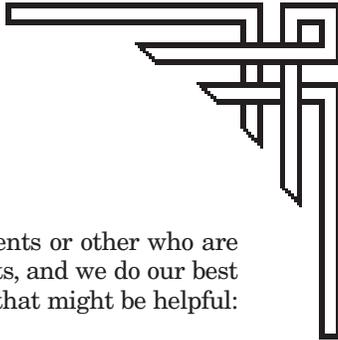
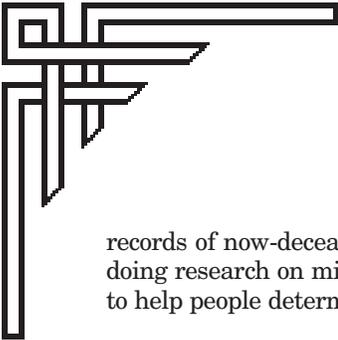
Corporate Sponsorships. For the third consecutive year, under the leadership of our President and Chairman of the Board, Lt Gen Mike Nelson, and of our Development Committee chairman, Maj Gen Si Johnson, we have worked hard on our corporate sponsorship program. At this writing, we have received sponsorship contributions in 2009 from several corporations and have gotten indications from a few others that they will continue to sponsor our work during these difficult times. Defense contractors and other businesses have been hard-hit by the economic problems that have affected all of us, and the Foundation appreciates the contributions made by these companies who help us to spread the word about the history and heritage of American air power.

Communications with Members. We are attempting to do better in communicating with Foundation members and with the general public through our Website and by other means.

The Members-Only section of the Foundation's Web site has archives of *Air Power History* from 2000 through the present available for online viewing, cover to cover. The Symposium archive section has all the papers that were presented in the 2007 symposium, and all of the visual presentations (briefing slides) that were used. These sections of the Web site were opened last year. We plan to expand our Website and Web-based information and services over the next several years, as funds become available, but wanted to open these sections for use now. Someday, we intend to put all 55 years of *Air Power History* on our Website, indexed and searchable. Those uses are in the future. For now, if you want to get access to the Members-Only section and Symposium papers on the Web site, please send us an email at execdir@afhistoricalfoundation.org.



Frequently, we receive phone calls and emails from members and non-members who seek information about squadrons and other units, aircraft, and individual Air Force members. Some of these requests come from World War II, Korean War, or Vietnam War veterans, some from people who lived near air bases that were active during wartime but are now closed, and some from people who want to know about the wartime



records of now-deceased ancestors; a few of the requests come from high school students or other who are doing research on military history projects. The staff is happy to receive these requests, and we do our best to help people determine how best to conduct their research. Here are a few contacts that might be helpful:

The Air Force Historical Research Agency (AFHRA), located at Maxwell Air Force Base, Alabama, is the official archives of the US Air Force. They have historians and archivists on staff to assist people looking into various aspects of Air Force history. Contact information on the AFHRA is on the Web at <http://afhra.maxwell.af.mil>.

The largest military library in the world, the Air University Library, is also at Maxwell AFB. Their Web site is <http://aulibrary.maxwell.af.mil/lane.htm>.

The best source for an individual's military service records is the National Personnel Records Center, a part of the government's National Archives and Records Administration, located in St. Louis. The Web site is <http://www.archives.gov/veterans/military-service-records/get-service-records.html> and has contact information. Veterans and their next of kin may request individual records through that center.

Awards. The Foundation sponsors eleven awards annually. Several of the awards are presented to students in Air Force schools for writing the best history paper of the year, as judged by panels of faculty members. These awards typically are presented at the end of the academic year, so several of these processes are in work as this is written, and will be finished by the time it is read. These awards include the ones for an outstanding Air Force Reserve Officer Training Corps (AFROTC) cadet, and for the best history papers written by those in the US Air Force Academy, the Air Command and Staff College, the School of Advanced Air and Space Studies, the Royal Air Force Staff College (our Two Air Forces Award), and the Air Force Institute of Technology (our Bryce Poe II Award, named for our past President, the late General Bryce Poe II).

