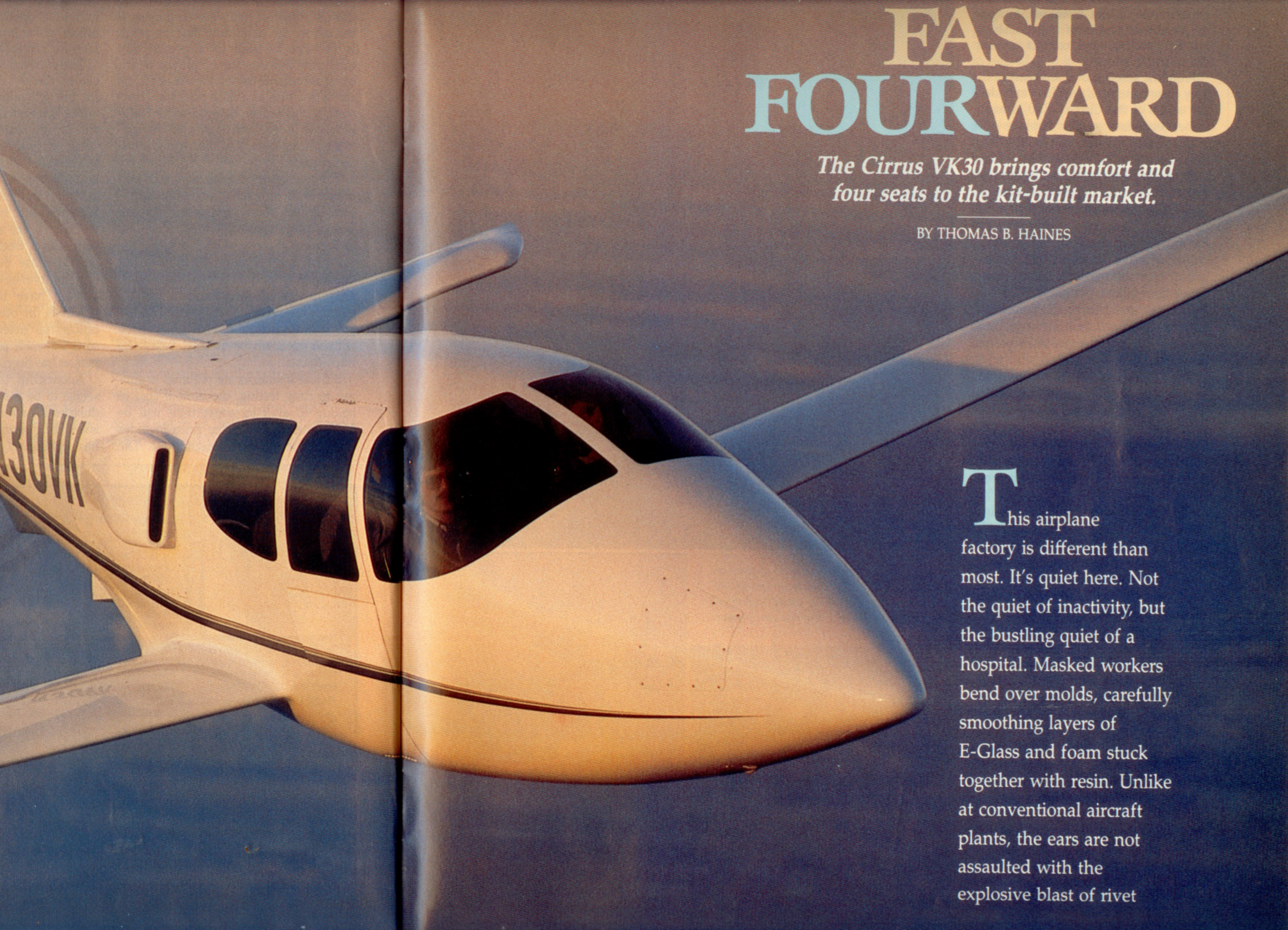


FAST FOURWARD

The Cirrus VK30 brings comfort and four seats to the kit-built market.

BY THOMAS B. HAINES

This airplane factory is different than most. It's quiet here. Not the quiet of inactivity, but the bustling quiet of a hospital. Masked workers bend over molds, carefully smoothing layers of E-Glass and foam stuck together with resin. Unlike at conventional aircraft plants, the ears are not assaulted with the explosive blast of rivet guns, the whir of metal lathes, and the plummeting of drop hammers. Here, the nose is the victim. The shops reek of the paradoxically stinking and yet almost enticing odor of the chemicals. Imagine the combined smells of nail polish remover, gasoline, and contact cement. No smoking, please.

