The Northrop Gamma

Designed for speed, destined to spawn a dive bomber

BY PETER M. BOWERS

One of the most glamorous commercial airplanes of the early and mid-1930s was the Northrop Gamma. Although it did not introduce the age of the slick and fast, all-metal, single-engine monoplane, it was an early and certainly the best-publicized practitioner of the new style. It was one of those designs that fit the old statement: "If it looks right it'll fly right." Even tied down, the Gamma looked fast, and it was.

Technically known as Northrop Model 2, the Gamma was a product of evolution. Hardly anything on it was new—everything had been tried and proven on earlier Northrop models and even on aircraft that designer John K. Northrop had developed for other companies.

Northrop had long believed that the way to improve airplane performance was to clean up the design. He started in this direction with a small, single-seat sport biplane that he designed for the Loughead brothers in 1919 (their company was later spelled Lockheed). The major feature of this airplane, other than folding wings, was a clean, monocoque fuselage of oval cross-section that greatly improved the streamlining and resulted in greater speed and climb for a given horsepower.

The 2-B Polar Star is the only Northrop Gamma still in existence; its original owner was Antarctic explorer Lincoln Ellsworth. Unlike other models, the Polar Star could be equipped with twin floats. It now is stored in the National Air and Space Museum.

Northrop left Loughead in 1920. He joined Douglas in 1923, but he was unhappy working on big, boxy biplanes, so he quit Douglas in 1926 to become a cofounder and chief engineer of the new Lockheed Aircraft Company in Burbank, California. At Lockheed he had free rein to apply his ideas, and he designed the world-famous Lockheed Vega, a super-clean, cantilever monoplane that was a radical development for its day.

However, the Vega and its derivatives were all wood, and Northrop had highly innovative ideas for metal construction. He formed a new company of his own, Avion, later to become Northrop Aircraft Company, still in Burbank. He soon was producing successful commercial designs that used his new, multi-cellular stressed-skin wings. The eight-place Alpha airliner and mailplane of 1930 can be considered the direct ancestor of the Gamma.

Northrop Aircraft Company was taken over by the United Aircraft and Transport conglomerate that merged with Stearman, and all its tooling was moved to Wichita, Kansas. Northrop then formed his third company, the Northrop Corporation, backed with 52-percent ownership by his old employer, Douglas. He moved the company into the abandoned Moreland Aircraft

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continued

Company plant on Mines Field at the Los Angeles municipal airport.

The first design laid down by the new firm was another single-engine transport, the nine-place Delta, which was basically an enlarged Alpha with the cockpit moved forward. However, the first two airplanes actually built by the new Northrop Corporation were two Model 2 Gammas. These essentially were enlarged but slimmed-down Alphas with the cockpit located aft, but were only single- or two-seat designs without provisions for passengers. They were designed for mail and express carriage, and custom models were used for speed and for exploration flights.

Only seven civil Gammas were built (along with several military models), but they made significant contributions to airline development, aided Antarctic exploration and set countless inter-city speed records.

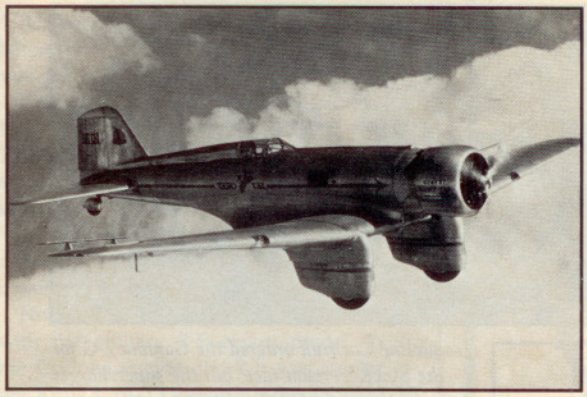
Construction was all metal in the tradition of the pioneering Alpha. The wing was in three sections: a flat center section that contained the fuel tanks and supported the unique Northrop landing gear, and two outer panels that were joined to the center section by Northrop-developed flanges covered by an aluminum hat-section channel. Other designs, notably Douglas and North American, soon adopted this Northrop-developed structure. The generous dihedral angle was formed at the wing/center section joints. The airfoil tapered from an NACA 2415 section at the roots to an NACA 2409 at the tips.