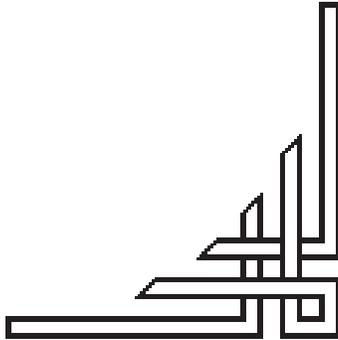
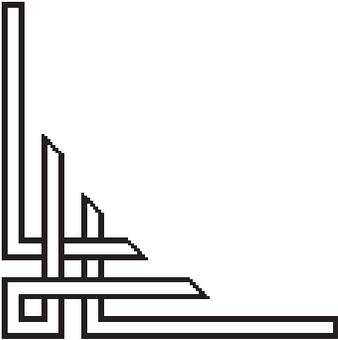
John Kreis and the Award Panels. I want to acknowledge the outstanding work that one of our Board members, Mr John Kreis, has performed for several years. Each year, he recruits members of panels to judge entries for two awards, and he oversees the process. Our best article award is presented each year to the author(s) of the outstanding article published in *Air Power History*. That panel has completed its work for the 2009 award, and the panel's judgments appear elsewhere in this issue. We also present an award for best military history book that was reviewed in *Air Power History* in the preceding year. The judges for that award are still hard at work, reading and reviewing twelve outstanding books.

Books. Our most recent three books are available for purchase either online (at www.afhistorical-foundation.org) or by calling the office at (301) 736-1959. We can email or mail a description and order form upon request. The books include *WORLD WAR II: A Chronology of War*, published in 2008, at \$60.00, including shipping; *U. S. AIR FORCE: A Complete History*, published in 2006, for \$50.00; and *The AIR FORCE*, published in 2002, for \$40.00.

We appreciate the long-standing support and encouragement that the Foundation's members have given to the Board of Directors and to the staff as we have worked for you. We believe, as I think you do, that our understanding of the past helps us to envision and then work toward the future that we need. We must see the past clearly, discuss the record of air power, debate its advantages and disadvantages, and come to some understanding of the actual efficacy of air power. As we work on the aforementioned programs on your behalf, we welcome your comments and further suggestions for improvement.

Warm regards,

Tom Bradley



THE AIR FORCE HISTORICAL FOUNDATION
PROUDLY PRESENTS A SYMPOSIUM ON
Thursday, October 8, 2009

The Balkans Air Campaigns in the 1990s and Their Influence Since 2001

Sheraton Crystal City Hotel, 1800 Jefferson Davis Highway, Arlington VA 22202

Banquet Speaker: **General Norton A. Schwartz**, Chief of Staff, USAF (Confirmed)

Two panels encompassing the air campaigns in Bosnia, 1995, and in Kosovo, 1999, and air operations since 2001

Morning Keynote Address by **Dr. Benjamin Lambeth**, RAND Corporation (confirmed)

Morning Panel: **Air Operations in Bosnia and Kosovo**

Afternoon Keynote Address by **Dr. John Nagl** (LTC, US Army (Ret)), President,
Center for a New American Security (confirmed)

Afternoon Panel: **The Aftermath, including Air Warfare since 2001**

AGENDA

(Timing subject to change)

- 7:00 - Continental Breakfast & Coffee
- 8:15 - Welcome, Opening Remarks, and Introduction of Keynote Speaker
- 8:30 - **Morning Keynote Address by Dr. Benjamin Lambeth**
- 9:10 - **Moderated Panel, Air Operations in Bosnia and Kosovo**
- 11:00 - Break
- 12:00 - Luncheon with speaker (awards for best article and best book)
- 2:00 - **Afternoon Keynote Address by Dr. John Nagl**
- 3:00 - **Moderated Panel, The Aftermath, including Air Warfare since 2001**
- 4:45 - Break
- 6:00 - Reception
- 7:00 - **Awards banquet (Speaker: General Norton A. Schwartz, Chief of Staff, USAF (Confirmed) and presentation of the Air Force Historical Foundation's Third Annual General Carl "Tooey" Spaatz Award and Third Annual Maj Gen I. B. Holley Award)**

REGISTER ONLINE AFTER MAY 20 AT www.afhistoricalfoundation.org or email execdir@afhistoricalfoundation.org or call (301) 736-1959 to register or for more information.

