

# The P-38 Lightning

Radical, non-radial

BY JOHN CILIO



P38 prototype

**A**n anonymous bomber gun crew once wrote a song about P-38 Lightning's: "Oh, Hedy Lamarr is a beautiful gal, and Madeleine Carroll is too; but you'll find if you query, a different theory amongst any bomber crew; for the loveliest thing of which one could sing, this side of the Pearly Gates, is no blonde or brunette of the Hollywood set; but an escort of P-38s . . ."

With four .50-caliber machine guns plus a 20-mm cannon, the P-38 had enough firepower to sink a ship. Bomber crews liked any fighter escort, but few Allied fighters would pursue bandits into the bomber formation. The P-38 looked like no other plane, with engines mounted on its twin booms and the pilot's nacelle centered between them. It was so distinctive that it was hard to confuse with enemy aircraft, which resulted in relatively few "friendly fire" losses.

The P-38 represented one of the most radical departures from tradition in American fighter development. Thanks to the British Air Ministry, which, on June 23, 1938, placed a \$25 million contract (about \$365 million in 2007 dollars) with Lockheed for up to 250 airplanes, the aircraft became known as the Lightning. Before that, the P-38 was destined to be called the Atlanta.

Ironically, after giving the Lightning its name based on its potential performance, the British order removed the aircraft's strongest assets. The aircraft order specification did not include the turbochargers or the counter-rotating props. There was a ban on exporting superchargers at the time. Without these features, the British version of the aircraft could not live up to its potential and proved pretty much useless in combat. The planes were eventually returned to the United States and, after being refitted with counter-rotating props, were used for training purposes.

Evolving from a 1937 U.S. Army Air Corps (USAAC) proposal re-

quest, the new aircraft had demanding specifications. The P-38 requirements were for a pursuit aircraft capable of interception and attack at high altitude achieving 360 mph at 20,000 feet and 290 mph at 1,500 feet. It had to reach altitude with an ascent time of just six minutes. Additionally, the aircraft had to be able to fly full throttle for more than one hour, carry double the armament of a standard fighter, and take off and land over a 50-foot obstacle within 2,200 feet. These specifications presented a challenge, yet Consolidated, Curtiss, Douglas, Lockheed, and Vultee all submitted proposals.



**Lockheed's P-38 brain trust talking over engineering drawings. Team members, left to right: unknown, Kelly Johnson, Hall Hibbard, Joe Johnson, and James Gerschler.**

The Lockheed design proved to be radical, creating a two-boom, two-tailed aircraft to achieve the specifications. Each of the engine booms housed a 1,150-hp Allison V-1710C 12-cylinder liquid-cooled engine with an exhaust-driven turbosupercharger, the radiators, and main landing gear. The Allison engine was just off the drawing board itself, having recently completed a 150-hour type approval test at 1,000 hp.

The USAAC was skeptical about such a radical design and the manufacturer's claims of 400 mph speeds.

But on June 23, 1937, Lockheed was awarded a contract for one XP-38 prototype, and construction began in July 1938. The prototype was completed in six months. On the last day of the year, the completed XP-38 was stripped down, covered with canvas, and loaded onto a convoy of three trucks. It was moved to March Field in California in great secrecy. On the very first day of ground testing, Lt. Benjamin S. Kelsey piloted the aircraft into a ditch after his brakes failed.

The first flight of a P-38 was January 27, 1939, and numerous flap, brake, and control problems were revealed. Attempting to complete a

record-breaking cross-country flight, the prototype crashed on February 11, 1940. It was just a few hundred feet shy of the runway at Mitchel Field in Long Island, New York. The test pilot escaped unharmed, but the aircraft was completely destroyed. It was still an impressive display of the aircraft's capabilities.

By September 1940, Lockheed was authorized to build 13 test aircraft and was able to cut 1,300 pounds from the original prototype design. Test flights revealed a host of technical problems, and

one, initially believed to be tail flutter, was a serious issue. During high-speed flight approaching Mach 0.68, especially during dives, the aircraft's tail would begin to shake violently, and the nose would tuck under, steepening the dive. The terminal-velocity dive caused what became known as compressibility lockup. It was a difficult problem and was not solved for years. Capt. Leonard Gold, a 9th Air Force P-38 pilot, experienced compressibility lockup in the war and survived.

