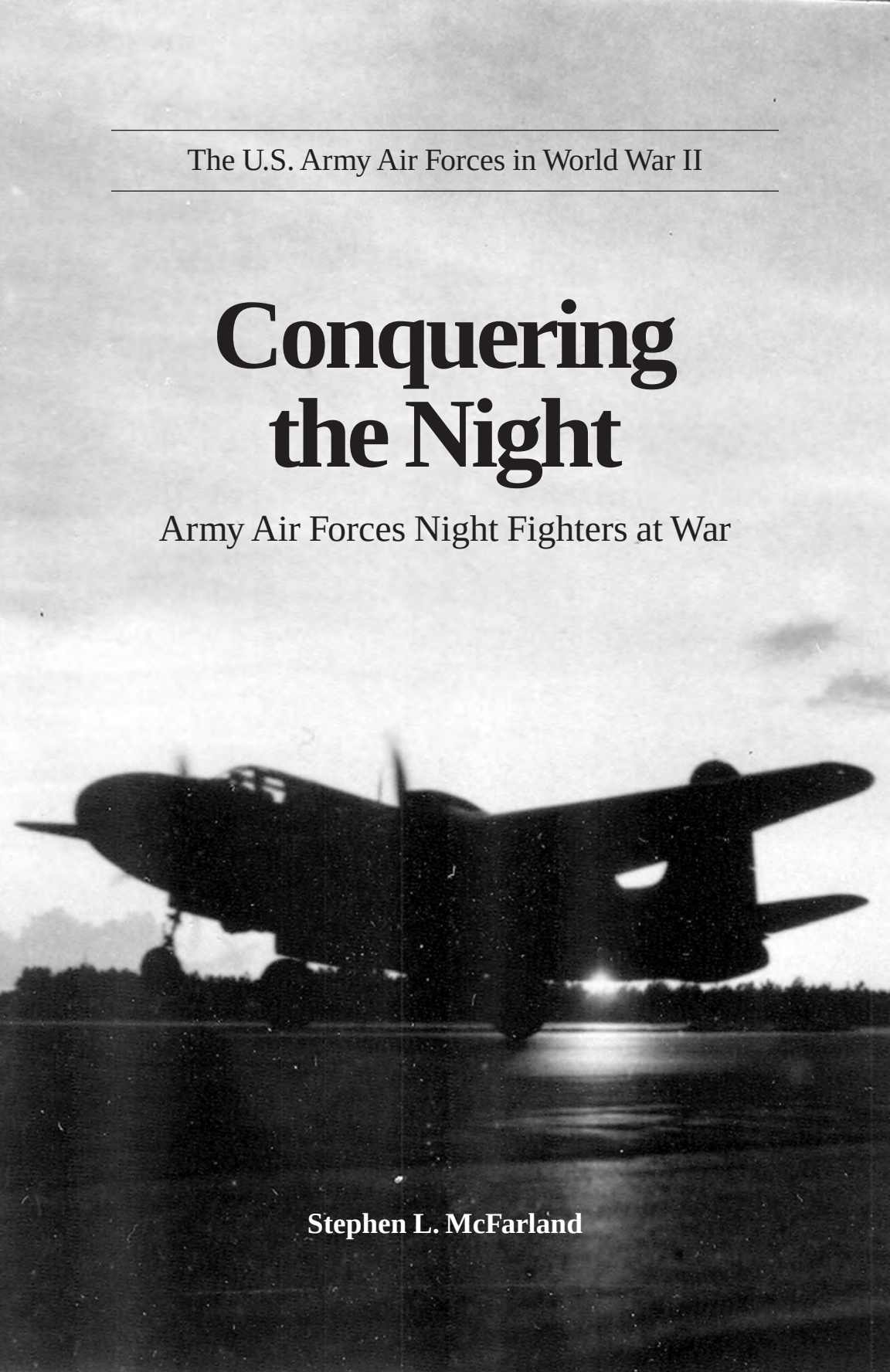
The U.S. Army Air Forces in World War II

Conquering the Night

Army Air Forces Night Fighters at War



Stephen L. McFarland

A Douglas P–70 takes off for a night fighter training mission, silhouetted by the setting Florida sun.

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The author traces the AAF's development of aerial night fighting, including technology, training, and tactical operations in the North African, European, Pacific, and Asian theaters of war. In this effort the United States never wanted for recruits in what was, from start to finish, an all-volunteer night fighting force.

Cut short the night;
use some of it for the day's business.

— Seneca

For combatants, a constant in warfare through the ages has been the sanctuary of night, a refuge from the terror of the day's armed struggle. On the other hand, darkness has offered protection for operations made too dangerous by daylight. Combat has also extended into the twilight as day has seemed to provide too little time for the destruction demanded in modern mass warfare.

In World War II the United States Army Air Forces (AAF) flew nighttime missions to counter enemy activities under cover of darkness. Allied air forces had established air superiority over the battlefield and behind their own lines, and so Axis air forces had to exploit the night's protection for their attacks on Allied installations. AAF night fighters sought to deny the enemy use of the night for these attacks. Also, by 1944 Allied daylight air superiority made Axis forces maneuver and resupply at night, by air, land, and sea. U.S. night fighters sought to disrupt these activities as an extension of daylight interdiction and harassment efforts. The AAF would seek to deny the enemy the night, while capitalizing on the night in support of daylight operations.

Airmen Claim the Night Skies

Airmen did not wait long to exploit what writer George Sterling called the "star-usurping battlements of night." Aviation pioneers flew their fragile aircraft into the gloom, in search of the camouflage of darkness and in pursuit of enemy aircraft seeking the same edge. In 1909, Wilbur Wright and Army 2d Lt. Frederick E. Humphreys became the first Americans to fly at night, orbiting College Park, Maryland, in Signal Corps Airplane No. 1 for forty-two minutes and drawing a large crowd from Baltimore and

Washington. The genesis of aerial night fighting, however, came in World War I from a Germany desperate to break through the morass of trench warfare on the Western Front. The Germans sent bombers to England to carry the war to the home front—behind the armies in the field.

The first true night fighter aircraft were British, struggling to hunt down German Zeppelins lurking in the night skies over England in 1915. These slow behemoths were sitting ducks in daylight, so they were used primarily after dark. For six months British airmen struggled to find the Zeppelins and shoot them down. This effort exposed several problems: once notified, how to ascend and reach the enemy's altitude before he flew out of range; how to find the enemy in a darkened sky; and, finally, how to knock him down. Technology soon provided answers, allowing R. A. J. Warneford to use aerial bombs to claim the first Zeppelin in June 1915. British night defenses exacted an increasing toll, claiming 79 of the 123 airships Germany built for the war.

The enemy then switched from Zeppelins to a bomber airplane offensive against England. At first striking by day, German Gothas and Giants soon sought the night's protection from British defenses. What airmen lost in bombing accuracy by flying at night they more than made up in safety against enemy defenses. The night assault caught the public's imagination, but caused no serious damage. British planes performed well against German bombers protected by machine guns and the dark; in fact, the night itself proved the greater danger. In nineteen night raids, the defense, guided by radio intercepts, ground observers, searchlights, and blind luck, claimed twenty-four invading bombers, while thirty-six others were destroyed in unrelated crashes. Together, German bombers and airships claimed about 1,400 dead on the ground and nearly 3,400 injured, enough to threaten the British sense of pride and breach the insular protection previously afforded by the English Channel. Though the German aerial offensive hardly threatened the British war effort, it did force a diversion of eight hundred British fighters from the Western Front, where they were sorely needed. Though primitive, this first "Battle of Britain" set the stage for the aerial night fighting in the next war.

Conquering the Night through Research

Because of inadequate funding and official disinterest, night fighting became the responsibility of regular U.S. tactical squadrons during the interwar years. These units had enough problems preparing for day war, much less confronting the obstacles of darkness. Yet, despite minimal budgets, pioneering airmen still strove to conquer the night by developing blind-flying techniques, primarily at the Army Air Service's Engineering Division at McCook Field, and later at the Army Air Corps' Materiel

Division at Wright Field, both near Dayton, Ohio. The research of 1st Lts. Muir S. Fairchild and Clayton Bissell in the 1920s showed that night operations required a specifically designed aircraft with great speed and maneuverability and an unobstructed view for the pilot. Test flights revealed that pilots became disoriented when they lost sight of the ground and the horizon. Human senses contradicted aircraft instruments, while vertigo magnified a pilot's confusion. The biggest problems were how to land and navigate at night. U.S. airmen tested electric landing lights and flares without success, though the tests did reveal the need for illuminated instruments and flame dampers for engine exhausts.

In 1928 Edwin Link's ground trainer made practicing for night missions safer and less expensive, but did not solve the basic problem of flying into inky blackness. Intrepid airmen such as 1st Lts. James Doolittle and Albert Hegenberger attacked the problem of blind takeoffs and landings in what the *New York Times* called the "greatest single step forward in [aerial] safety." Newly invented illuminated instruments—a specially designed artificial horizon, directional gyroscope, turn indicator, radio beacon, and barometric altimeter (developed by the Pioneer, Kollsman, and Taylor Instrument Companies, the Sperry Gyroscope Company, and Bell and Radio Frequencies Laboratories)—allowed Doolittle and Hegenberger to make blind flights from 1929 to 1932 that opened the night skies to military operations. At the end of this critical period, 1st Lt. Carl Crane published the first U.S. treatise on night flying, *Blind Flying in Theory and Practice* (1932). Soon the homing beacon indicator and radio compass made possible night navigation, and flying the air mail across the country during the 1930s gave Army airmen practical experience in flying at night. Late in the decade, U.S. bomber squadrons were practicing occasional night missions, including mock interceptions in which fighter (pursuit) aircraft were guided by searchlights on the ground.

Obvious to aviators was the seemingly insurmountable obstacle of finding another airplane in the vast emptiness of the night sky. If the opposing crew took basic precautions to "black-out" their aircraft, the optimal range of an intercepting pilot's vision declined to 750 feet or less, though on especially clear nights with strong moonlight three-mile visibility was possible. Night fighters needed assistance from the ground to bring them within visual range of their targets. Until 1938 this help came from searchlight crews lucky enough to illuminate an intruding aircraft and from acoustical locators using conical horns to focus incoming sound. There were also vain attempts to detect radio waves emitted by the spark plugs of aircraft engines or infrared radiation from engine exhaust gases. Tests at Fort MacArthur, California, in 1937 and in Hawaii in 1940 proved the futility of such efforts.

All this development seemed to make no difference. A new generation of bombers such as the Martin B–10 could fly higher, faster, and

farther than any fighter in the world, convincing a whole generation of Americans to agree with erstwhile British prime minister Stanley Baldwin that "the bomber will always get through," whether day or night. On its test flight the Boeing B–17 Flying Fortress set a world record, flying 2,270 nonstop miles at 252 miles per hour. Many airmen believed fighter aircraft could never intercept and shoot down such bombers in broad daylight, let alone at night. Since bombers could strike by day without peril, there would be no need for night missions and no need for a night-fighting capability. Only when the Second World War revealed these new bombers to be vulnerable to attack during the day and unable to "always get through" did the need for night fighters again become clear.

