VOODOO: 550-MPH EXPERIMENTAL

KITPLANES®

YOUR HOMEBUILT AIRCRAFT AUTHORITY

CubCrafters EX-3/FX-3

Another Better Cub!

ROTAX 915 iS
Rotax Raises the Bar

RV-8 ON ICE
How Ice Hurts Performance

CHOOSING AN ELT
Which One's Right for You?

JULY 2018
www.kitplanes.com

FLIGHT REVIEW

CubCrafters EX-3/FX-3

Another better Cub!

BY PAUL DYE

When CubCrafters started out many years ago, their intent was to build a better Cub, a daunting challenge when you think about the fact that this ubiquitous airplane is known the world over as both a workhorse and a fun machine to fly. Cubs have explored the far reaches of the globe and brought their pilots back so they can tell the stories—how can they get any better?

The answer is that they can be made lighter to give them better performance, aerodynamic mods can make them handle better, and modern construction techniques can make them easier to build and maintain. The end result is a modernized version of the venerable machine that the public associates universally with "light airplanes."

Not only did CubCrafters redesign (and redefine) the Cub, they took a look at the business of producing airplanes and turned that on its ear as well. This single company produces Part 23 certified machines, ASTM-certified Special Light Sport aircraft, kits for Experimental Light Sports, and kits for the E/A-B market. And now they are deeply involved in a factory-assist program that is similar—but different—to what other companies have pioneered. They have their fingers in almost every niche of the light-plane market, and their sales reflect that, with delivery slots for finished aircraft pre-sold into 2019.

It's an exciting time to visit CubCrafters' facility in Yakima, Washington, and we did so early this

Photos: Chris Cram (courtesy of CubCrafters) and Paul Dye

year to sample their latest design, available as either a complete kit (the EX-3) delivered to your workshop, or as a factory-assisted build (the FX-3). Either way, the customer is part of the build in varying degrees, and either way, you end up with one great flying machine.

What's New

The EX/FX is the next evolution of the CubCrafters line, borrowing from all of the previous models, and particularly from lessons learned with the XCub. Powered by CubCrafters' proprietary CC363i engine and a constant-speed prop, the airplane has tremendous performance due to power, aerodynamics, and light weight.

Let's start with power. A panel of CubCrafters experts sat down and asked how they could do better than the traditional IO-340 that they have been using on previous versions. They added features they wanted such as tapered-barrel Millennium cylinders, a counterweighted crankshaft to better absorb the power pulses from the 9.0:1 compression, and roller tappets. They decided to use the Silver Hawk EX fuel injection system, but are sticking with the dual Light Speed electronic ignitions they have been using for years. Adding a special cold-air sump fabricated in house and a flow-bench engineered induction system for better breathing gives them 186 hp to deliver to the Hartzell Trailblazer prop—a constant-speed, blended-airfoil scimitar measuring 86 inches in diameter. The front end of this airplane looks and means business.

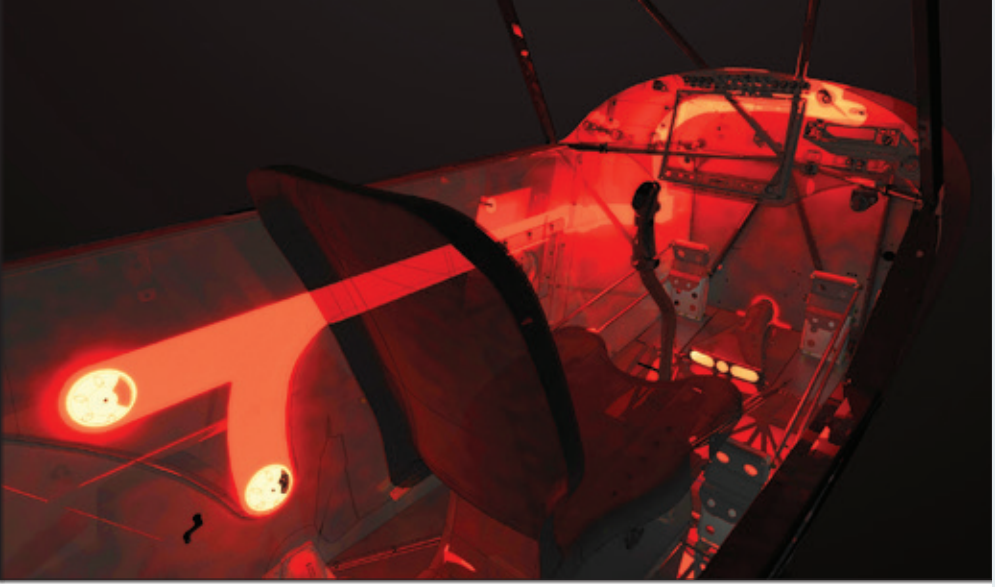
Large cooling gills have been tailored to optimize cooling flow through the cowling.