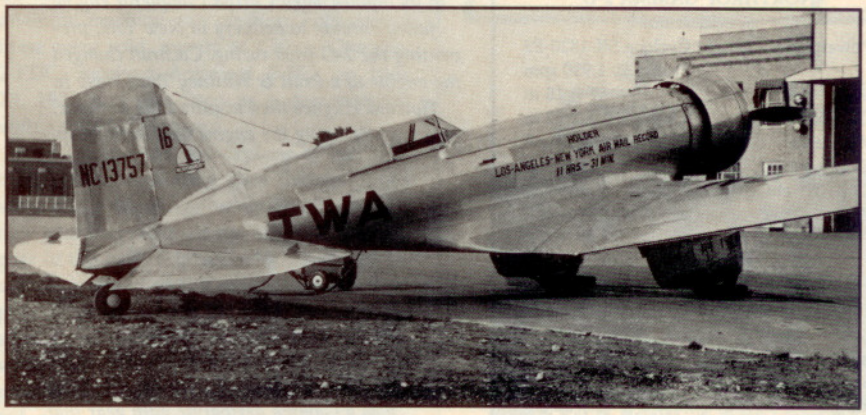
One new and thoroughly unique feature was the use of full-span split flaps under the trailing edge of the wing. The ailerons were installed as separate structures above the wing but otherwise were positioned in the standard location. These quickly earned the nickname of "park benches" because of their appearance. They were soon deleted, however, and the flap area was reduced to make room for conventional inset ailerons.

The semi-monocoque fuselage with circular cross-section sat on top of the center section. This relationship called for a large fillet on each side to streamline the junction. Details were worked out in the wind tunnel at the California Institute of Technology. Instead of merely a sheet-metal fairing between the two structures, the big fillet was built as an integral part of the fuselage, and its internal volume was put to practical use.

The Gamma was designed to use radial engines, and several different models in the 700- to 1,000-hp range were available as options. All were enclosed in full NACA cowlings. Northrop had learned the speed advantages of these when they were added to his early Lockheed designs. In fact, the Lockheed Air Express of early 1928 was the first production airplane to use one.

At the time, engineers thought that the main functions of the cowling were to smooth out the airflow around radial engines and to improve the cooling. Actually, the cowling added thrust. Its curve functioned as an airfoil and generated lift as though it were a circular wing, and that lift had a significant forward component. The full magnitude of the cowling effect was proven by a 1932 racer on which the cowling was pulled forward into the propeller.





The prototype Gamma 2-A with park-bench ailerons (left) was designed for Texaco pilot Frank Hawks' publicity-seeking, record-speed attempts. One of TWA's three Gamma 2-Ds (below) also set a speed record for transcontinental mail-planes. Another pioneered high-altitude operations as the Overweather Laboratory. The third was sold to Ellsworth.

The fuselage layout of the Gamma was traditional 1920s mailplane, with the pilot well behind the wing and the mail/cargo compartment over the wing and right on the center of gravity. While this was a step backward from the Delta, it was a heritage from the Alpha. Besides, that is where the first customers wanted it.

Depending on the customer's requirements, seating could be for one or two under the newfangled sliding canopies. The military was in the process of adapting canopies to its traditional open cockpits; speeds above 200 mph required such crew protection. Whether housing a single pilot or two in tandem, the cockpit locations on various Gammas differed noticeably.

The mail/express models had a 110-cubic-foot compartment forward of the cockpit, but some custom models substituted a small cabin with a single window on each side. This was not intended for regular passenger use.

The first Gamma, the 2-A, was built to the special requirements of Captain Frank Hawks, then employed by Texaco, who had been setting inter-city speed records to publicize Texaco gasoline, first with a Lockheed Air Express and then with a Travel Air Mystery Ship. His Gamma was a single-seater with the new 715-hp, twin-row Wright R-1510 Twin Whirlwind engine (erroneously referred to as a Wright Cyclone in many references to the Hawks airplane). Texaco paid $40,000 for the prototype Gamma, which was delivered on December 17, 1932.

After a few shakedown speed dashes around the country, Hawks set a new coast-to-coast speed record by flying nonstop from Los Angeles to New York in 13 hours 30 minutes on June 2, 1933. This was followed by an almost continuous assault on established inter-city records until 1934, when the airplane was sold to speedboat builder Gar Wood. It was entered in the 1936 Bendix race from New York to Los Angeles, but blew up over Stafford, Kansas. Pilot Joe Jacobson parachuted safely from the airplane and rushed to Los Angeles to participate in other races.