In the United States, air doctrine reinforced a disregard for night operations. At the Air Corps Tactical School, first at Langley Field, Virginia, and then at Maxwell Field, Alabama, the faculty developed daylight high-altitude precision strategic bombing and advocated this concept as the offensive doctrine of the U.S. Army Air Corps. Large fleets of fast, well-armed bombers would attack key chokepoints in an enemy's industrial fabric by day—the most rapid, efficient, and least bloody means for defeating the enemies of the United States. The revolution in bomber technology represented by the four-engine B–17 made axiomatic the belief that no defenses could stop such an attack. Brig. Gen. Oscar Westover expressed the conviction of most U.S. airmen when he declared that "no known agency can frustrate the accomplishment of a bombardment mission." Norden and Sperry optical bombsights could locate precise industrial targets from four or five miles up under the proper conditions, but only during the day and in the absence of high winds and excessive cloud cover.

This strategic bombing doctrine and its advocates overwhelmed any airmen still concerned with defense and fighter operations, and encouraged the building of an air force committed to daylight bombing operations. Thus, the Materiel Division redirected its research in blind and night flying to the problems of aiming bombs through overcast. Defensive strategies reflected this emphasis on daylight precision bombing, and more defensive-minded airmen began to focus on the problems of daylight interception. Even the conflicts of the interwar period, including the Spanish Civil War, gave U.S. airmen no persuasive reasons to alter their thinking.

Night Fighters in the European War

The Battle of Britain in 1940 was a rude awakening. At first, German aircraft struck at England by day and night, the few night missions scheduled only because Luftwaffe Commander Hermann Göring wanted an all-out, around-the-clock, effort. After losing nearly 1,700 aircraft in three months to British defenses by day, however, Göring switched his bombing attacks to the night in October 1940. This change in strategy also coincided

with his decision to target British morale, better attacked in the uncertainty of night, with lighter losses.

Unfortunately, the British were woefully unprepared, with only eight squadrons of obsolescent night fighters (Defiants and Blenheims). Royal Air Force (RAF) pilots had to rely on newly developed long-range ground radar for warning and assistance with interception. This radar system, however, had been built with day missions in mind. Ground controllers could get day fighters to within five or ten miles of the bomber formations, where the pilots' eyes took over. At night, directions to within five or ten miles of the target meant that the pilots might as well have stayed on the ground. The results were devastating: over Coventry on the night of 14/15 November 1940, 165 RAF sorties failed to bring down any of the 437 attacking Nazi bombers.

By 1941 the British had discovered how to use German navigation radio beams to determine where enemy bombers would attack. When this technology was combined with radars mounted in the intercepting aircraft, nighttime defenders began to claim an increasing number of enemy bombers. Still, in the last mass raid of the Blitz, hundreds of night fighter sorties resulted in only seven of the 507 attacking bombers shot down. In May 1941 Hitler began shifting Luftwaffe units to the east preparatory to the assault on the Soviet Union. The British had won the Night Blitz, not because of the success of their night fighters, but because of the Führer's capriciousness. German losses to British night defenses and to all other causes during the Night Blitz never exceeded four percent.

U.S. officers sent to England to observe the Battle of Britain experienced the terror of night bombing and learned the lessons of night fighting firsthand. Col. Carl A. Spaatz, future head of the U.S. bombing campaign against Germany, reported the need for a night fighter aircraft high on the list of requirements for building a U.S. combat air force. In later talks, British and U.S. officials agreed that the United Kingdom would assume primary responsibility for night defense, with the RAF to produce 4,380 night fighters and the United States 1,687.

Spaatz and other U.S. observers returned to the States with lessons learned by the British: crews needed special qualifications; night fighting required special training; muzzle flashes and tracers could blind the night pilot; and ground control of intercepting aircraft by radar and radio was essential to success. But the most important lesson was that groping around in darkness looking for a moving airplane would most likely end in failure.

Radar Illuminates the Night

Key to opening the black sanctuary that shielded night bombers was the development of radar, both ground-based and units carried aloft in

aircraft. The sixteenth-century English dramatist John Lyly could write that the "night hath a thousand eyes," but until radar, aircrews knew that night interception was the product of luck rather than any number of eyes. Though the properties of radio waves had been known and understood since the late nineteenth century, not until 1922 did the United States Navy begin active research into **ra**dio **d**etecting **a**nd **r**anging. (Radar—a Navy term—was adopted officially in 1940.) Successful experiments with aircraft soon attracted Army interest. The key development for World War II night fighters was the accidental discovery by Lawrance A. Hyland in 1930 that radio waves reflecting off an aircraft in flight, previously believed too small to measure, actually could be collected and gauged. By 1936 Americans were testing pulse radars, allowing a transmitter to receive its own signals bounced off an airplane in flight, for measuring distances. The U.S. Army began deploying ground radars in 1940, but the large amounts of electrical power needed to generate the radio waves (in wavelengths of one to three meters) and the size of the antennas precluded their use in aircraft. The technology also suffered from antennas being fixed in a stationary position. Aircraft flying through the resulting directional radio beam created a temporary blip on a cathode ray scope that disappeared once the aircraft had overflown the beam. The sweeping hand of a rotating radar beam was unknown at the time.

Under the threat of aerial attack from the continent, Britain made a considerable investment in the new technology. Robert Watson-Watt of the National Physical Laboratory and Hugh Dowding of the RAF constructed a belt of fixed warning radars able to detect incoming aircraft at over one hundred miles. Like U.S. radars, they required enormous towers (up to three hundred feet) and power consumption equal to that of a small town. These early warning radars provided range, altitude, and bearing data, allowing the Ground Control of Interception (GCI) radar controller to vector a night fighter by radio to within several miles of a target. At that point another means of detection had to be used. Meanwhile, under the codename MAGIC MIRRORS, British researchers strove to develop a radar set small enough to fit into an aircraft but with minimal power demands.

By August 1937 a handmade, experimental model was ready. The Mark I Airborne Interception Radar entered combat in September 1939, searching the North Sea for minelaying seaplanes at night. It had restricted range and suffered from excessive interference on the radar scope from ground returns. The Mark II and III versions showed little improvement. Then in November 1940, after three years of development, the new Mark IV airborne radar, mounted in twin-engine Beaufighters and Douglas Bostons, was ready to operate in Britain's night skies. Unfortunately, ground returns on the Mark IV, which used 1.5 meter wavelengths, created target-obscuring clutter on the radar scope to the distance the aircraft was above the ground. Also, returns were too vague to make accurate determi-

nations. At this point, radar was still more art than science. Nevertheless, Mark IV-directed night fighters achieved their first victory in November 1940 and went on to claim 102 victories out of 200 airborne radar contacts during the Night Blitz over England from March to June 1941. Despite this success, the Mark IV's limitations underscored the importance that luck still claimed in night fighting.

The technological solution to these problems involved centimetric or microwave radar (wavelengths below 10 centimeters). These narrow beams were inherently more accurate and also minimized ground interference without requiring huge antennas. The answer to the problem of the large electrical demands of microwave radar came from the British team of John T. Randall and Henry A. H. Boot, who developed a resonance cavity magnetron to produce the necessary power. In September 1940, more than a year before the United States entered the war, the British Tizard Mission shared its radar achievements with the U.S. National Defense Research Committee (NDRC)—an unselfish display of good faith. Though Americans had made great progress in many areas of radar, they lacked the magnetron breakthrough necessary to power microwave airborne radar. The NDRC established Division 14 in October 1940 to produce a U.S. 10-centimeter radar, under the direction of the newly established Radiation Laboratory at the Massachusetts Institute of Technology (MIT) in Boston.

The U.S. commitment of resources to this project soon surpassed the small British development program. By March 1941 an MIT microwave airborne radar was flying in an Air Corps bomber and detecting aircraft at slant ranges up to eight miles. At first, wartime demands forced the Western Electric Company to produce the SCR–540 as a 1.5-meter radar set (equivalent to the British Mark IV), but soon the contractor converted to the 10-centimeter SCR–520 (British Mark VII), powered by one hundred kilowatts from Randall and Boot's magnetron. Though heavier than the 540 by six hundred pounds, the SCR–520 provided a more refined target and suffered less from ground reflections. Meanwhile, the serious U–boat threat in the North Atlantic diverted most initial production of the airborne radar from aerial night fighting to antisubmarine operations. By late 1942, technology advanced even further, as MIT, Western Electric, and Bell Telephone Laboratories introduced the 10-centimeter SCR–720 (British designation Mark VIII and X), a system with a 6.5 mile range and generally invulnerable to enemy jamming.

Armed with airborne radar and assisted by ground-based systems, U.S. night fighters could now penetrate the darkness that offered sanctuary to enemy night bombers. The next requirement was an aircraft with sufficient speed and firepower to catch Axis enemy planes and knock them from the sky.

Developing a True Night Fighter

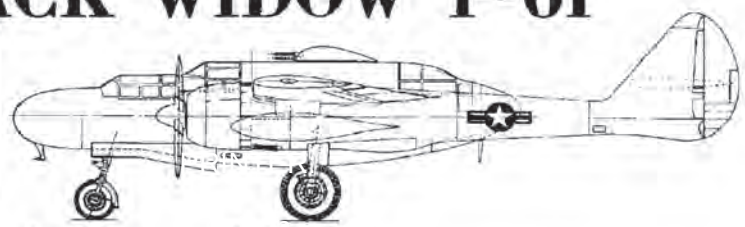
The United States, comfortable in the knowledge that British airmen would carry the brunt of night combat for the time being, could afford to develop its night fighters slowly, under peacetime priorities. Wartime priorities, on the other hand, forced the British to take a fast, off-the-shelf U.S. attack bomber, the Douglas A–20 Boston, and convert it to a night fighter equipped with the Mark IV airborne radar.

For the long-term, the Air Corps wanted a specially designed night fighter, built according to Muir Fairchild's guidance from the early 1920s. The original request for proposals called for a "Night Interceptor Pursuit Airplane." In response to a proposal from Northrop, the Army Air Corps ordered two XP–61 prototypes in January 1941 for $1,367,000. Hungry for its first night fighter, the Air Corps ordered thirteen YP–61s two months later for service testing. The prototype was an all-metal, twin-engine, three-place monoplane with twin tail booms and a fully retractable tricycle landing gear. Its revolutionary slotted flaps and perforated spoilers allowed it to close on a target very quickly—up to 362 miles per hour (P–61A version)—and then to decelerate rapidly to only 70 miles per hour so as not to overshoot the target. Nicknamed the Black Widow, the P–61 had many teething problems, which prevented the first prototype from flying until May 1942, a service test model until February 1943, and a production model until October 1943. The Black Widow made its public debut in January 1944 during a mysterious night flyover of the Los Angeles Coliseum, rapidly appearing out of the dark like some gigantic bat, and then just as strangely disappearing, with only the roar of its engines testifying that it had flown over the surprised crowd at a halftime celebration.