Covering up all that power is almost a shame, but CubCrafters did it with a composite cowling that minimizes cooling drag while maximizing cooling. And if you are used to the view out the front of a Super Cub, be prepared for a surprise—the tapering cowling provides an excellent view over the nose.

Moving back into the airframe, the EX/FX is now rated for a gross weight of 2000 pounds. CubCrafters president Randy Lervold explained that they have been holding the gross weight at the old standard of 1850 pounds for years because they have managed to build an airplane with an empty weight several hundred pounds lighter than legacy Cubs, making the useful load that much higher. But pilots are pilots (especially bush pilots), and they always want more—so upping the gross weight now gives a significant boost to an already boosted useful load. The structure was there, and where it wasn't, they beefed it up with little addition of weight. The EX/FX was designed to Part 23 standards, just like the XCub, so there is nothing being overly stressed.

The EX/FX also borrows from the XCub when it comes to flight controls. Pilots liked the longer stick on the XCub, but engineering analysis showed that in order to use the longer stick, other elements of the flight control system needed beefing up because more leverage means more force can be applied by the pilot. We found the stick geometry to be very natural—enough stick length to get our hand above the legs, but not so high that you couldn't rest your arm on your leg to maintain smooth control. The EX/FX uses cables for aileron control instead of the pushrods of the XCub, but we didn't find that we could actually tell the difference.

Finally, it might seem to be a trivial improvement to many, but a lot of thought went into the new heater system,



The cabin heat flows from multiple ducts to provide hot air to both pilot and passenger, as well as the windshield defroster.

CUBCRAFTERS EX-3/FX-3

Kit price	$87,000
Estimated completed price	$179,030 (Includes CC363i engine [$39,990], firewall-forward kit [$13,990], Trailblazer prop [$18,060], and World VFR panel [$19,990])
Estimated build time	800-1000 hours
Number flying (at press time)	1
Powerplant	CubCrafters CC363i, 186 hp @ 2700 rpm
Propeller	Hartzell Trailblazer, 2-blade, constant-speed

AIRFRAME

Wingspan	34 ft 4 in
Wing loading	11.44 lb/sq. ft
Fuel capacity	44 gal
Maximum gross weight	2000 lb
Typical empty weight	1060 lb
Typical useful load	940 lb
Full-fuel payload	676 lb
Seating capacity	2
Cabin width	30 in
Forward baggage capacity	100 lb
Aft baggage capacity	60 lb

PERFORMANCE

Cruise speed	117 kt
Maximum rate of climb	2400 fpm
Stall speed (landing configuration)	30 kt
Stall speed (clean)	37 kt
Takeoff distance (to 50 ft agl)	90 ft
Landing distance (from 50 ft agl)	155 ft

Specifications and pricing provided by the manufacturer.

and it *does* make a difference if you fly in cold climates. It's no secret that most light aircraft have poor cabin heat from a single hole in the firewall and a heater muff around the exhaust pipes. It's even worse in most tandem aircraft for the rear seat occupant—in short, they probably need to dress warm. But in the EX/FX, extra attention was paid to maximize airflow and heat transfer into the cabin. Heat ducts flow that air to both the front and rear seats (Yes, this Cub has rear-seat heat!), and even to a defroster when needed. The difference is quite noticeable. We flew the airplane on a cold winter day over the Cascade Mountains and stayed toasty warm the entire time. CubCrafters has always been good with cabin amenities, and they kept that reputation going with the EX/FX.

With the new gross weight of 2000 pounds and an empty weight of 1023, the useful load of 977 pounds is astounding for a Cub. Forty-four gallons of fuel can be absorbed easily and still leaves 713 pounds for pilot, passenger, and cargo. Unless you're planning on carrying an elk, it's going to be hard to overload this machine. And with a cruise speed of 135 mph, you can carry that load a reasonable distance without having to plan overnight stops.

Flying the FX-3

We showed up at CubCrafters' door on a clear winter day in February, and the brand-new factory demonstrator was waiting for us, full of fuel and sniffing the sky as if to say, "Come on—let's not waste the day!" CubCrafters president, Randy Lervold, gave us the briefing on the upgrades and differences between the -3 and the earlier models, but it was clear he wanted to get in the air as well. So, in short order, we strapped in to the comfortable cockpit and fired up the big fuel-injected CC363i. The fuel tanks in the high wing are gravity feed, so no boost pump was required; we just pushed in the mixture, cracked the throttle, and hit the starter. The electronic ignitions fired right off, and the airplane was ready to go.

