THE CURTISS TANAGER

Winner of the Guggenheim Safe Aircraft Competition in 1929, this unique cabin biplane turned in a performance remarkable even by today's standards

by PETER M. BOWERS / AOPA 54408

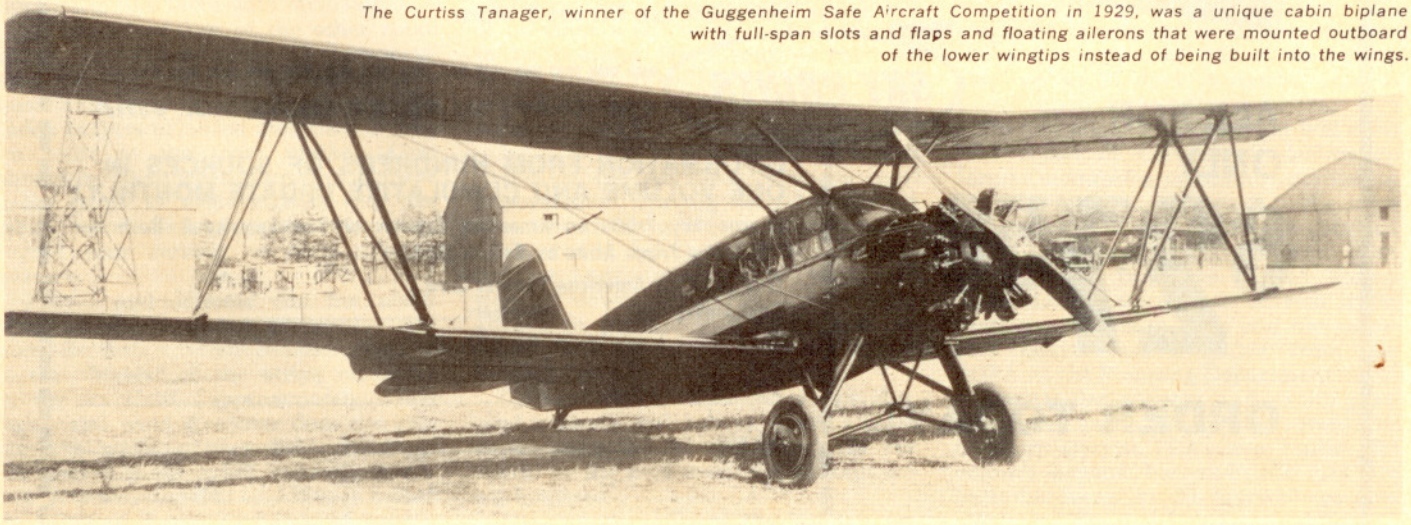
The Tanager climbing over the 35-foot barrier from a standing start 500 feet away—one of the requirements of the Guggenheim safety contest.

■■ Back in May 1927, just before Lindbergh's transatlantic flight made the world aviation conscious, the Daniel Guggenheim Fund for the Promotion of Aeronautics announced the Guggenheim Safe Aircraft Competition. This was no spur-of-the-moment thing intended to get quick results; the exacting and seemingly impossible requirements were very carefully worked out, and the contestants had over two years in which to produce aircraft that could meet these standards in a $100,000 winner-take-all fly-off contest.

