

■ The low-wing monoplane is the predominant design in general aviation today, but this was not always so. The "Monoplane Era" can be said to date from 1929, but the low-wing models were relatively rare in the early and mid-1930's. While many interesting designs of this style appeared, few saw real production. A few individual aircraft, such as the Gee Bee racer, Lindbergh's Lockheed "Sirius," and Frank Hawks' "Sky Chief" gave the low-wingers publicity way out of proportion to their actual numbers.

One established lightplane manufacturer that decided to bring out a low-wing two-seater was the Lambert Aircraft Corporation of St. Louis, Mo. This firm had started out late in 1926 as Central States Aero at Moline, Ill., then had become Mono Aircraft Corporation in 1927, Monocoupe Corporation in 1929, and Lambert in 1934. It also enjoyed the distinction of having four different chief engineers between 1930 and 1935.

Regardless of the firm's name of the moment, it was famous for a fine little side-by-side two-seater called the "Monocoupe" [February 1963 *PILOT*]. In the late 1920's, the company diversified by bringing out a large 220-245 hp cabin model called the *Monocoach*, a higher-powered version of the "Monocoupe" called the *Monosport*, and a cut-down open version of the "Monocoupe" called the *Monoprep*. However, all of these but the "Monocoupe" were dropped early in the depression, and the company itself shut down in 1933.

It was reorganized in July 1934 as Lambert at St. Louis' Lambert Field, and Al Mooney soon became chief engineer. Mooney had a distinguished career behind him, having been the designer of the old Alexander Eaglerock biplane [Feb. 1969 *PILOT*] and the later Alexander *Bullet* low-wing cabin monoplane. After leaving Alexander, Mooney turned out a similar low-wing under his own name but the depression blocked development. At Lambert, Mooney helped get the "Monocoupe" back in production and, with economic conditions improving, designed a couple of new models when the company decided to diversify again.

One was a light twin that became a second *Monocoach* and the other was a low-wing sport two-seater that became the second *Monosport*. Unfortunately, neither of these found the market that Lambert sought; only one *Monocoach* and five *Monosports* were built.

However, the termination of Lambert's sales effort on the *Monosport* was not the end for that design. Mooney left Lambert and teamed up with K. K. Culver to form a new company—Dart Aircraft of Columbus, O. This firm bought the *Monosport* design rights from Lambert and some of the airplanes, and then produced an improved version that was named the "Dart." This model continued the line of *Monosport* serial numbers that had been started at Lambert.

As originally developed at Lambert, the *Monosport* (hereafter called the

YESTERDAY'S WINGS

Chubby open-cockpit monoplane featured full-cantilever wings with extremely low aspect ratio, nearly elliptical planform. Of 64 built, 29 still in existence today

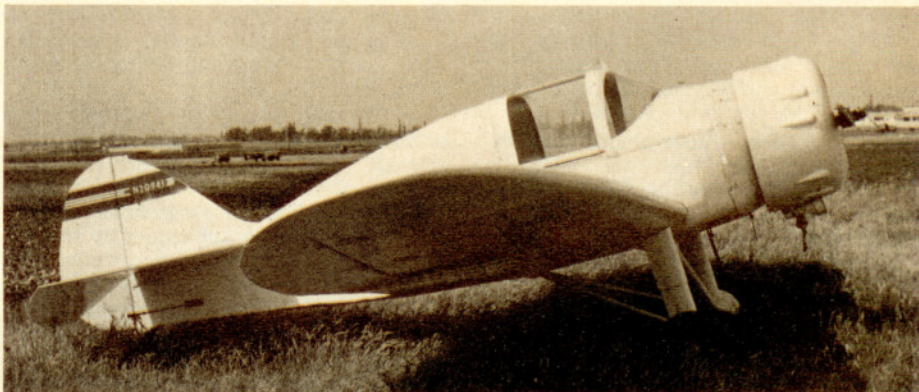
THE DART

by PETER M. BOWERS / AOPA 54408



A "Dart" Model G with 90 hp Lambert engine photographed at Oakland, Calif., in May 1941. This airplane is now being rebuilt at Chatsworth, Calif., with a 165 hp Warner engine. Can any AOPA member identify the "Mosaque Air Corps"?

