Proving it can be done legally

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When Bryan Melborn (EAA 716464) and I began this Firefly project last year we had three goals: 1) Build an aircraft that we would enjoy flying; 2) Incorporate new hardware that wasn't available for ultralights in the 1980s; and 3) Comply fully with Part 103. After four months of work we accomplished our goals. This is how we did it.

AIRFRAME

We chose the New Kolb Aircraft Firefly, one of the few kits available that truly fits the weight restrictions of Part 103. Its other advantage is that the Firefly is built like a traditional airplane. The main fuselage is pre-welded at the factory using chromoly aircraft tubing. The wings are all-aluminum ribs mounted on a 5-inch diameter aluminum main spar, and then covered using Poly-Fiber fabric and paint, including a layer of silver primer as an ultraviolet barrier. Almost all other components and hardware are aircraft-grade. These methods and materials give the Firefly its superb flying characteristics as well as its high strength-to-weight ratio.

The airframe was built per plans except for a few changes to accommodate the float attachment. The standard Firefly has a fiberglass nose fairing that streamlines the front of the airplane and houses the instrument panel. We opted to eliminate the fairing both to reduce weight and regain the thrill of wide-open ultralight flight. We also left the fabric covering off the fuselage. At 55 mph the air feels smoother than on the covered version, and we saved about 10 pounds. →

Photos by Helen Melborn

A clean and simple installation of the Rotax 447 engine, showing the hot side here with Jet Hot ceramic coated exhaust pipes.

To save weight, we left off the nose fairing found on most Fireflys, which typically housed the instrument panel and instead added this instrument console. It opened up the view. We also used only a sling seat to save weight.

FUEL SYSTEM

In the past, most ultralights used plastic and rubber components for storage, interconnecting plumbing, and primers in fuel systems. That worked and was light and inexpensive but required constant inspection and frequent replacement of the components. We chose to design a system based on components commonly used on more advanced aircraft. Our fuel tank is a cut-down aluminum dune buggy tank that weighs in at 2.5 pounds. The fuel leaves the tank through a brass finger strainer and connects to an Andair mini gascolator. AN fittings and 3003-0 aluminum tubing carry the fuel to a mini fuel selector. The selector allows fuel to be directed to either an Essex primer or the main fuel feed to the engine. During preflight, fuel can be sampled from the bottom of the gascolator, which is at the lowest part of the system. The ability to drain unwanted water and debris from the fuel system is not common in many ultralights.

Next the fuel selector is moved to the prime position, and the Essex primer can be used to force fuel up to the engine. After priming is complete, the selector is moved to the "on" position and the engine is ready to start. Prior to the fuel getting to the fuel pump it passes through a small inline aluminum filter with a 10-micron stainless steel screen. The new fuel system components added about $800 to the airplane, but annual replacement is eliminated and higher quality fuel to the engine is assured.

INSTRUMENTS AND ELECTRICAL SYSTEM

Because we'd eliminated the nose pod, a small floor-mounted console was fabricated to accommodate the instruments and gauges. We chose a Grand Rapids Technologies engine information system (EIS) because of its small size and low weight. A Winter airspeed indicator and panel-mounted compass complete the instrument group. Because of its location in the top left corner, the compass is unaffected by magnetic interference.

As a special touch we fabricated a pitot tube and static port out of some surplus Russian titanium. In previous aircraft I preferred basic steam gaug-

es, but the EIS was a good choice in this application because it includes all of the basic engine monitors and flight gauges including a fuel level gauge. Everything is powered by a simple Key West regulator, and no battery is required. On the first few test flights, it took a few minutes to get accustomed to the lower position of the instruments and gauges, but the reward of opening up the view was well worth the effort.

AND OTHER STUFF...

We used a standard Rotax 447 with single capacitor discharge ignition (CDI). The 447 offers excellent performance on the Firefly, and because of its high power-to-weight ratio it still allows the Firefly to meet the maximum weight restrictions. A two-blade, 64-inch Warp Drive prop with nickel leading edges completes the power package.

I had been pleased with the aluminum Czech floats we installed on my first Firefly, *Puddle Buster* (see *Sport Pilot*, July 2005). The floats are still available from Sport Aircraft Works for about $3,200. We used the same proven mounting system that was designed for the *Puddle Buster*, available from Custom Air. All of the tubing and hardware in the float-mounting kit is clear anodized for corrosion resistance and permanent beauty.

We used a Ballistic Recovery Systems VLS650 hard pack aircraft parachute. Even though it used up almost all of the 24-pound allowance for safety equipment, it did offer several advantages such as longer repack time and it can be fully exposed to the outside of the aircraft.

