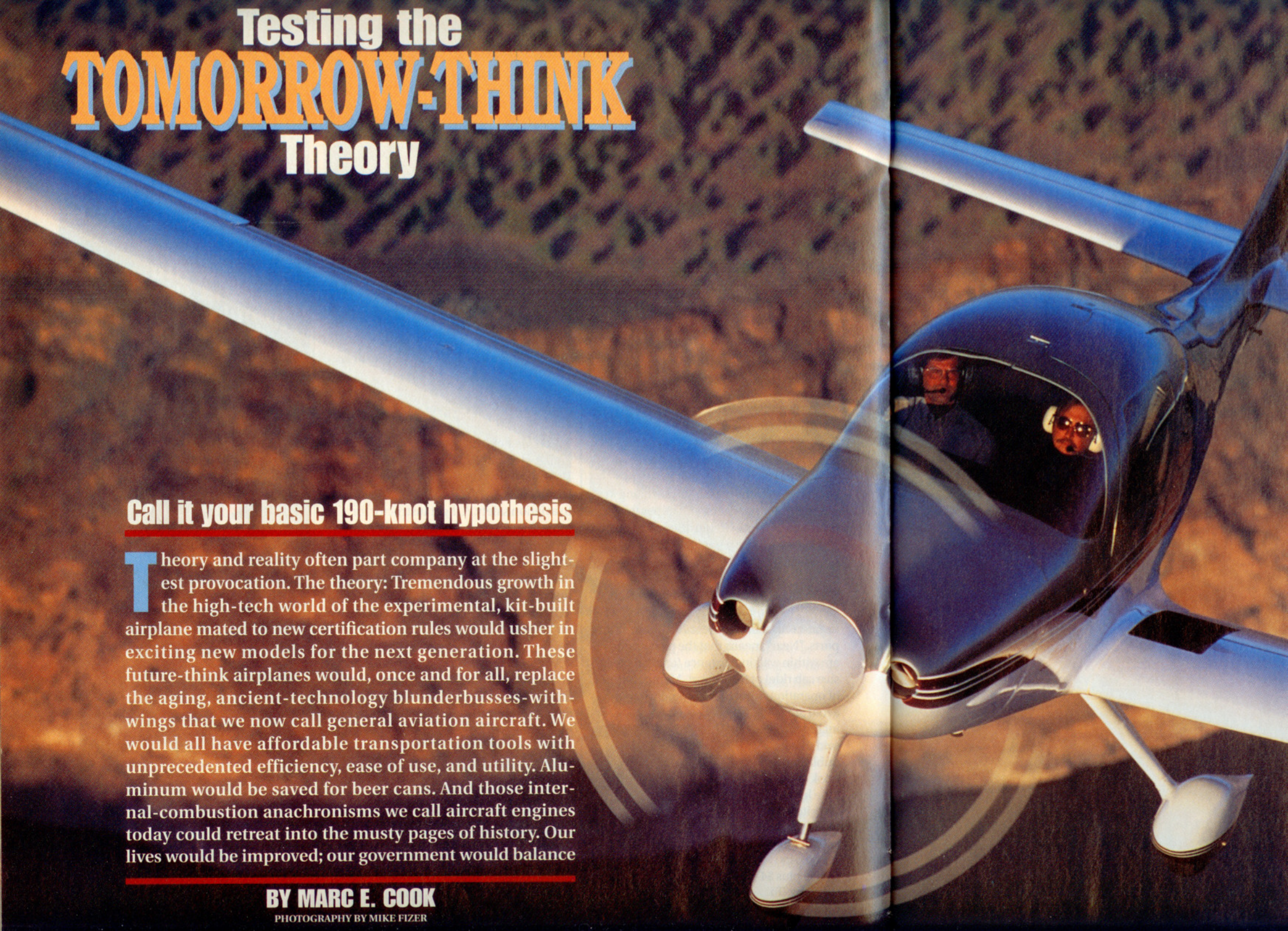
Testing the TOMORROW-THINK Theory



Call it your basic 190-knot hypothesis

Theory and reality often part company at the slightest provocation. The theory: Tremendous growth in the high-tech world of the experimental, kit-built airplane mated to new certification rules would usher in exciting new models for the next generation. These future-think airplanes would, once and for all, replace the aging, ancient-technology blunderbusses-with-wings that we now call general aviation aircraft. We would all have affordable transportation tools with unprecedented efficiency, ease of use, and utility. Aluminum would be saved for beer cans. And those internal-combustion anachronisms we call aircraft engines today could retreat into the musty pages of history. Our lives would be improved; our government would balance