The visibility over the nose is about as good as it gets in a Cub. You can easily see to taxi, and even when following closely behind another Cub for a later

Two knobs direct heated air in abundance to the passenger and/or the defroster.

The new heat duct between the pilot's legs is very effective—even in a mountain winter.

photo mission, we felt none of the blindness we remember from our old J-3 days. Sitting in the front seat helps. Run-up is quick and straightforward, checking the dual Light Speed ignitions and the big constant-speed Hartzell prop. Then it was on to the runway, pulling one notch of flaps, adding power, lifting the tail—and flying away...all in about the time it took for you to read this sentence.

To say that the initial climb is spectacular is an understatement. The airplane simply levitates away from the earth, and pulling back to make the climb steeper is both comfortable—as it feels very solid—and a little frightening. There is no substitute for power!

Don't let that impish grin fool you—this machine is all business!

The airplane feels stable at low speeds with steep banks, with little nibbling at the stall, as you'd expect with non-STOL-ish airplanes. Later in the flight, we added flaps and went to full throttle, then hauled back to a rocket-like attitude for an approach to a power-on stall that had us almost lying on our backs. This rock-solid feel at low speeds contributes to the fun you'll have maneuvering around trees on final approach to a gravel bar or short dirt strip. It's a confidence builder.

As we climbed southward out of Yakima, with a stiff wind blowing out of the north, we crossed the nearby ridgeline that looms in a pilot's face with no difficulty. As we rolled into some progressively steeper turns, the improved aileron design that appeared on the XCub showed once again how CubCrafters has tailored the design through careful flight testing to make an airplane that is simply delightful. Yes, it's still a Cub, and it's not going to do an aileron roll in a couple of seconds like your Pitts. But compared to a genuine original Cub (J-3 or Super, take your pick), the FX-3 is quick and responsive. It enters and exits a roll rate crisply, making quick maneuvers easy to initiate and formation flight fun.

One of the most noticeable things in turning flight is the low nose. The cowl slopes away from the pilot in a way that will have you climbing in turns if you don't think about it. In most "Cub-alikes," you put the cowling close to the horizon in a turn, but in the FX-3, you'll have to put it significantly below. This means better visibility in turns, as well as in climb. It's easy to get used to—and enjoy—but it's something for which you'll want to adjust.

Stalls were a non-event, power off. There was little break in the clean stall and no tendency to roll off to either side. With flaps extended, the break was positive—about what you'd want for teaching people stalls—with positive roll and yaw control throughout. This is a well-engineered and tailored machine.

After getting the feel of the plane, we headed over to a short grass strip in the farmland south of Yakima for a few

Amateur, Assisted, or Pro?

CubCrafters has taken builder assist and turned it around—but is it legal? The answer is an unequivocal yes, and they have worked closely with the FAA to make sure this is the case. CubCrafters is one of the few companies that sells certified Part 23 aircraft, ASTM standard LSA aircraft, and Experimental kits, so they are very aware of staying within the regulations for each type.

In traditional homebuilding, an Experimental/Amateur-Built aircraft is put together from plans, parts, or a kit in someone's workshop, and it is allowed to be licensed if the builder performed the "major portion" of the build for the purposes of education or recreation. The point of this rule is to prohibit individuals or companies from producing aircraft without meeting certification criteria set up by the FAA in Part 23. Such certification is expensive and time consuming—hence the Experimental category and the kit market.

Many people want aircraft that can only be had in the experimental world, either because of performance, cost, or equipment capabilities. But, they may not have the time, skills, or dedication to put one together from start to finish by themselves. One way for them to get such an airplane is to buy one on the resale market, and this is becoming more common as builders age out of their flying days and look to find good homes for their machines. There's nothing illegal or problematic about this. The airplanes were still built for education and recreation, and nothing stops their resale.

Enter, however, the "pro builder"—someone who offers to build you a custom airplane for a price. This is against the rules, but it can be hard to figure out where to draw the line. Perhaps an individual loves building so much that they just keep building and selling and building and selling. Without peering into their mind, it can be hard to tell if they are doing this as a business or as a chain hobby. There are blatant cases of pro building, but many others that live in the shadows.

There are also manufacturers that see a need to help potential builders climb the often-daunting peak of building an airplane.

Billet-machined aileron and flap hinges tell you that this is not one of old Mr. Piper's Cubs.

Gap seals improve elevator effectiveness—important for slow flight and short takeoffs and landings.

landings and takeoffs. One notch on downwind, two notches on base, and an approach speed down between 50 and 60 mph was comfortable and natural. There was plenty of power to adjust approach angle radically if required—and frankly, you could "blow" the tail up or down with the slipstream for an added measure of control. There was plenty of elevator in the flare for a good three-point. Wheel landings were a piece of cake, and the hardest thing is to make yourself stop doing circuits; they are just that much fun!

