

A white Lancair aircraft is shown from a low angle, flying upwards and to the right. The aircraft's wings, tail, and fuselage are clearly visible. The background is a dark, textured surface with a reddish-brown hue, suggesting a sky or a studio backdrop. The title "LAUNCHING COLUMBIA" is printed in large, bold, orange letters with a green shadow effect in the upper right corner.

# LAUNCHING COLUMBIA

**T**hat Lancair's first production-aircraft effort shares names with one of NASA's space shuttles is appropriate in a lot of ways. Just as launching one of our orbiters takes a large and dedicated crew—one that will not tire at the inevitable and myriad setbacks—Lancair's staff must not grow weary of the multitude of seemingly make-work steps in the certification process. For a company used to penning a design and building it for experimental/amateur-built rules, jumping into the murky waters of certification can be a

***Lancair shoots for the stars***

**BY MARC E. COOK**

PHOTOGRAPHY BY MIKE FIZER



chilling experience.

But Lancair, by all appearances, is slogging through the FAR Part 23 muck at a good clip. Two examples of prototype Columbia 300s are flying, and the flight test program is making good headway. The airplane received a provisional type certificate in time for Oshkosh this year—basically an endorsement from the FAA that the airplane, operating within a limited envelope of speed and weight, is *certifiable*. Lancair founder Lance Neibauer predicts that certification will be in hand by April 1998 and that turnkey airplanes will emerge through the doors of Lancair's Bend, Oregon, production facility about six months later. Incidentally, the original plan was to have certification early *this* year, but at least Lancair is not alone in the grim reality of slipping schedules. The Cirrus SR20, a similar new-think composite four-seater, has seen its share of busted deadlines.

When we visited Lancair, the first of five modules that form the production facility had been erected down the road from the firm's Redmond, Oregon, base. A separate flight-test and engineering group was encamped in an industrial park a

***That first jump into the murky waters of certification can be a chilling experience.***

short drive from the kit constructor's digs, though those individuals are expected to move into the Bend plant by year's end. Separation of the kit builders and the production staff is a necessity, in part because they are two different companies. But there are significant differences in philosophy. Where the kit side of the house is likely to have a bright idea, build a prototype part, and then go fly it on an airplane, the rules are entirely more rigid for the production staff. Says Neibauer, "On the production side, we're concerned with quality control, conformity, traceability, and other certification issues. These considerations do not hinder the kit guys to such a degree. But between the two staffs, I see great cross-pollination."

Certainly the goals and philosophies of the two halves of the Lancair family differ, as the Columbia does from its Lancair Super ES progenitor. In fact, it's fair to say that, aside from appearances and a few key items, the Columbia is a completely







different airplane. Such are the demands of certification—and, to a far greater degree, of designing an airplane to be produced by a skilled staff with jigs and fixtures and more working space than a two-car garage. “When you design an airplane, you have to ask, ‘Who is the customer?’” says Neibauer. “For the kit builder, you must design the airplane one way. When it’s intended for production, you can design a one-piece wing because you’ll have the facilities to handle a 36-foot part. The guy building his own airplane does not.”

Yes, the Columbia looks a lot like the ES. In general dimensions, the two are similar, and they share the basic Continental IO-550; in the ES this engine was a 280-horsepower version (at 2,500 rpm) tweaked up to 2,700 rpm. But for the Columbia, Continental certified a version of the crossflow-head 550 called the N1A—essentially the same engine used in the Mooney Ovation—for the full 300 hp at 2,700 rpm. With a tuned induction system, this engine can post good fuel specifics. Cylinders originally designed for the high-power, turbocharged variants of the Continental 520 should help the Columbia engine’s longevity. Plans to back-certify a 210-hp, IO-360-powered Columbia have been put on hold.

While reworking the ES for series production, Neibauer took the opportunity to enlarge the cabin. The cross section is a bit less round than the ES, giving better headroom up front and generally better outward visibility. Thanks to a cabin width listed at 49 inches and height slated to be 51 inches, both the appearance and reality of the interior are of great volume.