From the smell and molds emerge the gray composite fuselage skins and slender wings of the Cirrus VK30, a handsome, four-place pusher airplane—the brainchild of brothers Dale and Alan Klapmeier. The VK30 has the exterior of a diminutive Learjet, the cabin space of an F33A Bonanza, and the speed out of a well-worn, 290-horsepower Textron Lycoming IO-540 like few other airplanes flying. At 4,500 feet msl, the prototype cruised at a true airspeed of 205 knots at about 70-percent power and burning about 15.5 gallons per hour. The brothers Klapmeier expect production aircraft with a 300-hp Lycoming engine to cruise at about 220 knots at 75-percent power at 5,500 feet msl.

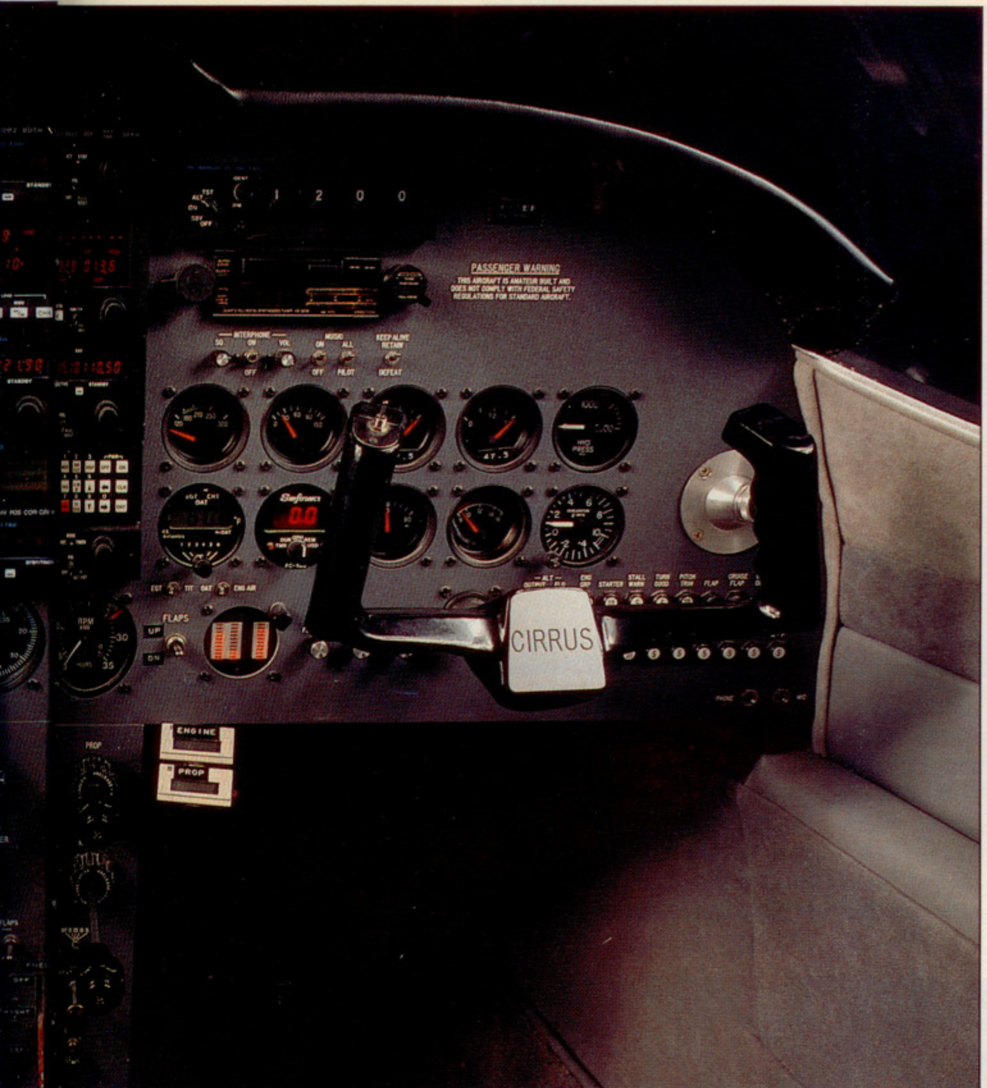
The Klapmeiers felt the two most important things pilots consider in an airplane are comfort and speed, though good looks certainly don't hurt. With that in mind, they configured a comfortable four-place cabin and then set about making it go fast. The result looks pretty good, too.

The Cirrus project started out in a barn, with Dale and Alan cutting molds and shapes out of blocks of foam. As they moved to the production stage, they bought a hangar at the Baraboo-Wisconsin Dells Airport, located about 60 nautical miles southwest of Oshkosh. They added on and on, until they finally ended up with about 18,000 square feet of production and office space at the airport. They also recently purchased the fixed-base operation on the field.