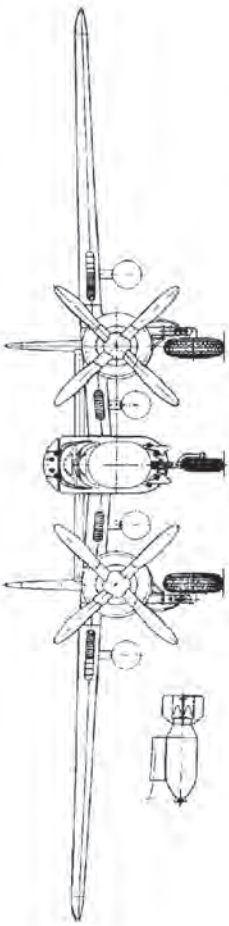
The P–61's long-delayed development forced the AAF to seek an interim solution. Since the British had been converting Douglas Boston attack bombers to night fighters since 1940, it seemed logical to fill the gap left by the "Night Interceptor Pursuit Airplane" project with the night version of the Boston, known as the Havoc. The RAF had also fitted some Havocs with a powerful searchlight to illuminate enemy aircraft and allow accompanying Hurricane day fighters to attack. Renamed the Turbinlite, these aircraft proved ineffective because the searchlight blinded everyone in the area, friend and foe alike.

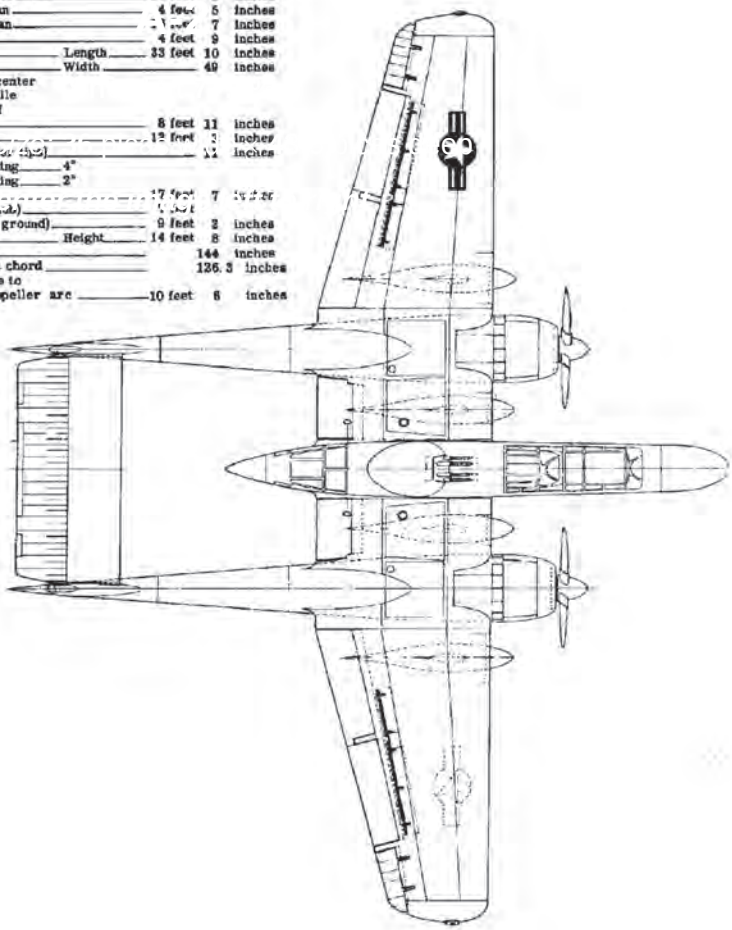
In October 1941 U.S. airmen installed in Douglas Boston attack bombers their version of the Mark IV airborne radar, initially the handmade AI–10 and later the manufactured SCR–540. Thus modified and redesignated the P–70, sixty of these aircraft became available at Douglas's Santa Monica plant when supercharged engines needed for the bomber version could not be allocated. Armed with four 20-mm cannons and airborne radar, the P–70 could carry up to two thousand pounds of bombs on night bomber missions. However, the absence of superchargers and therefore a diminished high-altitude capability guaranteed their failure as night

Dimensions of the
NORTHROP
BLACK WIDOW P-61



Wing spread		66 feet	
Over-all length		48 feet	inches
Horizontal stabilizer		18 feet	8 inches
Inner wing flap span		4 feet	5 inches
Outer wing flap span		3 feet	7 inches
Aileron span		4 feet	9 inches
Crew nacelle	Length	33 feet	10 inches
Crew nacelle	Width		49 inches
Distance between center line of crew nacelle and center line of engine nacelle		8 feet	11 inches
propeller arc		12 feet	3 inches
Clearance (propeller tip)			14 inches
Dihedral - inner wing	4°		
Dihedral - outer wing	2°		
Tread width		17 feet	7 inches
Height (propeller hub)		7 feet	
Height (wing tip to ground)		9 feet	2 inches
Rudder	Height	14 feet	8 inches
Root chord			144 inches
Mean aerodynamic chord			126.3 inches
Distance from nose to center line of propeller arc		10 feet	6 inches





A Northrop P–61 Black Widow in its "stealth" camouflaged shiny black paint, out of place in the daylight skies over California.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fighters. The desperate need for anything that would fly at night nonetheless warranted orders for 65 more combat versions and 105 trainers. By September 1942, 59 P–70s were ready for combat, with about half going to training schools at Orlando, Florida, and the other half to operational units defending the Panama Canal (24th Fighter Squadron) and Hawaii (6th Fighter Squadron).

Meanwhile, the P–61 Black Widow faced mounting technical problems: aerodynamically-induced tail-buffeting, a move of the cannons from the wings to the belly, a requirement for additional fuel capacity, Plexiglas nose cones that melted in the sun, and delays in receiving remotely controlled gun turrets (in demand for the B–29) slowed production even more. Labor problems and material shortages also contributed to delays at Northrop's Hawthorne, California, plant, which built only 34 in 1943, 449 in 1944, and 199 in 1945. Only 100 Black Widows were overseas by D–Day, June 6, 1944.

But what a technical marvel! Two 2,000 horsepower Pratt & Whitney Double Wasp engines powered the P–61, two-speed General Electric turbosuperchargers boosted performance at altitude, and four 20-mm cannons and four .50-caliber machine guns provided killing power. Though the Black Widow was designed for a crew of three (pilot, radar operator [R/O], and gunner), the gunner sometimes did not fly in combat because the remote-controlled gun turret was either deleted or fired by the pilot. Armor plates protected the crew from machine gun fire. The pilot could use 5.8 power night binoculars mounted in the cockpit and connected to the optical gunsight. Four illuminated dots on the gunsight allowed the pilot to determine the enemy's range. The R/O sat backwards, unable to see what lay ahead, his eyes trained on the radar scope between his knees.

The P–61 was perhaps the first "stealth" technology to fly for the United States. Following tests at the National Defense Research Committee, Northrop painted the night fighter glossy black to help it hide in darkened skies by reflecting light away rather than down to the ground. Baptized the Black Widow, certainly one of the most apropos nicknames ever, the P–61 (including the version with water injection) could fly up to 370 miles per hour in level flight at 30,000 feet, reach an altitude of 41,000 feet, and climb to 20,000 feet in 8.5 minutes. Fully loaded, it weighed only as much as an empty B–17 Flying Fortress. The seven hundred Black Widows built were, by any terms, the most sophisticated and advanced piston engine-powered, propeller-driven aircraft of the war.

All this performance came with a high pricetag. With Northrop's assembly line in full gear, a completely equipped P–61 cost $180,000 in 1943 dollars, three times the cost of a P–38 fighter and twice the price of a C–47 transport. But, unconcerned with cost, the men who flew the Widow loved it. According to one, it was "fun to fly" and especially suited for its role of flying by instruments because of its stability. The P–61 pilot manual said: "When the Black Widow takes to the night sky, sticking her

Left: **SSgt. William Gradischer cleans the glass observation post of the P–61 radar observer.**

Below: **Cockpit of a Northrop P–61 Black Widow.**

long nose into whatever trouble lies there, she is hard to see, hard to hit, and hard to beat." Its full-span landing flaps and retractable ailerons afforded great maneuverability. Some pilots believed the plane needed more speed, but what fighter pilot has not asked for greater speed? Others criticized the multiple ribs in its canopy that obstructed vision. Still, any aircraft that could bring down an Me 410 flying 375 miles per hour at 24,000 feet and a Ju 52 flying 90 miles per hour at 1,000 feet in the darkness of midnight was obviously a successful fighter.

The Germans soon learned what the Black Widow could do and endeavored to collect one. Pilot 1st Lt. Paul A. Smith and R/O 1st Lt. Robert E. Tierney followed a bogey (enemy aircraft) to the ground, the German plane playing a game of tag, always staying safely ahead of the P–61, but never attempting to lose it either. After nearly thirty minutes of chase, Smith and Tierney found themselves at low altitude flying through a "killing field" of light German antiaircraft guns supported by searchlights. Having lost their port engine, the 422d Night Fighter Squadron (NFS) crew nursed the damaged Black Widow back to their home base. Though the P–61 bore eighty-seven holes, the Germans were unable to claim their prize.

AAF Col. Phineas K. Morrill laid the groundwork for a major controversy in September 1943, when he requested that all of the night fighter squadrons trained by his 481st Night Fighter Operational Training Group be equipped with twin-engine British Mosquitoes rather than American P–70s or P–61s. The proposal received little attention until June 1944, when Maj. Gen. Hoyt S. Vandenberg, Deputy Commander in Chief of Allied Expeditionary Air Force in Europe, added his weight to Morrill's request. Considering that "neither the P–61 nor the P–70 type aircraft are suitable night fighters . . . and that little success can be expected," Vandenberg wanted U.S. night fighter squadrons to switch to British-provided Mosquitoes.

To resolve the controversy, Lt. Gen. Carl A. Spaatz, Commander of United States Strategic Air Forces in Europe, ordered a July 5, 1944, flyoff at Hurn, England, pitting the P–61 directly against Vandenberg's choice, the British Mosquito. Lt. Col. Winston W. Kratz, director of night fighter training in the United States, bet $500 that the Mosquito could outperform the Widow. According to the 422d NFS historian, the competing P–61, "tweaked" to get maximum performance, proved faster at all altitudes, "outturned the Mossie at every altitude and by a big margin and far surpassed the Mossie in rate of climb." All in all, the historian noted, "a most enjoyable afternoon—Kratz paid off." The official report concluded that the "P–61 can out-climb the Mosquito due to the ability of the P–61 to operate indefinitely at military power without overheating," critical to closing on a bogey.

Despite this impressive performance, the Black Widow lacked the speed advantage necessary to intercept some high-flying enemy bombers.

A P–61 from the top. The three crew positions, from front to back, are the pilot, gunner, and radar operator.

At Leyte in the Pacific, chagrined Army pilots had to ask for help from single-engine Marine F6F–3N Hellcats to stop nightly Japanese high-altitude intruders. The AAF had tested its own single-engine and single-crew night fighters in 1944 over France, sending two P–51s and two P–38s on twenty-one sorties with a RAF night squadron. Their lack of success, at a cost of one P–38, prematurely ended the AAF's experiment with single-engine or single-crew night fighters. U.S. airmen were con-

vinced that such aircraft should be twin-engined and carry more than a single crewman—the P–61 Black Widow would have to do the job.

