

Air and Space this Week

Item of the Week

THE P-61 BLACK WIDOW

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One of the coolest-looking warplanes at the Smithsonian National Air and Space Museum's Udvar-Hazy Center is the P-61 "Black Widow" night fighter. Born of the Battle of Britain, it arrived late too in the War to rack up a big record, but when it was deployed, it dominated the night sky. The XP-61 prototype made its first test flight 82 years ago, on May 26, 1942.

BOMBING OF LONDON CREATES A NEED

Germany had tried to bomb Britain out of the War, long before Pearl Harbor. There was a lot of information sharing between Britain and the U.S. at the time, and we had military officers over there in 1940. One was LtGen Delos Emmons, and he was shown a valuable new British technology, radar, both in large-scale for early detection of incoming air raids, and a smaller unit that could be mounted in a medium-sized aircraft. He also saw success of RAF Spitfire and Hurricane fighter aircraft against German bombers in the daytime and how it forced the Germans to bomb at night, when the British fighters couldn't find them. This was before the Lend-Lease program had been set up, but Emmons was able to bring a cavity magnetron, the guts of radar, back to the States under the [Tizard Mission](#).

The British Purchasing Commission was tasked with looking at US aircraft and others to determine if any could meet Britain's urgent need for nighttime aerial defense. There wasn't one, because the operational requirements were quite severe. The BPC wanted a high-altitude, high-speed, heavily-armed interceptor that could fly at night for many hours on patrol over British cities and military targets, and be able to carry the heavy airborne version of their new radar technology. They contacted American aircraft designer/manufacturer Jack Northrop with these requirements, and he began design work. It quickly became apparent to him that an aircraft that met the British specifications would have to be large enough to hold the radar, armament, and fuel required, and, therefore, it would have at least two powerful engines.

Meanwhile, LtGen Emmons had come back home and issued a report on what he had learned, including the radar and their need for a capable night fighter for bomber interception. Emmons chaired a Board charged with studying his report and making recommendations as appropriate. The night fighter specs were sent to the USSAC's Air Technical Service Command at Wright Field. In late October, 1940, the Northrop Chief of Research happened to be at Wright Field and was contacted by the ATSC about the Board's night fighter requirements (but

not the radar). The Chief met with Northrop the next day (10/22). Northrop must have chuckled, because the Board's requirements were essentially the same as the ones the RAF had given him earlier on which he was already working. A week later, the USSAC issued a request for design proposals. There were only two submissions: Northrop's (which won) and the Douglass XA-26A, which eventually became the A-26 attack aircraft.

EVOLUTION OF THE INITIAL DESIGN

Northrop realized that his night fighter had to have a lot of space in the fuselage for radar, fuel, and armaments big enough to knock down bombers. Since it was the first designated night fighter, dogfighting qualities were not high priority, but the ability to fly high and fast were. He opted for a basic design much like that of the P-38 fighter aircraft: a central fuselage with guns, two big wing-mounted engines with tail booms extending back from their nacelles, and twin rudders connected by a single elevator. Armament consisted of two turrets, each with four Browning .50 caliber machine guns. Some evaluators balked at considering an aircraft of this size as a "fighter;" it had a 66' wingspan and a projected full-load weight of 11 tons!

Northrop considered several permutations of the initial design, trying and ultimately rejecting a more-conventional single tail and replacing one of the turrets with a battery of 20 mm cannons, first in the wings and later in the main fuselage.

Northrop's design, "Northrop Specification 8A," was submitted to the Army Air Materiel Command at Wright Field on December 5, 1940. It was accepted, with a few minor modifications on December 17. Funds were granted for two wind tunnel test scale models and two full-sized prototypes on January 10, 1941, and the plane was given the designation, XP-61.

Service testing would begin on March 10, 1941, and Northrop received an order for 13 YP-61s. The mounting of heavy cannons on the wing proved unsatisfactory, and they were moved to inside the fuselage, which decreased drag, improved aiming, and made for easier servicing. The move also increased the amount of fuel that could be carried in the wings in four self-sealing tanks, rather than two. The wings had provisions for the addition of racks that could carry four large bombs or drop tanks. By mid-February, 1942, a total of 410 aircraft were on order, along with the necessary spare parts, etc.

PRODUCTION

The first production model of the P-61A was built in October, 1943. Unfortunately for the Black Widow, the dorsal gun turret it was to carry was the same as the one for the Boeing B-29, which had a higher priority, therefore, some of the first run of the P-61A didn't have the turret. That turret had already proved to be a problem for the P-61A, causing buffeting on the tail when the turret was rotated. It was converted into a forward-firing position only, controlled by the pilot.