REGISTRATION FEES

The symposium registration fees depend upon military status and membership in the Air Force Historical Foundation (AFHF). Members of the military in uniform, and civil servants, from any service and from any nation, are charged lower prices, as are members of the Foundation.

ACTIVE MILITARY OR ACTIVE CIVIL SERVICE (ANY SERVICE, ANY NATION)

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Presentations and Luncheon	\$80	\$100
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Banquet with Reception	\$80	\$100
Presentations and Both Meals	\$140	\$190

CIVILIAN (INCLUDING RETIRED MILITARY, CIVIL SERVICE, OR CURRENT CONTRACTOR)

	FOUNDATION MEMBERS	NON-MEMBERS
Presentations and Luncheon	\$120	\$150
Luncheon	\$60	\$75
Banquet with Reception	\$120	\$180
Presentations and Both Meals	\$225	\$350

DISPLAY TABLE	Members: \$50	Non-Members: \$100
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Letters

IMHO: P-51 Rocks

Thanks to everyone who wrote in commenting on my article, "The P-51 Mustang: The Most Important Aircraft in History?" [*Air Power History*, Vol. 55, No. 4, Winter 2008, pp. 46-58] Only a few of the letters commented on the basic idea of article: that the P-51 was important because it was the only high performance aircraft that could fly deep enough into Germany to destroy the *Luftwaffe* fighter force. I found my critics' arguments factually inaccurate, and replied to them individually. Much of the rest of the correspondence focused on the P-47, and what a good ground attack airplane it was, but that was not the point of the article. It did not matter how good the P-47 was at ground attack after D-Day, but rather that the P-47 could not do the mission that made D-Day possible.

Other letter writers claimed that different aircraft as the "best fighter of World War II"—again, not the point. The arguments about which fighter was the best of World War II might take up volumes. I never flew World War II fighters, but I have some years flying modern fighters and have found that serious fighter pilots understand that, as much as they love their own, "best" is an elusive term.

When it comes to my personal view of the best fighter(s) of World War II, I turn to those who *actually flew* a variety of them *and* flew them in combat. The two best sources I have found that meet these criteria are *Report of Joint Fighter Conference: NAS Patuxent River, MD - 16-23 October 1944* and Captain Eric Brown's misnamed *Duels in the Sky: World War II Naval Aircraft in Combat*, which actually discusses most of the major World War II fighters.

The Joint Fighter Conference was the report of a conference of several hundred Allied—RAF, AAF, USN, Fleet Air Arm, etc.—combat pilots, engineers and test pilots and included comparison "fly offs" and reports of every major U.S. fighter of the time, as well as a Seafire II, Mosquito, and a late model Zero. The comments and evaluations of these aircraft by real combat fighter pilots are illustrative.

Eric "Winkle" Brown was a British test pilot who flew 487 separate types of aircraft (and many more, if one counts various models of the same type—e.g. Spitfire I, XI, XIV) but more importantly flew combat missions in several British and American fighters and tested virtually every Allied and *Luftwaffe* fighter of

World War II. This experience makes his evaluations important. In my humble opinion, these two books should be the core of any ethereal discussion of "the best fighter of World War II."

Dr. Marshall L. Michel, Historian, 86th Airlift Wing, Ramstein AB, Germany.

News

Best Article Award 2008

A three-member panel of judges chose "Setting the Record Straight Regarding Lieutenants White and McCullin, Tuskegee Airmen," by Joseph D. Caver, Jerome A. Ennels, and Wesley Phillips Newton, as winner of the Best Article to appear in *Air Power History* during 2008. The article appeared in *Air Power History*, Vol. 55, No. 3, pp. 4-11.

