



RED HOT

*You buy it.
You build it.
You fly it
—fast.*

BY THOMAS B. HAINES

Sliding the canopy closed on the candy-apple red Lancair 320 is like pulling on a pair of driving gloves. The airplane fits snug and comfortable. You hardly know it's there because it seems to have become a part of you. The stubby little wings are yours. The



The 320 was developed because a number of builders wanted to put the larger engine into their 235 kits.

spunky fuel-injected Lycoming O-320 is yours, and its 160 horsepower makes the sky overhead yours as well.

Rest your arm on your thigh and lay two fingers on the wooden stick. You would no more use an entire hand to control the Lancair than you would a fist to take a pulse. Push the throttle forward and feel the none-too-subtle thrust on your back as the constant-speed propeller pulls you down the runway. Before you've had two scans of the panel, the airspeed indicator points to 65 knots. With a gentle tug on the stick, the airplane jumps off the runway. Flip a switch and in less than seven seconds the landing gear is in the Lancair's belly.

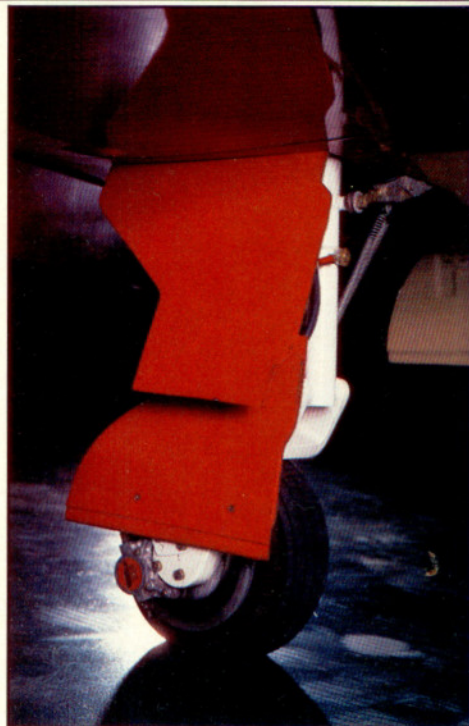
The altimeter winds up in a hurry as you are rocketed upward at 2,000 fpm. Lower the nose and blip the electric trim switch to maintain 120 knots and the VSI still points to 1,600 fpm.