"I ascended to 52,000 feet, escaping from two German fighters, and when I felt I had lost them, I needed to dive down to denser air," he explained. "We were told by [Lockheed test pilot] Tony LeVier to firewall the throttles in a steep dive. At some point I blacked out, regaining consciousness around 25,000 feet or thereabout; then around 12,000 feet I started to roll the trim tabs back, and she started to come out [of the compressibility lockup], and I headed home. During Tony's same visit he showed us how we could bail out without hitting the horizontal stabilizer. To my good fortune, I never needed to bail out."

Early production models were not considered ready for combat, but in October 1941, the first combat-ready fighter, a model E, rolled off the assembly line. The aircraft featured self-sealing fuel tanks and upgraded armor in the cockpit. The horizontal tail system was adjusted for better control. Heavier armament, including a 20-mm cannon with 10 times the ammunition capacity of its predecessor, was installed. America was not yet at war, but a heavy fighter was prepared to fight.

After the Japanese attack on Pearl Harbor, the West Coast seemed vulnerable, and the public was restless. It was not clear where the enemy fleet would appear again, and en-



**The primary production facility for the P-38 was in Burbank, California. The second plant was located in Nashville, Tennessee. The first P-38 from the Nashville assembly line was nicknamed *Volunteer*.**

emy subs shelled cities in California and Oregon in early 1942. Immediately, P-38s were assigned to coastal patrols because of their long range. Australia, our last Pacific ally, was also in danger. To help, four Lightnings were hurriedly transported to Australia aboard the SS President Coolidge in March 1942. The F-4 models joined the 8th Photographic Reconnaissance Squadron, 5th Air Force to begin operations out of Australia and then New Guinea. They were the first Lightnings to see combat.

Being trained to fly twin-engine fighters was not always a prerequisite for flying the Lightning. Capt. Arthur Heiden, a P-38 and P-51 flight instructor in World War II, said, "A P-38 pilot usually got his training in two ways. The first way, of course, was twin-engine advanced training in Curtiss AT-9s, which had the unhappy feature of having propellers you couldn't feather. . . . A second way to get into the P-38 was to transition from single-engine fighters. In this event, someone probably took him up in a multi-engine transport or bomber and demonstrated engine shutdown a couple of times; after skimming the tech order, a blindfold check, and then ignoring the checklist, he blasted off."

Capt. Gold talked about his training experience with the P-38.

"For a short period of time, we were assigned to the Oakland Municipal Airport to test-fly all aircraft prior to their being sent to the Pacific," said Gold. "The military required aircraft to have four hours of flying time before going into combat, and that was our job. These planes came in on flat cars, and the final assembly took place at the airport or nearby. When we got there and reported to the admiral on Monday, we told him that none of us had ever been checked out in a twin-engine plane before. His answer was, 'There are 12 P-38s in the parking area. Go out tomorrow morning, get in the cockpit, start up the engines, taxi around, read the tech manuals, and be ready to fly on Friday.' When one of our group started to ask questions, he stopped him and pointed to his wings on his chest and said, 'You are a pilot, aren't you?' The pilot said yes, and the admiral's answer was, 'Get your butt out there and fly the plane,' which we did."

The USAAC needed help training pilots to fly the Lightning, especially with the increased production. Lockheed created piggyback Lightning trainers, and the two-seat system greatly reduced accidents by allowing the instructor, who sat in the front seat, to share



**Lockheed's P-38 was the first fighter to use the two-seat system. Other first-line fighter training systems later adopted it. Test pilot Jimmie Mattern (front) and Army Air Forces ace Maj. Clarence Shoop show the tight fit of the piggyback trainer.**

his experience with the student, who sat in the rear.