The two look like they ought to be still in college, if not high school. But their youthful looks belie their business sense. Dale, 28, majored in business and economics. Alan, 31, has specialities in physics and economics. Their company is called Cirrus Design Corporation. With the help of a progressive banker and a dedicated group of employees, they have built and sold eight kits and accepted deposits on 16 more. About 20 employees now man the shops; engineers labor shoulder to shoulder with blue-collar workers.

Once the brothers had decided on the cabin-class fuselage, they designed an engine compartment capable of han-

The Cirrus panel provides plenty of space for instrumentation. The trim system moves the entire stabilizer (below). For takeoff (right), pull back until rotation and then relax the pressure.



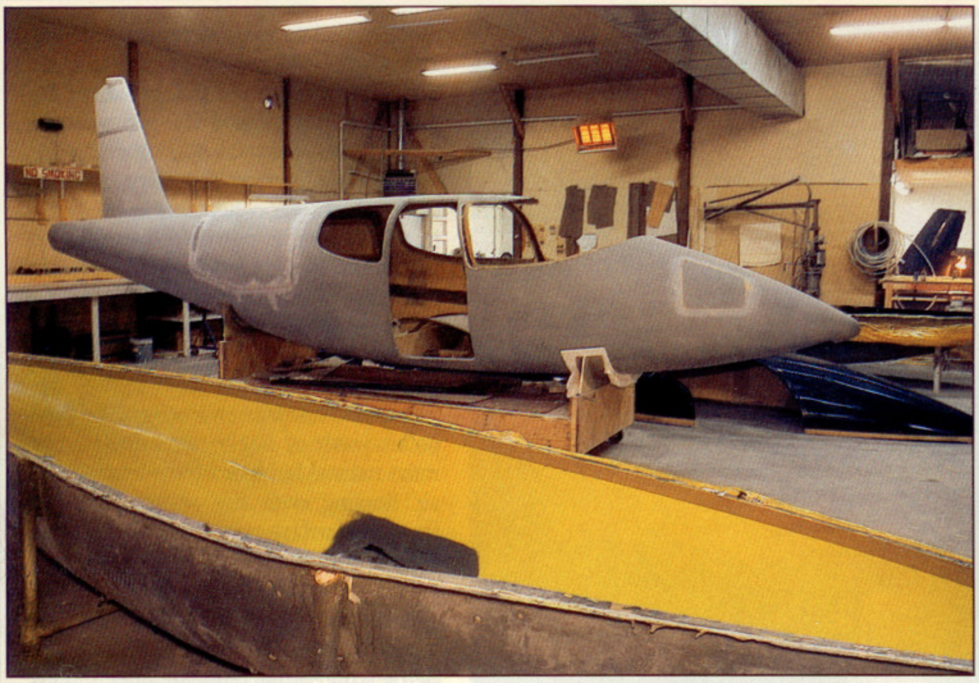
dling a variety of powerplants in the 290- to 350-hp range. In fact, one kit nearing completion in California will be powered by an Allison 250-series turboprop engine rated at 420 shaft horsepower. The number-two Cirrus prototype, which was scheduled to be flying in mid-March, is powered by a 350-hp aluminum-block Chevrolet V-8 modified automobile engine.

The VK30's high cruise speeds come not from brute horsepower alone, but also from the natural laminar flow design of the fuselage and wings. The propeller wash of tractor aircraft destroys most natural laminar flow, meaning the air flowing over the wings separates from the surface near the leading edge. It then gurgles and whirls over the top, creating drag. A laminar flow wing design permits more air to remain "attached" to the surface over a greater area of the wing—thus reducing drag and increasing speed. With the VK30's propeller in the back, the prop wash does not disturb the airflow over the wings, tail, and fuselage.

In order to maintain a near-optimum angle of attack in cruise flight, the Cirrus employs cruise flaps, like those used on some high-performance sailplanes, on the trailing edge of the main Fowler flaps. By adjusting the cruise flaps in flight, the pilot can precisely trim the airplane to achieve the angle of attack that permits the greatest speed. In addition, the cruise flaps on each side can be moved independently of one another, allowing them to be used for roll trim.

This complex flap system has caused some engineering heartburn on the number-one prototype aircraft, the only one flying as of mid-February. The bushings used on the Fowler flap-track on the prototype tend to bind under the heavy air loads unless the cruise flaps are first unloaded, the Klapmeiers discovered after flying the airplane. As a result, setting the flaps for takeoff and landing in the prototype requires the finger dexterity of a court stenographer and the quick arm of a professional blackjack dealer. Bearings rather than bushings will fix the problem on subsequent airplanes. More on the flaps later.

The unusual drive shaft system on the Cirrus, which one would think would be the engineering problem, has been mostly trouble-free during the prototype's 450 flight hours over the last two years, according to Alan. The engine sits behind the cabin on the aft section of the wing and slightly behind the center of



The Cirrus fuselage is shipped in one piece (left). Internal access (below) is relatively easy.

gravity. The easy solution would be to mount the pusher propeller right to the engine, but such a blunt tail destroys the laminar flow around the fuselage and creates a multitude of CG and control surface quandaries.