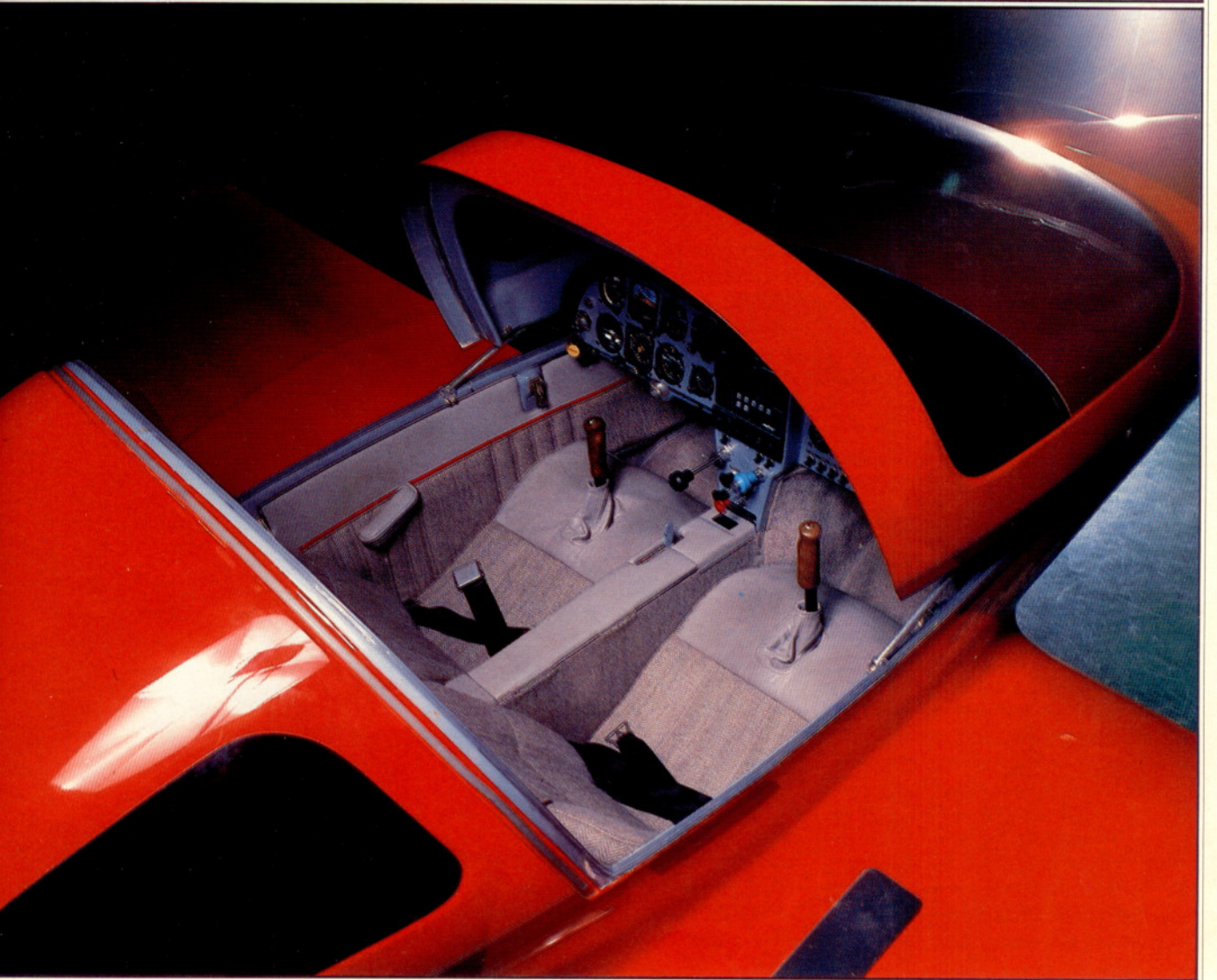
In cruise, the airspeed indicator shows 182 knots at 25 inches manifold pressure and 2,500 rpm, about 75-percent



power. True airspeed at 3,000 feet is about 205 knots, says Lancair's Donald Goetz. All the while, the Lycoming sips just 8.6 gph. At that power setting and with 43 gallons of fuel in the standard wing tanks, the Lancair will cruise 990 nautical miles, according to Lance A. Neibauer, designer of the Lancair and founder of Neico Aviation, Incorporated, which markets the Lancair kits. An additional 10 gallons in optional auxiliary tanks boosts the range to 1,255 nm. Fuel is pumped from the wing tanks to a header tank. Goetz waits until the header tank is about half full and then pumps from a wing tank for about six minutes. An electronic timer on the well-equipped panel beeps a reminder when it's time to shut the pump off.

Except at slow speeds, the Lancair 320 is a feet-on-the-floor airplane. In fact, the demonstrator has no rudder pedals on the right side. Two-finger flying is mandatory, but the controls are not so

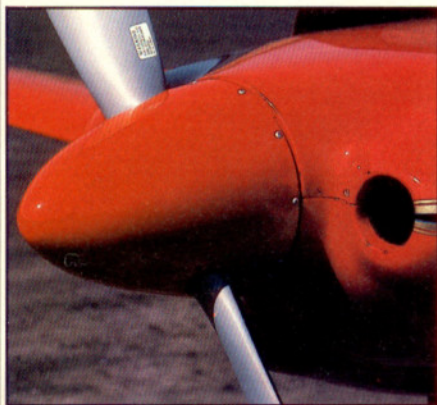




touchy as to be squirrely.

Roll control is exceptional. A little right stick and the airplane rolls right and stays there with no tendency to overbank or for the nose to drop. Differential ailerons reduce adverse yaw in turns and at slow speeds by deflecting the inside aileron up about 50 percent more than the outside aileron is deflected down.