On May 29, 1942, 25 Lightnings began operating in Alaska's Aleutian Islands. Attu, the westernmost American island, is 1,100 miles from the Alaskan mainland and 750 miles northeast of the Japanese Kurile Islands. The positioning of these P-38s foreshadowed Japan's first attack on the Aleutians, which occurred at Dutch Harbor on June 3, 1942. Two months later, on August 9, 1942, the P-38, with its extended range capabilities, claimed its first two Japanese victims. Two P-38Es from the 343rd Fighter Group were reaching the end of a 1,000-mile patrol when they happened upon a pair of Japanese Kawanishi H6K flying boats and destroyed them.

On August 14, 1942, a P-38F and a P-40 shot down a Focke-Wulf Fw 200 Condor in the Atlantic. It wasn't a particularly difficult target, but it was the first Luftwaffe aircraft destroyed by the P-38. The Luftwaffe used the Condor to support the Kriegsmarine, which was searching for Allied convoys and warships to be targeted by U-boats. Its loss was one more step toward winning the battle of the Atlantic.

The P-38 was undergoing rapid technological improvements, and the production model designations rapidly advanced. The P-38F version rolled into production in late 1942. More than 500 were built. It could transmit a pair of 1,000-pound bombs, carry drop tanks for extended range, or hold a 22-inch torpedo. The P-38F also tightened its turning radius in a dogfight with the introduction of combat flaps, which could be rapidly extended to 8 degrees during maneuvers.

Lightning fighter groups were part of the Allied buildup for Operation Torch in North Africa. The battle would eventually clear the Axis powers from North Africa and set the scene for an invasion of southern Europe. P-38s bombed and strafed ground targets, interdicted Luftwaffe transport aircraft,

escorted light and medium bombers, and were frequently called on to escort heavy bombers. Although still small in number, the Lightnings could pack a punch.

One of the first P-38 escort missions took place on November 19, 1942, when Lightnings escorted B-17s on a raid over Tunis. On April 5, 1943, 26 P-38Fs of the 82nd destroyed 31 enemy aircraft. It was also in North Africa that the P-38 suffered its heaviest losses. On August 25, 1943, 13 P-38s were shot down in a single sortie by 53 Bf-109s. No 109s were lost, and a few days later, 10 more P-38s were shot down after claiming only one enemy victory. Luftwaffe ace Franz Schiess flew in this September sortie and solidified his reputation as a Lightning killer. Of his 67 victories, 17 were Lightnings.

After North Africa, Lightning pilots, including those from a photo-reconnaissance unit under the command of Col. Elliot Roosevelt, President Roosevelt's son, turned north and focused on defeating the Luftwaffe in Italy. In one raid, nearly 300 bombers attacked Naples on consecutive days in mid-July. These raiders were protected by 170 P-38 fighter escorts and faced very little enemy fighter action. In other bomber raids, when large formations of P-38 escorts were present, there was little Luftwaffe response. A single P-38G was captured intact by the Italians during the war when the pilot landed at an Italian base by mistake. This Lightning was flown against Allied aircraft but was quickly grounded for lack of parts.

As the war advanced northward and to higher altitudes, the P-38 began to experience problems. Very few pilots had flown the Lightning at the altitudes required by the 8th Air Force. Most pilots were completely unprepared for high-altitude operations or for the technical problems involved.

A former 8th Air Force captain

recalled, "These new [P-38] pilots made their attempts to go to altitude. This is what the curriculum called for and they gave it their best, but those early airplanes, the way they were set up, just wouldn't make it. There were disastrous incidents of ignition breakdown because of high-tension leakage. The oxygen systems were woefully inadequate....They were blowing up engines on the basis of one engine blowup every seven hours. Intercoolers were separating the lead from the fuel, and the result was lowered octane. Hands and feet were freezing; pilots were calling their airplanes airborne ice wagons, and they were right. Frost on the windows got thicker than ever."



**A new P-38 Allison engine arrives in the field.**

By early 1943, a major limitation of the P-38 was understood. No longer would a high-speed vertical dive, which often caused a compressibility stall that locked the controls, cause a pilot fatality. The enemy no longer had a steep dive as an escape route either. The compressibility problem, as P-38 designer Kelly Johnson believed all along, was not a P-38 problem but a physical problem that any high-speed aircraft would encounter. After Mach 0.75 wind tunnel speeds could be created, the compressibility problem was revealed to be the center of lift moving back toward the tail.

