Get up and go

Shooting cross-country in the Lancair IV–P

BY JULIE K. BOATMAN

PHOTOGRAPHY BY MIKE FIZER

We're at 16,500 feet and looking down at three states. I glance over at Steve Lackey, who built the 51 percent of this Lancair IV–P that homebuilders are required to complete themselves. He's smiling too. Lackey and partner Mike Moffitt have reason to, because there aren't a lot of piston-powered airplanes out there, production or kit, that can do what the IV–P does—and what theirs does particularly well. And that is fly fast and fly high.

While there are pressurized piston singles available (the Cessna P210 comes to mind), there's only one you can build yourself. And none can go as fast as the IV–P. Lancair International began developing the IV series in 1990, and the –P was introduced in November 1992. Now most builders opt for the pressurized model for its ability to take pilots above most of the weather (to 24,000 feet msl at an 8,500-foot cabin altitude) and speed them on their way.

And what speed! More on that in a bit.

The fuselage of the IV–P is constructed from woven carbon fiber in anywhere from three to 70 layers—depending on the part—sandwiched around a central Nomex honeycomb core. The spar caps, longerons, and roll cage structures are fabricat with unidirectional carbon fiber for strength. The carb fiber offers strength, pound for pound, that is nearly th times that of steel, according to Lancair.

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Lackey estimates that it took about 4,500 hours over four years to build their IV–P—his first project—making use of fastbuild wing and horizontal stabilizer kits. "I wish they had a fastbuild door kit," Lackey laments, as that part of the process was particularly challenging. All told, more than $300,000 in materials went into the airplane, which included $67,000 for the panel—a "turnkey" process through Aerotronics Inc., of Billings, Montana, that gave the owners dual Garmin GNS 430s and a GMA 340 audio panel, a Bendix/King 55 horizontal situation indicator, a Vision Microsystems engine monitor, a Meggitt S-Tec Fifty-Five X autopilot, and a Kenwood CD player.

Moffitt and Lackey chose the Teledyne Continental TSIO-550 with twin turbos and three intercoolers—an extra intercooler is optional; the engine normally comes with

The panel features a Garmin stack with dual GNS 430s and an entertainment system—with plenty of room to grow. Moffitt is planning a glass panel in his next IV–P.

two. The IV–P comes with a pilot-controlled oil-cooler door to help regulate airflow over the cooler during flight. The pair chose to relocate the oil-cooler door pull to the pilot's side panel to eliminate kinks in the line. The mod puts the door within easy reach of the pilot for manipulation during flight: Regulating the oil temperature to 185 degrees Fahrenheit is critical for longevity. The -550 produces 350 horsepower at 2,700 rpm and can run hot (hence the extra intercooler).

About that speed

We flew with 45 gallons a side for our test flight; this IV–P holds 110 gallons total with 106.5 usable. Standard tanks give 90 gallons, but Moffitt and Lackey put extra bays in the wings for more range.

When I hopped in the airplane it had 59.2 hours on the Hobbs, and Lackey and I set off for the racetrack. The IV–P steers via differential braking; the rudder becomes effective at about 20 knots—which the airplane reaches before you have the throttle in halfway—so directional control on takeoff is a nonissue.

The book says to expect a takeoff distance of 1,500 feet; in slightly cooler than normal conditions I used 1,900 feet to get N456PW airborne. Immediately I felt the responsiveness of the controls through the sidestick, which is canted at 12 degrees right of vertical in a natural, ergonomic position. The control feel is very stiff; Lackey likes it that way because the controls are very effective—especially at higher speeds. You don't want much deflection too quickly or you'll be on your back. The controls are balanced: Aileron, rudder, and elevator demonstrate about the same response.

Many kitbuilders have assistance flying off the initial 25 hours of flight-test time. This initial flight phase ensures that the airplane is ready to be released to its final operating standards (see "There Will Be a Test," page 99). Because 6PW is the first airplane Lackey and Moffitt have built, they trusted their airplane's first 10 hours to test pilot Charlie Kohler of Transportation Services Consulting, who is a designated airworthiness representative for the Lancair IV series, and a Lancair instructor with more than 4,500 hours in the IVs. His own IV–P has more than 1,800 hours on it.