Training for War

To fly these night fighters, the United States needed a different breed of aviator. So difficult and dangerous was the assignment that the AAF relied on volunteers only. Yet the mission was so exciting that there were always plenty of volunteers. One wartime ace, Robert F. "Shorty" Graham, described night flying as "an indescribable experience, with its stars, moon, and cloud valleys," that helped offset the dangers. In addition to having the basic flying skills, the night pilot had to master twin-engine flying, night formation flying, night gunnery, night recognition, night navigation, ground control radar, and blind landings. The enormity of this task, compounded by a shortage of training aircraft and instructor pilots, delayed the formation of the first specifically planned U.S. night fighter squadron, the 414th, until January 1943. Priorities were never high because the same British squadrons that had helped to defeat the German Night Blitz over England were still available to fight for night air superiority in support of the Allied cause.

Back in the United States, the AAF assigned the V Interceptor Command initial responsibility for night training. En route to the Philippines in 1941 when the Japanese launched their invasion, Col. Willis R. Taylor's command was ordered back to Orlando, Florida, to train personnel for defense wings. Taylor put Maj. Donald B. Brummel in charge of the 81st Fighter Squadron. With no trained instructor pilots or R/Os, no aircraft, no radar, and no communications equipment, the 81st in July 1942 faced the monumental challenge of training sufficient crews to man seventeen night fighter squadrons within twelve months.

Night training began in July 1942 at the Fighter Command School, Night Fighter Division, AAF School of Applied Tactics in Orlando. Brummel had a core of U.S. veterans who had served with the British in the Battle of Britain and soon dispatched five more of his original officers to train in the United Kingdom. Equipped with three B–17s, one B–18, and twenty-two P–70s, the school did not get Beechcraft AT–11s for airborne radar training and P–61s for combat training until March and November 1943, respectively. Three squadrons directed night training: the 348th at Orlando (initial training and instrument flying), the 349th at Kissimmee Field (transitional training), and the 420th at Dunnellon Field (operational training). As more training aircraft became available, the 424th Flying Training Squadron also assumed responsibility for operational training.

Aircraft shortages kept flying training, in one graduate's opinion, "very rudimentary." Though a squadron commander, Maj. Oris B. Johnson

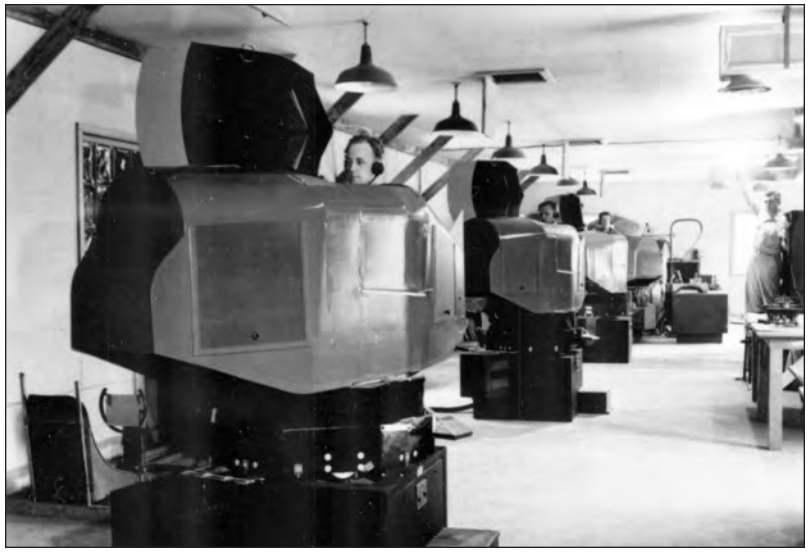
got only six flights in a P–61 before being sent overseas. The School of Applied Tactics ordered the 348th Squadron to fly 5,925 training hours in February 1943, but with only eleven operational aircraft, each aircraft had to fly twelve hours out of every twenty-four—an impossible task. To make matters worse, one of the eleven P–70s was being used to test a new radar, and two were flyable but unusable because of radar failure.

To recruit students, Brummel searched the various flying schools in the United States, looking for pilots with twin-engine training and especially for those with experience in night takeoffs and landings. In 1942 the requirements included a minimum of six months' service as a rated pilot, moderate night vision, skill in instrument flying, "extreme stability of temperament," knowledge of squadron administration, and ability to command. Maj. Gen. William Kepner, commanding all fighters supporting strategic bomber operations from England in 1943 and 1944, wrote the commander of IV Fighter Command, in charge of the night fighter training fields:

> Night fighter pilots must be picked for their ability to operate at night and that means able to use a lot of instruments, and of course they must be fed and prepared physically to have good eyesight at night. You must have a willingness to fly alone long distances at high altitude with low temperatures. In other words they should combine all the aggressive and dogged fighting characteristics with a somewhat phlegmatic disposition that bores in like a bulldog without any other idea than getting the job done. Their courage and resourcefulness will have to exceed, if possible, all that any pilot has ever had before. This is some guy and you have to produce him.

Twenty-seven volunteers from the 50th Fighter Group were the first to answer the call, heading to Williams Field in Arizona for transition training before departing for Florida in August 1942. Simultaneously, two dozen volunteer R/Os entered Airborne Radar School at Boca Raton, Florida. Once this original cadre filled the training program, the Florida schools began accepting volunteers at the end of basic flying training. Trainees had to complete twin-engine flying training and Training Command's B–25 transition school before beginning night fighter training.

Training consisted of two phases; night flying and night fighting. First came 78 daylight flying hours and 137 hours of ground school, followed by 76 flying hours and 30 hours of ground school in night fighting. Subjects included instruments, airborne radar, night navigation, meteorology, aircraft recognition, searchlight coordination, and airborne radar-ground control radar coordination. Lacking real nighttime combat experience, the AAF created a training program that was ad hoc from the beginning. In all, the night fighter crew would receive 93 hours of instrument flying, 90 hours in a Link trainer, 15 hours of night interceptions, and 10 ground control radar intercepts. Remarkably, no provision was



Above: **Night fighter pilots "flying" the Link trainer, November 1943, Orlando, Florida.**

made in the curriculum for night intruder attack tactics until late July 1943, when an RAF pilot with sixteen night victories introduced the tactics to the U.S. training program.

Having established four training squadrons and activated ten night fighter squadrons in Florida, the AAF ordered the entire night fighter training program to California in January 1944, to be headquartered at Hammer Field near Fresno. The Air Staff had decided that the School of Applied Tactics should not be in the training business, though the ground control radar training program would remain at Orlando. Under the overall supervision of Fourth Air Force and the 481st Night Fighter Operational Training Group, commanded by Lt. Col. William R. Yancey, night crews were organized into Overseas Training Units and entered three phases of training. Phase One consisted of familiarization training at Bakersfield Municipal Airport. Phase Two, designed to weld pilots and R/Os into teams, along with instruction in day and night interception, was conducted at Hammer Field. Phase Three advanced training, including intensive night flying practice, took place at Salinas Field. Each phase lasted approximately one month. Finally, after two more months of organizational training at Santa Ana Field, the night fighter squadrons were ready for transfer overseas.

The 481st graduated three units shortly before D–Day—the 423d NFS in March and the 425th NFS and 426th NFS in May 1944. Then the AAF made another change in the training program. In May the 319th Wing under Col. Ralph A. Snavely replaced the 481st, with the 450th and

451st AAF Base Units supplanting the training squadrons. The director of operations, responsible for day-to-day training, was Lt. Col. Winston W. Kratz. Under Snavely, the 319th Wing completed training for five new Night Fighter Squadrons: the 427th, 547th, 548th, 549th, and 550th.

Training itself was intense and hazardous. The AAF claimed the accident rate "never reached alarming proportions," but admitted "it was serious enough to demand the constant attention it received." One R/O, 2d Lt. Robert F. Graham of the 422d NFS, said he flew six to eight hours each night in a strenuous program that he believed prepared him for the rigors of combat. And preparing for combat meant flying under combat conditions, which meant young men were going to die. Missing from the program was any training in night intruder interdiction flying, not added until March 1945 and then only two hours' worth.

In April 1943, the 414th, 415th, 416th, and 417th Night Fighter Squadrons, the first units to complete the training, received their orders to deploy overseas. The squadron commanders complained that the men had not received enough flying time and had no experience in the Beaufighter, which they were told they would be flying in combat. The war, however, would not wait.

Forth to Battle

The first U.S. night fighter unit was the 1st Pursuit Squadron (Night), formed from the 15th Bombardment Group (Light) in March 1942 after AAF Commanding General Henry H. (Hap) Arnold's representative in England asked for a fighter unit, to be equipped with British-provided Turbinlite aircraft. Having arrived in England in May 1942, the 1st Squadron soon reverted to the 15th Bomb Group (Light) because of the failure of British Turbinlite operations. The 15th went on to launch the United States' first bombing strike against German targets on July 4, 1942, flying borrowed British Boston IIIs—by day.

Meanwhile, the 414th and 415th NFS became the first graduates of the hastily organized training program at Orlando, having flown P–70s and Link trainers. After their transfer to England in late March 1943, the squadrons gained additional training from experienced British units. While there, they practiced night flying in Blenheims left over from the Battle of Britain before converting to Beaufighters and giving up the P–70s in which they had trained in the States. The P–70 proved too slow in climbing to operational altitudes (45 minutes to 22,000 feet) and performed poorly at high altitudes. Several veteran U.S. pilots already flying with the RAF joined the 414th and 415th before they moved to North Africa for combat in July 1943. Two new squadrons from Orlando, the 416th and 417th, then replaced the 414th and 415th in England.

Plans for Operation TORCH, the invasion of North Africa, gave shipping priority to offensive aircraft, delaying the arrival of night fighter units. After Lt. Gen. Dwight D. Eisenhower reported that he was "gravely concerned" about the lack of night protection, veteran British units were rushed in to fill the void. Only two days after arriving on the scene, British Beaufighters made their nighttime presence felt, downing eleven out of thirteen attacking Luftwaffe bombers. In part, British success could be attributed to the advanced microwave Mark VIII airborne radar, which did not suffer from the range limitations of the Mark IV/SCR–540 airborne radars that equipped U.S. Beaufighters. Over the next few months, more British night squadrons were deployed to North Africa before the first U.S. squadron, the 414th, arrived in June 1943. The 415th NFS joined these American pioneers during the summer.

Temperatures of 130 degrees in the shade and a constant shortage of replacement parts were only two of the obstacles ground crews faced in keeping the Beaufighters flying. Friendly fire from jittery Allied ground gunners increased the dangers of night flying. Yet, relying primarily on British ground control radar, U.S. crews soon began to score aerial victories, with the first one credited to Pilot Capt. Nathaniel H. Lindsay and R/O Flight Officer Austin G. Petry of the 415th NFS on July 24, 1943. Unfortunately, excessive ground clutter displayed on the Mark IV airborne radars held the 414th and 415th's Beaufighters to four kills by the end of the North African campaign. The 416th and 417th squadrons eventually joined Twelfth Air Force, but flew unproductive convoy and harbor patrols. The 417th's opportunity came on October 22, 1943, when ground control radar vectored the newest U.S. night fighter squadron to twenty German aircraft, but the Beaufighters' Mark IV airborne radars proved unable to maintain contact.