In power-off stalls, the control forces become noticeably lighter at slower speeds, but ailerons and rudder are ef-



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fective throughout the maneuver. A little rudder pressure keeps the nose straight as it drops over.

The tinted canopy affords excellent visibility, though it must create an eerie feeling in clouds. Ventilation is good at cruise, but on a 94-degree day the cabin did heat up in a hurry while practicing low-speed maneuvers.

Most pilots of single-engine aircraft need only to shed 30 or 40 knots in the pattern. With the Lancair 320, the goal is to shed closer to 100 knots. Push the prop control forward and the 66-inch Hartzell propeller helps slow the aircraft to 120 knots, where the gear can be lowered. Except for the need to bleed off speed upon entering the pattern, landing the Lancair is a conventional affair. At 100 knots, drop in some flaps via the electric switch. On base leg, add enough power to maintain 80 knots. The airplane sinks rapidly when the speed gets below 75 knots. Pull the nose up to flare and at about 60 knots it's time to use the disc brakes. Generally, about 800 feet of

runway will roll by before the Lancair is stopped.

All of the numbers mentioned are for Neico's Lancair 320 demonstrator, a bright red airplane that looks the essence of speed. Builders of Lancair kits will see different numbers, depending on their building skills. In some cases, however, they may see even better numbers. A 70-inch propeller with a more efficient profile than that of the demonstrator is now available.

More than 100 Lancair 320 kits have been shipped since it was first introduced in February 1988. Those familiar with the Lancair history will see the resemblance to the Lancair 235, but Neibauer contends the familiarity is only skin-deep. The Lancair 235 is powered by a Lycoming O-235 engine with a fixed-pitch propeller, resulting in a maximum cruise speed at sea level of 195 knots, according to the company. The 320's max cruise is 217 knots. Standard fuel capacity is increased on the latest model by 10 gallons. The fuselage is about a foot longer, and rudder and tail fin areas are larger, providing better yaw control. The wing is about an inch shorter. Cockpit headroom was increased by 3.5 inches, and the cabin is 1.25 inches wider.

Additional horsepower and the constant-speed prop improve takeoff performance. Builders may choose fuel injection in their O-320 engine, an option not available on the 235.

