

The Alexander Bullet

Flying too far ahead of its time.

BY PETER M. BOWERS

Aviation progresses through a continuous process of improvement that generally is referred to as the state of the art. Changes cover just about everything connected with the airplane, including materials, mechanisms, aerodynamics and propulsion systems. An innovative, or even a radical, feature on a manufacturer's new model one year, may well become industry-wide standard equipment one, or even 10, years later.

Sometimes, new and obviously beneficial advances do not catch on the first time around. It may be that they are not perfected at the time and are too much trouble to produce. Or, they are not cost-effective in that they do not improve the airplane enough to justify the cost. Or, the tradition-bound customers are not ready for change.

A prime example of an airplane that was brilliantly conceived, but too far ahead of its time, is the Alexander "Bullet" of 1929. While it is a very conventional airplane by today's standards, or even 1940's, it made important breaks with the design traditions of its day. It introduced some new concepts that took a long time to win acceptance.

Peter Bowers, AOPA 54408, works for Boeing. But when he flies, he prefers antiques or his homebuilt, winner of the 1962 EAA design contest.

The Bullet was produced by the Alexander Aircraft Company of Colorado Springs, Colorado. It was a major deviation from the design custom of that firm, which had built its solid reputation on a line of conservative, open-cockpit biplanes starting with its founding in the Denver suburb in 1925. The principal designer was Al W. Mooney, a young engineer who had been instrumental in upgrading the original Alexander "Eaglerock" biplane into a popular series.

The Bullet was not a model that evolved step by step from a proven design; it was entirely new. That it was a collection of departures from tradition was its drawback.

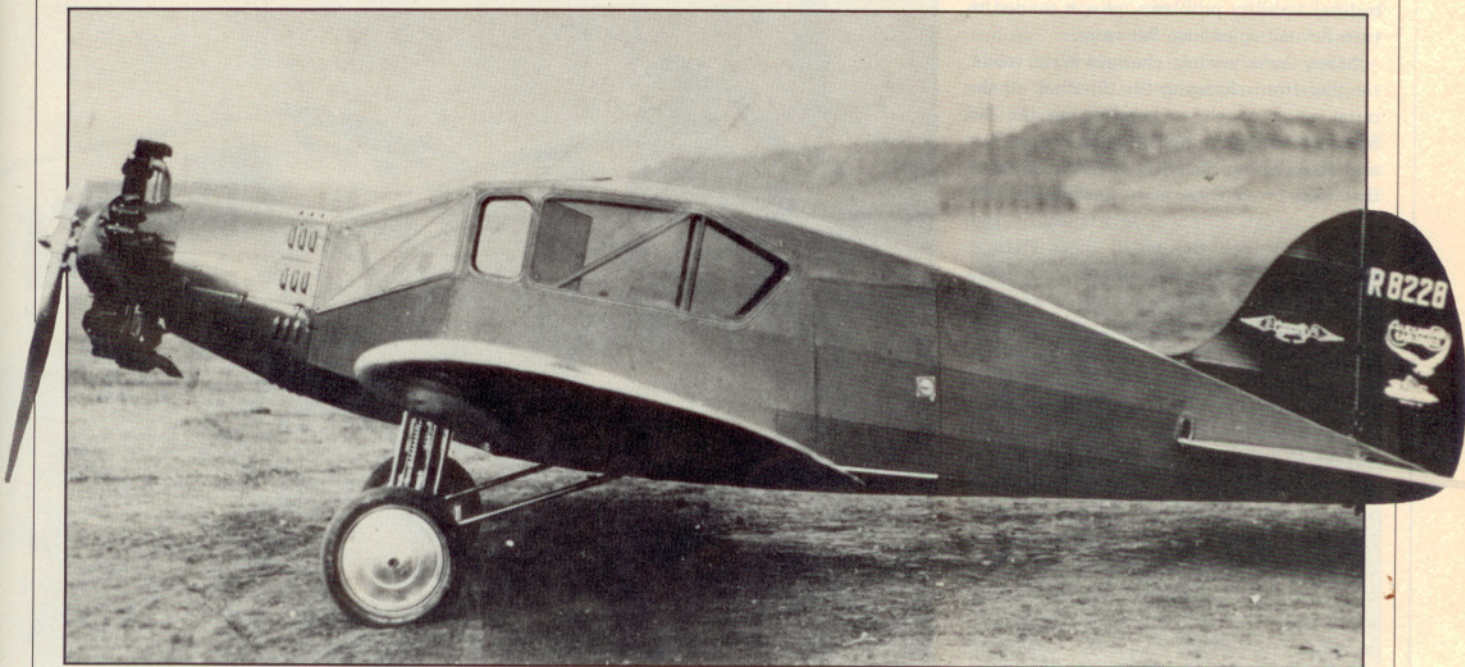
The name Bullet originally was intended to apply to a whole line of airplanes with the same basic structure and layout but having different passenger capacities, powerplants and performance. (A modern equivalent would be the Piper Cherokee line.) The various Bullets were to be identified by caliber. The projected two-place, 60-hp model was to be the .22; the four-place, 150- to 165-hp model, the .32; and the four-place, 300-hp model, the .45. As only four-seaters in the 150- to 165-hp range were certificated, the caliber system was abandoned.