We practiced Lervold's recommended short-field takeoff technique a couple of times. Two notches of flaps, a touch of back pressure on the stick, add full power, and release the brakes. You're flying off in a three-point attitude in a plane length or two (OK, maybe three; we didn't measure). If we'd had any headwind, we'd have probably hovered off like a helicopter. Power and a great wing, coupled with good controls, make this stuff easy.

A good test of handling qualities for any airplane is formation flying, and on our photo mission, Lervold gave me the airplane to fly solo while he took command of the photo ship (another Carbon Cub, of course). Flying a new ship in formation is always interesting, but I found the airplane to be quick and responsive, and easy to put anywhere I wanted. The constant-speed prop allows for good braking in an overshoot, and there was plenty of rudder to steer the nose in and out. Overall, the airplane was a delight in formation and handled like a much faster and more responsive airplane than any Cub-like plane I have flown.

As we returned to Yakima's 7000-foot towered runway later in the day, we did a formation landing. As Lervold touched down in a Carbon Cub, and I was approaching the threshold in the FX-3, an Alaskan Airways Dash 8 called for takeoff clearance. The tower asked me to expedite, and though I was already nearly at running speed, I added a little power in the wheel landing. Lervold later commented how

These companies want to do as much as is legally allowed to make that happen. Enter builder assist. Probably the most famous of these programs is the Glasair Two Weeks to Taxi method of building a Sportsman: The builder shows up for an intense two-week period and "builds" their airplane with the assistance of factory support technicians.

The FAA provides a checklist that is used to assure that the major portion of an airplane is built by amateurs (for the purpose of education and recreation). It is a tally sheet that lists the fabrication and assembly tasks involved in building an airplane, and in the simplest terms, it must be completed so that amateur builders have performed 51% of the tasks. Which specific tasks are not important—what counts is the percentage completed by amateur builders and the percentage done for them by professionals.

In traditional builder assist programs, the builder performs a large number of assembly tasks using parts that have been fabricated by the factory. CubCrafters' program has turned that around. They place their emphasis on fabrication, rather than assembly. This means that the builder shows up for a week of intense fabrication work under the tutelage of factory technicians. In that week, they fabricate enough of their parts to fulfill the majority of the 51% rule. They then go home and their parts are kept in quarantine (so to speak) until the factory has time to assemble them into an airplane. Finally, the builder comes back for a couple of days to help with final assembly (to finish the 51%), and then they can either fly their own test program, or the factory pilots can do it for them. In these cases, they return again to pick up the completed airplane.

It's non-traditional, but within the lines drawn by the FAA. It allows ownership of an E/A-B aircraft by folks who don't have time to do it the traditional way—but want to stay within the rules.

—P.D.

nicely I lifted off and flew just inches above the runway to the exit taxiway. Frankly, I didn't even feel much difference between the high-speed taxi and flying—control was good, even with 15 knots of wind on the nose.

In the Cockpit

CubCrafters Cubs are different than regular Cubs. Not only has the company taken 70 years of experience with the basic platform and improved the machine, they have also spent a great deal of time thinking about the flying experience for the pilot and passenger. Starting with the seats, the front is ground adjustable to allow you to fit your leg length to the rudder pedals. The rear seat sling is much more comfortable than anything you'd find in an original Cub, and the cabin seems spacious. The windows on both sides swing up and have a nicely machined capture latch to hold them there. The door swings down in two pieces on the right side, giving more entry room. Both front and rear seats have full flight controls, including toe brakes.

The instrument panel is dominated by a single large Garmin G3X screen, giving you flight and engine instruments, plus moving map capability. The ADS-B/transponder system is remote mount, with pilot control via the EFIS, and the single GTR 200 com radio is also controllable from the screen. However, we did it from the radio head out of habit. Switches are arrayed across the top of the EFIS for the aircraft electrical system and lighting. The mixture is a push-pull knob on the left side of the panel and is easy to adjust. The left side also has throttle and prop control. Push-pull knobs for the new heat system are on the top of the panel. And, of course, seeing as how this is a CubCrafters airplane, there are cup holders mounted both fore and aft.

The large G3X Touchscreen provides everything you need for aviating and navigating.

The large baggage area is reachable from an outside door on the right side of the aircraft or from the cabin by reaching behind the passenger seat. There is plenty of room back there for camping and exploring gear.