Critical to a successful intercept were two factors: speed and ground control radar. 2d Lt. Daniel L. McGuire, a veteran of seventy-five combat missions, explained that ground control radar was useful up to only about sixty miles from the transmitter site. Because the antiaircraft artillery zone defending the site had a radius of fifteen miles, night fighters had only the forty-five miles outside the ground fire zone to the limit of ground control radar range to locate, track, and down an intruder. At speeds of 250 miles per hour, the pursuers had only ten minutes to do their deadly job. It took nearly that long to reach operational altitudes, so there could be no scrambling of fighters once an enemy appeared on the ground control radar screen. Night pursuit aircraft would have to be at altitude, orbiting and waiting, when a bogey appeared.

The ground control radar station used a cathode ray tube designated a Plan Position Indicator to plot the paths of aircraft within radar range. Aircraft appeared on the tube as little blips of light, with identification friend or foe (IFF) radio transmissions identifying the night fighter that the ground control radar operator, or fighter controller, was trying to vector to

an interception point. Using VHF radio, the controller directed the night fighter to a point several miles to the rear of the intruder. (A serious limitation of the system was that each ground control radar could control only one night fighter at a time.) Once the airborne R/O made contact with the enemy on his radar set, he directed the pilot to a location where visual contact could be made, at which point the pilot took over. Visual contact was needed to aim the guns and to insure visual recognition of the target, as required by the rules of engagement. Until then, it was a matter of blind faith, with the pilot relying on the R/O behind him to direct an intercept. Though the pilot usually had a radar screen in the cockpit, he dared not look at it for fear of ruining his night vision. Surprise was essential. An enemy using evasive maneuvers was difficult to shoot down. Surprise an enemy at two or three hundred feet "and open fire with four 20-mm cannons," according to 2d Lt. Robert F. Graham, "and that was it."

Obviously, teamwork was critical. The ground control radar fighter controller could see things the airborne crew could not. The rule in most squadrons was "no night fighter unit is any better than its control." Pilot and R/O combined two pairs of eyes, each having a separate responsibility. The pilot had to make smooth consistent turns, whether hard or gentle, or the R/O, with his eyes focused on a small scope, would become confused. According to the wartime commander of the 422d NFS, Maj. Gen. Oris B. Johnson (Ret.), there was no fear of collision, no use of intuition, and no flying by the seat of your pants. Johnson and his R/O, Capt. James "Pop" Montgomery, flew together from August 1942 until the end of the war. They became so much a team that Johnson could always tell when Montgomery had made airborne radar contact because "he began to breathe hard." Proof of the importance of teamwork was a mission in which Montgomery kept Johnson on the tail of a bogey for fifteen minutes, though the pilot never made visual contact. Johnson's oxygen mask had pulled loose, blurring his vision. The team as a whole was greater than the mere sum of its two parts.

Ground control radar technology alone could not provide accurate altitude directions, so the night fighter had to check out various altitudes, making speed essential for intercepting an intruder before he reached the antiaircraft artillery fire zone. On the other hand, airborne radar was dependable at a distance of several miles. If the night fighter approached too fast, it would probably overshoot the target, requiring the use of speed brakes at about four thousand feet from the target. Too slow an approach and the target might enter the ground fire zone or move beyond airborne radar range. Stateside training taught that the proper technique was for the pursuer to synchronize his speed with the target's speed and close slowly, but pilots in combat soon discovered that such a tactic took too long and too often allowed the target to escape.

Another stateside lesson involved using exhaust flame patterns to identify the targeted aircraft. One pilot who received such "extensive

training" in flame pattern recognition techniques reported that after eighteen months of combat operations in Europe, he had never seen the exhaust of a German plane that was not entirely blacked out by flame dampeners. This training technique was not a total waste, however, because if a suspect aircraft did show exhaust flames, it was usually American. The best method for identifying the target, according to combat returnees, was to silhouette it against the sky from below and identify it by shape and size. A bonus of this technique was invisibility, because if the enemy was using radar, he would be blind to an approach from below.

A night fighter pilot followed his R/O's directions to get within visual distance, usually 750 feet or less. Some veterans learned that if they could not make visual contact, a trick of the trade was to fire the aircraft's cannons blindly, hoping the bogey would open fire, revealing his presence. As one pilot reported, "the practice is admittedly risky but at times has proven effective." The riskiest practice, however, was following an intercept into the antiaircraft artillery zones—enemy or Allied. To a man, night fighter combat veterans agreed that the biggest threat they faced was Allied ground fire. Having the ground control radar fighter controller also in charge of antiaircraft artillery fire helped, but friction between the ground artillery and airmen usually prevented any effective cooperation.

During the invasion of Italy in September 1943, the four U.S. night fighter squadrons began to reequip with the SCR–720 airborne microwave radar, though security concerns restricted it from use over enemy-held territory, and it was not released for general use until May 1944. The new radars raised morale but did not bring better hunting. 417th NFS crews did not get their first SCR–720 kill, a Ju 88 downed while on convoy duty, until early February 1944. The continuing lack of opportunities encouraged the 417th's historian to write "at last" when the squadron racked up its next aerial victory in late March. Victories were hard to come by, especially because the RAF did most of the night flying. Over Anzio the 415th claimed only two confirmed kills in three months of operations. Its crews reported they were "fired on by friendly flak more than by enemy flak." In April 1944 the 416th NFS replaced the 415th because their Beaufighter Mark VIII airborne radar sets proved less susceptible to the window/chaff German pilots had begun using in large quantities. The 416th NFS did little better than the 415th, despite the advanced radar, because of a lack of aerial targets. In 542 missions from January 28 to May 25, 1944, including two months over Anzio, the 416th achieved only thirty-three airborne radar contacts, resulting in two kills.

All four U.S. night fighter squadrons found poor hunting in the Mediterranean theater. Night after night the Beaufighter-equipped 417th NFS, newly arrived at Corsica, rose and found the skies empty, except for one unlucky German off Spain in March. On the night of May 12/13, 1944, however, the Luftwaffe launched a heavy strike against Allied bases at Alesan and Poretta, Corsica, damaging or destroying over one hundred

B–25s on the ground and killing or seriously wounding ninety-one personnel. The attacking He 177s proved too fast for the 417th's Beaufighters, which claimed only one probable kill. The 414th, 415th, and 417th flew night cover for the invasion of southern France, but again the major threat they faced was trigger-happy Allied gunners on the ground. With Allied troops ashore, the 414th and 417th returned to intruder work in Italy, while the 415th flew night cover for the American Seventh Army's drive north through France.

Even when the night fighters found targets and hit them, the results were not always guaranteed. On May 14, 1944, the 416th NFS ordered Capt. Harris B. Cargill and R/O Flight Officer Freddie C. Kight into the air at 0335 hours to intercept a German intruder. Kight needed twenty-five minutes of ground control radar guidance before locating the bogey on his airborne radar. Identification friend or foe transmissions identified the target as an enemy aircraft, which then initiated evasive maneuvers and dropped window/chaff. Still, the rules of engagement required visual identification. Fifteen minutes of maneuvering brought Cargill into visual contact four hundred feet from the target. Two hundred rounds of 20-mm and 1,260 of .50-caliber fire forced the Ju 88 into a violent dive toward the ground. In night combat, however, especially with clouds, verification of a kill was tough. The bogey disappeared from ground control radar and airborne radar screens, and ground troops reported seeing a German aircraft flying very low before it "disappeared towards water." The Victory Credit Board refused to grant Cargill and Kight a victory.

Posterity will never know exactly how many aircraft were shot down by U.S. night fighters. Theirs was a lonely war. Claims had to be substantiated, which was usually not possible at night. A ground control radar operator could help, confirming that a bogey disappeared from his screen at the time claimed by the night fighter crews. R/O 1st Lt. Robert E. Tierney of the 422d NFS remembered his pilot, 1st Lt. Paul A. Smith, radioing "Murder! Murder! Murder! Give me a fix!" to his ground control radar fighter controller after a kill. Smith then climbed to a higher altitude, orbiting the spot of the victory, so the controller could plot the location. The next day a reconnaissance aircraft would fly to the plotted position, if one were available, and attempt to photograph the downed enemy plane. But Tierney, Smith, and the rest of the night fighter crews were in a war that could not be stopped to tally victory credits.

Britain's decision to stop building Beaufighters after January 1, 1944, condemned many U.S. night fighter pilots in the Mediterranean theater to flying war-weary aircraft that were already three years old by 1944. The 414th got P–61s and the 416th Mosquitoes in late 1944, while the 415th and 417th soldiered on with the venerable Beaufighter (some of which had fought in the Battle of Britain), though the latter had the highest accident rates in the theater. Nevertheless, with RAF units, U.S. night fighters forced the Luftwaffe into single aircraft "nuisance" raids during the Italian

campaign. Flying at low altitudes to hide their presence from airborne or ground radars and using radar jamming and window/chaff to confuse Allied ground control radars, the occasional German reconnaissance flight offered no aerial threat to Allied operations.

By mid-1944 Allied daylight air superiority had so weakened the Luftwaffe that it was forced into mostly night operations. U.S. night fighter squadrons flew missions to stop these nocturnal ventures, yet the vast majority of radar contacts proved to be Allied aircraft. In the words of the men searching for German bogeys, "none seemed anxious to press the attack." Anxious to contribute to victory, the night fighters had to find a new way to wage war. The British had initiated just such a new mission for night fighters back in June 1940.

Night intruder missions were the brainchild of Flight Lt. Karel M. Kuttelwascher, a Czech pilot who had escaped to France in 1939. Committed to attacking Nazis, he found defensive patrols too passive. Initially he proposed using night fighters in a counterair role, striking against enemy night air power at its source—German airfields. On an early mission, Kuttelwascher shot down three German bombers in five minutes. Then, on another sortie, he claimed eight bombers that crashed because his presence prevented them from landing and refueling. Emulating their Czech comrade, RAF night crews, flying U.S.-built Bostons, endeavored to shoot down German bombers returning to their bases after missions against England, just as the crews turned on their landing lights. British intruders also began strafing trains on their return flights to England. Pouncing on the unsuspecting victim so close to home, where the enemy felt most secure, had a dramatic effect on Luftwaffe morale. Many of these British nighttime missions also supported Bomber Command operations, attempting to suppress German night fighters as they rose to intercept the bomber streams.

In 1944 U.S. units expanded on this role of night intrusion. If the enemy would not come up and expose himself to aerial combat, AAF night fighters would follow the British lead and attack him at his airfields. Moreover, when German ground forces used the cover of darkness for maneuvering and resupplying to avoid the overwhelming Allied air superiority in the day, the night fighters attempted to harass them in the starlit skies. These operations often differed from British intruder missions in that the U.S. night fighters performed armed reconnaissance, flying over enemy territory during darkness with no preplanned targets, in search of targets of opportunity: troop movements, motor transport, shipping, and railroads. These missions were flown in conjunction with day interdiction efforts in order to isolate enemy forces on the battlefield twenty-four hours a day.