Recently Lancair improved engine baffling to keep temperatures across the cylinders more consistent—temps above 380 degrees F, even in prolonged climbs, are rare, according to Lancair General Manager Timothy Ong.

Four adults sit comfortably in the leather interior of this IV-P, leaving room for nearly full fuel.

"If you have one airplane in your system to build, this is the one to do," says Kohler, who has used his airplane to go—as an example—from Fargo, North Dakota, to Daytona Beach, Florida, in four hours, 40 minutes. "You get a lot more out of the effort," both in terms of performance and in terms of resale value.

And Kohler's comments hit the mark, at least from my amateur viewpoint. Steep turns and lazy 8s feel quick and graceful, and the speed at which we're rocketing around the thin air can't be told from our lofty perch—the airplane is tightly made. And the climb rate is stellar: We maintained about 700 fpm once above 15,000 feet, with nearly double that climb rate at sea level, at 160 knots indicated airspeed (KIAS).

Rudder, aileron, and elevator trim are all electric, with indicators for the rudder and pitch trim. Aileron and pitch trim controls are located on the stick, with a high or low pitch trim speed available. Rudder trim is found on the center-lower panel. Lackey has found the rudder trim important to use in conjunction with balanced fuel burn to keep the autopilot happy—the two wing tanks are separately fed.

We stopped for a brief time at 13,500 feet to note cylinder head temperatures: They averaged 350 degrees F through the course of our flight. Leaning is accomplished by monitoring the turbine inlet temperature (TIT) on the turbocharger and adjusting accordingly. We saw a 1,650-degree F TIT while running 50 degrees lean of peak per Continental instructions.

After leveling at 16,500 feet, we executed speed runs in the cardinal directions, hitting an average of 190 KIAS at 30.2 inches manifold pressure and 2,410 rpm. At the prevailing density altitude, this equated to 255 KTAS (knots true airspeed). Wanting so badly to show me a groundspeed above 300 knots, Lackey seemed disappointed—a sharp contrast to the unadulterated

There will be a test

Many pilots acquire their certificates and ratings without ever having wielded a wrench, aviation or otherwise. Their experience with the realm of test flights is limited to the first flight after an oil change or annual—but in these cases they're still flying someone else's handiwork. That said, a number of aircraft owners get a great deal of satisfaction from maintaining their own mounts. Even so, working on a factory-built airplane and building your own are two different things.

Lancair is a pioneer in fastbuild kits, and offers programs in which an owner can build his or her entire airplane at the company shop—with adult supervision. And the average pilot need not be wary of going this route for lack of previous experience. "The worst person to build the airplane is an engineer," says Charlie Kohler, a designated airworthiness representative for Lancair aircraft, "because they want to change it. It's better to have someone who is just in production mode."

So are you ready to go where only your wrench has gone before? It's a hypothetical question until the day of the first test flight arrives. Luckily, there are many resources for the aspiring builder-pilot to use when constructing a flight-test plan. The most important thing is to have a plan, and follow through with it.

AOPA's subject report on homebuilt aircraft, compiled by the AOPA Aviation Services department, was developed to provide answers to common pilot questions on building an airplane. You can find this subject report on AOPA Online (www.aopa.org/members/files/topics).

The FAA also has guidance for amateur-built aircraft test programs, which you can find in Advisory Circular 90-89, *Amateur-Built Aircraft Test Flying Handbook*. Just reading through its pages gives you a sense of what professional test pilots already know—that flight-testing an airplane is not a daredevil exercise, but an incremental process. *—JKB*

Speed brakes are vital if you need to slow down from the IV–P's 250 KTAS-plus cruise speeds and descend in reasonably short order.