BY MARC E. COOK
PHOTOGRAPHY BY MIKE FIZER

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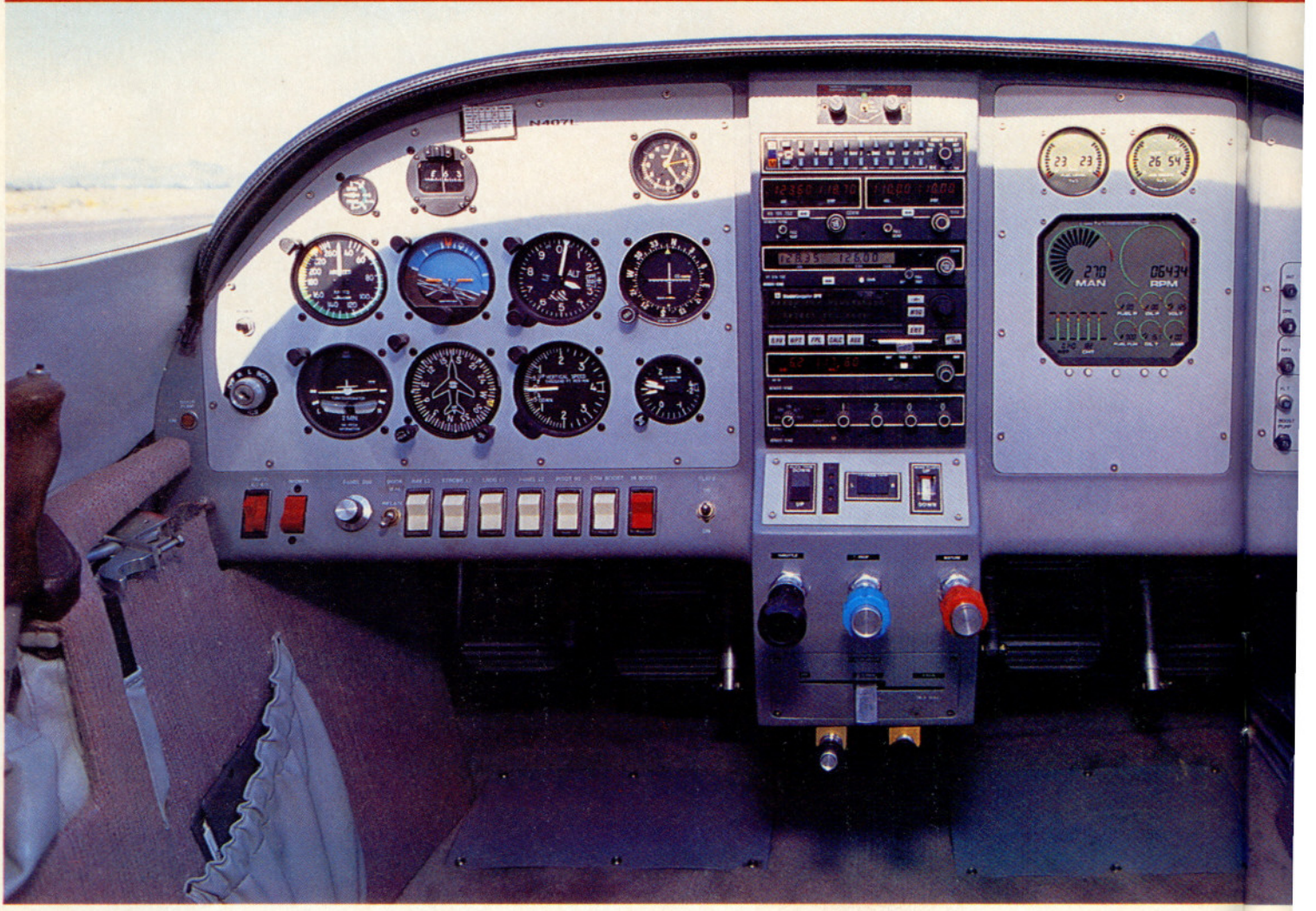