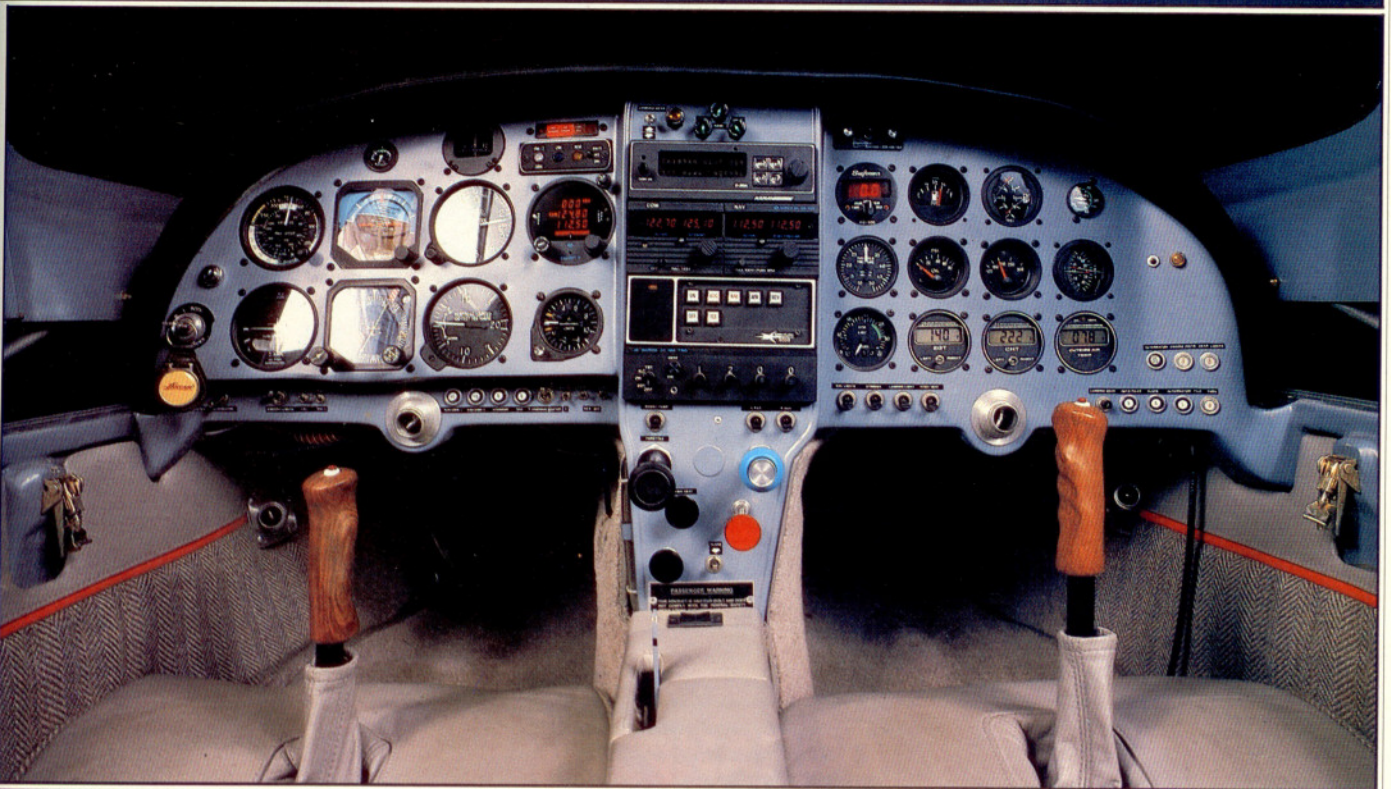
The landing gear on the 320 is taller, providing more ground clearance for the larger propeller. A new nosewheel strut was designed. The flap system was redesigned, providing a larger area and up to 45 degrees of deployment, compared to the 235's 25 degrees.

The 320 was developed because a number of builders wanted to put the larger engine into their 235 kits. Neibauer squeezed the engine into an existing 235, but found he had to make so many changes to accommodate the larger powerplant that it would be easier to design a new aircraft.

But with the task completed, the response to the Lancair 320 has been "overwhelming," says the designer.

"For some the number one joy is building the aircraft—the tinkerer. Others want to build it to fly it, though they must enjoy the building, too. The 320 is a more universal aircraft. With the 320 you can have a full IFR panel. It can handle the weight of the constant-speed prop, and it can carry the fuel to be a





cruise aircraft. The 235 is a small sport airplane and should be used that way."

Since first offering the 235 in 1985, the company has shipped about 270 kits, and about 35 aircraft are flying, according to Neibauer. He claims to have the best-selling high-performance kit airplane in the world.

People are buying kit airplanes because they aren't getting what they want from production aircraft, Neibauer explains. "Guys are tired of dropping \$100 in the fuel tank and then doing it again four hours later."

The Lancair is different from production aircraft not just because you build it yourself, but because of the materials. Lancairs are built of epoxy-based advanced composites, which are cured at high temperatures under high pressure, as opposed to wet lay-up, room temperature composites. The wet lay-up

process is the same process used in boats and in some other kit aircraft. Wet lay-up composites generally are considered to be heavier and less stable than advanced composites, particularly at high temperatures. Beech constructs the Starship with advanced composites.

The Lancair core materials are Du Pont Nomex Honeycomb and High Temperature Divinycell Nomex Honeycomb under a skin of E-glass. High Tech Composites, located near Neico Aviation's Santa Paula, California, base, fabricates the composite kit parts. Neibauer owns an interest in that company, too.

The composite construction not only results in a light, strong airframe, it also permits compound curves, maximizing aerodynamic efficiency. According to Neibauer, aluminum structures would weigh more and would be nearly impossible for inexperienced builders to as-

semble. Builder mistakes in composite materials are easily repaired, he says.