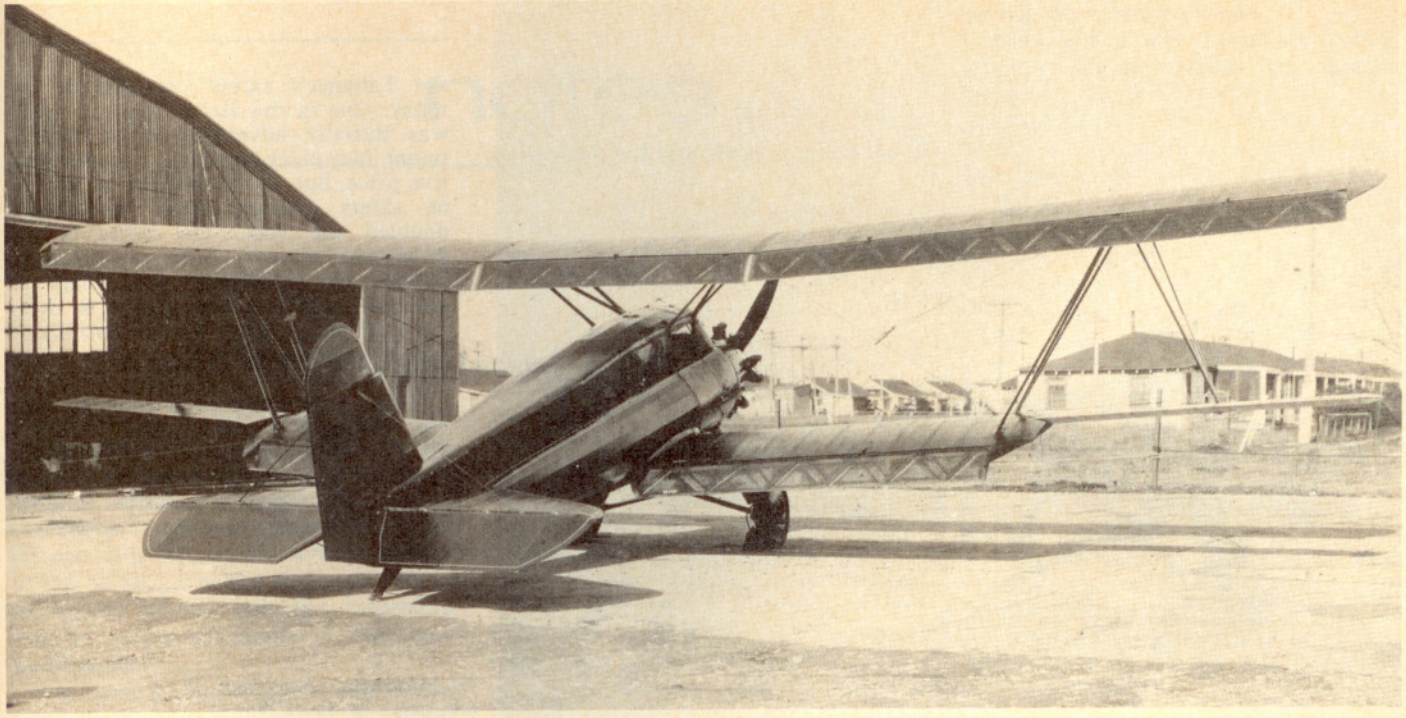
The principal requirements were for a "safe" airplane, with a speed range of 35 to 110 mph, that could take off in a distance of 300 feet and clear a 35-foot obstacle 500 feet from the starting point. The aircraft also had to have a landing run of only 100 feet, and the ability to stop within 300 feet after passing over the 35-foot obstacle. A maximum glide angle of 12:1 was required. The minimum glide speed had to be 38 mph, and the minimum rate of climb was set at 400 fpm.

Of even greater importance were the low-speed handling characteristics. Prime objectives were inherent stability and improved low-speed controllability, with a view to elimination of the stall-spin accident that was said to be the principal cause of aviation fatalities at the time. The idea behind the unusually low landing speed was that if the plane was going to hit the ground, the impact would be less at the lower speed, and the chances of personnel survival would be much greater.

The airplane was to be as nearly foolproof as possible, but also had to have a useful degree of practicality, instead of being merely a freak that could cover the performance envelope. It had to carry a useful load of five pounds per horsepower and be able to fly two people for three hours. The load requirement eliminated the easy approach of building a big floater that could meet



The Curtiss Tanager, winner of the Guggenheim Safe Aircraft Competition in 1929, was a unique cabin biplane with full-span slots and flaps and floating ailerons that were mounted outboard of the lower wingtips instead of being built into the wings.



This view from behind shows the enormous area of the Tanager's wing flaps. The floating ailerons are in the neutral position for airplane flight at a high angle of attack.

CURTISS TANAGER

Specifications and Performance*

Span	43 ft 10 in
Length	26 ft 8 in
Height	11 ft 4 in
Wing area	333 sq ft
Powerplant	Curtiss Challenger, 185 hp @ 1,830 rpm
Empty weight	1,959 lb
Gross weight	2,841 lb
Fuel	57 U.S. gal
High speed	111.6 mph (110 required)
Minimum speed (clean)	41.5 mph
Minimum speed (slots and flaps)	30.6 mph (35 required)
Climb	700 fpm (400 required)

*Guggenheim test figures; these did not cover such items as range, cruise speed, and ceilings.

the slow-speed requirements through light loading and then get past the high-speed end by using a big engine.

The Curtiss Aeroplane and Motor Co., then the country's largest airplane manufacturer, decided to enter the competition. Preliminary studies at the Garden City experimental plant quickly determined that no existing "standard" design could be modified to meet the full requirements. Some of the contestants tried this and were unsuccessful; however, Curtiss started an entirely new design, named the "Tanager," late in 1927.

Since the low-speed performance was most important, conventional thinking dictated a large wing area and a light structure. Curtiss achieved this with a large cabin biplane—two wings to provide ample area, and a cabin (in a time of open cockpits) to reduce drag. The structure was conventional: wood-frame wings; aluminum-frame ailerons, fin, and stabilizer; welded steel tube rudder and elevators; and a riveted aluminum tube fuselage with a beefed-up cabin area, all fabric covered. All components were carefully engineered for minimum weight, and the landing gear was a special long-stroke unit capable of absorbing excessive impact.

Even with all of its area, studies showed that the Tanager would not meet the low-speed requirements with its conventional Curtiss C-72 airfoil and 185-hp Curtiss Challenger engine. The lift coefficient had to be increased. There were two ways of doing this, and Curtiss used them both.