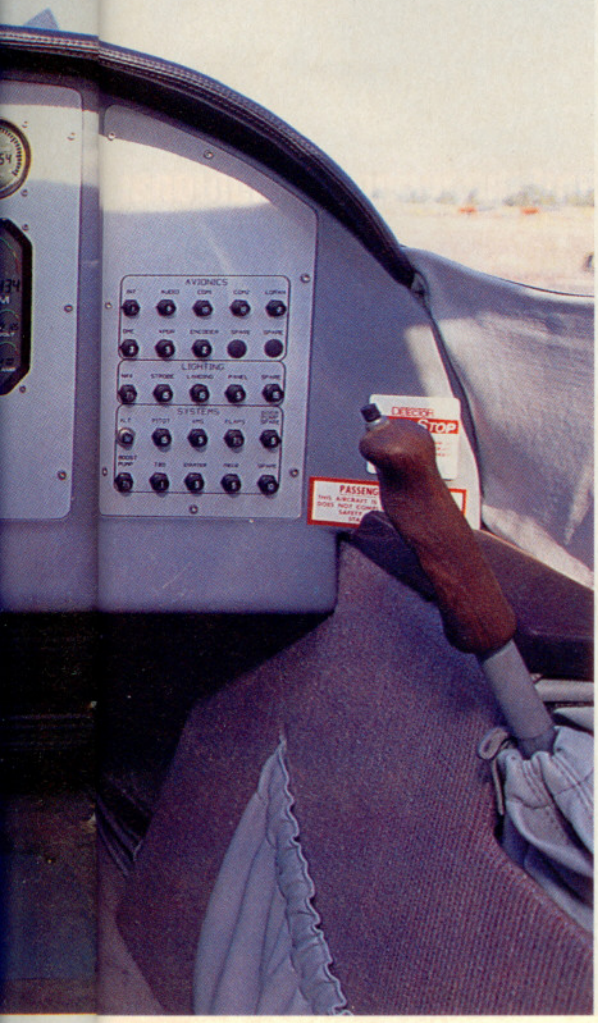
the budget.

And the reality?

A combination of general economic malaise—and new certification rules that didn't fall very far from the Federal Aviation Regulations Part 23 tree—has made this new wave more a trickle than a torrent. Looking back, it's clear that many of the kit manufacturers investigating production versions of popular homebuilts have retrenched. Stick to the core business, don't get involved with the FAA's arduous certification rituals, they seem to have said. Alas, our budget remains as unbalanced as an infant and a rugby player on a seesaw, and our home team continues to crank out designs dating back 35 years or more.

But there *is* activity. Amid much press, Cirrus Design has penned and built prototypes of its next-generation SR20 four-place airplane. Certification of this composite, 200-horsepower machine is expected sometime in early 1997, about the time Cessna should be turning up the wick on Skyhawk production.

curve is remarkably shallow.



For the last three years Lance Neibauer and his prospering kit company, Neico Aviation, have been making noises about certifying a version of the four-place, fixed-gear Lancair ES. Now, with an infusion of overseas money and the hiring of additional engineering personnel, the production ES project is well on its way. The airplane still has not been given a distinct model name, although the company says it will not be "ES." The price is expected to be $139,000 for an airplane with basic IFR equipment and a 200-hp Continental IO-360-ES. A version with the 280-hp Continental IO-550-G—similar to the current Super ES kit—will run $169,000. To the harrumphs of cynics who say it can't be done, Neibauer replies, "We haven't seen anything in the numbers that says we can't make that price." (Lancair intends for the kit version of the ES to remain available. Today, the basic airframe price is $34,900. With all the quick-build options and a factory-new engine, a completed ES will run between $75,000 and $90,000.)