Sherman White, Jr. and James L. McCullin were two young men who had completed Army Air Forces flight training at Tuskegee Army Airfield, Alabama, in 1942, Sherman graduated on May 20 and James on September 6. Both men joined the 99th Fighter Squadron and moved to North Africa for combat training early in 1943. In June, they engaged in combat with the *Luftwaffe* over the Mediterranean. Then, on July 2, both were part of a fighter escort for B-25 bombers heading for Sicily when their flight encountered German fighters. The American pilots kept the Germans at bay, but when the squadron returned to Tunisia, White and McCullin were gone. No trace of their aircraft or of them could be found, and none has been discovered in the intervening years. These two fliers were not the only ones to be lost without a trace during the war, and as with the others, their friends and family have wondered for years what happened to them.

In 1953, a story appeared that noted that White's and McCullin's aircraft had collided on take-off the day they went missing. The story was untrue, but it continued to be told for years, repeated in books and on at least two television specials about the Tuskegee Airmen. Authors Caver, Ennels, and Newton sought to uncover what really happened to the two young men, and in doing so, as they say, "to set the record straight." There were no definitive reports of what happened to the two fliers, but it is virtually certain from the pilot de-briefings taken later that day that both were shot down when they and

a number of other pilots engaged an attacking formation of German FW-190 and Bf 109 fighters. Lieutenants White and McCullin were the first black Americans to die in aerial combat.

This year's judges—Douglas Wright, Torger Anderson, and Ken Alnwick—praised several other articles published in 2008 for their excellence. This year's competition was close, three articles scored within a point of each other, and all of those nominated related incidents and circumstances important in the development of the U. S. Air Force. This article won because of the quality of the research and writing, and the humanity of the subjects—White and McCullin—whose gallantry should no longer be overlooked.

The other articles the judges considered covered topics as diverse as the exploits of Howard Hughes and the pilots who flew the X-15 to near orbital space-flight, to air power in pursuit of terrorist enemies of civilization, to the escape and evasion of an American pilot eluding the Japanese in French Indochina, and of the development of technology and tactics critical to today's air operations, both in combat and in support of law enforcement.

Air Power History publishes a wide variety of excellent articles, and includes in each issue reviews of books that are relevant to air power and the Air Force. This year, to recognize a greater scope of accomplishment, we are initiating a new recognition for authors not only of articles to appear in *Air Power History*, but also of books that are reviewed in our journal. These are accounts of personal exploits by airmen; they are much different from the scholarly articles or books, but they are highly informative and entertaining. This year, we have two such first-rate articles. One, "Chasing the XB-70 Valkyrie," is by George J. Marrett, who flew chase planes close behind the XB-70 so that he could look into the tailpipes to observe critical responses of the high performance airplane's engines. Mr. Marrett describes a collision of one XB-70 with an F-104 that resulted in the destruction of both aircraft. In "Korean War Diary," William Y. Smith recounts his experiences in 1950 and 1951, first as an F-84 pilot flying escort and interdiction missions, and then as a forward air controller. Both excellent articles, they retain an importance for us as a part of the USAF's legacy in combat and technology development.

All of the articles in 2008 were excellent, and all authors ought to be proud of their accomplishments.

Mr. John F. Kreis, Chairman, Publications Awards Committee

Reunions

The A-1 Skyraiders will hold a reunion September 24-26, 2009, in San Antonio, Texas. Contact:

Rocco DeFelice
(213) 659-5965
e-mail: rdefelice@satx.rr.com
or
John Larrison
(830) 779-200
e-mail: jonlarr@lavernia.net

FB-111 Crews and Maintenance Staff will hold a reunion October 1-4, 2009, in Fort Worth, Texas. Contact:

Gary Patterson
104 Amberjack Court
Georgetown, Texas 78633
(512) 863-9363
e-mail: GPatter445@aol.com

The Air Force Officer Candidate School Classes 1943-1963 will hold a reunion October 9-12, 2009, in Washington, D.C. Contact:

Dave Mason
(757) 369-1169
e-mail: blokemason@cox.net

The 27th Air Transport Group (310th 311th 312th and 325 Ferrying Squadrons; 86th 87th, 320th, and 321st Transport Squadrons and 519 and 520th Service Squadrons) will hold a reunion October 15-18, 2009, in Oklahoma, City, Oklahoma. Contact:

Fred Garcia
6533 W. Altadena Aver.
Glendale, AZ 85304
(623) 878-7007

The Tan Son Nhut Association and the Seventh Air Force Flight Operations "Scatback" will hold concurrent reunions

October 15-19, 2009, in Pigeon Forge, Tennessee. Headliners include Lt. Thomas R. Norris, USNR (Ret.), Medal of Honor recipient, and Col. Darrel D. Whitcomb, author of *Rescue of BAT 21*. Contact:

Rich Carvell
(807) 932-8085
e-mail: rcarvell@suddenlink.net
www.tsna.oeg/reunion/index.html

The Eighth Air Force Historical Society will hold a reunion October 15-18, 2009, in Cincinnati, Ohio. Featured is a roundtable forum on "Air Corps POWs," comprised of authors, curators, Pentagon investigators, academics, film makers, and former POWs. Contact:

Gregory Hatton
350-65th St. Apt. 22C
Brooklyn, NY 11220
(718) 836-5951
e-mail: gregoryhatton@earthlink.net
www.8thafhs.org/reunions.html

The TAC Missileers will hold a reunion July 15-18, 2009, in Dayton, Ohio. Contact:

Joe Perkins
e-mail: perkster@fcoll.com

OCS Class 58A will hold a reunion September 14-17, 2009, in Las Vegas, Nevada. Contact:

Mort Friedlander
e-mail: mortnsal@cox.net

2010

The Association of Air Force Missileers will hold a reunion October 6-10, 2010, in Tucson, Arizona. Contact:

Col. Charlie Simpson, USAF (Ret.)
Exec/ Dir., AAFM
PO Box 5693
Breckenridge, CO 80424
970-453-0500
e-mail: afmissileers@msn.com
www.afmissileers.org

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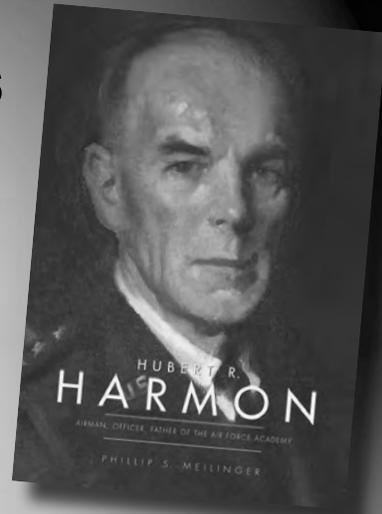
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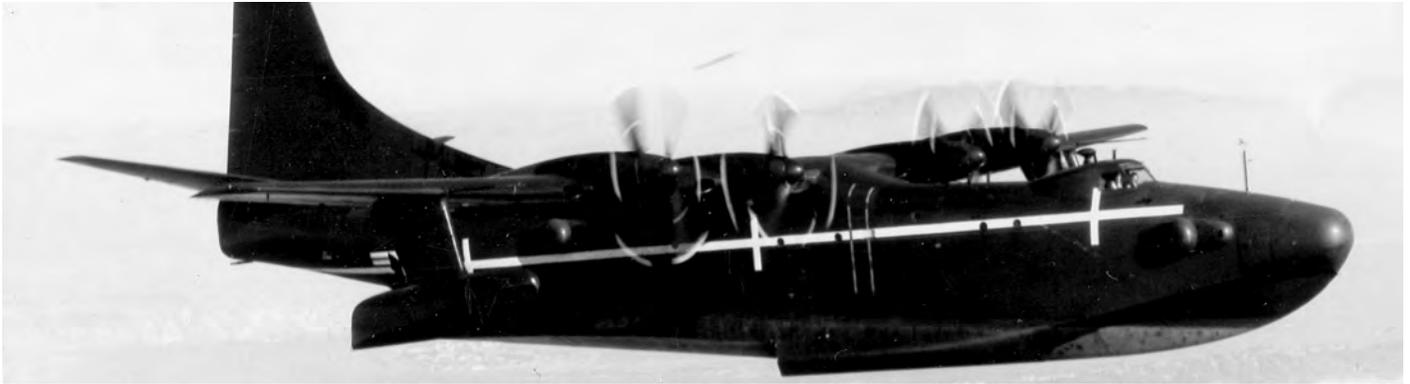
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Happy Fiftieth, Atlas



