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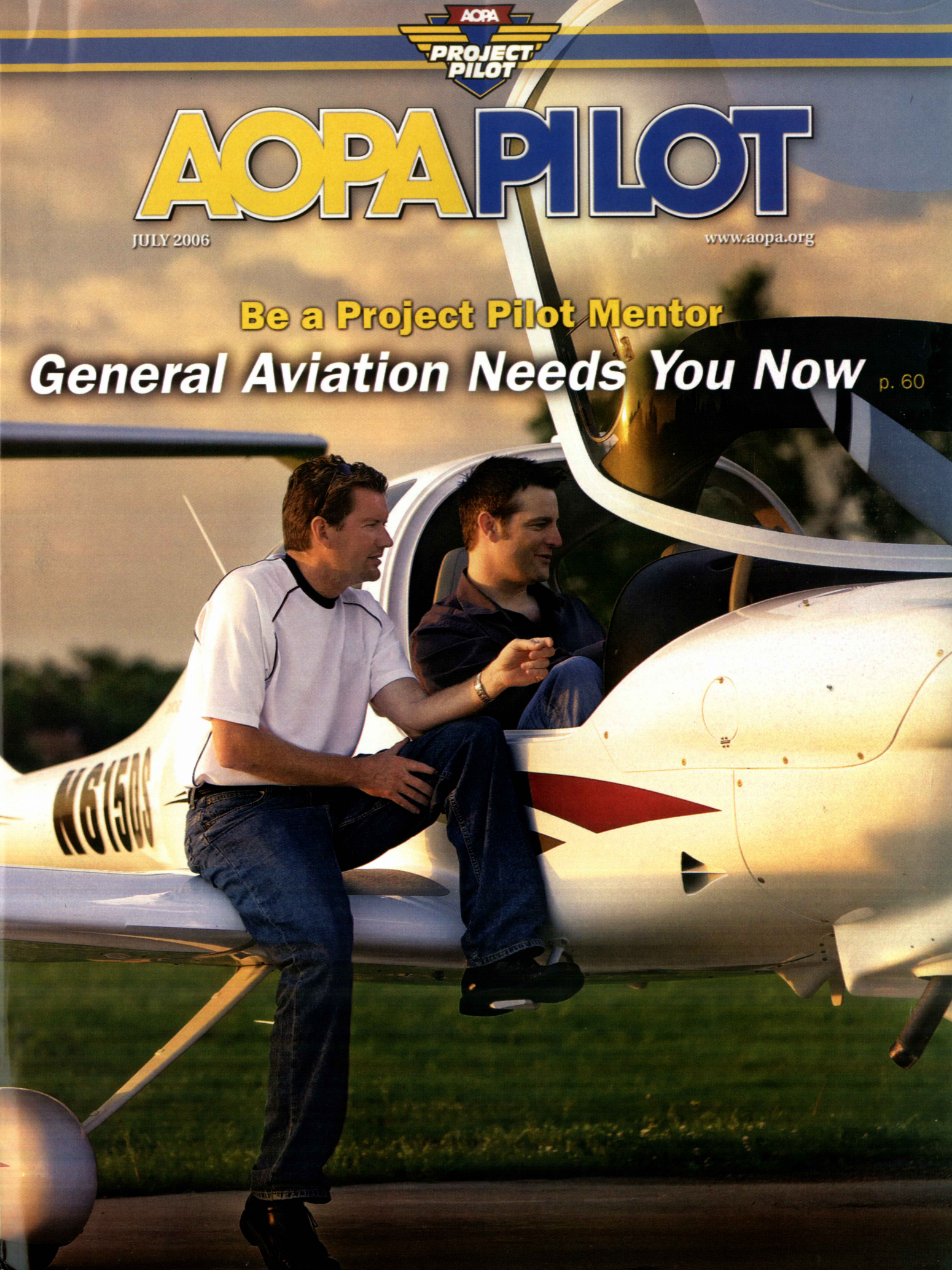

The Liberty challenge

Liberty Aerospace dares us to test operating costs

BY ALTON K. MARSH

Liberty Aerospace officials once marketed their XL2 as a sporty cross-country airplane. They have now recast its message as an economical airplane based on the company's claims for operating costs (called "rebranding" in the marketing game). Liberty officials challenged *AOPA Pilot* to test their claims. OK, we said, but we're going to have fun with it.