Lancair's time line looks like this: By January 1996, it will have determined a build site for the production ES, which will need a 100,000-square-foot facility. Neibauer says he'd like to keep the company in central Oregon, but about five possible sites have been recognized. By the end of the first quarter in 1996, a non-conforming prototype will be flying—it will be aerodynamically and structurally identical to the production version but will not have been through the detailed conformity inspections. By September, a conforming prototype is expected to emerge; both of these prototypes will be the 280-hp models, with approval for the smaller-engine airplane stemming from the Super's flight testing. According to Lancair, certification should come by the first half of 1997, with production to begin later in the year.

Meanwhile, modifications to the basic kit-form ES have been committed to improve its producibility and comfort. Still, it will strongly resemble the current ES and its record-book-filling, 350-hp turbocharged Lancair IV progenitor. The current kit-built's fuselage comes from the same mold as the IV, that's true; and they share cowlings and major portions of the engine mounts. But to help cut costs, the ES uses more conventional E-glass prepregs, whereas the IV and the pressurized IV-P employ graphite over much of their structures. Lancair decided that the ES does not need the structural stiffness of the IV, since it's not expected to go as fast. Some graphite remains in high-stress areas like spar caps and in the rollover structure. This basic construction will carry over to the production version.

While it shares the IV's airfoil shape, the ES has 40 percent more wing area, matched by 50 percent more horizontal tail area. This gives the ES considerably lower wing loading than the IV, but still higher than most family-class four-seaters. The kit versions of the ES and Super ES have maximum gross weights of 2,900 pounds and 3,000 pounds, respectively, giving each about 1,200 pounds of payload. Lancair is performing all structural testing of the production models with a 3,200-pound max weight in mind, although performance considerations will probably restrict the small-Continental ES to a max weight of around 2,900 pounds. Predicted empty weights are 1,800 pounds for the 200-hp airplane and 1,900 pounds for the big-motor model.

Among the other changes from kit to production versions: Many changes have been wrought on the airplane's construction to slash build time and to

make it through certification more easily. Right now, it takes around 2,000 hours for a homebuilder to construct an ES; Lancair hopes to get the assembly time down to 1,100 hours at first, and eventually nearer to 800. Understand that this is with trained factory workers and a significant number of jigs and fixtures, and it does not include the labor hours required to lay up and prepare the basic fiberglass shells.

Perhaps more important to buyers of the production ES, the cabin will grow in width by four inches, to 49 inches overall; the upper, forward corners of the fuselage will be pushed out to give a bit more headroom. Also, the wing structure will be changed to a single-piece main spar and through-cabin carry-through. Extra space under the seats will be opened up for a spine-saving crush zone and simplified routing of controls and electrics. A second cabin door, a mirror image of the current airplane's left-hand gull-wing, will be included, and the instrument panel will be treated to a restyle from an automotive interior stylist. (We caution Lancair to remember that style should always follow function where instrument panels are concerned.)

Lightning protection will be standard on the production ES, because Lancair intends the airplane to be certifiable for instrument flight from the start. An expanded-foil mesh will be applied to the outside of the composite surfaces to help the odd lightning bolt to find its way through the structure without turning the airplane into gooey blobs; the technique will be adapted from the process used on the Glasair III-LP (see "Striking New Technology," March 1995 *Pilot*). Lancair has also received a small business innovation research (SBIR) grant to investigate new ways of ice protection with a TKS-style weeping-wing system. It's uncertain whether that project will bear fruit in time for the start of ES production.