Photo by Peter M. Bowers

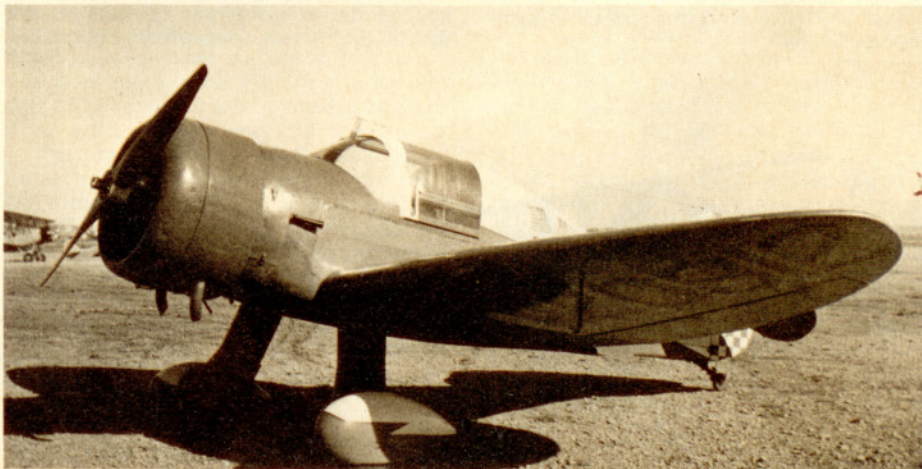


Originally a GK with a 90 hp Ken Royce engine, this "Dart" is now Model GW using a 90 hp Warner and is still flying at McCook, Neb.

Photo by E. M. Sommerich

The single experimental "Dart" G1, also known as X-1, with 145 hp Warner engine, single-strut landing gear, and the wing shortened five feet. The factory built parts for a retractable landing gear "Dart" but never marketed one.

Photo by John C. Collins





Postwar Applegate & Weyant "Dart" GC with Continental A-100 engine and hinged cabin sides, photographed in 1964. The change to a flat engine greatly improved the forward visibility. This plane now carries a 145 hp Continental.

Photo by Peter M. Bowers

"Dart") was a chubby low-wing monoplane with an open cockpit seating two side-by-side. If any single feature of the design could be considered unusual at the time, it was the wing. While low wings were still relatively rare on lightplanes, wing location was not the "Dart's" distinguishing feature.

For one thing, the wing was full cantilever, a rare feature for any lightplane at the time. The absence of external bracing gave the "Dart" an exceptionally clean appearance that was spoiled only somewhat by the jungle of landing gear struts. Structurally, the wing was unusual in that it was a wood structure with built-up ribs, two spars, and fabric covering, yet was torsionally stiff. This was achieved, at a great saving in weight and cost over the more common plywood covering, by the use of a double internal drag-wire system above and below the spars in the manner of the contemporary Cessna *Airmaster* and the earlier Cessna AW [Jan. 1971 *Pilot*].

By far the most noticeable feature of the wing, however, was its extremely low aspect ratio, or ratio of overall span to average chord, coupled with a nearly elliptical planform. In this one feature, the "Dart" was way off the established norm (so were the other Mooney monoplanes back to the *Alexander Bullet*). Its aspect ratio was only 5.9 while the "Monocoupe" had seven and the contemporary Taylor E-2 *Cub* [Oct. 1971 *Pilot*] had 6.7.

The stubby outline of the wing was reflected throughout the rest of the design. The welded-steel-tube vertical tail was extremely low relative to its length, the steel-tube horizontal tail also had a lower aspect ratio than was normal, and the whole thing was tied together with a very short and wide welded-steel-tube fuselage. It was truly a balanced design; no single part alone was out of proportion relative to the others so they all looked like they really belonged together.

While the low-aspect-ratio wing had certain aerodynamic disadvantages in the area of induced drag and decreased lift-to-drag ratio, it also had advantages. The long chord put a lot of area into a relatively short span to give light wing loading. The close coupling and light loading combined to give later

"Darts" a reputation as top aerobatic planes in their horsepower class. With only 90 hp, the originals couldn't do much, but conversions with 145 and even 220 hp actually made a career of airshow aerobatics.