Meanwhile, Operation STRANGLE called for interdicting the flow of supplies to Nazi forces in Italy. Its success during the day forced the enemy to travel at night. Night fighters were thrown into the breach, ac-

cording to a squadron historian, to bridge "the gap so that the destruction of the enemy air force, the isolation of the battle field, and support of the ground forces, might be put on a 24 hour basis." Air leaders divided northern Italy into fifty-mile squares, with an aircraft orbiting each square, to be relieved by other aircraft throughout the night. At its peak, this night effort included four A–20 squadrons from the 47th Bombardment Group and the three night fighter squadrons in Italy, the 414th, 416th, and 417th, flying the venerable British Beaufighters. Unfortunately, the operation's success was difficult to measure. Except for crew reports, these forces lacked the ability to evaluate their effectiveness. Since Germany continued to resupply its troops in Italy by night, despite the most extensive use of interdiction of the entire war, apparently the effort failed, whatever price the night intruders exacted.

Artillery spotting was another job performed by night fighter crews. Flying over enemy lines, they looked for muzzle flashes. After dropping flares on a suspected position, the airmen would descend and attempt to identify the target. When a crew spotted an artillery position, they would radio a gun-laying radar behind American lines, which would mark the aircraft's position at that moment before directing an artillery barrage to the suspected enemy position.

In eighteen months of operations, using the ground and airborne radar-visual recognition technique of night interception, the four U.S. night fighter squadrons in the Mediterranean flew 4,937 sorties, received credit for downing thirty-five enemy aircraft, and in the process lost forty-eight of their own from all causes. These night fighters helped harry enemy aircraft, broke up raids, and lessened German night bombing accuracy. Their successes boosted Allied morale at the expense of Nazi morale. The official AAF history of the squadrons' activities reported that "their contributions, both toward the outcome of the actual battle and in the experience gained and lessons learned, were invaluable and greatly aided the ultimate Allied victory." U.S. night fighter squadrons set the tone and provided lessons for future U.S. night aerial activities: avoid bright lights, keep the windscreen spotless and unscratched, turn cockpit lights off, use oxygen from the ground up (combat experience showed an increase in night vision of 40 percent at 16,000 feet with the continuous use of oxygen), and use the corners of the eyes for the best night vision. The Mediterranean Allied Coastal Air Force believed "it does not suffice simply to practice them [these rules] spasmodically: one must live them constantly if one is to live constantly." The official history of U.S. night fighter operations in the Mediterranean theater concluded that "in terms of destruction alone they [the night fighters] had hardly justified their existence. On the other hand, their existence was one of the reasons they had few opportunities to destroy enemy planes."

Above: **Northrop P–61 Black Widows marked with invasion stripes soar over France.**

Below: **Maj. Leon Lewis in his P–61 *Wabash Cannon-Ball IV,* somewhere in France, September 1944.**

D-Day and Beyond

The first U.S. night fighter squadron sent to England to prepare for the cross-channel invasion was the 422d, which arrived in February 1944. The 422d was also the first to be equipped with the Northrop P–61 Black Widow. Led by Oris B. Johnson, the squadron grew out of the cadre of the 348th Training Squadron at Orlando. At twenty-three, Johnson was "the old man"—the oldest officer in the squadron at the time—and its first commanding officer. Given the priority of the European theater throughout the war, the 422d operated with the best available radars: the SCR–720 airborne radar, microwave ground control radar, and the first ground control approach radar in Europe. Eventually, the 423d NFS joined the 422d in England, only to be converted to night reconnaissance (and redesignated the 155th Night Photographic Reconnaissance Squadron). Training first with the 425th NFS, and later the 415th NFS, which came up through southern France, the 422d night fighters flew against subsonic German V–1 cruise missiles in flight, the 422d claiming five and the 425th four of the German "buzz bombs."

Over the Normandy beaches and hedgerows, these U.S. squadrons, joined by six RAF night fighter squadrons, provided night protection for

Above: **Czech night ace RAF Flight Lt. Karel Kuttelwascher (2d from left) poses with AAF night fighter training officers, including Lt. Col. Winston W. Kratz, training director (far left), and Maj. Oris B. Johnson, later commander of the 422d NFS (center).**

Allied armies in their drive into France. Moving to the continent in July, the 422d NFS was assigned to the IX Tactical Air Command (First Army), the 425th NFS to the XIX Tactical Air Command (Third Army), and the 415th NFS to the Seventh Army. Because the 425th helped protect the flank of Patton's Third Army on its end run blitz across France, it flew primarily intruder missions. In September and October, for example, it claimed no aerial victories. The 422d, meanwhile, racked up an enviable record, starting its record of night kills on August 7, 1944, when Pilot 1st Lt. Raymond A. Anderson and R/O 2d Lt. John U. Morris, Jr., collected the first night credit of the European Theater of Operations. Proving how deadly the Black Widow could be, from October to December 1944 the 422d claimed to have shot down twenty-four of the fifty-one bogeys it identified as enemy aircraft. In December alone, primarily during the Battle of the Bulge, Johnson's crews claimed sixteen kills on thirty-eight visual contacts. The 425th joined in with eight aerial victories.

On the continent, U.S. night fighter squadrons worked with the most advanced ground control radar system available. The AN/CPS–1 microwave early warning radar had a range limited only by the horizon. Operating at 10-centimeters, it provided accurate range and azimuth information to the fighter controller who directed P–61s to their targets.

Aerial victories were nonetheless hard to come by. The 422d NFS experienced the best hunting. From September to November 1944, its crews undertook 461 ground control radar chases, resulting in 282 airborne radar contacts and 174 visual sightings. But of these sightings, only 20 were identified as enemy aircraft and 7 were shot down. Seven out of 20 in three months' combat was a prodigious nighttime accomplishment, but it did not represent a major contribution to the war effort.

With few interceptions, U.S. night fighters in northern Europe, like their counterparts in Italy, turned to night intruder missions. In the last three months of 1944, the 422d strafed 8 locomotives and 318 railroad cars. Patton's Third Army was making a breakthrough at Metz in mid-November, forcing the Germans into retreat and jamming the roads behind enemy lines. Accurate accounts of the destruction were impossible, but the 425th's Black Widows created havoc and intensified the rout. During the Battle of the Bulge, the night fighters of the 422d and 425th Squadrons were the only U.S. aircraft able to fly at night and in bad weather in support of the beleaguered 101st Airborne Division defending Bastogne—thus demonstrating the potential of all-weather aircraft. The 422d and 425th claimed 115 trucks, 3 locomotives, and 16 railroad cars. Night fighter pilots did not need moonlight to strike, only a cloud ceiling of at least 1,500 feet. A 422d ace, 2nd Lt. Robert F. Graham, remembered that they "had little trouble in going most any place at any time" because of their instruments and the quality of their instrument training. Only a shortage of aircraft and parts for the radar equipment prevented the night fighters from adding to their successes in the Ardennes.

Aerial hunting also improved for the 422d NFS during December's Battle of the Bulge, when crews found forty-one enemy aircraft and downed sixteen. The pilot-R/O team of 1st Lt. Robert G. Bolinder and 2d Lt. Robert F. Graham shot down three planes—an FW 190, Me 110, and He 111—during one mission on December 16—enemy aircraft Graham remembered as "staying up past their bedtime." 1st Lts. Paul A. Smith and Robert E. Tierney became the first U.S. night aces the day after Christmas, shooting down two Ju 188s. That night also saw other squadron members shoot down three more German aircraft. In January and February 1945, the hunting again turned sour, as the 422d claimed one of only four enemy aircraft identified. Then, during the Battle of the Ruhr Pocket in March and April, the Luftwaffe attempted to airlift supplies to the surrounded troops at night, and Allied night fighters were called on again to clear the skies of enemy aircraft. With the U.S. microwave ground control radar covering the entire area, the P–61s scored fourteen kills, mostly Ju 52 transports. Pilot 1st Lt. Eugene D. Axtell got his fourth and fifth victories on April 11, becoming an ace during this campaign. Axtell's credits were just two of the seven the 422d racked up that night—the best night for U.S. night fighters of the war.

A favorite tactic for night intrusion beginning in 1945 was to drop fuel tanks filled with napalm. The liquid bombs did not have to hit the target directly, and the resulting blaze illuminated the area for follow-up strafing. The P–61s also carried high-velocity aircraft rockets (HVARs), high-explosive bombs, and incendiary bombs. Such varied armament was necessary because the few night fighters involved in night interdiction had to magnify their capabilities.

Many pilots, to be sure, avoided night flying because of the inherent danger associated with minimum visibility. Surprisingly, however, the intruder missions by night fighter squadrons proved remarkably safer than day fighter-bomber attacks. The 425th NFS flew 1,162 intruder missions from October 1944 to May 1945, losing six aircraft—a loss rate of only 0.5 percent. The protection darkness provided more than compensated for the dangers of night flying. Nevertheless, as 422d NFS Commander Oris B. Johnson said, "intruding was a real adventure." One of his R/Os, Robert F. Graham, judged such missions "hairy" because of the many "immovable objects" such as radio antenna masts lurking in the dark.

Altogether, the 422d NFS flew 1,576 sorties in France and Germany, with official credit for 48 German aircraft destroyed (including 5 V–1s), 5 probably destroyed, and 5 damaged. Its crews also claimed to have damaged or destroyed 448 trucks, 50 locomotives, and 476 railroad cars. Six of the nine American night aces of the war came from the 422d: Pilots Paul A. Smith, Herman E. Ernst, and Eugene D. Axtell and R/Os Robert E. Tierney, Edward H. Kopsel, and Robert F. Graham, each with five kills. A distinguished unit citation testified to the squadron's success. The 425th NFS tallied 14 more kills (including 4 V–1s), with 1 probable and 2 damaged.

Above: **A 422d NFS P–61 strafing a German locomotive at the Battle of the Bulge, during the day. This day and night capability pioneered the "24-hour all-weather Air Force."**

Left: **Lt. Col. Oris B. Johnson, posing before his Black Widow, somewhere in France, August 1944.**

Below: **Loading a bomb aboard a P–61 for a night intruder mission.**

Right: **Insignia of the 421st NFS, the "Mad Rabbiteers"—winners of thirteen night aerial victories in World War II.**

Below: **Lt. Herman E. Ernst, an ace with five victories for the 422d, in his P–61 *Borrowed Time*.**

These 62 claimed kills pale in comparison before the more than 20,000 aerial victories Americans claimed in the daylight against Germany, but the two night fighter squadrons claimed that 55 percent of their airborne radar contacts resulted in visual contacts and 68 percent of these were shot down. The Black Widows were not always successful, but they could be as deadly as their namesakes.

A serious constraint on night fighter action in the European war was the shortage of replacement aircraft and parts. Ground or airborne radars required frequent repair and were only as good as the supplies of replacement parts allowed. More successful units, according to the 422d NFS historian, learned to make deals for their spare parts "outside any supply procurement channels." Scroungers were worth their weight in gold. The 422d received only one replacement P–61 in five months of combat operations, leaving only four of its sixteen aircraft operational during the Battle of the Bulge, when weather prohibited all but night fighters from flying. The 422d's commander felt fortunate to have a supply sergeant with a penchant for "stumbling on" caches of spare parts, especially radar tubes, and a maintenance chief with a degree in electrical engineering from Texas A&M University. Crews were plentiful, but they had to share and fly the same aircraft up to four separate missions each night. As they contributed to victory in northwest Europe, U.S. night fighters fought the enemy, Allied antiaircraft artillery, and even their own supply organizations.