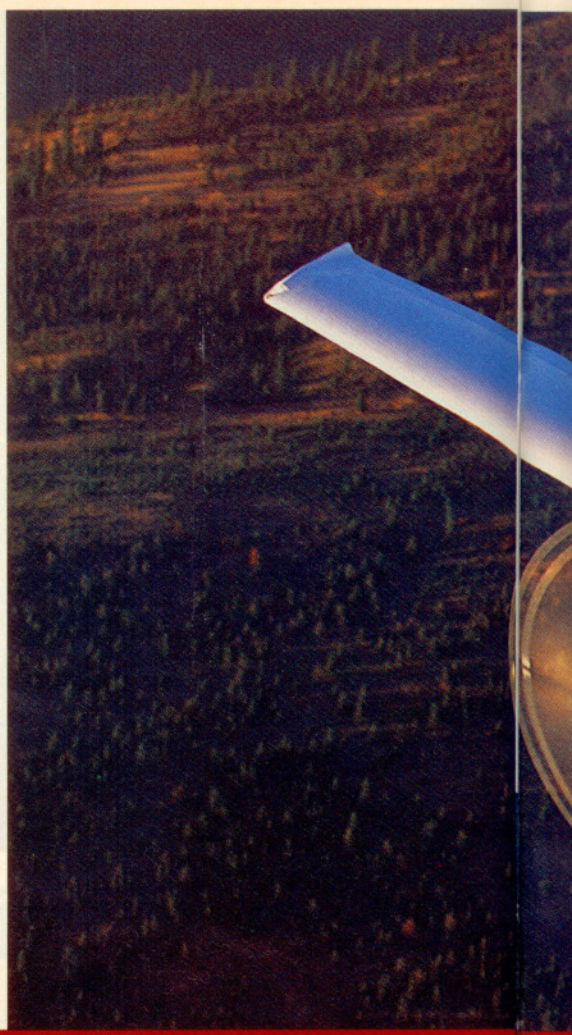
Even with all the changes under the skin, Lancair expects the production version to fly very much like the current kit-built ES. We spent some time with the factory's Super ES on the notion that the airplane could be representative of the finished product a couple of years hence.

As mentioned, the Super carries a Continental IO-550-G, ostensibly rated at 280 hp and familiar to owners of Mooney's new Ovation. (Lancair originally thought a turbocharged version of the smaller Continental would be mated to the ES fuselage, but packaging problems pointed toward the larger, normally aspirated engine as a better alternative.) With its efficient cross-flow heads and tuned induction system, this engine could be thought of as the 350-hp TSIO-550-B without turbos. In the Super ES demonstrator, Lancair has the prop governor tweaked to give 2,700 rpm at takeoff; normally, the IO-550-G redlines at 2,500 rpm. Though Continental doesn't list it, estimates of the engine's output at 2,700 rpm range from 310 hp to about 315 hp.

With this kind of motivation available, it's no surprise that the Super ES is quite a performer. Initial climb rates at full power border on the giddy-making; we noted 2,000 feet per minute from 2,500 feet msl at some 500 pounds under maximum gross weight. Climbing through 5,500 feet at 105 knots indicated, the Super still posted a 1,600-fpm ascent using full throttle (23 inches) and 2,560 rpm. Fuel flow was 21 gph at this setting.

Leveled at 7,500 feet for cruise checks, the Super ES really began to strut its stuff. With the throttle wide open and the prop set to 2,500 rpm, the airplane turned in a GPS-verified 190 knots true, burning 15 gph. With engine rpm reduced to 2,300 and the mixture set at 13 gph, the Super ES posted a speed of 184 knots true. During previous flights in the 200-hp ES, we noted an optimum cruise speed of around 160 knots on about 10.5 gph.