One method was to use trailing-edge flaps, and the other was to use full-span, automatic leading-edge slots. The former had been known for years but were hardly of benefit to the conventional planes of the time. The latter had been developed by Handley-Page in England in the early 1920s and had seen only slight use up to 1927. The combination paid off handsomely for Curtiss with an 83% increase in lift coefficient —33% from the flaps and 50% from the slots.

Low-speed controllability was taken care of with large tail surfaces, four degrees of dihedral in the wing, and unique floating ailerons projecting spanwise from the ends of the short lower wing. The ailerons could trim automatically to fly at zero angle of attack regardless of airplane attitude.

Flight characteristics were all that could be desired. Perfect turns could be made at all speeds with aileron alone; the Tanager could recover from any unusual attitude "hands off"; and safe landings could be made from any altitude merely by cutting power, then pulling the stick full back and holding it there.

The Tanager made its first flight on Oct. 12, 1929, and was turned over to the contest committee on Oct. 29. It was the only one of a dozen contestants that appeared to completely fulfill all requirements, and was declared the winner. Runner-up Handley-Page promptly sued Curtiss for the full sum of the prize money (which just about covered the Tanager's development costs) because of patent infringement, but that's another story.

While the Tanager turned in a performance that is remarkable even by today's standards, and proved the effectiveness of many "safety" features, we do not find many of these features in use today, at least in the Tanager's combinations. Why?

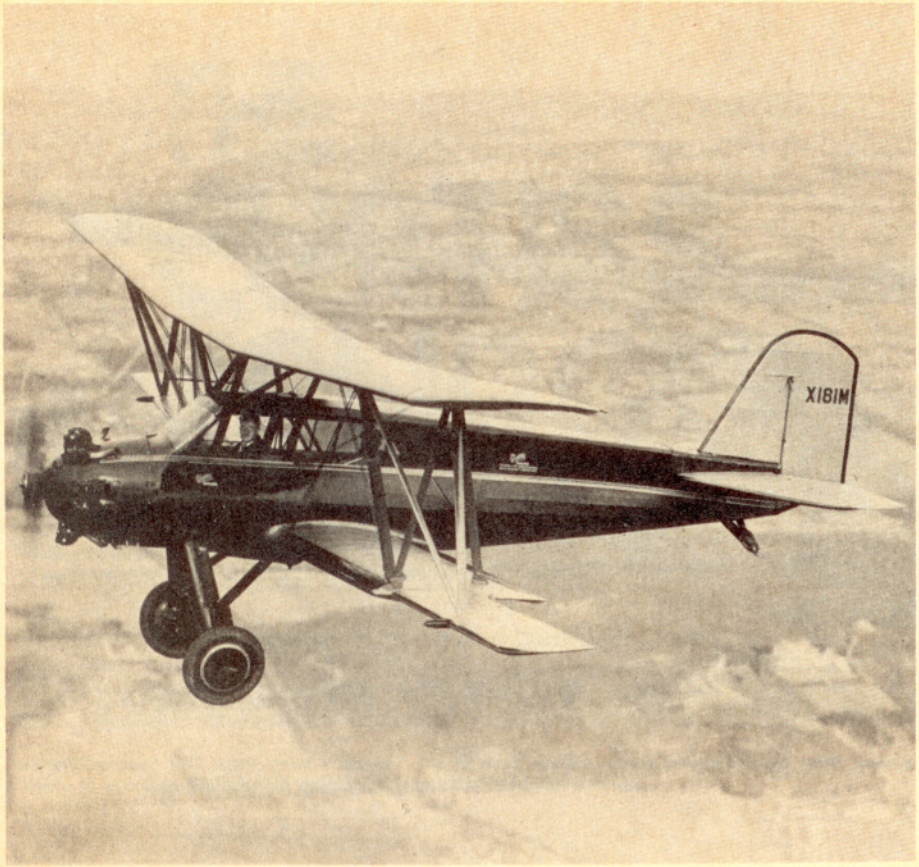
The primary reason is cost. Curtiss did not put the one-and-only Tanager's features into subsequent civil designs because the depression came along just then, and new designs were made as simple as possible to keep the price down. All those gadgets carried premium price tags.

As requirements for an increased performance range came along in later years, wings were made smaller and power was increased to get more speed. It then became necessary to add flaps to bring the landing speed down to acceptable figures that were still well above that of the ultra-slow Tanager.

We see only two near-applications of

the Tanager's safety concepts in use today. One is the Helio Courier, which was initially advertised as a conventional four-place airplane at a competitive price, but was fitted with a number of safety features that just about doubled the cost. The other is the Robertson Aircraft Corp. approach of extensively modifying the wings of standard production airplanes to delay the stall and produce safely controllable speeds significantly below the norms for those models.

These two approaches confirm what the Tanager demonstrated back in 1929: Safe, slow-speed, and virtually foolproof flight is possible, but the premium price tag that it carries is much higher than the average customer is willing to accept. □



The Tanager in "clean" flight, with slots closed and flaps retracted. Curtiss could have added a few mph to the top speed with an engine cowling and wheel pants. However, the added weight would have been detrimental to the 30-mph landing speed.