The most obvious feature of the Bullet, since most general aviation designs in late

1928 were open-cockpit biplanes, was that it was a low-wing, cantilever monoplane. Most monoplanes in the sport and private-owner field had high wings with strut bracing, and the costly cantilever construction was only beginning to come on strong in the transport field.

In that field, too, aerodynamic refinement of the traditional airframe had gone about as far as it could. Retractable landing gear was just around the corner and soon would be seen on the revolutionary Boeing Monomail and on the Lockheed Orion, which were single-engine airliners. But the little Bullet was a year and a half ahead of them: Its wheels retracted inward and lay flush with the lower surface of the wing. Retractable landing gear had been around for a long time and were an essential feature of amphibians; but retracting the wheels on a clean, light landplane was new and good for a speed increase of about 20 mph.

Otherwise, construction of the Bullet was conventional. It had welded-steel-tube fuselage and tail structure, and two-spar, wood-frame wings. Some cantilever monoplanes achieved torsional stiffness for their wings by using plywood or metal skins; but the Bullet wing was fabric covered and relied on internal bracing for needed stiffness.



In 1929, The Alexander Aircraft Company broke away from its conservative line of open-cockpit biplanes with the first Alexander Bullet, the C-1. This model developed from a completely new idea, and not a proven design.

The wing, featuring a new experimental M-H airfoil developed by Mooney and his assistant, L.H. Height, was in three sections. A straight-chord center section supported the fuselage, the landing gear, two 20-gallon fuel tanks and two baggage compartments. The removable outer panels have elliptical trailing edges, and the leading edges were elliptical from half-way out.

The earliest Bullets had a unique, Mooney-developed feature that was to reappear in some of his later designs—a forward-sloped rudder hinge line that was supposed to improve control at high angles of attack. Further aerodynamic help, supposedly, was derived from the fuselage—the top was contoured like an airfoil to contribute extra lift. This was borrowed from Bellanca designs. While it made a good merchandising gimmick, the lifting-fuselage concept does not stand up under analysis as a separate wing with fractional aspect ratio, enormous tip losses and a long center-of-pressure travel. Dual stick controls were provided, as were push rods for all flight controls, another innovation new to lightplanes.

The first Alexander Bullet, designated Model C-1, was flying in February 1929. Later test models made sensational appearances at the 1929 National Air Races, where they walked away with the private-pilot events in their horsepower categories. These were not certificated production airplanes—they were flying on restricted licenses.