The ES uses its simple hinged slotted flaps—the IV uses more complicated Fowlers—to good effect. Approaches can be flown at 75 knots without so much as raising the pilot's dander, and there's still enough buoyancy in ground effect to give plenty of margin. While many high-performance models with the ES's speed potential make you sit up and pay attention, the Super comes off as so docile and predictable that the learning curve is remarkably shallow. Unaccelerated, power-off stalls result in vigorous bobbing of the nose, and little else. The electrically operated flaps successfully get the nose out of the way for a good view on final approach and create some needed drag for speed reduction. Still, the big Continental is almost at idle from the downwind-leg turn to



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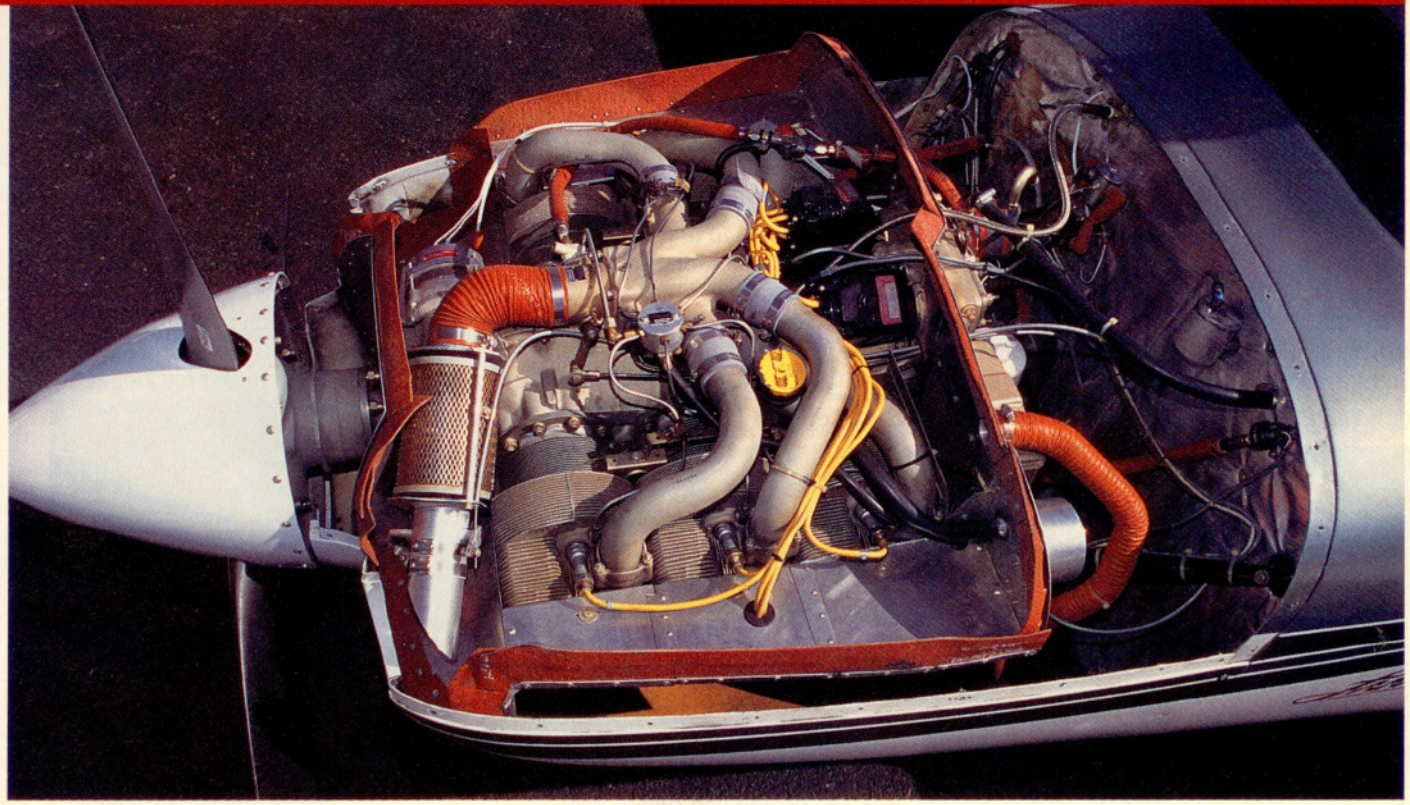
engineering personnel, the production ES project is well on its way.



Lancair expects the production version to fly very much like the current kit.

short final. You won't work too hard at making good landings in the ES, but you must be up to speed with the castering nosewheel. While most kitbuilts employ this simple steering system, few production airplanes do, and it's likely some of the transitioning pilots will object to steering with brakes alone.