From the Outside

To many people, a Cub is a Cub. But look close at the EX/FX-3, and you'll find lots of little details you won't see anywhere else. Aileron and flap hinges are billet-machined aluminum, so you'll never see the telltale rust stains common on almost every 60-year-old airplane you'll find. The elevators have gap seals on the top surface of the hinge line, adding to the excellent pitch response you get at low speeds.

Modern avionics require modern sensors, and magnetometers work well in fabric wings.

The prop knob tells you that you can get every single pony out of the engine when you need it.

A mark of any good bush plane these days are the big Alaskan Bushwheels, and the latest CubCrafters airplane doesn't disappoint. The big, bubbly tires make touchdowns soft, even on uneven and rocky terrain. Using them often on pavement can be costly, however, as that soft rubber is not happy when chip-sealed asphalt tears away at it. It has been said that every landing on pavement can cost you $10—but the fun of taking them off airport is worth it to most. CubCrafters uses ventilated brake disks to help cool them down after aggressive stops, and we can confirm that you can stop in a remarkably short distance. Ground handling is also excellent, and the pneumatic tailwheel provides good handling.

Taking a look at the cowl, the four-into-one exhaust stack has its own tunnel down the middle of the bottom cowl. Up front, underneath the airplane's snout, is a new NACA duct feeding two inlets for the improved cabin heat system.

Another obvious improvement up on the nose is the composite Hartzell blended airfoil propeller; it's an impressive 83-inch scimitar that really grabs the air for good short-field pulling power.

The overall impression is of a mature, powerful machine with plenty of features and power to haul you, your passenger, and your cargo up into the mountains with performance (and comfort) to spare.

FX—Builder Assist Turned Upside Down

If you choose to build your own Carbon Cub but don't have the time (or feel you have the skills) to do it the traditional way, there is another option: building your aircraft at the CubCrafters facility in Yakima. "FX" is short for "Factory Experimental," and it means that you fabricate parts and help assemble the aircraft at the factory, with their tools, under the watchful eyes of technicians who do this every day. Not the first to offer a factory build assist program, CubCrafters has taken a unique twist on the process—they emphasize fabrication, not assembly.

The FAA considers an airplane to be amateur built if 51% of the tasks on their kit evaluation checklist are performed by an amateur for the purposes of education and recreation. The FAA National Kit Evaluation Team (NKET) analyzes kits for compliance with the "major portion rule" and publishes a list of kits and programs that qualify. The list can be found

Tundra tires are only natural for an airplane designed for the bush—the only choice you have to make is big…or bigger.

Go ahead—stand on the brakes—the ventilated disks can take it.

(Left) CubCrafters' assembly line shows the build-up of fuselages as they move down the row. (Right) A wing undergoing final assembly.

at *https://tinyurl.com/y7p6aabz* and is updated as new kits are evaluated.

The important score to look for is the first column of any of the checklists, which shows the portion that is completed by the manufacturer. This needs to be less than 50%, and companies that offer quickbuild or factory-assist options strive to get it as close to that number as possible.

Note on the NKET list that many of the tasks are fabrication, rather than assembly, and each line item is equally weighted. While other factory assist programs focus on assembly, CubCrafters' program for the FX leans toward fabrication. This works because of the way the checklist is written. For instance, customers don't have to make all of the wing ribs—they only have to make "a wing rib." They do one, and the factory builds the rest.

CubCrafters aircraft consist of a huge number of vacuum-bagged, resin-infused parts. Although a builder doesn't have to make them all, they do cut carbon fabric for layups, assist in vacuum bagging and infusing a certain set of parts, and clean flashing and other excess material off of parts to finish them. In short, they get a crash course in carbon part layup and fabrication while building parts for *their* airplane.

At the end of the week, the factory takes all of the parts built by the customer and puts them in a single staging area, ready for assembly into an aircraft. They add to that pile the parts that the factory fabricates, and when the time

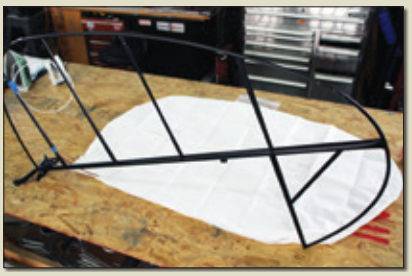
Practice, Practice, Practice…

How do you know if building a CubCrafters kit is right for you? One way is to try a practice kit. While many kit manufacturers have practice kits that introduce a prospective builder to the methods and techniques used to fabricate or assemble their aircraft designs, CubCrafters is one of a few manufacturers that has taken a different approach. With their practice kit, you end up with a part that you can actually use on your own airplane—a rudder, in fact.