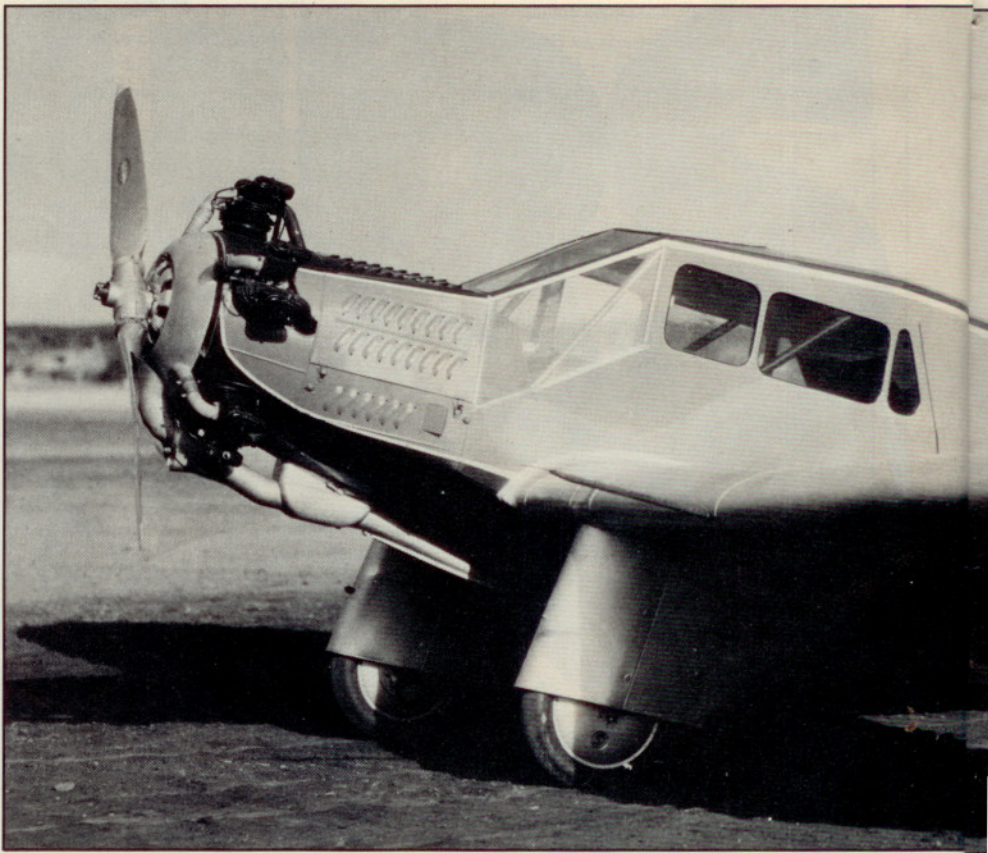
One of the early mechanical problems was with the gear-retraction mechanism. Retraction was accomplished by turning a hand wheel, mounted on the front spar, that doubled as the base for the front seats. The mechanical problem soon was solved. Aerodynamic problems were more acute and not as easily overcome. The airplane had longitudinal stability problems, plus it tended to turn normal spins into flat spins.

Many aerodynamic changes were made, ranging from changing the dihedral on the outer wing panels to lengthening the tail five feet, straightening the rudder hinge line and abandoning the M-H airfoil in favor of the well-proven German Gottingen 387. The wingspan also was shortened by two and a half feet. Before all these changes were made, however, Mooney left to form a company under his own name in Wichita. The modifications were initiated by the noted aerodynamicist Max Munk, of NACA M-series airfoil fame. But, Munk left before all the problems were solved, leaving the job to a European designer, Ludwig Muther.