The second Gamma, the 2-B Polar Star, was built as a tandem two-seater with cabin for Antarctic explorer Lincoln Ellsworth. (Actually, it was delivered a month ahead of Hawks' 2-A, so it is sometimes referred to as being the first Gamma.) Like the 2-A, the 2-B had the short-lived park-bench ailerons. The unique feature of the 2-B was that it could be fitted with twin floats. However, when taken to Antarctica in January 1934, it was on skis.

After one test flight in Antarctica, the 2-B was parked overnight on an ice floe. The floe drifted out to sea and began to break up, sending the airplane through a crack in the ice. Its wings rested on top of the ice, however, preventing the airplane from sinking. The damage was too great to be re-

paired on site, so the Polar Star was returned to the factory.

Ellsworth had his airplane back in the Antarctic the following December, but because of differences with his pilot, little was accomplished on that trip. The third Ellsworth expedition, (1935 to 1936), with the Polar Star backed up by another Gamma provided by Texaco, resulted in the first aerial crossing of the Antarctic continent, which was made in five hops. The Polar Star was returned to the United States and is now in the National Air and Space Museum in Washington, D. C.

The third Gamma, the single 2-C, was not one of the seven Gammas manufactured for the civil market. The U.S. Army tested it as the YA-13 attack aircraft in 1933. Other than a 710-hp, single-row Wright Cyclone engine, the notable feature of the YA-13 was a military-type greenhouse canopy located far forward. The YA-13 soon was modified to become the XA-16 by the installation of the new 850-hp Pratt & Whitney R-1830-7 Twin Wasp engine. The XA-16 was the first military airplane to use this engine. The Army then ordered 110 modified versions of the XA-16, but with smaller engines, lowered canopy and modified landing gear. These were designated A-17s; 129 similar models, A-17As, had inward-retracting landing gear.

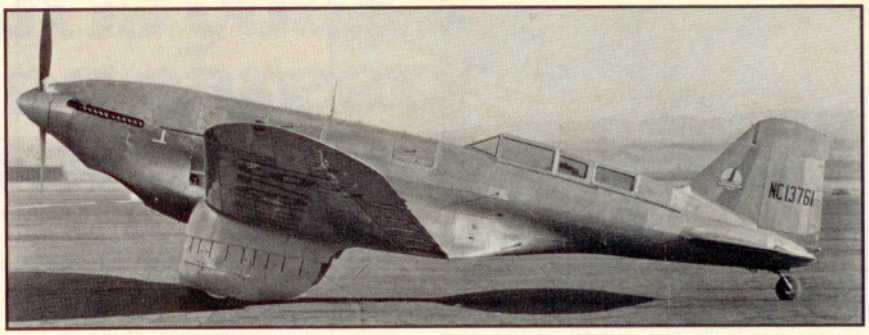
The next three Gammas, 2-Ds, went to TWA as mail and express airplanes. After setting a transcontinental record (for mailplanes) of 11 hours 31 minutes, the airline sold two of its 2-Ds, one of which went to the Antarctic with Ellsworth. The one that TWA kept became famous as the Overweather Laboratory that pioneered sub-stratospheric airline operations.

The airline models were the only Gammas to receive approved type certificates. ATC A-549 was issued to the 2-D on August 9, 1934. The first two civil Gammas had operated on Experimental and Restricted licenses and were not certificated.

Pilot Jacqueline Cochran ordered the sixth civil Gamma as the 2-G two-seater for the 1934 MacRobertson race from England to Australia that was to be held in October. This differed from all the others in having a 700-hp, liquid-cooled, geared and supercharged Curtiss G1V-1570 Conqueror engine installed. Because of the engine, the 2-G did not qualify for an ATC, but it received the lesser Category II certificate 2-489 on September 29, 1934.

A ferry pilot was delivering it to New York for Cochran when the supercharger failed over Texas. The airplane was damaged in the forced landing and could not be repaired in time for shipment to England. Cochran used another airplane in the MacRobertson race.

Meanwhile, she replaced the Conqueror engine in her 2-G with a 700-hp, twin-row Pratt & Whitney R-1535 Twin Wasp Jr., the same engine then being used in the A-17.