"I broke an ulcer over compressibility on the P-38 because we flew into a speed range where no one had ever been before, and we had

difficulty convincing people that it wasn't the funny-looking airplane itself but a fundamental physical problem," recalled Johnson after the war. "We found out what happened when the Lightning shed its tail, and we worked during the whole war to get 15 more knots of speed out of the P-38. We saw compressibility as a brick wall for a long time. Then we learned how to get through it."



**Lockheed solved the compressibility problem by adding dive flaps, which changed the geometry of the P-38 wing underside when diving. Kelly Johnson, left, is shown with a flap in his hands, pointing out its essential features to Tony LeVier, a Lockheed test pilot. The flap can be seen on the underside of the P-38 wing behind them.**

The dive flaps represented such a significant technological improvement that field-installable kits were rushed to bases around the world. In March 1944, 200 dive-flap kits, intended for European P-38Js, were destroyed in a friendly fire incident in which a Royal Air Force fighter shot down the Douglas C-54 that was bringing the shipment to England. The installation was so im-

portant that, in the spring of 1944, newly manufactured P-38s were towed out to the tarmac and modified on the field. The last 210 P-38J models had the flaps installed on the assembly line.

Poor serviceability and constant engine problems coupled with a large number of single-engine landing accidents damaged the aircraft's 8th Air Force reputation. The improved P-38J and L models resolved most of the issues experienced in 1943, but it was too late. By September 1944, all but one of the Lightning groups in the 8th Air Force had converted to the P-51. The new Mustang had extended range and speed and was less expensive and easier to maintain.

The last fighter group to fly P-38s in the 8th Air Force was the 479th. It flew a combination of P-51 and P-38 pursuit aircraft. The pilots of the 479th had the privilege of

14 5-inch rockets in two batteries of seven launchers. Soon after their introduction, the rocket arrangement was abandoned and replaced by an inverted-pyramid mounting.

The 8th and 9th Air Forces kept an eye on the enemy with photo-reconnaissance P-38s until the end of the war. Traveling unarmed with powerful aerial cameras, pilots known as Foto Joe's flew the F-4 and F-5 P-38s. Their mission was to photograph enemy troop movements, airfields, and potential targets. These P-38s were faster than their armed counterparts, and the pilots depended on speed to stay alive. U.S. Army Air Forces Gen. Henry H. "Hap" Arnold said, "Our photo-reconnaissance pilots were instructed to fly on the theory that fighter planes win battles while camera planes win wars."

More than 1,400 F-4 and F-5 P-38s were delivered to the USAAC.



**Capt. Leonard Gold's photo-reconnaissance F-5 during World War II.**

flying one of the most advanced Lightnings of the war, the P-38L. Its Allison engines produced 1,475 hp, could reach altitudes of 28,700 feet, and produced considerably higher emergency power than previous models. It used an advanced electric turbo regulator, which replaced the hydraulic regulator, and was fitted with rocket projectile launchers. The first design installed

The Lightning quickly became the primary Pacific land-based fighter, replacing P-39s and P-40s. Freezing cockpits and other cold-weather issues were not a problem as they were in Europe. With its very long range, heavy payload, high speed, and fast climb rate, it was a natural. Like its predecessors, the P-38 could not outmaneuver most of the Japanese fighters, but its speed and

rate of climb gave American pilots the option to fight or run. Missions lasting nine, 10, or even 12 hours became routine. P-38L pilots out of Dutch New Guinea were flying 950 miles, fighting for 15 minutes, and returning to base. Many wounded Lightnings were able to limp home on only one engine.

Its most notable mission came in April 1943 when a squadron of 16 P-38s took down the aircraft transporting Japanese Commander-in-Chief Adm. Isoroku Yamamoto. Yamamoto was the chief planner of the Pearl Harbor attack, and his death was an irreplaceable loss to the Japanese. The Lightnings and their pilots were credited with destroying more than 1,800 Japanese aircraft in the Pacific theater—more than were attributed to any other Allied aircraft. It was quite an accomplishment, since so much of the air war was fought from carriers.

guns with 500 rounds each and a Hispano 20-mm cannon with 150 rounds proved even more deadly to lightly armored Japanese warplanes than they were to the Germans. The Lightnings were extremely rugged, too, taking a lot of battle damage while still being able to fly.