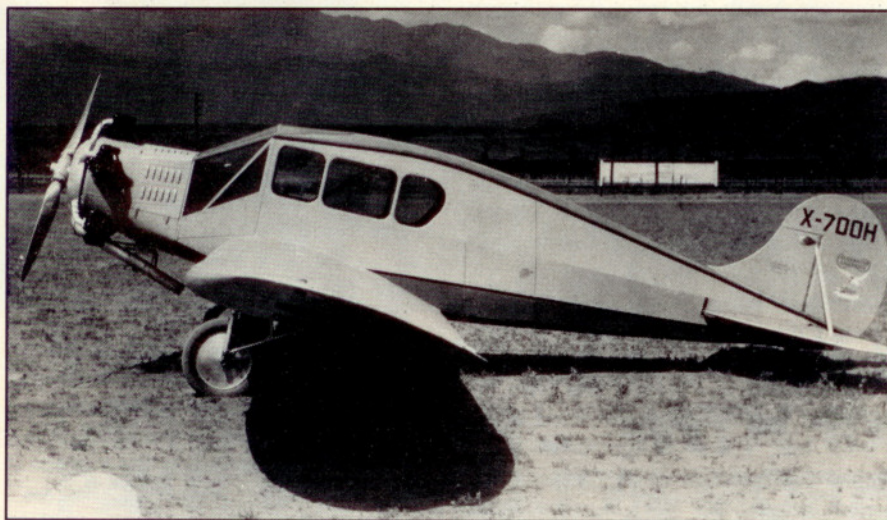
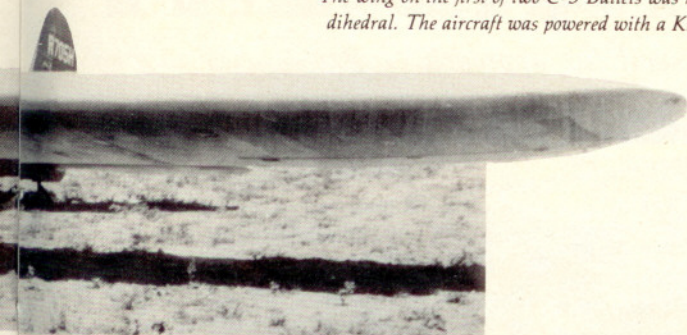
The C-7 version of the Bullet finally achieved certification on February 18, 1930, when Memo Approval 2-181 was awarded. However, one of the major features was reduced to an option—the landing gear of the C-7 were rigid and were enclosed with large sheet-metal "spats." These were still an innovation, appearing a couple of years before they became famous on the modified Northrop "Alphas" and later on the high-speed "Gammas." Memo 2-181 was rescinded



The improved C-3 had a 165-hp Wright J-6-5 Whirlwind engine in a shorter nose. Much effort was spent improving the Bullet, only to have the company close down, a victim of the Depression, in 1931.

