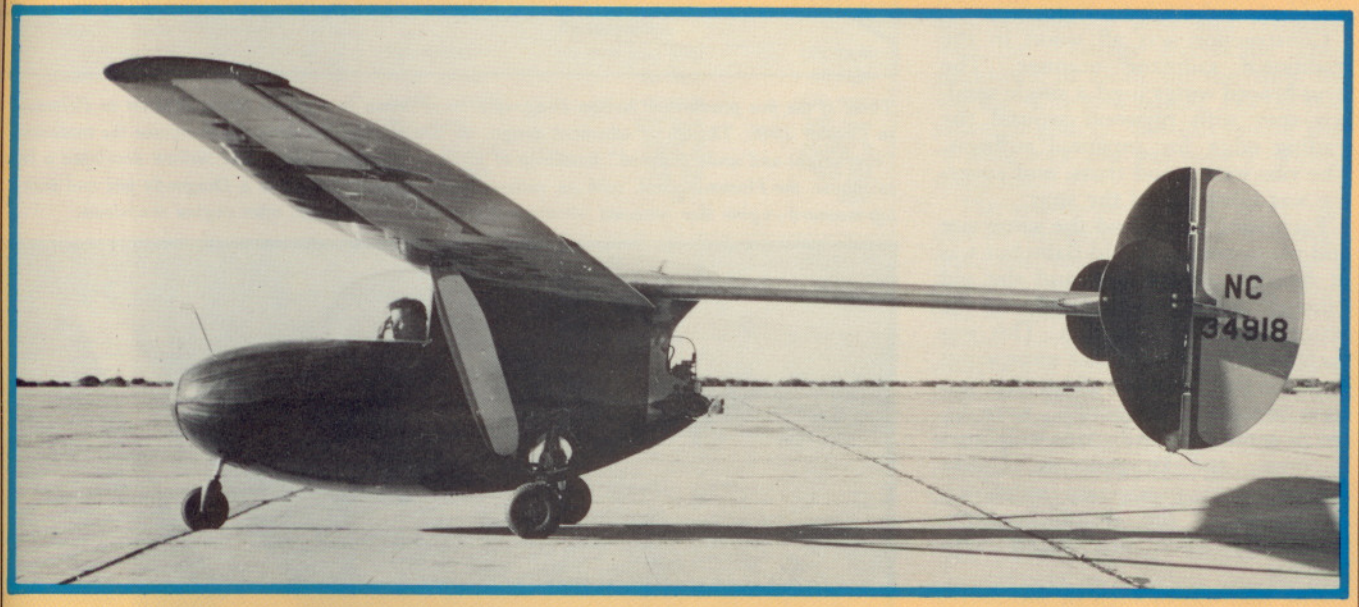
The Nelson Powered Gliders



BY PETER M. BOWERS
AOPA 54408

A major drawback to the soaring movement from the standpoint of the isolated individual is dependence on the help of others for the launch. From the middle 1920's there had been sporadic attempts at developing a self-launching glider, but no one came up with the right combination of airframe, powerplant and performance that would make an acceptable product. Most of them suffered from the double handicap of being an overweight glider and an underpowered airplane.

Basically, power for a glider or sailplane is considered a means of self-launching and occasionally a means of getting back to base when the lift gives out; it is not for cross-country cruising or operation as a low-powered airplane.

An American, the late William Hawley Bowlus, had been active in aviation since before World War I and was an enthusiastic glider pilot who turned a hobby into a career. Shop foreman at Ryan during the building of Lindbergh's *Spirit of St. Louis*, he later introduced Lindy and his wife to soaring. In the late 1930's he had a glider factory in San Fernando, Calif., where he turned out the kit-built Bowlus Baby Albatross, the first American sport sailplane available in quantity.

After selling his factory to another manufacturer in 1944, Bowlus set out to fulfill his 15-year-dream of a practical two-place powered sailplane. It was easy to enlarge the well-proven Baby design to a side-by-side two-seater, which he called the "Bumblebee." The unique pod-and-boom fuselage provided a natural spot for installing an engine without having to displace the people or introduce a ground-clearance problem for the propeller.