Another problem with the P-61A was that its plexiglass tail cone had the bad tendency to shatter during high-speed dives. Various remedies were tried that helped, but did not cure, the problem.

The prototype version of the Black Widow was, in fact, painted a flat black. The P-61As were delivered with an olive-drab paint scheme. Since the aircraft was intended as a night fighter, the USAAC conducted a test to see if anti-aircraft gunners could see the Black Widow with a searchlight. It turned out that the gunners could easily see a black matte or olive drab P-61 easily in the searchlight beam, but if the aircraft were painted a glossy black, it was almost invisible in the beam. So glossy black it was for the Black Widow!

The Brits had made most of the airborne radar system that would be installed in the P-61. Then Bell Labs and the Radiation Laboratory at MIT took the British Searchlight Control Radar model SCR-520 AI and upgraded it to the SCR-720 model, made by Western Electric. The radar had two components, a larger scope that allowed the radar operator to guide the pilot to the vicinity of a target, and a small scope the pilot would use to close into firing position. A number of smaller improvements were made along with the SCR-720 being added, resulting in the B-model of the P-61, but the Black Widow didn't hit its stride until the C-model was introduced.

THE P-61C

The penultimate version of the Black Widow was the P-61C. The airframe was basically the same as the B-models, but the propulsion system was not. The Pratt & Whitney R-2800 18-cylinder radial engine was installed, giving the Black Widow a top speed of 430 MPH at 30,000 feet. It had the same upgrade to "paddle-bladed" propellers that had increased the P-47s performance (see [here](#)). The P-61C was heavier than the earlier variants, and less maneuverable. But what really limited its utility was that the C-version came so late in the War. The first P-61Cs were accepted by the USAAF in July, 1945, after VE-Day. Only 41 were completed by the end of January, 1946. The introduction of jet aircraft limited the Black Widow's utility in the five years following VJ-Day. The few that were built were used for test and research purposes, but most were scrapped by the end of March, 1949. Four found their way into aviation museums, including the Museum of the U.S. Air Force, the Smithsonian National Air and Space Museum, The Mid-Atlantic Air Museum in Reading, Pennsylvania, and the Beijing Air and Space Museum at Beihang University in Beijing, China.

COMBAT

Aerial attacks on Guadalcanal at the end of 1942 underscored the desirability of having both daytime and nighttime fighter defenses. This was well before the P-61A was available, so the USAAF made do with other aircraft adapted a bit for night fighting. They were better than no defense, but an aircraft designed from the wheels up for night fighting would have been preferable.

Night fighting was a novelty when the War began. The USAAF had only one night-fighter squadron, the 6th at the time of Pearl Harbor; the next two NF squadrons (418th and 419th NFS) weren't activated until April 1, 1943, after Guadalcanal was secured. The 6th was the first to get the P-61A, in May, 1944. Up until that time, Japanese G4M "Betty" bombers could conduct desultory bombing attacks on U.S. positions with impunity, because they flew too high for the P-70 interceptor to reach.

The P-61A scored its first combat victory on June 30, 1944. Pilot Lt Dale Haberman was directed to the vicinity of a "Betty" bomber by his radar operator, and Haberman downed it with a burst from his cannon battery. The 6th NFS would score 15 more such victories.

The 421st NFS activated about that same time, and would operate from bases in New Guinea and Wake Island. On July 1, 1944, they got on the scoreboard when P-61A pilot Own Wolf and his radar officer Byron Allain were scrambled to investigate a radar contact on a potential bogey. Weather played hob with their approach, but Allain finally picked up the target, a two-engine medium bomber, on his own radar. Wolf fired the cannon battery and Allain fired his four .50-caliber machine guns. Down went the bomber.

The 418th NFS ended up the top-scoring American night fighter squadron of the War. They were based in what was then the Netherlands East Indies, and downed 18 aircraft. Their biggest night was on November 10/11, when they shot down three Ki-61 "Tony" fighters.

Final (non) Shot: The P-61 may have scored the final U.S. aerial victory in the War. A 548th NFS P-61B-2 named "Lady of the Dark," piloted by Lt Robert Clyde and radarman Lt Bruce LeFord encountered a Ki-44 "Tojo" fighter on the last night before VJ-Day cessation of hostilities. The Tojo pilot sighted the *Lady*, and ran for the deck. Clyde followed, in spite of radical maneuvering by the Tojo's pilot. Distracted by the *Lady*, the Tojo ended up crashing into the ocean, without Clyde firing a shot. Normally, an enemy aircraft lost during evasive action would have resulted in a victory credit to the attacking pilot, but Clyde and LeFord were never so officially credited.