Yes, the CubCrafters EX-2 Discovery kit is pricey at $995, but instead of a piece of wall art when you are done, you have your first finished part. Included in the package is a completely pre-welded rudder frame, sewn fabric envelope, tapes, rivets, and all of the liquids necessary to glue the fabric to the frame and then do a finish job. They also include necessary portions of the build manual and digital videos of the build process.

We gave the practice kit a try one afternoon at our airpark, inviting two other aluminum airplane builders and an A&P who owns a Cessna, but is restoring a Stinson. All we had to add to get started on the practice rudder were some brushes, pinking shears, an iron, and a box of nitrile gloves to keep things clean. Everyone did their homework by watching the video in advance, so we knew that the first step was fitting the pre-sewn cover over the frame. Then it was some careful cutting around the hinges and gluing the open edges to the frame along the bottom of the balance horn, and along the hinge line.

While all of us had taken at least the Poly-Fiber workshop (available at AirVenture and Sun 'n Fun), and a couple had covered aircraft before, none of us had significant recent experience—but we knew enough to proceed quickly and produce a nice-looking covered



The rudder practice kit comes with a frame, envelope, tape, rivets, and the necessary chemicals to get the job done.

Clothespins hold the envelope in place on the trailing edge.

End of the (assembly) line. The CubCrafters factory floor ends with finished airplanes ready to poke their noses into the daylight.

The CubCrafters delivery hangar is set up to allow FX builders to do final assembly tasks and take delivery of their finished aircraft.

comes to start the customer's airplane down the assembly line, they use that set of parts to build it.

When the aircraft reaches a critical final assembly point, the customer comes back and helps with that final assembly, earning more points on the NKET checklist. The finished plane is inspected by a local DAR, who Lervold says is no pushover. He quizzes the builder to make sure that they have an understanding of the major portions in which they participated. When the DAR is satisfied that the aircraft is amateur built—and in a condition for safe operation—he issues the airworthiness certificate.

The airplane then goes into Phase 1 flight testing, which the customer can fly, or it can be completed by the factory (for an extra fee).

Many homebuilders have raised an eyebrow over this type of homebuilding (see sidebar on page 10, "Amateur, Assisted, or Pro?"), but Lervold, a multiple-time homebuilder himself, has worked to make sure that the program meets the letter of the law. I asked him the obvious question, "Do you feel that a builder who has invested just a couple of weeks in the build is really qualified to hold the repairman certificate and do the annual condition inspection?"

Lervold's response was interesting and honest: According to him, there has not yet been a builder who has gone through the program and requested a repairman's certificate. They all understand the limitations of this kind of building.

rudder. Having all of the necessary materials included in the kit was very convenient. We didn't have to worry about not having the appropriate thinner, solvent, or other supplies. It took us about 3 hours to get to the point where the fabric was glued in place and the first coat of Poly-Brush was applied—not bad for metal airplane builders!

Next up was installing rivets in place of rib stitching, taping, and adding finish coats. Our rudder might not win a Lindy at Oshkosh, but it certainly was airworthy, and I wouldn't be embarrassed to have it on my aircraft.

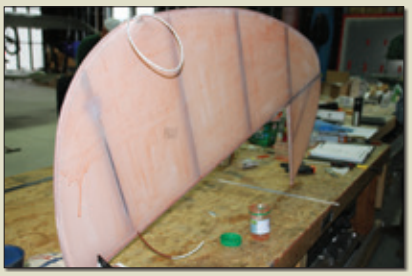
One of the nice things about the practice kit is that if you feel like you didn't get enough practice, you can cut off the fabric, and CubCrafters will sell you an inexpensive "refill kit" consisting of the fabric envelope and more chemistry, and you can do it all again.

Practicing is a great way to build skills, as well as to determine if the whole tube-and-fabric thing is for you. I predict that the CubCrafters kit can easily help nudge a lot of folks who might be on the fence into ordering a full aircraft kit. As one of our group said, "It's not rocket science—farm boys have been covering airplanes since the days of the Wright brothers."

—P.D.

The Poly-Fiber process is used to close the envelope around the frame.

Even a metal airplane builder can learn how to iron the fabric taut.



Ready for rivets and tape!

In any case, Lervold said that if a builder *does* ask, CubCrafters' policy is to discourage it. Most builders understand the advantage to having a second set of eyes look over the airplane on a regular basis anyway—even if they have the authority to do the inspection. It's a good point to remember, even for traditional homebuilders.

If builders of FX aircraft aren't asking the for the repairman certificate (one of the traditional reasons people build their own E/A-B aircraft), why do they choose to build? After all, an FX doesn't really save money over buying one of CubCrafters' certified aircraft. The answer is that the E/A-B category allows routine maintenance and modifications to be done by anyone—not just a licensed mechanic or repairman—and it also allow upgrades and modifications with experimental products, rather than ones that strictly meet TSOs. Experimental avionics are generally ahead of the certified aircraft fleet and cost significantly less (for more features), and having an E/A-B certificate allows upgrades from that segment of the market. It also allows condition inspections to be signed off by any A&P mechanic—not just one with an inspection authorization (IA). This is important in parts of the country where IAs are hard to find or schedule.