Jacqueline Cochran ordered the Gamma 2-G for the MacRobertson race, but the supercharger in its liquid-cooled Curtiss Conqueror engine failed enroute to delivery in New York, preventing the 2-G from racing. Cochran changed the engine to a Pratt & Whitney Twin Wasp Jr. Howard Hughes then acquired the airplane, changing the engine to a Twin Wasp.

NORTHROP GAMMA 2-D

Specifications

Powerplant	Wright Cyclone SR-1820-F3 710 hp @ 1,950 rpm
Span	47 ft 10 in
Length	31 ft 2 in
Wing area	363 sq ft
Empty weight	4,119 lb
Gross weight	7,350 lb
Wing loading	20.24 lb/sq ft
Power loading	10.35 lb/hp

Performance

High speed	224 mph @ 7,000 ft
Cruising speed	215 mph @ 7,000 ft
Landing speed	62 mph (flaps)
Initial climb	1,280 fpm
Service ceiling	20,000 ft
Range	1,700 sm

The last of seven civil Gammas, the 2-H, (below, top) was drafted in 1942 as the UC-100. The Navy BT-1 (below, bottom) was a Gamma derivative with gear that retracted backward into underwing fairings.

Howard Hughes then acquired the airplane from Cochran, installed a Pratt & Whitney Twin Wasp and set a new coast-to-coast record of nine hours 26 minutes on January 13, 1936. Actually, this was only a practice run for his next record assault in his own Hughes H-1 racer; in it he covered the same distance in seven hours 20 minutes on January 19, 1937.

The seventh and last civil Gamma, the 2-H, was another two-seater, powered with a single-row Cyclone. This was not ATCed either; it flew on an Experimental license from December 1934 to April 20, 1937 when it received lesser Approval 2-535.

The 2-H had a succession of owners, including Russel Thaw who bought it after piloting it to a third-place finish in the 1935 Bendix race. Cochran owned the 2-H briefly in 1938, and then it passed to publisher/physical culturist/health food promoter Bernarr Macfadden. He was to fly it in the

1938 Bendix race but ground-looped it just before the start. The damage forced him to withdraw from the race.

This last Gamma was drafted into the U.S. Army in 1942 as the UC-100 and in 1945 was acquired by Continental Airlines as war surplus. Nothing is known of its subsequent history.

One other civil Gamma was started but never finished; its components were used to repair the 2-G and the 2-H.

Northrop's major Gamma business was with the military 2-E export model. With the Cyclone engine, the 2-E was similar to the Army's YA-13 except for the addition of a ventral machine gun position. Fifty-one of these were sold, mostly to China. One, the 2-EDC, received Approval 2-503 on May 23, 1935 and was used as a demonstrator with a civil NC license.

The 2-E was the last airplane to use Northrop's unique landing gear fairings. They were a big advantage when fitted over the new gear that replaced the original three-leg gear of the early Alphas, which had 420 hp and a top speed of 170 mph. However, they proved to have serious disadvantages as speeds reached more than 200 mph, so they were abandoned at the end of Gamma 2-E production. All that sheet metal added wetted area that contributed to aerodynamic drag, and the extensive right-angle intersection between the fairing and the underside of the wing added the heretofore unappreciated factor of intersection drag. A few other manufacturers, notably Curtiss, Beech and Seversky, used somewhat similar fairings on their high-performance, fixed-gear designs but likewise abandoned them.

By 1935, Northrop had changed to a single-leg landing gear with a partial pant around the wheels for the Army A-17 model. There was still room for improvement, so, on the very similar U.S. Navy BT-1 model, Northrop switched to a backward-retracting gear that did not enter the wing but that became enclosed in boxy, underwing fairings. The final stroke was a full inward-retracting gear on the A-17A. With this, the Northrop landing gear fairings that had been a big advance in 1930 were now phased out.

In 1938, the second Northrop firm was taken over by Douglas as its El Segundo Division, and John Northrop went on to form the present Northrop Aircraft, Incorporated at nearby Hawthorne, California, in August 1939. Subsequently, at Douglas, the Northrop-designed XBT-2, a variant of the Gamma, went on to become the famous Douglas SBD Dauntless dive bomber of World War II.

No Gammas other than Ellsworth's 2-B in the National Air and Space Museum are known to exist today. □

Intrigued by airplanes long before his first ride in a Travel Air at age 10, Peter Bowers, AOPA 54408, has since logged more than 4,200 hours.