Pilots will otherwise enjoy the ES's fine handling—control forces will seem just a wee bit heavy to Beech Bonanza pilots, but about right for those accustomed to less-sensitive aircraft. There's also sufficient longitudinal and trim stability to make the Cherokee pilot feel right at home. The sidestick controller seems perfectly natural within a few minutes' acclimatization, and the airplane combines nearly the ideal mixture of natural stability with sufficient control authority and responsiveness.

While the pilot savors the handling, the passengers will feast on the cabin's roomy accommodations and superb visibility. Large windows cut high into the roofline help to remove any sense of claustrophobia and to make the interior seem even larger than it is. Call it a cross between a Bonanza's commodious headroom and nearly the shoulder-spreading span of a Piper Cherokee Six.

Given the 75 gallons of fuel aboard, the ES has good legs, too. If you figure that the Super will have a block-to-block fuel burn of 16 gph, you've got about 4.7 hours' total endurance. With the comparatively parsimonious IO-360 in the regular ES, you might plan for an 11-gph average, giving a total endurance of 6.8 hours.

Numbers and plans are just so much theory until Lancair has the airplane certified; a plant built; a production certificate obtained; and, most important, customers waiting with checkbooks in hand. (Actually, it has the buyers now. Lancair says that more than 70 customers are waiting, and it has begun to

The ES may be small on the outside, but the interior is high, wide, and handsome.

accept refundable deposits on delivery positions.) By all outward appearances, Lancair has begun to put the pieces of the puzzle down carefully. As Neibauer says, "We went to the FAA with our production and certification plans and said, 'Look, we're funded. We're not playing games; we're going to do this.' We came at it with good expertise and background, knew the issues, had what we thought was a realistic time line...and they [the FAA] were pretty stoked at the end of the meeting." Time, of course, will tell whether Lancair can turn the theory of a production ES into reality. □

Lancair Super ES (production version)
Base price (with basic IFR avionics): $169,000.

Specifications

Powerplant	Continental IO-550-G, 280 hp @ 2,500 rpm
Recommended TBO	2,000 hr
Propeller	Hartzell three-blade, constant-speed, 74-inch diameter
Length	25 ft
Height	8 ft
Wingspan	35 ft 6 in
Wing area	140 sq ft
Wing loading	23.0 lb/sq ft
Power loading	11.4 lb/hp
Seats	4
Cabin length	6 ft 7 in
Cabin width	49 in
Cabin height	50 in
Empty weight	(estimated) 1,900 lb
Maximum gross weight	3,200 lb
Useful load	1,300 lb
Payload w/full fuel	850 lb
Fuel capacity, std	75 gal (75 gal usable) 450 lb (450 lb usable)
Fuel capacity, optional	100 gal (100 gal usable) 600 lb (600 lb usable)
Oil capacity	8 qt
Baggage capacity	175 lb

Performance

Takeoff distance, ground roll	(est) 600 ft
Takeoff distance over 50-ft obstacle	(est) 800 ft
Max demonstrated crosswind component	25 kt
Rate of climb, sea level	1,500 fpm
Cruise speed (fuel consumption) 7,500 ft @ 75% power, best economy	195 kt (15 gph/90 pph)
Service ceiling	(est) 18,000 ft
Landing distance over 50-ft obstacle	1,000 ft
Landing distance, ground roll	800 ft

Limiting and Recommended Airspeeds

V_X (best angle of climb)	90 KIAS
V_Y (best rate of climb)	110 KIAS
V_A (design maneuvering)	160 KIAS
V_{FE} (max flap extended)	120 KIAS
V_{NO} (max structural cruising)	185 KIAS
V_{NE} (never exceed)	220 KIAS
V_{S1} (stall, clean)	62 KIAS
V_{SO} (stall, in landing configuration)	54 KIAS

For more information, contact Neico Aviation, 2244 Airport Way, Redmond, Oregon 97756; telephone 503/923-2244, facsimile 503/923-2255.

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.