Against the Rising Sun

American forces in the Pacific and Asia did not have the advantage of an ally like the British with extensive experience and advanced equipment to carry the night defense load until U.S. units were trained and equipped for battle. The Japanese army and navy air forces dominated the day skies in 1941 and 1942, however, and had no need to seek the night's protection. Only when the United States seized daylight air superiority after January 1943 did Japanese night missions become the rule. To cope with this growing problem, until the specially trained night fighter squadrons were ready, the AAF redesignated the Hawaii-based 6th Pursuit Squadron a night fighter unit. While the core of the unit remained in Hawaii to defend U.S. installations, in February 1943 one detachment deployed to Port Moresby, New Guinea, and another to Guadalcanal with six P–70s each to help ground forces struggling to defend those areas against enemy attacks. The crew members of these units had no formal night training.

Equipped with SCR–540 airborne radar (equivalent to the British Mark IV) and lacking superchargers, these first U.S. night fighters performed poorly. Most Japanese bombers flew above twenty thousand feet, while P–70s struggled to reach that altitude and operated best under ten thousand feet. Initially, the Americans lacked ground control radar, rely-

ing only on vague reports of penetrating aircraft from coastwatchers. Crews had to develop the techniques of ground controllers and antiaircraft artillery coordination in combat. Against these obstacles, Pilot Capt. Earl C. Bennett and R/O TSgt. Raymond P. Mooney of Detachment B on Guadalcanal claimed the first U.S. radar-directed (using the SCR–540, Mark IV airborne radar) night kill on April 19, 1943, though searchlights illuminated the enemy aircraft until radar contact had been made. Pilot 1st Lt. Burnell W. Adams and R/O Flight Officer Paul DiLabbio claimed the only kill for Detachment A at New Guinea in May. Although three squadrons eventually flew P–70s in the Pacific theater, they claimed only two victims. Eventually, the P–70s were withdrawn from night combat altogether and used for attacks on shipping.

To make up for the technical shortcomings of the P–70, the 6th NFS acquired a few P–38 day fighters with the speed and altitude to intercept enemy aircraft. Loitering at thirty thousand feet over Guadalcanal, the P–38s had to wait for ground-based searchlights to illuminate enemy bombers. This reliance on searchlights limited them to one night kill in May 1943. Later attempts to free the P–38s from this dependence by equipping them with Navy AN/APS–4 airborne radars ultimately failed because of the excessive workload imposed on the lone pilot.

The initial experience of the United States with night fighters in the Pacific was not stellar. On March 20/21, 1943, Detachment B's P–70s failed to stop Japanese night bombers from damaging fifteen of the 307th Bomb Group's B–24s and five of the 5th Bomb Group's B–17s on the ground at Guadalcanal. Eight months later, in November, enemy night bombers sank one and damaged three Allied ships at Bougainville. The AAF concluded from this initial experiment in night fighting that "it proved impossible to prevent the Japanese from inflicting some damage" on U.S. ground and surface forces. In November 1943, the AAF ordered the newly formed 419th NFS to Guadalcanal to rectify the situation. Equipped with ground control radar, but lacking aircraft, the 419th absorbed Detachment B of the 6th NFS. Demoralized by flying worn-out aircraft, the new squadron flew only three night patrols, six scrambles, four intruder missions, and four daylight sorties by the end of the year, claiming no enemy aircraft at a cost of five aircraft and four dead crewmen. It was hardly an auspicious beginning for Pacific-based U.S. night fighters.

The 419th NFS, like all U.S. night fighter units sent to the Pacific, suffered from the low priorities of the Pacific war. The ten night fighter squadrons that fought there had to make do with obsolescent ground radars, including the 3-meter SCR–270 and 1.5-meter SCR–527, as the Microwave Early Warning radar did not appear in the Pacific theater until late in the war. Even this vintage equipment was too few in number, as priority went to European operations. Spare parts, difficult to find in Europe, proved impossible to secure in the Pacific. Also, the terrain of Pacif-

Above: **The 419th Squadron's *Old Salty Dog* on a takeoff run down the pierced steel planking runway of Middelburg Island, Dutch New Guinea, January 1945.**

Left: **Capt. R. O. Stewart and Lt. J. J. Allen pose before *Old Salty Dog* on January 9, 1945, after claiming an Aichi E13A1a Jake reconnaissance floatplane for the 419th NFS.**

ic battlefields sometimes interfered with night fighter operations, allowing Japanese intruders to sneak in, shielded by mountains and hills. Ground radars were both susceptible to severe echoing from ground returns and easily jammed. Optimally, they had to be located in a flat area at least one-half mile in diameter—difficult to find on the Pacific islands. Erecting radars near the shore provided some relief.

Inexperienced radar operators only made matters worse. In January 1944, for example, the 418th NFS's fighter controller scrambled a P–70 to intercept a bogey, which was in fact another P–70 already on patrol against Japanese intruders. Ground control then vectored the patrolling P–70 to intercept the one just launched. While orchestrating a merry chase, the inexperienced controller directed both P–70s into a U.S. antiaircraft artillery zone, where they received heavy ground fire. Fortunately no one was hurt, though important lessons were learned about proper air-ground control and communication.

Many of the enemy sorties U.S. night fighters had to defend against most often were not coordinated raids, but individual attacks by "Bed-Check Charlie"—a nickname given to all such single flights, which seemed to come at the same time each night. More nuisance than threat, the attacks nevertheless affected morale and had to be stopped. Many chroniclers of combat in World War II write with near reverence for these solitary visitors, even recording remorse when night defenses downed a "Bed-Check Charlie."

The 418th NFS joined the 419th at Guadalcanal late in 1943, and its experience was typical of all the early squadrons in the Pacific. Its P–70s, unsuccessful in intercepting Japanese bombers over Guadalcanal, were ordered to switch to night intruder work. From Guadalcanal, the 418th accompanied MacArthur's drive toward the Philippines and Japan, moving to Dobodura, then to Cape Croisilles, Karkar, Finschhafen, and to Hollandia, New Guinea. In May 1944 the squadron converted to B–25s, allowing it to carry more ordnance on night intruder missions and have a better range for sea sweeps.

In August 1944 P–61s became available in the Pacific theater, and the 418th, equipped with them, converted back to defensive patrols, scoring four kills on Morotai and five from Mindoro during the Luzon campaign. In the thirteen nights following December 27, 1944, the 418th gained twelve of its eighteen victories of the war. Piloting a Black Widow, Maj. Carroll C. Smith became the highest scoring night ace of the war, achieving four kills on two missions on the night of December 29/30. Altogether, Smith racked up eight kills, though three of them came during the day. His R/O for the five night victories was 1st Lt. Philip B. Porter.

Meanwhile, the failure of B–24 night intruder missions over Luzon forced the 418th NFS to postpone its night fighter operations and return to night harassment and interdiction missions in support of MacArthur's forces. From the Philippines the unit went to Okinawa in July 1945, start-

ing intruder missions against Japanese airfields on the home island of Kyushu. Pilot 2d Lt. Curtis R. Griffitts and R/O 2d Lt. Myron G. Bigler claimed the last night fighter kill of the war during these operations.

At Wakde, the 421st NFS got its first kill on July 7, 1944, after seven months of fruitless night patrols with P–70s and P–38s, and then scored five more kills on Owi Island, four of them on the night of November 28 alone. It was on Owi that the "Mad Rabbiteers" of the 421st claimed the most unusual night kill of the war. Pilot Lt. David T. Corts, hard on the tail of a Japanese bomber, put his P–61 into a sharp turn when R/O Lt. Alexander Berg and gunner SSgt. Millard Braxton warned him of an enemy fighter on their own tail. Just as Corts pulled away, the fighter opened fire and shot down the enemy bomber; Corts and his crew did not receive official credit for the kill. Against aircraft that could reach their altitude, Japanese attackers resorted to the heavy use of window/chaff, which proved generally ineffective against the P–61's SCR–720 radar. On some missions the enemy used fighters at low altitudes to draw Black Widow patrols away from high-flying bombers.

According to the AAF, the "defense of Morotai [an island half way between New Guinea and the Philippines] was probably the most difficult task undertaken by American night fighters during World War II." Because of MacArthur's island-hopping strategy, Japanese air bases at Mindanao, Borneo, Halmaheras, and the Palaus and Celebes Islands surrounded Morotai. Mountainous terrain caused permanent echoes on early warning and ground control radars, creating blind spots through which Japanese bombers could penetrate without being detected. Sixty-three separate raids took place between October 8, 1944, and January 11, 1945. The defenders had P–38s orbit over their airfields at 25,000 feet, while antiaircraft artillery with its shells fused at 20,000 feet fired at the intruders. If searchlights illuminated a target, the ground fire stopped while the P–38s pounced on the now-visible enemy. Meanwhile, the P–61s of the 418th and 419th Squadrons orbited outside the ring of antiaircraft artillery fire, waiting for orders from the ground control radar fighter controller to vector them to a target. The defenders made sixty-one interceptions with their airborne radar, claiming five kills.

At Leyte in the Philippines, U.S. daylight air power proved so deadly that enemy forces converted to nighttime attacks almost immediately after the invasion. The arrival of the 421st NFS on October 31, 1944, promised to parry these blows, but the P–61 Black Widow lacked the speed advantage to intercept fast high-altitude Japanese aircraft that used water-injection to increase engine power. Crewmen of the 421st nevertheless proved what efficient coordination between ground control radar and the P–61 could accomplish, downing seven intruders before being relieved by Marine single-engine night fighters. These seven kills included four on the night of November 28. Joined by the 547th, the 421st spent the remainder of the war flying night convoy cover, PT boat escort, and long-range in-

truder missions against the Japanese home island of Kyushu. The thirteen kills of the 421st NFS and six of the 547th stood in stark contrast to the last U.S. night fighter squadron to arrive in the Pacific, the 550th. It flew in combat for eight months with P–38s by day and P–61s by night, without aerial success.

In 1944 Japanese night bombers launched a major effort to disrupt the construction of U.S. airfields on Saipan needed for the B–29 campaign against the home islands. Flying P–61s, the 6th NFS began defensive operations nine days after the Marines' June 15 landing. Enemy attackers held the initiative until new Microwave Early Warning radars linked to SCR–615 and AN/TPS–10 "Li'l Abner" height-finder radars made three Japanese sorties one-way trips. In thirty-seven attempts at interception from June 24 to July 21, the defense made twenty-seven airborne radar contacts and claimed three kills. It was on Saipan that a Pacific-based P–61 Black Widow snared its first victim on June 30, 1944.

A typical Japanese aerial assault force consisted of a dozen Mitsubishi G4M Betty bombers flying twenty miles apart. P–61 crews discovered that if they could shoot down the lead bomber, the others would jettison their bombs and flee. Black Widows from the 6th NFS and the 548th NFS downed five additional enemy intruders before the attacks stopped in January 1945. Thereafter, boredom set in for the crews of the 6th defending Saipan.

Occasionally success alleviated the boredom. Ground control radar vectored the 6th Squadron's "Bluegrass 56" over Saipan for five minutes, until R/O Flight Officer Raymond P. Mooney picked up the bogey on his airborne radar. He reported that

> the Bogey was traveling very slowly and after closing to 400 feet our craft held position for 3 minutes and finally got visual contact. Bogey was a Japanese single-engine dive-bomber (Kate). 90 rounds of 20-mm was fired point blank into the enemy plane. The fire was plainly seen to enter the right wing and fuselage. By accident cockpit lights flashed on in our craft blinding pilot and preventing further observation.

