

Flying Wings



The rocket powered MX-334 in flight.

Early studies of [delta wings](#) led aircraft designers to ask if an entire airplane could consist only of a wing, with basically no fuselage whatsoever. Such all-wing aircraft would have excellent payload and range capabilities because they would produce less [drag](#) than a conventional aircraft. This was true because the tail and fuselage normally cause a significant amount of drag. Eliminate the tail and fuselage and you have eliminated a great deal of drag, enhanced performance, reduced the amount of fuel required, and generally improved the handling capabilities of the airplane. These so-called flying wing designs were long a dream of a number of designers but did not become practical until recently. The biggest problem found when building a flying wing aircraft is that such designs are [inherently unstable](#) and they do not easily stay level in flight.



The N-1M with drooped wing tips.

Jack Northrop, the legendary innovative airplane designer and builder, long envisioned developing a flying wing. In the 1940s, he started work on a number of flying wing designs. These included the MX-334 "Rocket Wing," the XP-79B "Flying Ram" interceptor, the MX-543 piloted glider, and the JB-1A flying bomb. But his ultimate developments were the XB-35 and YB-49 flying wings, which were prototype strategic bombers. The XB-35 was powered by four large [piston engines](#) with [pusher propellers](#) (mounted behind the engine). It had a range of more than 5,000 miles (8,047 kilometers) with a 10,000-pound (4,536-kilogram) payload. Northrop received an initial contract for one XB-35 airplane, approved in November 1941 and an order for an additional XB-35 as a backup in January 1942. Later that year, the Air Force contracted for another 13 service test models, to be designated YB-35. But the plane was troubled by a complicated drive train and it lost out in a competition to the Convair B-36 for the role of the Air Force's next strategic bomber in the 1940s. Of the 15 B-35s built, only three flew.



The B-35 bomber had a wingspan of 172 feet. Elimination of the fuselage and tail surfaces increased its efficiency by cutting down drag and reducing the airplane to a nearly pure supporting surface where every part contributed to its weight-lifting ability. It was produced in 1946.

The XB-35 served as a testbed for the jet-powered YB-49, which was powered by eight turbojet engines. The YB-49 had four relatively small vertical tailfins mounted to the rear of the wing, but was a startling aircraft, looking like a giant arrowhead. Although a radical design, the YB-49 had numerous problems. The most significant was its lack of stability, which made it extremely difficult to fly. A crash in June 1948 that killed five crewmembers, including Captain Glen Edwards, for whom Edwards Air Force Base would be named, further damaged its prospects. The aircraft was canceled in 1949 and Jack Northrop left the bomber business a very bitter man, feeling that the Air Force had treated him and his aircraft unfairly.

Northrop was not the only person interested in the flying wing. Walter and Reimar Horten were German brothers who became interested in delta wings in the 1930s. By the 1940s they proposed a tailless jet-powered airplane that was all wing, known as the Ho IX or GÖTTA Go 229. The Ho IX was a fighter that would have had a top speed of an astounding 620 miles per hour (998 kilometers per hour), assuming it could be made to fly. But although work was started on a prototype, World War II ended before it could be completed. Many of those who were actually building the Ho IX doubted that it would have ever flown successfully anyway.



The B-2 bomber is a modern example of the swept-wing configuration.

The most famous flying wing was the only successful one, the Northrop-Grumman [B-2 Spirit](#) "stealth bomber." It was first started by the Northrop Corporation in the late 1970s (the contract was awarded in 1981; its first flight took place in 1989) but did not become fully operational until a decade and a half later due to its complexity and numerous initial problems.

The B-2 was an example of modern technology finally catching up with an earlier idea. By the 1970s, aircraft designers were deliberately developing airplanes like the F-16 that were unstable in flight, and therefore inherently maneuverable, controlling them in flight by sophisticated modern [computer control systems](#). Computer control systems now also made it possible to control the unstable flying wing design.

The flying wing still offered excellent performance and fuel efficiency advantages. But Northrop's designers also chose a flying wing configuration because it offered advantages for stealth; a vertical tail such as found in a conventional aircraft reflects [radar](#) energy. Eliminating it increased the aircraft's stealthiness, particularly from the side. The B-2 is capable of carrying as many bombs inside it as the larger B-52 and flying just as far. Although only 21 of these planes are in service, they played a major role in the 1999 bombing of Yugoslavia, which had a sophisticated air defense system, and are generally regarded as an amazing technological achievement, albeit a very expensive one.

--Dwayne A. Day

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