FX or EX—It's a Great Plane

There is no doubt that CubCrafters has refined the original Cub platform significantly over the years. With reduced empty weight comes increased useful load, regardless of increased gross weight or not. The extra horsepower and constant-speed prop (allowing that horsepower to be used) in their latest model gives an airplane that not only handles well, but performs at the top of its class. It is a fun airplane to fly slow,

An Interview with John Whitish

KITPLANES® sat down with John Whitish, CubCrafters' marketing director, to probe him on some of the reasoning and details behind the new EX-3/FX-3. Here's what he told us.

KP: Tell us—what prompted the design of the EX/FX-3?

JW: In June 2016, CubCrafters introduced the XCub, intended to top the category in terms of payload, speed, and range. XCub's low empty weight, max gross weight of 2300 pounds, and new Hartzell constant-speed prop were the keys to distinguishing it from our own offerings, as well as competitors'. What if we strengthened our EX-2/FX-2 airframe and added the same constant-speed prop? Presumably we'd gain much of the XCub's capabilities at a lower price.

KP: Tell us about the engine package for the new plane.

JW: We originally developed the Titan CC340 with ECi (since acquired by Continental) because we needed a light, powerful engine for our new LSA (Carbon Cub SS). We found that the Titan CC340 didn't like constant-speed props (or vice versa), so again we set out to design a light, powerful engine for our new EX-3/FX-3.

The CC363i is a lightweight four-cylinder engine built on tapered-barrel Millennium cylinders, a counterweighted crankshaft, and roller tappets from Superior Air Parts. Avgas is delivered by Precision Airmotive's Silver Hawk EX fuel injection system, which includes a backup electric fuel pump. Dual electronic ignition from Light Speed Engineering generates spark. Moderate 9.0:1 compression ratio pistons in the flow-matched cylinders (balanced and ported) serve the engine's extended service life. Sky Dynamics supplies a featherweight flywheel and 4-into-1 exhaust system. The base engine is assembled and tested by CubCrafters' long-time engine partner, Aero Sport Power.

Like our CC340 engine, the CC363i features a very light aluminum oil sump that is fabricated entirely by CubCrafters. This is one area where significant weight was trimmed. Most impressive, however, is the unique, ultra-lightweight cold-air induction system that CubCrafters designed specifically for this engine. The unusual curved plenum is molded in featherweight carbon fiber and receives air from a redesigned scoop on the underside of the cowl. Fuel injection, electronic ignition, and our new induction system contribute to amazingly consistent CHTs and EGTs across all cylinders.

KP: How does the new heater system provide more heat to the cockpit?

JW: In short, there are two larger heat muffs on a new exhaust with a more efficient air intake (new cowl scoop) and better ducts to pilot and passenger positions, as well as the windshield. The controls direct the BTUs where you need them.

KP: What plane did you use as the basis for the new design—where did you start?

JW: We started with the EX-2/FX-2.

KP: Tell us about the ailerons—how did you give those a more sensitive feel?

JW: These were part of the XCub development and actually trickled down to the EX-2/FX-2 before the XCub was even introduced. During flight tests, XCub prototypes with traditional ailerons required impossibly high stick forces at 130–150 mph. An airfoil was designed to replace the flat aileron, and a deep wing cove and blunt trailing edge were added. The family of changes serves to activate the airflow, which improves the aerodynamic response, lowers the lateral control loads, and increases aerodynamic centering. At traditional Cub speeds, pilots experience a crisp, tactile feel.

KP: We noted aileron control wires outside the struts (as is traditional). How come you didn't use the internal pushrods from the XCub?

JW: Because it's a Carbon Cub. We also didn't include many of the aerodynamic refinements, spring aluminum landing gear, and posh interior. Those are reserved for our flagship model.

KP: What are the differences (if any) between a finished EX and a finished FX?

JW: None. A qualified builder can assemble an EX-3 that is indistinguishable from an FX-3.

KP: What other props did you try on the airplane? We see that you settled on the Hartzell composite BA. Why?

JW: None. We went straight to the Trailblazer because of our experience with the prop on the XCub. Hartzell was an incredibly helpful vendor during the XCub development, and we received equally impressive support during the EX-3/FX-3/CC363i testing. High-class company. High-class people.

a great airplane to fly faster, and it will haul a heck of a lot into a high-altitude destination, regardless of whether or not there is much runway.