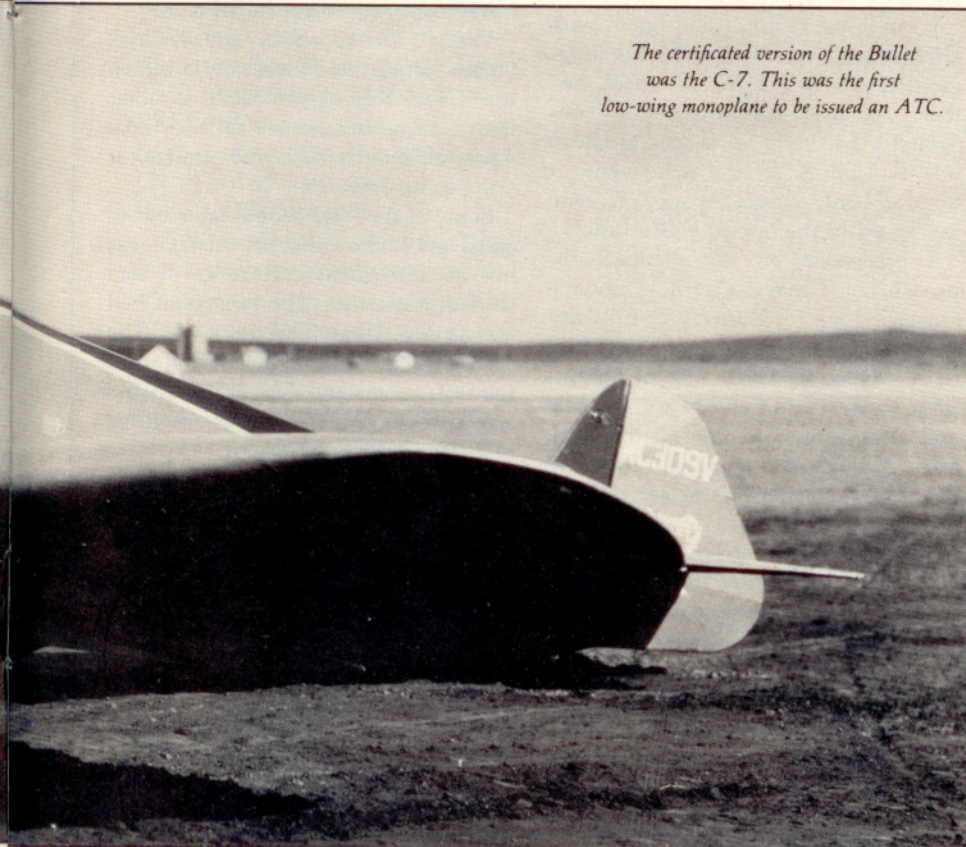


The wing on the first of two C-5 Bullets was rigged with no dihedral. The aircraft was powered with a Kinner engine.



On the second C-5, the shadow outlines the elliptical shape of the wing, outboard of the center section. The principal designer of the Bullet was Al W. Mooney, who left in 1929 to form his own company.

The certificated version of the Bullet was the C-7. This was the first low-wing monoplane to be issued an ATC.



and replaced by the full Approved Type Certificate A-318 on May 6, 1930.

This was a significant state-of-the-art milestone because it was the first ATC issued to a low-wing monoplane and to a nonamphibious retractable-landing-gear design (optional in this case). It is unfortunate that so much time was lost in debugging the truly revolutionary Bullet, only to have it be stifled by the Depression. But, other designs with similar features were certificated almost immediately after the Bullet.

In 1930, the advertised price for the C-7 was \$7,200, but this was soon dropped to \$6,500 because of the depressed market. Even this low price plus fantastic performance, for the horsepower, were not enough to attract customers. With the market for its bread-and-butter biplanes gone, Alexander made one valiant, last-ditch stand with the very light Flyabout. But, a major investment in a new factory (following a fire at the old location), the sales failure of the Bullet due to the Depression, the big cost overruns during the Bullet's development and the disappearance of the biplane market finally closed the company's doors in 1931.

The design concepts of the Bullet did not die with the company, however. Mooney carried some of his innovations on to his new enterprises. After his own firm folded, he went to Bellanca and worked on other low-wing monoplanes. He left Bellanca to design the Twin Monocoach and the second Monosport for Mono Aircraft and then redesigned the Monosport into the Dart for Culver. But, his influence at Bellanca proved to be strong because the Cruisair that appeared in 1939 still carried some of his innovations. The original three-place Cruisair bore a strong resemblance to the original Bullet, particularly in side view. Another Mooney trademark, the forward-sloped rudder, reappeared in the little Mooney Mite of 1948 and its four place enlargement, the M-20, later versions of which are still in production.

On its own, the Alexander Bullet was not a commercial success; but it was a pioneer in its class and left us a significant heritage. □

ALEXANDER BULLET C-7

Specifications

Powerplant	Wright J-6-7 Whirlwind
	165 hp @ 2,000 rpm
Wingspan	36 ft
Length	26 ft 10 in
Wing area	208 sq ft
Wing loading	13.41 lb/sq ft
Power loading	16.91 lb/hp
Empty weight	1,708 lb
Gross weight	2,790 lb

Performance

High speed	148 mph
Cruising speed	125 mph
Landing speed (no flaps)	48 mph
Initial climb	700 fpm
Service ceiling	15,000 ft
Range	540 sm