Part 103 allows aircraft that weigh less than 254 pounds to have an additional allowance of 60 pounds for floats and 24 pounds for a BRS. That adds up to a total empty weight of 338 pounds. After completing the Firefly we carefully weighed the aircraft and found that it weighed only 328 pounds—almost 10 pounds underweight. That is remarkable because it can be difficult to build an aircraft that even marginally meets the weight limits.

A close-up view of the interface of the main strut to the float. The U-shaped bracked was borrowed from the powered parachute industry. All components are anodized.

The Firefly sits on a custom-built trailer dolly that is easily pulled by a golf cart. It's an easy operation to move the trailer from the hangar to the lake about 100 feet away. The aircraft simply floats off the trailer in about 16 inches of water.

The 5-gallon fuel tank is a cut-down aluminum dune buggy tank. The red device in the fuel line is a 10-micron stainless steel fuel filter.

Bryan Melborn, seated in the Firefly, and Steve Boetto discuss the ultralight's handling characteristics during its first flight tests. The Firefly is offered as a kit by The New Kolb Aircraft Company, London, Kentucky. *www.KolbSport.com*.

FLIGHT REPORT

I have not test flown a new aircraft since about 1985, but because I had a lot more time in *Puddle Buster* than Bryan, I was elected. For me, first flights are a mixture of excitement and concern, but this one went off without a hitch. The Firefly lifted effortlessly off the water and was stable in all three axes. Climb was robust at more than 800 fpm, and roll rate was quick and light. Hands-off level flight was maintained with moderate power settings, and little or no rudder was required in the turns. It has the crisp and snappy feel of a sports car.

The Firefly with floats is a great combination. It handles much like a normal high-wing floatplane except that all of the control forces are much lighter. You fly with your fingers instead of your fist. Step taxi is firm and predictable, and direction is controlled with minimal rudder input. Glassy-water takeoffs can be accomplished in as little as 150 feet by lifting the right float. Moderate pressure on the left rudder is required during takeoff. Without the factory nose fairing to distort the air, the feel of the breeze across your arms and face is soft and comfortable. What a great feeling—I'm back in the 1980s again.

The Andair mini gascolator is shown at the bottom left in this photo. It's the lowest point in the fuel system and where we sample fuel from. The Essex primer and the Andair fuel selector are on panel behind the seat. All three are connected using 3003-0 aluminum tubing and AN fittings.

THE BUILDERS

I started flying back in the early '70s and always wanted to build my own plane. In 1983 I completed a Rutan Long-EZ and flew it for many years. As much fun as the Long-EZ was, I still had the urge for something simpler and lighter with an open feel. I met Homer Kolb at Sun 'n Fun 1985 and liked his simple designs and open cockpits. It would be another 20 years before I would get back to building a Kolb. In 2004 I worked on an amphibious float configuration for Kolb and met Bryan Melborn. In about four months we designed, built, and flew a retract float configuration of our own design and currently hold a patent on it. While showing the amphibious design at EAA AirVenture Oshkosh 2004 I had a chance to examine the factory Firefly and convinced Bryan we should try to fit it with floats without modifying the basic airframe. Six months later we completed the project and displayed the *Puddle Buster* at Sun 'n Fun 2005. The goal of our latest project was to take the *Puddle Buster* one step further and incorporate every custom change we liked and—if possible—reduce weight.

Bryan wanted to fly so badly when he was a kid that he actually jumped off the roof of his house with his mother's bed sheets. After seeing a magazine ad for the Easy Riser, he scraped all of his odd job money together and ordered a kit. He taught himself to fly it as a foot-launched glider, and sometime later he modified it with tri-gear and a 9-hp Chrysler two-stroke engine. From there he went on to build dozens of ultralights and homebuilt experimental aircraft, many of which have been awarded grand champion trophies at AirVenture Oshkosh and Sun 'n Fun. Although Bryan is a skilled pilot and has access to many high-performance certificated and experimental aircraft, he still prefers the simplicity and fun of flying ultralights.

OUR PHILOSOPHY

Building and flying ultralights is something I arrived at after many years of involvement in the sport of amateur aircraft. Bryan started there and has returned to his roots. We are concerned with the decline of activity in this area of aviation and the absence of new designs. The opportunity and freedom that the ultralight category provides is unmatched anywhere in the world. We hope that by demonstrating what can be done within the rules of Part 103 we can somehow inspire and motivate others to follow.