The lack of a suitable powerplant had been the major deterrent to developing a good powered glider. Standard lightplane engines were too much (the smallest available in 1945 was the 65-hp Lycoming O-145), and motorcycle engines were too heavy for their power, which was usually inadequate in the first place. Something new had appeared during World War II, however, that opened up new possibilities. This was a light air-cooled two-stroke-cycle engine that was used to power radio-controlled aerial targets for the military. Bowlus took this 20-hp Righter flat-four and put it at the rear of the pod. Adequate ground clearance was assured by use of a retractable tricycle landing gear. The engine could be started on the ground by flipping the prop in the traditional manner, but it could also be started in flight by a pull wire.

While three wheels instead of the traditional one, used by most sail-

Production model of the Nelson Dragonfly. Originally called the Bowlus Bumblebee, this two-seat powered sailplane was a development of the Bowlus Baby Albatross of the late 1930's. The 44-cubic-inch engine is installed at the rear of the pod.

PHOTOGRAPHY FROM THE COLLECTION OF THE AUTHOR

planes, imposed a slight weight penalty, it was a most important utility feature of the new design. Most of the predecessors stuck to traditional glider configuration, with one wingtip on the ground when the ship was at rest. This meant that assistants were still necessary at the launch and that such designs were mostly limited to operation from established gliding sites. The ground-stable Bumblebee kept the wings level, which meant that it could taxi about on the narrow taxiways of close-in airports, since the wings would clear the border lights.

Construction was all wood in the traditional sailplane manner. The strut-braced wings used a single semi-box spar with plywood around the leading edge for torsional stiffness. The ribs were wood truss, and covering was fabric aft of the spar.

Each wing panel had the same size and planform as the old Baby but was of heavier construction and the old "floater" airfoil was replaced with the faster NACA 4415 section. This was such an improvement that some wings built for the powered glider that was soon renamed "Dragonfly" were fitted to some Baby Albatross sailplanes to create the Dragontross. Unlike contemporary production sailplanes, the wings of the Bumblebee-cum-Dragonfly were not fitted with spoilers.

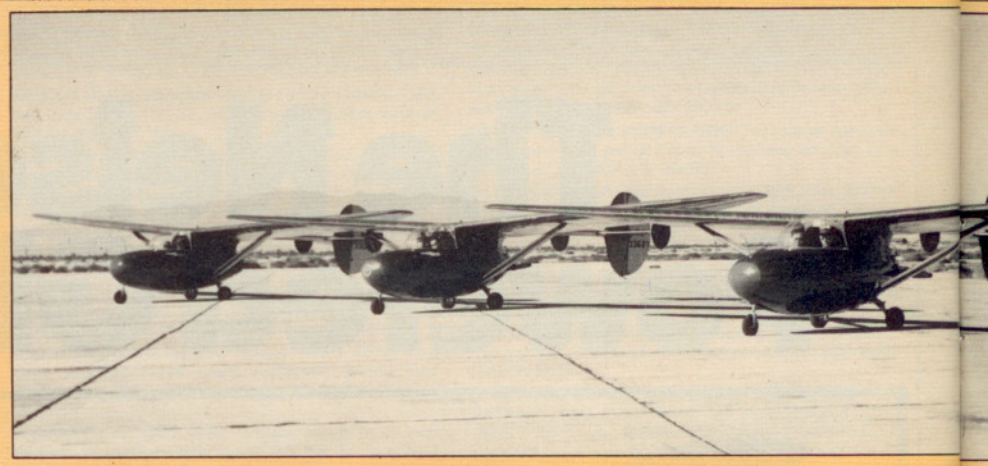
The pod was molded in two halves from mahogany veneer as on the production Babies, and the tail was carried on an aluminum tube adapted from irrigation pipe. A one-piece semi-bubble canopy hinged upward for access to the cockpit. Visibility was superior by contemporary standards but the drag penalty was high.

Bowlus now teamed up with an old friend, Ted Nelson, and they set up the Nelson Aircraft Corp. in San Leandro, Calif., to build and market the new model, now designated as the Nelson BB-1 Dragonfly. The prototype was successful, and various minor improvements were made to the production articles. Unfortunately, these combined to add 100 pounds to the empty weight without an increase in allowable gross. Plans to market the BB-1 in kit form, which had been so successful with the Babies, did not materialize.