The Lancair airframe consists of about 40 pieces. Builders assemble the pieces using epoxy resins. The builder does not need an autoclave, since Neico supplies the large components that already have been formed and cured.

The airplane is about 24-percent complete when it is delivered, thus easily meeting the Federal Aviation Administration's "51-percent rule," FAR 21.191(g). The FAA requires the builder to assemble at least 51 percent of an aircraft in order for it to be granted an "experimental" certificate. Amateur-built experimental aircraft can be flown at night and in IFR conditions, if properly equipped. They cannot be flown for compensation or hire.

A new Philippine corporation formed by Neibauer may increase the comple-

THE QUANDARY OF SUCCESS

Talking with Lance A. Neibauer, one gets the sense that he is a man learning to deal with success. He is brimming with ideas for new aircraft designs, and with the success of Neico Aviation more of the ideas will see the light of day. But like many entrepreneurs, Neibauer has had to adjust to running a larger, more complex company.

"It's a grind sometimes" is how Neibauer describes the day-to-day administration of Neico, which markets Lancair 235 and Lancair 320 kits. "I used to do everything by myself, but now I've had to learn to delegate. We still try to keep a family atmosphere here because support is so important in a business like this."

Despite the fact that the company ships an average of three aircraft kits a week, Neibauer still personally knows many of the builders. Pick a name from a list of builders and he immediately recognizes it. "Oh, yeah. He's the builder that isn't yet a pilot. He's building a 235 and going to learn to fly in it."

The gentle curves and elegant style of the Lancairs reflect Neibauer's artistic background. He was a graphic artist for an advertising agency before moving full-time into aviation. His first flight was in a Meyers 200. His uncle worked for Meyers Aircraft, and Neibauer spent a lot of time flying the four-place monoplanes. There is a resemblance between the Meyers 200 and the Lancairs.

Neibauer has no engineering degree, though he has done enough studying that he is comfortable talking with aerodynamicists.

He started designing an aircraft in 1981. "I intended to just build it for myself," he explains. "I felt tied up with wood and aluminum. After studying composites I realized that designs were unlimited. You could make any curve you wanted."

He went through three prototypes before deciding on the design that ended up as the Lancair 200, using a Continental O-200 engine. By that time others had become interested in the project. Neibauer turned down potential investors and began marketing the aircraft himself. First kit deliveries occurred after Oshkosh 1985. The Teledyne Continental O-200 has since been traded for a Textron Lycoming O-235 and the aircraft dubbed the Lancair 235. Last year the company began marketing the Lancair 320, designed to fly

with a Lycoming O-320 engine.

Blueprints in Neibauer's office outline his next project. The Lancair 4 is a four-place amateur-built aircraft—all composite, of course. The two rear seats face aft. Empty weight is projected to be 1,500 to 1,650 pounds. Several engine options will be available—from 210 to 300 hp. A 220-mph (190-knot) cruise is predicted. First flight will occur by the end of the year, he predicts. The aircraft may be at Oshkosh this summer.

"A four-place aircraft has to be fast and roomy. A two-place aircraft has to be fast and efficient," he says. "I'm still not convinced there's a good market for a [kit-built] four-place airplane yet. But maybe that's because nobody has the right one. Hopefully, we will have it."

He rhapsodizes about other ideas. There is talk of a high-performance kit—a bigger engine than the Lancair 320's, but a smaller wing. Already a Lycoming O-360 engine is being readied for testing in a Lancair 320 airframe, and several people are interested in a turboprop airplane, he says. Neico supplied Du Pont with a 235 kit to be built completely out of Kevlar. Du Pont, which manufactures Kevlar, wants to build it for promotions.

Asked if maybe he'd rather step out of the day-to-day operation of Neico so he could pursue other ideas, Neibauer admits the thought is appealing. But he says it will never happen. He needs the feedback he receives from builders and employees to keep the ideas coming, he explains. —TBH



Neico Aviation's rapid growth challenges Lance A. Neibauer (standing) and Donald Goetz.



tion number to 49 percent. These "fast-build" kits will sell for an additional \$4,500, but they will decrease construction time by about 500 to 700 hours, according to Neibauer. Average construction time now runs about 1,500 hours. About half the normal 40 pieces in an airframe kit will be assembled in the fast-build kit. The wing will be in only three pieces and the fuselage will be in one piece.