SPECSHEET

Lackey Lancair IV–P

Price as tested: $300,000 (materials only)

Specifications

Powerplant	Continental TSIO-550, 350 hp
Recommended TBO	1,600 hr
Propeller	Hartzell, 3-blade, 78 dia, constant speed
Length	25 ft
Height	7 ft 8 in
Wingspan	32.2 ft
Wing area	108 sq ft
Wing loading	23 lb/sq ft
Power loading	10.14 lb/hp
Seats	4
Standard empty weight	2,200 lb
Maximum gross weight	3,550 lb
Maximum useful load	1,350 lb
Payload w/full fuel	690 lb
Fuel capacity, as tested	110 gal (106.5 gal usable) 660 lb (639 lb usable)
Baggage capacity	150 lb

Performance

Takeoff distance, ground roll	1,500 ft
Maximum demonstrated crosswind component	21 mph
Rate of climb, sea level	1,200 fpm
Cruise speed/range w/45-min rsv (fuel consumption)	
@ 75% power, best-power mixture, 16,500 ft	255 kt (17.2 gph)
@ 65% power, best-economy mixture, 24,000 ft	284 kt/1,550 sm (17 gph)
Service ceiling	24,000 ft
Landing distance, ground roll	1,700 ft

Limiting and Recommended Airspeeds

V_X (best angle of climb)	110 KIAS
V_Y (best rate of climb)	135 KIAS
V_A (design maneuvering)	170 KIAS
V_{FE} (max flap extended)	132 KIAS
V_{LE} (max landing gear extended)	135 KIAS
V_{LR} (max landing gear retract)	100 KIAS
V_{NO} (max structural cruising)	220 KIAS
V_{NE} (never exceed)	274 KIAS
V_R (rotation)	80 KIAS
V_{S1} (stall, clean)	88 KIAS
V_{SO} (stall, in landing configuration)	64 KIAS

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.

happiness I felt in the left seat. Later, Moffitt sent me a digital photo taken of 6PW's 430s indicating 306 knots groundspeed at 24,000 ft during a trip the pair took last summer. This speed thing is important stuff.

Their trip from Houston to Concord, North Carolina, to Frederick, Maryland, took 4.5 hours of flight time over which they averaged 265 KTAS, for another point of reference. Without significant weather in the Carolinas, they could have made the trip nonstop. Their first cross-country trip, from Houston to Lakeland, Florida, took three hours and burned 62 gallons of fuel. Does this beat the airlines? It would be a tough call—if the airlines flew direct to Lakeland.

The pressurization system is designed to keep things simple, while offering a 5.5-psi differential at 24,000 feet msl, which translates to an 8,500-ft cabin altitude (CA). On our test flight, we opted for an 8,000-ft CA at 16,500 feet (about 2 psi) to keep the cabin cool. There's no air conditioning in the airplane, but the Houston-based Moffitt and Lackey have found that running a little more air through the pressurization system (at the lower differential) keeps the cabin from getting too hot in cruise, combating the greenhouse effects of the wide-open windshield and big side windows. The pressurization system is driven by the turbocharger, with an automatic wastegate for manifold pressure and an adjustable outflow valve for the pressurization system.

Looks aren't everything, but...

Moffitt and Lackey opted to install winglets, which not only add to the IV–P's already-inspiring ramp presence, but help in some aerodynamic ways as well. Winglets have two positive effects: Stall speeds should lower by about 8 to 10 knots, and the resulting pitch attitude at altitude changes to put the airplane more "on the step" because of the additional lift generated. "Plus, they look real good," says Lackey, emphasizing my earlier point.

After our speed runs, we started down from altitude in a sprightly fashion, using the rapid descent profile recommended by Lancair: 25 inches and 2,500 rpm with

the speed brakes deployed, holding 195 KIAS. This translated into an average descent rate of 2,000 fpm, which gets you down in a good hurry.

I leveled off at 6,500 feet for a stall demonstration. Earlier that day, Lackey had told me that in exploring the aircraft's stall behavior, they had found that indeed the winglets must be doing their job, as they had found power-off stalls to occur at less than 60 knots with a gentle break. Power-on stalls came at 88 knots indicated. My experience with the power-off stall induced a sharp break at about 60 KIAS, with a substantial wing drop to the right—but the airplane responded immediately to normal correction. Kohler later said this is fairly typical of the IVs.