A lot has changed at Liberty Aerospace, headquartered at Melbourne International Airport, Florida, since *AOPA Pilot's* last report on the XL2 (see "Liberty XL2: Give Me Liberty," July 2004 *Pilot*). For one thing, former two-term congressman and Internet service pioneer Keith Markley has taken over as director of marketing. He traveled to AOPA headquarters in Frederick, Maryland, to issue the challenge. It wasn't quite throwing down the gauntlet—more like throwing down the wrench.

There is little fleet experience on which to base operating costs, since only seven aircraft have been delivered at this writing, although 102 have been ordered (a Florida flight school will soon lease 35 of those). So how could it be done? I could witness an annual inspection (sort of like watching grass grow), fly an XL2 for an hour to test fuel consumption, and witness the company's claim that the wings can be removed in 15 minutes. If removing them is part of the annual inspection, they can be removed quickly, and the owner saves money.

No, I didn't actually measure the fuel quantities with the turkey baster you see in the photograph, but it made a good shot and photographer Winston Luzier especially liked the bubbles. The use of a stopwatch gets closer to the truth, but not all the way: The annual inspection was actually timed, but not by that Target stop watch.

Then came my effort to spice things up, to remove the grass-growing factor. Why not compare the XL2 with another aircraft and perform the annual inspections side by side? A race! Markley liked the idea because he knew the Liberty would win. We'd need an independent maintenance shop that was willing to cooperate, though, one willing to abandon profit for two days, except for the two annuals paid for by the aircraft owners.

Luckily the Florida Institute of Technology (FIT) College of Aeronautics, with a flight school and maintenance hangar across the airport at Melbourne, stepped in at that point to provide adult supervision. College of Aeronautics Dean Michael K. Karim suggested a few changes. A late-model Cessna 172 operated by FIT and needing an annual inspection could be used, but not as a competing aircraft. Rather, the Cessna was simply there to represent a different philosophy toward maintenance.

FIT would benefit as well, since it is always in the market for trainers, and it would get an unusually close look at the Liberty.

PHOTOGRAPHY BY WINSTON LUZIER

This is the actual scene (above) at the Florida Institute of Technology (FIT) College of Aeronautics of *Pilot's* annual-inspection face-off between a new Liberty XL2 and a reasonably new Cessna 172. Out of sight of the studious FIT officials, the author (right) uses a less-than-scientific turkey baster to symbolize exact fuel measurements after a test flight. It's the thought that counts.

Karim suggested that a two-member team consisting of one FIT mechanic familiar with that 172 (in leaseback to FIT) and one Liberty Aerospace mechanic perform each inspection. There would be no race. FIT officials said they would expect an aircraft like a Cessna 172 to take 25 hours, while Liberty claimed 10 hours. FIT Aircraft Maintenance Manager Dave Fuchs would referee and time the actual inspections, but repairs or problems found would not be included. FIT would have no role in fuel-consumption testing, other than to refuel the aircraft. I thought it best not to mention the turkey baster.

The results

Two years ago Liberty Aerospace officials bravely posted their estimates of operating costs online (www.libertyaircraft.com) for all to see. Obviously costs since then have risen; fuel costs are up and hourly maintenance costs have grown. That said, in 2004 the company predicted that an individual owner flying a Liberty XL2 for 100 hours a year can operate the aircraft for $56.15 an hour. As mentioned, the estimate predicted that an annual inspection would take 10 hours at a shop charging $50 an hour, but today FIT charges $75 per hour.

The two annual inspections were done by mechanics Rod Kern of FIT and Phil Lindstrand of Liberty Aerospace. Kern had never worked on a Liberty XL2, and Lindstrand had not worked on a Cessna 172 in 17 years. Prior to joining Liberty Aerospace, Lindstrand worked at Kennedy Space Center on Titan rockets. Seven years before going to Kennedy Space Center he was with FIT working on its fleet of Piper trainers.