The first fast-build kits were expected to be delivered from the Philippines in January. Only the 320 kit is available with the fast-build option.

In addition, Europeans, who account for about 25 percent of Lancair sales, and Asians may be able to purchase complete or nearly complete aircraft from the Philippines, since not all countries follow the 51-percent rule.

Neibauer chose the Philippines because labor there is relatively inexpen-

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sive and because the island government was encouraging investment by high-technology companies. The fast-build option would cost about \$16,000, instead of \$4,500, if it were assembled in the United States, Neibauer estimates.

The Lancair 235 kit costs \$16,975, not including engine, propeller, paint, avionics, and accessories. Another \$8,000 is necessary to complete the aircraft, according to Neico estimates, though it would be easy to spend much more on options and accessories. The Lancair 320

kit costs \$18,975, plus \$4,500 for the fast-build option. An IFR-equipped aircraft would require about another \$18,000 to complete, Neibauer says.

The result is a thrill-a-minute, head-turning performer. At a fuel flow of less than nine gallons per hour, operating costs are minimal. This is a new airplane, remember, so maintenance costs might be less than a used production aircraft that can cost about the same to purchase, yet delivers less performance.

The Lancairs only carry two people, but you can fill the seats and the tanks and still have useful load and space left over for baggage. Production aircraft do have one advantage: They can be used for commercial purposes; the Lancair cannot. But no production aircraft offers the Lancair performance per dollar of operating cost. And of course, no production aircraft can match the high of knowing you built it yourself. □

Lancair 320					
Base kit price: \$18,975, not including engine, avionics, paint, and accessories					
Specifications					
Powerplant	Lycoming O-320, 160 hp	Max ramp weight	1,685 lb	Cruise speed/range, no reserve, std fuel (fuel consumption)	121 KIAS
Recommended TBO	2,000 hr	Gross weight	1,685 lb	@ 75% power, best economy	210 kt/990 nm
Propeller	Hartzell, two-blade	Useful load	655-735 lb	8,000 ft	(51.6 pph/8.6 gph)
Recommended TBO	2,000 hr	Useful load, as tested	655 lb	Landing distance over 50-ft obstacle	n/a
Length	21 ft	Payload w/full fuel	397-477 lb	Landing distance, ground roll	900 ft
Height	6.58 ft	Payload w/full fuel, as tested	415 lb	Limiting and Recommended Airspeeds	
Wingspan	23.5 ft	Max takeoff weight	1,685 lb	Vx (best angle of climb)	121 KIAS
Wing area	76 sq ft	Max landing weight	1,685 lb	Vy (best rate of climb)	140 KIAS
Wing loading	22.17 lb/sq ft	Fuel capacity, std	43 gal (42.5 gal usable)	Va (design maneuvering)	148 KIAS
Power loading	10.53 lb/hp	Fuel capacity, w/opt tanks	53 gal (52.5 gal usable)	Vfe (max flap extended)	100 KIAS
Seats	2	Oil capacity	8 qt	Vle (max gear extended)	120 KIAS
Cabin length	5.25 ft	Baggage capacity	50-90 lb, 14 cu ft	Vne (never exceed)	235 KIAS
Cabin width	3.56 ft	Performance		Vr (rotation)	60 KIAS
Cabin height	3.54 ft	Takeoff distance, ground roll	900 ft	Vs1 (stall clean)	60 KIAS
Empty weight	950-1,030 lb	Takeoff distance over 50-ft obstacle	n/a	Vso (stall in landing configuration)	56 KIAS
Empty weight, as tested	1,030 lb	Max demonstrated crosswind component	22 kt	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.	
		Rate of climb, sea level	1,650 fpm		
		Max level speed, sea level	217 kt		