The original powerplant was the 90 hp Lambert R-266, a five-cylinder air-cooled radial and the same engine used in the contemporary "Monocoupe." On the prototype, this was enclosed in a thin drag ring, but later models used a full NACA-type cowl.

One detrimental feature of the original "Dart" was the side-by-side open cockpit. A cockpit of this type produced much more drag than two single cockpits in tandem, and the smaller the airplane, the higher the percentage of the overall drag contributed by the cockpit. Throughout the history of lightplane development there have never been any notably successful small side-by-side two-seaters with open cockpits. Some salvaged their marginal performance by enclosing the cockpits, and this is the route that Mooney took.

The turtledeck was built up to form the rear of a bona fide cabin and the streamlining was further improved by widening the forward fuselage contours to match the new NACA cowl around the engine. The entry and window situation was handled neatly; two sheets of plastic slid in double grooves at the back of the cabin and at the windshield frame. To enter, the plastic on one side was slid up on that side and down on the other to open the side. Stepping into the cabin from the wing was easy, but it was a long step up from the ground to the trailing edge of the wing.

In addition to the prototype, Lambert built four production versions, but did not obtain an Approved Type Certificate (ATC) for them. Instead, they were licensed under the lesser Category 2 Approval of 2-541. A full ATC, No. 674, was obtained by Dart Aircraft in April 1938. This originally covered the Model G with the 90 hp Lambert, but was expanded to include the GK with either the 90 Le Blond or the 90 Ken Royce and the GW with the 90 hp five-cylinder Warner. Some experimental versions were built with 125 and 145 hp Warner engines, but these were never licensed. There was also a Model GK-120 (also referred to as the GR) with a 120 hp Ken Royce.

In 1939, Dart Aircraft was reorganized as the Culver Aircraft Company and the same airplane remained in production as the Culver "Dart." "Dart"

production ended at serial number 50 when the Culver plant moved to Wichita, Kan., and came out with a new Mooney design, the Culver *Cadet*.

However, this was still not the end for the persistent "Dart." The firm of Applegate & Weyant acquired the design rights and put it back in production in 1946 at a new Dart Aircraft Corporation located first in Quincy, Mich., and then in Elkhart, Ind. Relatively minor changes were made, including the flat-six Continental A-100 engine, hinged sides to the cabin, and 6.00 x 6 wheels in place of the old 18 x 8 x 3s. The new "Dart" plant turned out 14 GC models, still under ATC-674, which continued the original serial numbering but were assembled at the Meyers Aircraft plant in Tecumseh, Mich. Applegate & Weyant also made a notable attempt to produce "Dart" kits for home assembly to sell, less engine, for \$1,250, but this scheme did not win FAA approval.

Of the 64 "Darts" known to have been built, 29 still exist today. None are "working" general aviation planes in the usual sense; all are in the hands of appreciative antiquers, who have formed a type-club for "Darts" within the framework of the Antique Airplane Association. Lloyd Washburn, 3958 East Washburn Drive, Port Clinton, O., 43452, is the president, and the author wishes to acknowledge his valuable assistance in the preparation of this article. Lloyd's breakdown on the survivors shows nine flying, 14 in process of rebuilding, four in storage, and two unknown.

It should be mentioned that the AAA's "Type Clubs" are instrumental in getting more orphaned airplanes back in the air than would otherwise be possible. This is due to the members' unselfish exchange of parts, data and know-how within what is effectively a specialized aeronautical cooperative. In the case of the "Dart," this is shown by the fact that modifications have been approved that allow the old "Dart" to use the modern 125 hp Lycoming engine. Orphan engines that were none too reliable even in their heyday are one of the major problems with restored antiques. With a good modern engine in it, the "Dart" does not look like something out of the distant past—it can hold its own right along with the current general aviation types. □

Dart GK SPECIFICATIONS AND PERFORMANCE

Span	29 ft. 6 in.
Length	18 ft. 7 in.
Wing area	145 sq. ft.
Powerplant	Ken Royce 5F, 90 hp @ 2,250 rpm
Empty weight	950 lbs.
Gross weight	1,550 lbs.
High speed	135 mph
Cruise speed	118 mph @ 65% power
Climb	800 ft./min.
Service ceiling	15,000 ft.
Range	550 mi. @ 70% power