Fuchs kept meticulous notes and personally checked on the progress of the inspections. The Cessna required 21 hours and 20 minutes to complete (far fewer than FIT's prediction) and the Liberty XL2 required 13 hours and 40 minutes, more than the Liberty prediction. The total Cessna bill, counting only routine annual inspection items, was $1,597, and that for the Liberty was $1,020.

Some may note that a 172 is larger and therefore, it would naturally take longer. A point well taken, but for discussion, let's say we somehow could increase the size of the XL2 to match the dimensions of the Cessna. The XL2 would still have fewer inspection ports. The Cessna has 19 inspection ports held on by a total of 157 time-consuming screws, and, once all those coverings are off, the Cessna has control cables that are more time consuming to inspect than the pushrods used to operate the Liberty flight controls. (Only the bolts on the ends of the pushrods have to be inspected.) If the mechanic suspects fuel leakage, then six more inspection panels on top of the Cessna wings with 19 screws each must be removed. Four of the inspection panels beneath the Cessna wing leading edges require first removing screws from the cuffs at the top of the wing struts. By contrast, the XL2 has only one inspection port per wing and one in the tail. Additionally, most of the systems that need to be inspected can be examined by removing a huge belly panel.

The XL2 had a disadvantage in that one mechanic had never seen the aircraft before, though the other at least had past experience with a 172. It re-

quired extra time while Lindstrand explained the new procedures to Kern. "A second inspection would be much closer to the 10-hour prediction made by Liberty," Fuchs predicted.

Aside from the time it took to perform the annuals, the mechanics' opinion of the aircraft was equally important. Kern said he was impressed by the Liberty XL2. "It was designed with the mechanic in mind," he said. "Other aircraft have areas that are nearly inaccessible to the mechanic." Lindstrand had stronger words for the Cessna, saying the difference in the two maintenance approaches was "night and day."

Were both wings of the Liberty XL2 pulled in 15 minutes? Almost. (The Cessna wings are not removed during an annual inspection.) Although the two-step procedure is simple—an electric motor mounted in the XL2 simultaneously withdraws three large pins and two people slide the wing out—there is also preparation time, such as removing fairings. Both wings were off in about 25 minutes. Removing the wings allows for the aircraft to be trailered, saving hangar costs. Reinstalling the wings wasn't quite as fast because the right one became finicky and needed additional time.

The fuel-burn test

Liberty's Scott Lurken, the director of flight operations who provides demonstration flights for customers, suggested we do two one-hour flights. The first would be conducted as an owner might at higher power when flying cross-country. The second would be a typical training flight directed by Lurken, a former FlightSafety International instructor, using lower power settings typical of flight schools.

> "It [the Liberty XL2] was designed with the mechanic in mind."
>
> —*Rod Kern, FIT*

Liberty's estimate published online for an owner-flown aircraft was five gallons per hour; Lurken estimated a flight school might expect 4.5 gallons per hour.

For the owner-operated test I topped off and flew with Lurken on a round-robin flight from Melbourne to Titusville, a route featuring views of the huge Vehicle Assembly Building at Kennedy Space Center.

After reaching 2,500 feet (obviously fuel consumption would be lower at a higher altitude) I pulled the single engine control back to 75-percent power as indicated on a display screen. It was a 68-degree Fahrenheit day and no, there was no particular reason for picking 2,500 feet: It was serendipitous. The 125-horsepower Continental IOF-240B engine is equipped with FADEC (full authority digital engine control), the technology that gives Liberty officials the confidence to claim low fuel consumption. After a few minutes Lurken noted that the FADEC computers were using 2,750 rpm out of 2,800 available to maintain 75-percent power and asked if most owners would run their engine that hard. I agreed they would not, and brought the power back to 65 percent, a setting that reduced rpm to 2,650 for the duration of the flight.

The wing pull took 25 minutes for both, even with the help of Liberty's Keith Markley (brown jacket) and Phil Lindstrand (right) and FIT Cessna 172 expert Rod Kern. An electric motor drives the wing bolts (below, right).