A big attraction of any traveling airplane—particularly to the nonpilots aboard—is the quality of the interior. Lancair’s mock-up, which withstood thousands of backsides at Oshkosh this year, shows that the company is ready to raise the bar. Sensual curves, rich materials, and smart design all are present. We worried slightly when Lancair announced that the interior would be dictated by an automotive stylist—the few general aviation aircraft to have suffered this fate got pretty panels that didn’t hold much. But the mock-up combines good ergonomic sense with first-rate materials. As promised, the Columbia has two large doors on either side of the fuselage, and an enlarged (from the ES spec) baggage door.

If the production versions are faithful to this bit of airshow tease, Lancair will deserve a round of applause. Experiences at Oshkosh, incidentally, led to a few



minor changes in the interior. "We noticed that a portion of the trim in the door frame was getting scuffed," says Neibauer. "So we have come up with a nice piece of molded composite instead. We want this airplane to look good for years after it's built."

This new interior you can see; the multiplicity of changes under the skin from ES to Columbia you cannot. The fuselage molds are completely different, using a vertical split line and integrating the vertical stabilizer into this basic mold. Previously, the ES used horizontally split fuselage pieces, with a third section for the tail. Once again, production considerations drove this part of the redesign. Like the ES, the Columbia uses mainly E-glass—a conventional fiberglass cloth in this case pre-impregnated with epoxy—supplemented with graphite in load-

**Good cruise speed and exceptional low-speed performance are the focus of the flight test program.**

critical locations such as the wing spar caps and fuselage longerons. Similarly, the Columbia's wing is a new airfoil with wholly revised architecture under the skin. With twin main spars, the wing not only is easier for Lancair to build, but it offers tremendous structural advantages. "We sawed one of the spars in half and the wing still met the limit loads," observes Neibauer.

A big focus of the Columbia flight test program is to tweak and trim that wing to offer what the company says is unparalleled low-speed performance without sacrificing cruise speed. One of the tricks that will probably see production is a cuff on the leading edge, from the tip to a point about four feet inboard. This cuff increases the leading-edge camber to help improve aileron authority during high-angle-of-attack flight. The Columbia's ailerons also sport small vertical tabs to help improve responsiveness in the stall. And while the basic control-system scheme is identical to that of the ES—pushrods and torque tubes for roll and pitch, with cables for the rudder—virtually all of the carbon control surfaces are new. "We've spent a lot of time fiddling with the flaps and ailerons to get just the right low-speed handling," says Neibauer. The company is aiming to have the air-

plane's max-weight, landing-configuration stall speed around 57 knots.

Such emphasis on low-end handling comes in part from trying to meet the FAR 23.221 spin requirement. In particular, Lancair is going for a provision under FAR 23.221 (2) that allows the company to demonstrate that the airplane is "spin resistant." In order to pass this provision, the airplane must be able to maneuver extensively with the stick full aft without diverging. In addition, using ailerons and rudder in the proper direction, the airplane must be slowed to full-aft-stick condition and then, with the rudder applied to the stop to promote spin entry (in both directions in subsequent tests), without going into an actual spin for 360 degrees of rotation. Moreover, this heading change cannot take place in less than four seconds. Other maneuvers to determine that the airplane is benign when grossly mishandled must be successfully completed without departing controlled flight. It's not an easy regulation to meet.

Lancair is considering a number of ways to meet these criteria. Most likely, the engine will have to be canted in its mounts to help with maximum-power yaw. According to the flight test crew, the airplane handily meets the requirements in every maneuver save for the 75-percent-power, full-left-rudder example; there, the torque of the engine and large rudder work against the team.

Another aim for the flight-test segment is to refine the high-speed handling qualities. Right now, the responsiveness and stability in pitch are commendable. The airplane seeks and holds trimmed airspeed well and is easy to fly in turbulence, without any undue hunting in pitch or speed. In addition, the stick-force gradient is fairly steep, a desirable trait in an airplane intended to be used as a cross-country mount and, possibly, by low-time pilots. But as it is, the Columbia's roll forces are excessive. While the helm responds to small inputs well and making slight roll corrections proves easy enough, a very steep force gradient makes maneuvering at high speed in even moderately bumpy conditions a chore. Neibauer knows all about this. "I don't very often put on my CEO hat and stomp down the halls making demands, but in this case I have made it clear that we're going to get the ailerons lightened up."