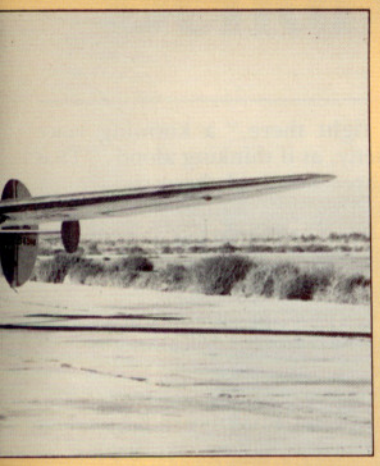
The principal change was the installation of a better engine, the battery-ignition Nelson H-44 (for 44-cubic-inch displacement) built by Nelson as a follow-on to the basic Righter. This could be pushed to 25 hp for takeoff at 3,900 rpm. The later H-49 produced 28 takeoff hp at 4,000 rpm.

Powered gliders were something new to the FAA at the time. They didn't know quite how to classify it. There was talk of creating a whole new category for it, but the Dragonfly was finally certificated as a glider with auxiliary power and received Glider Approved Type Certificate G-19 on April 11, 1947.

However, a lot of restrictions were attached. The ship had to take off with power—it was placarded against airplane, auto and winch tow. Apparently the FAA overlooked shock-cord launching, which was the hardest of all on the airframe but was no longer in common use in the country. Also, there was a minimum crew weight requirement, which often

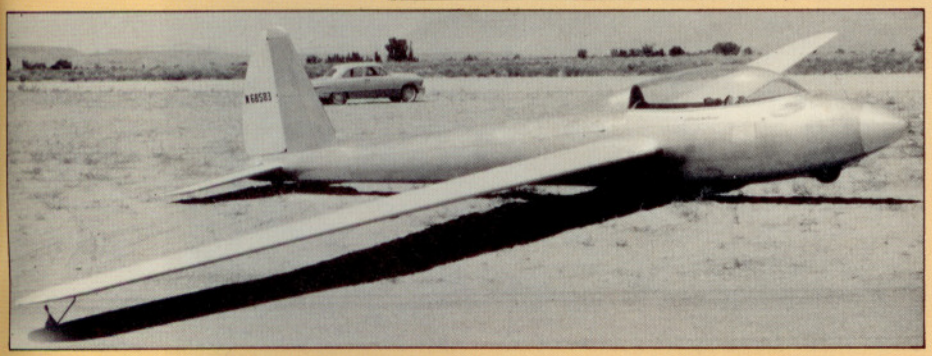


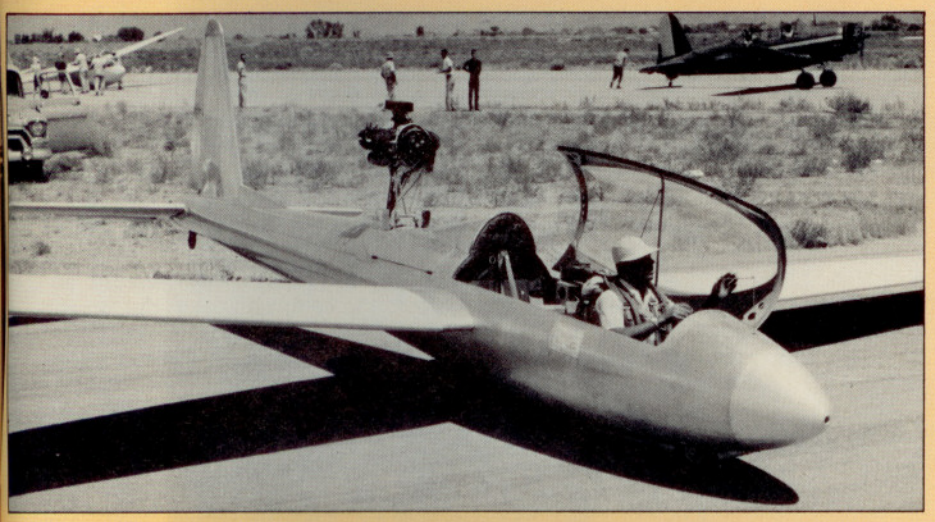
Three of the five production Nelson Dragonflies were shown in a public demonstration in Palmdale, Calif. in October 1946. Though of advanced design, the Dragonflies did not quite overcome the traditional "overweight and underpowered" handicap of previous powered gliders. Ted Nelson developed a better sailplane, the Hummingbird, with an entirely new airframe attached to a Dragonfly pod and with a top-mounted engine that retracted for streamlining into the fuselage, after engine shut-down.