At that power setting I saw groundspeeds of 111 to 115 knots and had a 90-degree, 18-knot crosswind along the route. No true airspeed test was done because it would have interrupted the cross-country test. In the past I have tested the Liberty XL2 and found a max true airspeed of 122 knots. Using Lurken's time-calibrated flight-instructor brain, we returned to Melbourne when he said to and the Hobbs meter read one hour as we reached the fuel truck on the FIT ramp. The top-off required 6.1 gallons, a gallon more than predicted.

After refueling we took off on a typical training flight. I used power settings suggested by Lurken because in real life, that's what a student would do. Power settings changed constantly, of course, as Lurken called for slow flight, steep turns, stalls, and a descent to a lower altitude for S-turns along a canal. Naturally, stall recoveries involved full power. Then Lurken's CFI brain alarm went off and it was back to Melbourne for a touch-and-go landing followed by a full-stop landing. Precisely one hour had again elapsed, and it took 5.1 gallons to refill the tank. To be fair, the fuel-truck meter was halfway between 5.0 and 5.1. That's a little higher than Lurken had predicted, but not so much that he will get arrested by the fuel-consumption police.

It isn't just fuel consumption that keeps engine operating costs low. The overhaul cost of a non-FADEC IO-240 engine is $21,200, but because Continental is confident the FADEC system will reduce wear and prevent owner abuse that might come from improper leaning, the overhaul cost of the IOF-240 (F for FADEC) engine is $15,400, not including labor. (Liberty had estimated on its Web site that the overhaul cost would be $16,854 not counting labor, so the actual cost today is lower than predicted.) The time between overhauls for the IOF-240 is currently 2,000 hours, but Continental hopes to increase that amount.

The engine uses two computers, each one equipped with redundant processors, called FADEC PWR A and FADEC PWR B. If the A electronic control unit made by Aerosance fails, the B unit takes over in a millisecond. The engine keeps running. Yes, if both A and B fail, the engine quits, but how many times has the electronic ignition in your car suddenly quit? It should be pointed out that if both magnetos used in today's aircraft fail, the engine also quits. It seems unlikely that both control unit A and B would fail. That's because each control unit has two independent FADEC systems, A and B. FADEC A is powered by the main bus (which also provides power for starting and includes the alternator in its circuit). FADEC B is powered by a backup battery, recharged by the alternator, and is isolated from accessory loads such as avionics and lights.

Liberty's Phil Lindstrand re-torques and re-wires the bolts on the composite propeller of the Liberty XL2, something the Cessna 172's metal propeller does not require.

The Liberty engine has neither magnetos nor a vacuum system, since gyros are electrically driven, and therefore, the aircraft gained a time advantage over the Cessna during the annual inspection. That's because magnetos have to be inspected and their timing checked, and the vacuum system has to have a new filter installed. The FADEC control units are self-checking and require no inspection time during an annual.

Additional checks

Another important aspect of ownership is the cost of parts, but Liberty officials do not plan to stock parts. Things like tires, brakes, and batteries will be purchased from maintenance shops at the usual rates. I did ask what a wing might cost, in case an aircraft is damaged by a storm. Liberty officials had never fielded that question before, but decided that painted and installed, the total cost of a single wing replacement will not exceed $10,000. A new stabilator will not exceed $3,000, also painted and installed.

There was one more thing I could check, and that was to call the AOPA Insurance Agency to see what a typical rate might be for a pilot with 1,000 total hours and an instrument rating. Liberty used those total flying hours and rating qualifications to come up with an estimate two years ago of $1,815 per year, which was accurate at the time it was predicted. However, a recent check brought a general quote from AOPA Insurance Agency of $2,100 per year (for a hangared aircraft).

What does all this say for Liberty's original operating-cost estimate of $56.15 per hour (including gas, oil, maintenance, typical parts, insurance, and an engine replacement fund) if the pilot flies 100 hours per year? Factoring what I found into the original Liberty estimates of two years ago, the hourly operating cost of an XL2 is getting close to $70 an hour. By comparison, the current rental rate for an older and slower Cessna 152 at an FBO near AOPA headquarters in Maryland is $85 an hour.

How does it fly?