Gear doors are the limiting factor for gear retraction (which needs to happen before you hit 100 knots), but the legs can come back out below 135 knots. We aimed for an airspeed in the traffic pattern of about 120 knots, with 100 knots over the fence. I didn't come near the Lancair stud-pilot landing roll of 1,700 feet, wanting to be nice to the new brakes and all. Instead, we ate up about 2,800 feet of runway after crossing the threshold at 20 feet agl, using full flaps (30 degrees). Regardless, it's not a big surprise that for most mortals, this is not a short-field airplane.

Winglets lower the IV–P's stall speed—plus they look really good.

Of course, this isn't the only area where you see payback for the heady numbers. Though Lackey is a 3,000-hour-plus flight instructor who "grew up in a crop-duster's hangar," he says, Moffitt is a private pilot with fewer than 600 hours and no instrument rating—though he's working on that rating. He previously owned a Bellanca Super Viking and got addicted to going fast. Hence, the dreams of a IV–P, and his partnership with Lackey: Moffitt powered the checkbook, and Lackey the tools. The insurance cost is steep. The first-year quote: $9,000—taking into consideration the first eight hours of dual with Kohler—for Lackey alone. The second year, the cost would go up to $10,000 with Moffitt on the policy.

The landing gear is strong enough to do the job but doesn't take kindly to abuse. With a normal touchdown speed above 90 knots, the IV–P requires solid directional control on landing—the gear won't absorb mistakes.

While Lackey and Moffitt received training in their IV–P from Kohler, Lancair also offers training for pilots through its approved flight school. Kohler figures he has trained more than 100 pilots in the model, primarily in the customers' airplanes.

The bug bites hard

When I checked back in with Moffitt earlier this year (our original test flights had been flown in May 2004), he had

some news: They had sold the airplane last September. But Moffitt's reasons for doing so are testimony to the design. "I decided to sell the plane for several reasons: one, to prove to my bankers and myself that there is a strong market for an airplane that is this expensive and also experimental. Also, I had mentioned to you my desire for a glass cockpit. By selling the IV–P, that will enable me to build another IV–P." Lackey is currently building a IV–P for a private owner, and "I'm waiting for him to finish so he can start our next airplane," says Moffitt. "I can honestly tell you that I miss the IV–P a lot. I have even called on several other IV–Ps to buy so I won't have to wait two years to have the next plane built."

The current owner of the Lackey Lancair (kitbuilt aircraft are named after their manufacturers—the builders who craft them) is pilot Ron Gregory of Monroe, Louisiana. Gregory's son, Craig, is a pilot, and daughter Susie is learning to fly. "We went looking for the fastest single-engine, prop-driven, turbocharged four-seater we could find. The Lancair IV–P was the one for us. I jumped in my [Cessna] 206 and headed for the Lancair factory.... After checking everything there I quickly came to the conclusion that, given my lifestyle, I wouldn't live long enough to build one and then fly it. Charlie [Kohler] trained me and helped me find the finest airplane I'd ever flown. The rest is history."

The Gregorys fly their airplane to their cabin near Freedom, Idaho, landing at Afton, Wyoming. "The trip to our cabin is 1,065 nm and, depending on the winds, it takes from four to six hours." On Kohler's advice, Ron keeps the manifold pressure at 30 inches, running the mixture 10 degrees lean of peak, with a TIT of 1,600 degrees F and a fuel flow of 17.1 gallons per hour. "Steve did a wonderful job building the plane and has been very supportive in the maintenance of the plane."

i Links to additional information about Lancair kitbuilt airplanes may be found on AOPA Online (www.aopa.org/pilot/links.shtml).

As Moffitt and Lackey know, and the Gregorys are finding out, the price of such speed and grace may seem high, but so are the rewards. AOPA

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