By early 1943, several P-38 pilots had reached ace status. The two leading American World War II aces, Maj. Richard Bong and Maj. Thomas B. McGuire, scored their last victories in the P-38.

The third-highest-scoring P-38 ace, Col. Charles H. MacDonald, met Charles A. Lindbergh, who was to fly with the 475th Squadron. Lindbergh was on a mission to teach the P-38 pilots to increase



**P-38 cockpits had plenty of room and almost twice as many instruments as other fighters.**

planes' guns blazing, when at the last moment, Lindbergh pulled up. The wounded Japanese fighter could not follow and dove into the sea."

The P-38J airframe proved flexible, and several P-38J fighters were converted into two-seat bomb group formation leader aircraft. This specially converted aircraft carried a pilot, a bombardier, and a Norden bombsight with a typical "Boston type" transparent nose and also carried instruments for both navigation and bombing. Similar to the photo-reconnaissance aircraft, it flew without armament or bombs. The aircraft were moderately successful in their missions. Oddly enough, the first conversion was carried out by Lockheed engineers at Langford Lodge, England, after the 8th Air Force had already moved on to P-51 fighters.

Lockheed developed a more advanced version of the bomber formation leader aircraft. Called the Pathfinder, it featured an elongated cylindrical nacelle with a blunt, hemispherical nose. It housed more advanced instrumentation than its predecessor, including "Gee" radar for bombing through clouds. The first Pathfinder raid was April 20, 1944, against a Luftwaffe airfield in France. Very few Pathfind-



**Amphibious trucks known as ducks bring a fully assembled P-38 to the beach.**

In P-38E and later versions, the guns were staggered in the nose at various lengths to ensure a straight ammunition-belt feed into the weapons. This focused firepower concentrated a parallel stream of bullets, allowing aerial victory at much longer distances than could be achieved by fighters carrying wing guns. Four .50-caliber machine

their operational range. They flew together on July 28, 1944, on what was to be a milk run. MacDonald later told how this "uneventful" mission became a sticky situation: "As a Japanese fighter broke through the formation, its pilot set his sights unknowingly on Lindbergh's P-38. They were on a collision course, both air-



The P-38M night fighter was ready for combat. Notice the antennas under both the left and right wings, and the bomb-shaped nose pod.



A post-World War II Lightning with a scale-model F-80 jet mounted on its underside for early tests.



P-38 with row of missiles.



World War II vintage color photo of a P-38 Lightning in flight.

ers were ever produced.

The final Lightning model produced during the war was the P-38M Lightning night fighter. In October 1944, Lockheed began production with the AN/APS-4 AI radar pod under the nose and its guns equipped with flash hiders to prevent the loss of pilot night vision. Its crews trained at Hammer Field in California, but the war ended before they could be deployed. This radical night fighter's maiden flight came on January 5, 1945, and between 75 and 80 were produced.

On August 25, 1945, a pair of P-38 aircraft, piloted by Col. Clay Tice and his wingman, were the first American aircraft to land, although unauthorized, in Japan after the August 15 surrender. The *Nebraska State Journal* summed up the P-38 Lightning perfectly when it wrote, "The Lockheed P-38 Lightning fighter plane is unique for its versatility. It is used by the USAAF as a high, low and medium altitude fighter; interceptor; bomber escort; light bomber; skip bomber; dive bomber; attack bomber and strafing; supply dropping plane; night fighter; 'piggy-back' fighter-trainer; tank buster; smoke screen layer; and photo reconnaissance plane."

They were also known to tow gliders and operate on skis and could be equipped as fast ambulances. More than 100 pilots became aces in Lightnings.

The only fighter to be in production before and after World War II, a total of 9,923 were built. Late models of the P-38 carried scale models of the F-80 Shooting Star aircraft into initial test flights. The P-80 Shooting Star jet was later to win history's first all-jet battle. The P-38s that survived World War II were sold as surplus. Surviving aircraft flying in 2007 could fetch a cool \$5 million.

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