Otherwise, the Columbia is a model of deportment. Stable and predictable, with lighter roll forces, the airplane will be quite entertaining to fly. Pattern behavior is good, with large, effective slotted flaps that produce relatively little pitch change











and can really help the descent profile. Many pilots who have flown both the Columbia and the ES remark that the kit airplane in many ways has better, more engaging handling. That may be true, but two separate sources within Lancair admit that the ES, as it is, is simply not certifiable under Part 23.

Lancair says that the Columbia will do 191 knots true at maximum cruise, a seemingly fantastic number for a largish four-place, fixed-gear single. But the Super ES we last flew posted just that kind of number, and, according to the company, improvements in the Columbia's airfoil allow it to slightly outperform the ES in side-by-side tests, despite having a somewhat larger cabin and carrying a bit more weight. "We have a newer wing [than the existing models] and less surface drag because of the smoothness of the composites," Neibauer says. "And the total drag of a properly faired fixed landing gear is not that great." We'll have to wait to get our hands on a production example to verify the cruise numbers. Expect the big Continental to drink about 15 gallons per hour at top cruise—sipping from the 100 gallons of fuel on board, the Columbia ought to stay aloft for almost six hours with reserves. That's a no-wind range of more than 1,100 nm.

As the deadline for receiving the type certificate looms, the Lancair crew will simultaneously seek a production certificate for the airplane at the Bend facility and continue development on interior detailing and service tests. For now, the basic avionics packages have been deter-

#### Lancair Columbia 300

Base price: \$185,000 with VFR equipment  
\$205,000 equipped for IFR

#### Specifications

Powerplant	Teledyne Continental IO-550-N1B, 300 hp @ 2,700 rpm
Recommended TBO	2,000 hr
Propeller	Hartzell, three-blade, constant-speed
Length	25 ft 2 in
Wingspan	36 ft 1 in
Wing area	140 sq ft
Wing loading	24.2 lb/sq ft
Power loading	11.3 lb/hp
Seats	4
Cabin width	49 in
Cabin height	51 in
Empty weight	2,045 lb
Max gross weight	3,400 lb
Useful load	1,355 lb
Payload w/full fuel	755 lb
Fuel capacity, std	100 gal (600 lb)
Oil capacity	12 qt

#### Performance

Takeoff distance, ground roll	not available
Takeoff distance over 50-ft obstacle	N/A
Max demonstrated crosswind component	N/A
Rate of climb, sea level	1,340 fpm
Cruise speed/endurance w/45-min rsv, std fuel (fuel consumption, ea engine)	
@ 75% power, best economy	191 kt/5.9 hr (90 pph/15 gph)
Service ceiling	N/A
Landing distance over 50-ft obstacle	N/A
Landing distance, ground roll	N/A

For more information, contact Lancair, 2244 Airport Way, Redmond, Oregon 97756; telephone 541/923-2244; fax 541/923-2255.

All specifications are based on manufacturer's preliminary calculations; production versions may vary. All performance figures are based on standard day, standard atmosphere, sea level, maximum gross weight conditions unless otherwise noted.

mined. The base VFR airplane will carry a single AlliedSignal Bendix/King KX 155A nav/comm and KT 76C transponder, altitude encoder, Trimble TNL1000 VFR GPS, PS Engineering PM 501 mono intercom, and basic gyro instruments; the price is set at \$185,000. The so-called domestic IFR package adds a glideslope to the KX 155A, a KMA 26 audio panel/intercom, an IFR-approved GPS (probably a KLN 89B), and an S-Tec System 30 two-axis autopilot; this airplane is pegged at \$205,000.

All Columbia models will be approved for IFR day and night flight, thanks to lightning-protection technology explored in a NASA-funded program using a Glasair III kitplane. The Columbia will employ an expanded-foil mesh under the primer coat, above the composite materials themselves. These conductive panels will be electrically linked. External radio antennas will have to be used.

For now, the company is focusing on getting the type and production certificates for the Columbia 300, but there's rampant speculation that a follow-on airplane could be a turbocharged, retractable version, sort of a cross between the Columbia and the Lancair IV. Neibauer won't say much on the subject, noting only that such an airplane would be a reasonable accompaniment to the Columbia. But for now, his eyes—and those of his flight-test crew—are on the 300. After all, you don't launch another shuttle while there's still one up there in the deep blue of space. □

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