NELSON POWERED GLIDERS

	DRAGONFLY 1946	HUMMINGBIRD 1957
Specifications		
Powerplant	Nelson H-44, 25 hp (T.O.) @ 3,900 rpm	Nelson H-59A, 43 hp (T.O.)
Span	47 ft 4 in	54 ft
Length	20 ft	22 ft
Wing area	169.3 sq ft	175 sq ft
Wing loading	5.5 lb/sq ft	6.5 lb/sq ft
Power loading	37.6 lb/hp	46 lb/hp
Empty weight	515 lb	810 lb
Gorss weight	940 lb	1,150 lb
Performance		
High speed	88 mph (red line)	120 mph
Cruise speed	55 mph	80 mph
Landing speed	40 mph	39 mph
Initial climb	275 fpm	350 fpm
Ceiling (power)	7,000 ft	10,000 ft
Minimum sink	3.9 fps	3.0 fps
Glide ratio	20:1	25:1





A change to tandem seating made a fine sailplane of the Hummingbird, after which it was redesigned in metal. Empty, the nose wheel is off the ground. Rollers under the wingtips permit taxiing with one wing down. A closeup of an occupied Hummingbird shows the side-hinged canopy and the engine extended.

meant that a lightweight pilot flying solo had to carry ballast, a tricky item to keep track of. The only required instrumentation was a tachometer and an airspeed indicator.

In operation, the five production models built were so marginal in take-off and climb, particularly in hot weather, that Nelson converted them all to pure gliders. This, of course, called for lifting of the glider-type launch restrictions but also cut down on the major sales appeal of the design. In later years at least one Dragonfly has been reconverted to power as a historical curiosity.

Since the pioneering Dragonfly didn't have enough performance to satisfy the customers, Nelson, now reorganized as Nelson Specialty Corp., sought to develop a better sailplane. With the assistance of designer Harry Perl, Bowlus having departed, this was started in 1955. A Dragonfly pod was faired into a conventional semi-monocoque plywood fuselage fitted with a set of longer full-cantilever sailplane wings with a Gottingen 549 airfoil. A major change was made to the powerplant installation. A 40-hp (43 hp for takeoff) Nelson H-59A engine was mounted as a pusher above and behind the seats and retracted into the fuselage electrically after shutdown to clean up the ship for soaring. The new model, PG-185 (for powered glider), had 185 square feet of wing area and was named "Hummingbird."

The side-by-side seating, which was nice for sociability and ease of instruction, still made for high drag, so a major change was made to the front end to tandem seating. This aerodynamic refinement made the Hummingbird a better two-seat sailplane than any other then available. One earlier change was a minor setback, however. The landing gear had been changed to two wheels in tandem, with the forward one steerable for taxiing. Unfortunately, this put the wingtips back on the ground. Rollers on the tips still permitted taxiing, but the old clearance problem reappeared.

By the time the Hummingbird was ready for production, Nelson decided that metal, not wood, was the way to go, so the structure was redesigned.

The Hummingbird in its final configuration was a breakthrough design—a fine two-seat sailplane by contemporary standards that also performed well under power. Still, it never got into full production. Only seven were built, one PG-185 and six PG-185B's. All the gadgetry, refinement and the high cost of hand-building in small quantities ran the cost up to $10,000. This pretty well priced it out of the late-50's market, where most of the two-seater requirements were still being met by either war-surplus military models or the postwar Schweizer 2-22 trainer. Nelson sold the Hummingbird design but no production resulted.

There is now a boom in two-seaters, plus wide acceptance of a whole new generation of powered sailplanes, some of which should properly be referred to as soaring airplanes rather than powered gliders. With little more of a change than a modern-technology wing, the Hummingbird could easily find a place in modern soaring if the price could be kept down. □