The fighter controller notified Pilot 2d Lt. Jerome M. Hansen that the bogey had disappeared from the ground control radar scope just as Hansen had reported opening fire. The kill had to be listed as a probable, though Hansen and Mooney received the Air Medal for their efforts. Mooney was the 6th's lone ace, with five kills to his credit.

Sometimes the crews also met with embarrassing failure. Vectored to an unidentified bogey flying without its identification friend or foe transmitter turned on, one of the 6th's Black Widow pilots interrogated the suspected target twice without result. In a running battle that spoke poorly of the Widow pilot's aim, the night fighter fired 235 rounds of 20-mm cannon shells and 720 rounds of .50-caliber ammunition. As the pilot made

his second pass, the ground controller reported the bogey was friendly. The overeager P–61 crew from Saipan had already put six large holes in the U.S. Navy PBM patrol aircraft, a near tragedy. The PBM had to be beached after landing to prevent it from sinking. Though uttering a few choice, but not repeatable phrases, the Navy reported no injuries. The rules of visual engagement were perfectly clear; unfortunately, the humans who executed them were not perfect.

Saipan was also the site of the United States' first effort at airborne warning and control. Two B–24s of the 27th Bombardment Group equipped with radar sets were to vector P–38s to intercept Japanese aircraft. Unfortunately, the system was never used in combat.

On Iwo Jima the AAF combined the SCR–527 and SCR–270 radars for early warning acquisition and the AN/TPS–10 for ground control of interception operations to stop the two or three Japanese bombers attacking Allied forces on this island each night. Early warning radar would detect the bombers' presence at around 140 miles, between seven thousand and fifteen thousand feet high. At fifty-seven miles, the "Li'l Abner" ground control would make contact and begin vectoring defending P–61s of the 548th and 549th to intercept them. Usually, the Japanese intruders would drop window/chaff at thirty miles, blocking the older metric early warning radars, but the microwave 3-centimeter AN/TPS–10 kept working. Within ten miles of the Iwo ground radar, the night fighters would break contact, and antiaircraft artillery would take over. Eventually, after May 1945, there were few intruders to attack, and the two night fighter squadrons soon shifted focus to intruder work in the Bonin Islands.

Night intruder work to cut off Japanese garrisons on scattered islands proved critical in the Pacific war. Generally this involved attacks on enemy shipping. Because P–70s were ineffective in the night interception role, commanders pressed them into intrusion work as early as October 1943. When P–61 night interceptors began arriving in the early summer of 1944, night intrusion work stopped until the spring of 1945. Soon, Allied victories left few Japanese bombers to attract night fighter attention, and U.S. night crews returned to intruder operations.

Preparing for the invasion of Bougainville, Detachment B of the 6th NFS from Guadalcanal began bombing Japanese airfields there in October 1943. Squadrons such as the 418th switched from P–70s to B–25s to improve the efficiency of their night intruder missions. Bigger bombers meant bigger bomb loads and longer range. For its part, the 418th NFS developed an innovative way of attacking enemy positions in cooperation with PT boats patrolling near Japanese-held islands. As guns onshore opened fire on the decoy boats, the B–25s attacked the muzzle flashes so visible at night. Commanders also used night fighters to suppress night artillery, a job reportedly much appreciated by Marine and Army units struggling against stubborn Japanese defenders.

Night flyers quickly found that skip-bombing attacks on enemy shipping, so effective by day, were also possible at night. Without radar, airmen had trouble seeing ships at night, but soon discovered their wakes were a dead giveaway. Flying at 250 feet, fighters and bombers, including B–17s and –24s, dropped their bombs about sixty to one hundred feet short of the target, allowing the bombs to skip into the side of the targeted vessel. Some four-engine SB–24 bombers were equipped with SCR–717 air-to-surface radars for finding targets at night and AN/APQ–5 low-altitude radars for bomb aiming. Called "Snoopers," three squadrons of about forty SB–24s serving with Fifth, Thirteenth, and Fourteenth Air Forces claimed to have sunk 344 enemy ships, barges, and sampans at night, with 62 more probably destroyed and 446 damaged.

Missions in the China-Burma-India Theater

The P–61s of the 426th NFS went to China in November 1944 to protect B–29 bases from Japanese intruders. As elsewhere, the night fighters found the hunting poor, claiming only four kills by February 1945. Though shifted to primarily night intruder work, P–61 crews also attacked enemy personnel attending signal fires that guided Japanese night bombers to U.S. bases.

Within the CBI, the greatest success in night intruder work occurred in Burma, largely because the Japanese were forced to use a single net of north-south roads, one railroad, and the Irrawaddy River. Day fighters again drove the enemy to operate mainly at night, creating attractive targets for the P–61s of the 427th NFS and the B–25 Mitchells of the 12th Bombardment Group and the 490th Bombardment Squadron. Flying at 1,500 feet, these aircraft followed preassigned roads until they spotted truck lights. Diving to 150 feet, they swept down the road with guns blazing. Standard procedure called for a return twenty minutes later to restrafe burning vehicles and hamper the enemy's recovery efforts.

The Legacy of Night and All-Weather Flying

America's night airmen operated at the periphery of the war effort. While British and German strategic bombing transpired primarily at night, U.S. airmen were committed primarily to daylight bombardment operations, except for B–29 fire raids on Japan's cities. In the explosive expansion for war, the AAF mobilized 1,226 squadrons, including 4 night fighter training units, 1 night reconnaissance unit, and 16 combat night fighter squadrons, each authorized only twelve aircraft. Of the more than one hundred thousand fighter aircraft that the United States produced for the war, only nine hundred were night fighters. Night units were never

formed into groups, wings, or commands, but operated independently as squadrons, attached to higher echelons such as the IX Tactical Air Command. Only 666 night fighter crews served overseas. They fought in Europe, North Africa, Italy, Sicily, Corsica, France, Germany, Burma, China, the Philippines, and any number of exotic locations, some well known, others not: La Senia, Elmas, Ghisonaccia, Borgo, Pontedera, La Banca, Pomigliano, Honiley, Bristol, Istres, Strassfeld, Giebelstadt, Maupertus, Chateaudun, Coulommiers, Madhaiganj, Chengtu, Hsian, Pandaveswar, Myitkyina, Lingayen, Puerto Princesa, Guadalcanal, Dobodura, Cape Croisilles, Karkar, Hollandia, Morotai, Milne Bay, Saidor, Saipan, Iwo Jima, Nadzab, Peleliu, Okinawa, Middelburg, Palawan, Mindoro, Zamboango, Tarakan, Sanga Sanga, Owi, Palawan, and Ie Shima.

Larger numbers and higher priorities probably would not have boosted their contribution. Night fighters were solitary hunters; they could not enter combat in formations. Doubling or tripling their numbers would not have brought greater success, especially with so few targets. What successes they had, 158 officially recognized night kills, can be attributed to the quality of their weapons, the commitment and quality of their crews, and luck. On the other hand, their failures were caused by the limitations of their aircraft and weapons and inadequate training. Members of the 422d NFS were convinced that if night fighters and their crews were "assisted by certain mechanical aids" and properly trained and employed, "then sortie for sortie they will prove as deadly if not more so than their day counterparts."

Obviously, night work was dangerous. On intruder missions crews normally had to make two passes, the first to see and identify the target and the second to bomb or strafe it. With flak batteries alerted, second passes often meant death or a trip to a POW camp. The 419th NFS spent 639 days in combat from its arrival on Guadalcanal on November 15, 1943, to its last mission from Palawan Island on August 14, 1945. In 1,972 combat missions, the squadron claimed five Japanese aircraft destroyed at night—at a cost of twelve pilots and eight R/Os and thirty-one aircraft lost to enemy action or crashes. Night interception missions were always fought alone, though with the comforting thought that within range a ground controller watched every move on a radar screen. Retired Maj. Gen. Oris B. Johnson, wartime commander of the Europe-based 422d NFS, never felt lonely on night missions. He was "too damn busy," except the one time in December 1944 when solitude might have been preferred. His ground controller vectored him onto eight FW 190s flying in formation. Eight were too many to mess with, even though on a previous night Johnson had willingly attacked a flight of three because he knew he had radar "eyes" and the Focke-Wulf pilots did not.

Ironically, the enemy aloft was not the only source of danger. Crews in the Pacific flying at twenty thousand feet amid air temperatures of ten degrees below zero complained of a headquarters decision to withhold heat-

ed flying suits from aircrew in that "warm" tropical theater. Instrument failures, a nuisance during the day, were deadly at night. But on August 15, 1945, the 419th's squadron historian could record that after "the peril of tropical diseases, the dearth of supplies, a monotonous diet of dehydrated and canned food, and the total lack of civilization or female companionship for twenty-three uninterrupted months . . . morale received a tremendous boost when President Truman announced the surrender of Japan." "When do we go home?" replaced all thoughts of danger and the difficulties of night flying.

The downing of 158 enemy aircraft in the war seemed out of proportion to the 900 expensive P–70s and P–61s and 16 combat squadrons the United States mobilized to control the skies at night. What damage might enemy night bombers have inflicted if they had flown against Allied forces unopposed? Maj. Gen. Oris B. Johnson believed night fighters contributed mightily to Allied victory, seizing the night skies from the Axis powers, but also, and more importantly in the long run, establishing "the basic concepts of all-weather flying critical to American victory in DESERT STORM." As early as 1945 airmen began to speak of a new concept in aerial warfare—the "24-hour all-weather Air Force." Though they had only "scratched the surface" of night intruder possibilities, these night fighter pioneers, with their victories and sacrifices, laid the foundation for a new form of aerial warfare, which would be revealed in all its devastating intensity nearly five decades later in the night skies over Iraq.

APPENDIX 1

Official Victory Credits for Night Fighter Squadrons
(based on Air Force Aerial Victory Credits)

6th NFS	17
414th NFS	11
415th NFS	11
416th NFS	5
417th NFS	8
418th NFS	18
419th NFS	5
421st NFS	13
422d NFS	43
425th NFS	10
426th NFS	5
427th NFS	0
547th NFS	6
548th NFS	5
549th NFS	1
550th NFS	0
TOTAL	**158**

APPENDIX 2

Night Fighter Squadron Aces

422d Night Fighter Squadron

1st Lt. Paul A. Smith (pilot) and 1st Lt. Robert E. Tierney (R/O)	5 kills as a team	European Theater of Operations
1st Lt. Herman E. Ernst (pilot) and 1st Lt. Edward H. Kopsel (R/O)	5 kills as a team	European Theater of Operations
1st Lt. Eugene D. Axtell (pilot)	5 kills	European Theater of Operations
2d Lt. Robert F. Graham (R/O)	5 kills	European Theater of Operations

418th Night Fighter Squadron

Maj. Carroll C. Smith (pilot) and 1st Lt. Philip B. Porter (R/O)	5 kills as a team	Southwest Pacific Theater of Operations

6th Night Fighter Squadron

2d Lt. Raymond P. Mooney (R/O)	5 kills	Southwest and Central Pacific Theaters of Operations

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