POST-WAR

The P-61 was retired from night fighting as soon as the War ended. The need for night fighters/interceptors had waned, and in the interim, such duty was picked up by the rather odd F-82 Twin Mustang and the Northrop F-89 Scorpion jet fighter. The P-61 went through several variants not-related to night fighting, and found most utility as the [F-15 Reporter](#) reconnaissance aircraft, and the USMC's F2T-1N radar trainer. The F-15's finest hour was providing reconnaissance during the invasion of South Korea by the North at the start of the Korean Conflict.

The Twin Mustang looked like it was created by basically chopping the left wing off of one P-51 and the right wing off another, and welding the stumps together. It was a little more elegant than that, but not much. It was created as a long-range escort for the B-29 late in the War, with a pilot in both cockpits taking turns with the flying and navigating duties. The Twin Mustang

was one of the first US aircraft operating during the Korean Conflict, and it actually scored the first three victories by U.S. forces there. There is one in the collection of the National Museum of the U.S. Air Force; for more info about this interesting aircraft, see:

<https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/196411/north-american-f-82b-twin-mustang>

NACA acquired one of the two XF-82 prototypes built in October, 1947 and was using it for aeronautical research on ramjets, based out of NACA's Flight Propulsion Laboratory outside Cleveland (later taken over by NASA, NACA's successor, as the Lewis FPL and now the Glenn FPL). On December 14, 1949, it skidded on an icy runway and sustained damage sufficient to cause NACA to scrap it. It was sold to a collector of retired aircraft, who cut it in two to take it home. Tom Reilly, a noted aircraft restoration expert, found the remnants of the XF-82 in the collector's boneyard in 1997, and decided to restore it to flight status. The collector was initially reluctant to sell, but Reilly was persistent and persuasive, busily trying to acquire other XF-82 parts. The collector relented in 2008. Reilly moved the material to his base in Georgia, and assembled a cadre of experts that spent an aggregate total of 207,000 hours rebuilding it from the rare Merlin engines down to the paint details. Reilly flew the resurrected warbird for the first time on January 28, 2019, and it was a big hit at the EAA AirVenture event that year in Oshkosh, b'gosh. It's now on display at the Warbird Museum in Titusville, Florida. For more about this aircraft and amazing restoration, see: <https://www.nasa.gov/history/the-nacas-xf-82-twin-mustang-returns-to-flight-after-70-years>.

The other aircraft to replace the P-61 after the War was Northrop's F-89 Scorpion, a two-place twin-engine jet that made its first flight in August, 1948. Deliveries to the Air Force began in July, 1950; a total of 1,050 were produced. Its biggest claim to fame was that its latest variant was able to carry four AIM-4C Falcon missiles and two Genie air-to-air rockets tipped with atomic bombs. One Genie was actually tested over the Nevada Test Range on July 19, 1957! The National Museum of the U.S. Air Force has a Scorpion on display, see:

<https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/198080/northrop-f-89j-scorpion>.

FINAL TALLY

Only 674 P-61s were built during the War (another 32 were completed after VJ-Day). The victory total for the Black Widow amounted to only 109 aircraft and 18 V-1 flying bombs. The RAF didn't buy any, even though their requirements played a big role in the P-61's development; they preferred a night-version of their de Havilland Mosquito. American pilots loved the P-61, it was a stable platform and easy to fly, and unlike the P-38, it did quite well on one engine. It had an auto-pilot, a new innovation at the time, and remote fire-control. Its radar antenna was contained entirely in the nose of the airplane; there were no external antennae to cause drag. But it was basically a "bridge" plane, the intermediate step leading to fully-capable jet-powered interceptors.

And it makes a very cool museum display!

REFERENCES

A number of links to useful resources are buried within the text above. In addition:

NASM: https://airandspace.si.edu/collection-objects/northrop-p-61c-black-widow/nasm_A19510044000

National Museum of the United States Air Force:
<https://www.nationalmuseum.af.mil/Visit/Museum-Exhibits/Fact-Sheets/Display/Article/196248/northrop-p-61c-black-widow>

Aviation-History: <http://www.aviation-history.com/northrop/p61.html>

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