This year marks the fiftieth anniversary of the first U.S. intercontinental ballistic missile (ICBM), the Atlas, being placed on strategic alert. On September 1, 1959, the Air Force accepted the Atlas. A week later—after a Strategic Air Command (SAC) crew launched an Atlas training missile—General Thomas S. Power declared the ICBM operational. On October 31, 1959, a nuclear-armed Atlas D was placed on alert in the 576th Strategic Missile Squadron, at Vandenberg Air Force Base, California. Air Force Space Command and the Twentieth Air Force are commemorating the event in October 2009. For additional information, log on to the AAFM website: www.afmissileers.org

Colonel Charlie Simpson, USAF (Ret.), Executive Director of the Association of Air Force Missileers (AAFM), "Victors in the Cold War."



Our Spring 2009 mystery aircraft was the XP5Y-1 flying boat patrol bomber tested in the 1950s by the U. S. Navy.

When Consolidated Vultee, also called Convair, was completing final design work at San Diego, Calif., near the end of World War II, the XP5Y-1, also called the Convair Model 117, was an exceedingly ambitious project for which the planemaker held high hopes.

Already some admirals envisioned a strategic force of seaplanes that would operate around the world, free of any need for concrete runways or sovereign politics. It might give the Navy a nuclear mission similar to that assigned to the Air Force's Strategic Air Command. At minimum, a big, ocean-borne warplane would be able to prowl the world's maritime approaches, searching for Soviet submarines.

The XP5Y-1 and the anticipated production P5Y-1 was a large, high-wing flying boat with Allison XT-40-A-4 turboprop engines driving six-bladed contra-rotating propellers. With its sleek body and single-step hull, it was almost 128 feet in length with a wingspan of almost 146 feet and weighed over 147,000 pounds fully loaded.

The Navy ordered two prototypes on May 27, 1946. The first aircraft (bureau no. 121455) made its initial flight on April 18, 1950 at San Diego, piloted

by E. S. "Sam" Shannon. Just weeks later, the start of the Korean War altered some naval priorities. Even as the Navy was reconsidering whether it wanted the XP5Y-1 for patrol duty, in August 1950, the aircraft set a turboprop endurance record of 8 hours 6 minutes.

On July 15, 1953 bureau no. 121455 was lost in a spectacular but non-fatal mishap in which pilot Don Germeraad and his 10-man crew had to parachute into San Diego Bay. The second XP5Y-1 was used for beaching tests but never flew and was scrapped in 1957.

The XP5Y-1 design evolved into the Navy R3Y Tradewind tanker-transport, about a dozen of which had a brief but troubled operational career in the 1950s.

Our follow-up photo depicts the sole XP5Y-1 in dark blue Navy colors with white stripes for flight test camera reference.

Of 28 readers who submitted entries in our "name the plane" contest, eight confused the XP5Y-1 with the later R3Y. From among the remaining correct entries, our "History Mystery" winner is retired Air Force Col. Sid Tucker of Granbury, Texas. He will receive as his prize a copy of the book "Hell Hawks," a history of a P-47 Thunderbolt fighter group in combat in World War II.

Again, we pose a challenge for our plane-spotting readers. Can you identify this issue's "mystery" aircraft.

Remember the rules:

1. Submit your entry on a postcard. Mail the postcard to Robert F. Dorr, 3411 Valewood Drive, Oakton VA 22124. Entries may also be submitted via e-mail to robert.f.dorr@cox.net.

2. Correctly name the aircraft shown here. Also include your address and telephone number. Please note: Entries not accompanied by both an address and a phone number will be disqualified. This has happened.

3. A winner will be chosen at random and will receive an aviation book.

This feature needs your help. Do you have a

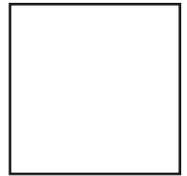
photo of a rare or little-known aircraft? We'll return any photos provided for use here.



This Issue's Mystery Plane



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