There are many ways to build a Cub-alike airplane, from starting with plans, to using a basic kit with a welded fuselage and plans, to a few kits that are meeting today's standard of "complete." The EX-3 kit is probably as complete as anyone can imagine. We're sure you'll order a few things extra, but we can't figure out what those things might be. CubCrafters has gone to great lengths to make sure you have everything you need. And if you decide to spend some time in Yakima to build your FX version, there is nothing you need to bring except your enthusiasm and your checkbook. CubCrafters even maintains a small fleet of courtesy cars for their resident customers—that's how much they are thinking about the customer experience.

Either way, EX or FX, you'll have a wonderful Cub when you are finished with the project, one that will fit naturally into the outback or slot itself into the pattern at any GA airport. "It flies like a Cub" is a compliment in and of itself—but in the case of the -3 model, it does much better than that. ✚

KP: Can the airplane be put on larger or smaller main gear if a person wants to go even rougher or wants to fly mostly off of pavement? What options are available for tires?

JW: Being Experimental, the builder/buyer can do whatever they like. However, with the 80-inch Trailblazer, clearance is an issue with anything shorter than the included 3x3 landing gear and 26-inch tires. With the 83-inch prop choice, 29-inch tires are required for adequate prop clearance. Thirty-one-inch Bushwheels are the largest we recommend.

KP: What are the reasons that a person might want an EX/FX versus a Part 23 aircraft from you?

JW: Because of the increased latitude provided by Experimental certification. Owners/builders can modify their airplane if they choose. That is especially important considering today's accelerated evolution in avionics. For adventure airplanes, advancements over current landing gear are an incentive. Owners/builders can service their airplane too (though we don't necessarily encourage FX buyers to do that). We're big proponents of owning Experimental. Though pilots can use Part 23 certified aircraft commercially, the lingering stigma attached to the term "Experimental" is not valid for our FX program.

KP: Tell us about the FX build program. How long does it take?

JW: Seven working days (a five-day session and a two-day session). From the builder's initial arrival here to the delivery of his finished airplane, ready for Phase 1 test flight, is about 60 days.

KP: You turned builder assist on its head—What prompted the unique take on builder assist with the FX program?

JW: Jim Richmond, CubCrafters' founder, prompted it. He asked the question, "How can more airplane buyers enjoy the benefits of owning Experimental?" FX offers Experimental ownership and greater involvement in the construction process (and thus greater familiarity with the airplane) with less commitment (time, effort) than a kit.

KP: If a person builds the FX version, what components do they actually fabricate at the factory? Give a few examples.

JW: The list is long. Builders cut all of the tubing for the fuselage. They cut and lay up all but the largest of the composite parts. They cut and, where appropriate, hydroform all of the sheet-aluminum parts, including wing ribs, extensions, and instrument panel. They form and rivet (880 rivets!) their ailerons and flaps.

KP: Does the builder of the FX version help in final assembly of the aircraft, or is it ready to go when they come back to fly?

JW: Most, but not all, of the assembly is complete when the builder returns for their second two-day session. This is when they install the seats and harnesses, landing gear and tires, LED lighting, cowl, spinner, and a smattering of parts that finish the assembly.

KP: If a person orders an EX model, how complete is the kit? What might they still need to buy? Does it come with a razor blade taped to the outside of the box, like the old Christen Eagles, just to emphasize that it is "complete"?

JW: Builders have to supply their own box knife, as well as all of the tools required to complete the build. They will also need to buy two batteries, paint, and an ELT if they choose to use one. *Everything* else is included in the kit.

KP: What is the price for the FX versus the EX (similarly equipped). In other words, what is the cost of the builder assist program?

JW: Apples to apples, the premium for the FX airplane will be about $70,000 over an EX with the same equipment.

KP: Does the builder of an FX do any fabric work?

JW: Yes, he/she cuts several of the envelopes, but does not actually install them on the fuselage or wings. Since fabric installation is smack in the middle of the aircraft assembly, more fabric work doesn't fit well into the program.

KP: How does the FAA look at the FX program—are they satisfied that the builder is doing the major portion per the National Kit Evaluation Team (NKET) checklist to qualify the airplane as amateur-built?

JW: Several FAA offices, including our Manufacturing Inspection District Office (MIDO) in Spokane and Flight Standards District Office (FSDO) in Seattle, as well as MIDOs in our customers' home districts have reviewed and approved the Amateur-Built Fabrication and Assembly Checklist for FX airplanes produced so far, and thus the aircraft were approved for Experimental certification. However, the National Kit Evaluation Team has not reviewed the FX program, and we haven't asked since the FX is not a kit.

—P.D.