The flight report was included in the July 2004 article and little has changed. I found I still enjoy flying it. Increasingly, castering nosewheels as employed on the Liberty are becoming common on new aircraft, proof of widening market acceptance. It's the same story with the stick used on the XL2. Other certified aircraft have control sticks, as do many of the new light sport aircraft emerging on the market. (All orders to date have been for the IFR-certified XL2.)

Finger brakes, operated by two levers on a console between the seats, are less common. I found them a little awkward as I taxied two years ago and had the same impression this year, but ask new student pilots what they think of toe brakes, and they'll say the same thing. The brakes on the XL2 require a hefty pull; a lever in front of the fingertip controls is raised to lock the brakes for the engine runup. I had to learn to trust the brake lock during runups.

Lurken was asked why the Liberty has a castering nosewheel and fingertip brakes: "To be inexpensive, these aircraft must not be complex." Most Liberty aircraft go out the door at $150,000.

Excellent stability keeps the pilot workload low. I made a point on our second flight of leaving my left hand off the stick for several minutes, and using gentle rudder action to guide the aircraft to the practice area. The aircraft required little attention. Procedures are simple as well. There is no descent checklist because there is nothing to do. The after-takeoff and before-landing checklists consist of a reminder about flaps.

Visibility is outstanding, something that is extremely important at a busy flight school. The XL2 has two gullwing doors, and pilots experienced with such doors and now reading this are thinking, "Wind!" But on the two days I flew there were steady 12- to 15-knot winds, yet there was never any concern that a door might get damaged while entering or exiting the aircraft. A hydraulic cylinder and rugged door construction ensure that the wind can't suddenly rip the door out of the pilot's hand and bend its hinges.

A Liberty manufacturing update

What has changed since *AOPA Pilot's* 2004 article?

A factory has been set up in a warehouse on the Melbourne airport. The company once received carbon-fiber fuselages from Slingsby in England, but now they are made in-house. (The metal wings, ailerons, flaps, rudder, and stabilator are made in Romania.) The carbon-fiber process Liberty uses is called a "vacuum bag and oven forming system," and that means strips of carbon fiber are laid into a form and held there by vacuum pressure while a huge oven cures it into a solid part. "The pronounced edges that we have are very difficult [for other companies] to do, and we're pretty proud of it," said Production Manager Randy Owens. "I've done military products at other companies in the past, and we were never able to pull this off. We never got the definition (sharp angles)."

While I reported that the company was committed two years ago to reducing the weight and reaching a 588-pound useful load, that goal has not been reached. The aircraft weight has been reduced by nearly 70 pounds, partly by eliminating the use of larger flush rivets and going to thinner metal in the wing. There is a gross-weight-increase program planned with a target of 1,740 pounds, and that should meet or exceed the goal. The current maximum gross weight is 1,653 pounds.

Folding wings were to be available as an option, allowing owners to tow their airplanes home and avoid hangar fees. However, the certification program would have been too expensive, given that the FAA indicated that it would take a long, and therefore expensive, look at the idea. Folding wings could be more easily certified in Europe. The aircraft is not certified yet in Europe.

The airframe is still restricted to a life limit of only 225 hours, but that began to change in June when an aircraft test article was placed on a fatigue-testing machine at Wichita State University in Wichita. It will shake 24 hours a day, seven days a week. By the end of June, Liberty officials predicted, the life limit would increase by 1,500 hours a month and grow at that rate until 25,000 hours is reached. The goal I reported two years ago was 15,000 hours.

A tiny liquid-crystal-display screen used to indicate flap position would not work below 14 degrees Fahrenheit, so the operation of the entire aircraft was prohibited below that temperature. The flap indicator system now uses lights and the restriction has been lifted.

Liberty officials are looking at glass-cockpit options for the XL2.

Speeds faster than 130 knots indicated airspeed when operating at 80-percent power have been seen by Liberty factory pilots. While there are speed differences among the first aircraft emerging from the factory, it's a good bet that all are economical to operate—we've got the data. AOPA

i Links to additional information about the Liberty XL2 may be found on AOPA Online (www.aopa.org/pilot/links.shtml).

Samantha Jay (background), team leader for the lower half of the Liberty fuselage, prepares a carbon fiber shell for fittings.

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