Instead, the Cirrus engine is connected, via a dry fluid clutch, to a 78 × 4-inch aluminum drive shaft stiffened by wraps of graphite. The dry fluid clutch acts as a torque-limiting device, explains Alan, in that it allows the drive shaft to slip slightly at resonant frequencies. The drive shaft is then connected to a 12-inch steel "stub shaft." The stub shaft absorbs the thrust and bending loads from the constant-speed propeller; none is transmitted back to the engine. The prototype uses a three-blade, 74-inch, composite and wood Hoffman propeller.

The Klapmeiers turned to Aerocar designer Molt Taylor for help in designing the drive system. The VK30's drive shaft and dry fluid clutch are similar to the one Taylor had certified for his Aerocar.

Because oil must travel more than 6.5 feet from the engine-mounted governor to the propeller, the prop is sluggish in response to changes in rpm settings. A solution under consideration is moving the governor nearer the prop. Another solution may be an electrically controlled prop.

In fact, the long oil line apparently was the culprit in an accident in mid-February. Alan and Cirrus marketing consultant Rich Blackmon were returning to Wisconsin from a demonstration tour in Florida when the oil line broke over Georgia. Apparently, the line chafed where it passed through a bulkhead. The engine seized, and they landed the VK30 in a plowed field—gear and flaps up. No one was hurt, and aside from the prop and the obviously ruined engine, the airplane received little damage. The Cirrus is scheduled to be flying with a 300-hp IO-540 engine and new prop in time to make it to the Experimental Aircraft Association's Sun 'n Fun Fly-in in Lakeland, Florida, April 8 through 14. The number-two prototype with the V-8 engine also may be at the show.

Dale and Alan Klapmeier

The two most important things pilots consider in an airplane are comfort and speed, though good looks certainly don't hurt.

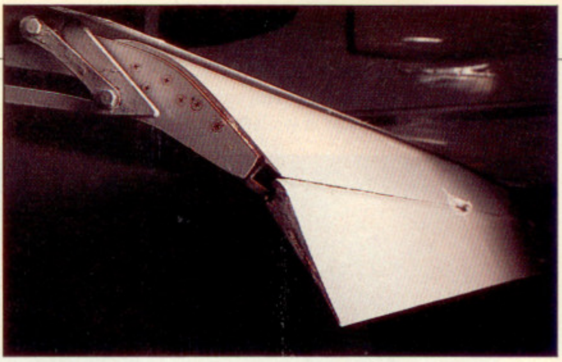
Cooling an aircraft engine buried inside a fuselage is not the problem many people believe it to be, according to Alan. The Cirrus uses a large fan in the engine compartment to cool the engine while on the ground because there is no prop out front to circulate the air. A single, electrically controlled cowl flap helps maintain the proper cylinder head temperatures in flight. The airscoops on the side of the fuselage have been made smaller because originally the engine ran too cool, Dale says.

Entrance to the VK30 cabin is through a clamshell airstair door on the right side of the fuselage. A small baggage area is located behind the rear bench seat. The pilot and front-seat passenger step through a narrow aisle between the two front seats.

Because the wings are located behind the rear seats, all passengers have an excellent view up and down. The nose slopes out of sight of those in the front seats. The number-one aircraft has a two-piece windshield; subsequent aircraft will have a one-piece windshield that is extended about five inches lower on the nosecone. The wraparound windshield gives a true Learjet feeling to the pilot.

A blustery January crosswind promised an adventuresome flight as I taxied the VK30 to Runway 19 at the Baraboo-Wisconsin Dells Airport. Alan occupied the right seat.

For takeoff, Alan set the main flaps to the takeoff position. The cruise flaps also were down.



On the runway, I cranked an aileron into the wind and applied full power. Tracking the centerline was easy—despite the wind. Per Alan's instructions, I pulled the yoke about halfway back and waited. At about 70 knots, the nose began to lift off, and less than 2,000 feet from the numbers, the airplane jumped into the air. There was not as much tendency to overrotate as I had been told to expect in a pusher airplane. I flipped the gear up and pulled power back to about 25 inches manifold pressure and 2,500 rpm for the climb. I then blipped the thumb-operated electric trim switch down. The trim system moves the entire horizontal stabilizer, not just a trim tab. On the prototype, though, the electric motor is much too fast, causing dramatic pitch changes with just the touch of the switch—another thing to be fixed on future production aircraft.

Alan then showed me the drill for the flaps. First the cruise flaps are brought up. Then the main flaps are brought up. Then the cruise flaps, with separate toggle switches for left and right sides, are put partway back down for the climb. On subsequent airplanes with bearing actuators, the main flaps will be brought up and the cruise flaps will be left in the Down position, which significantly increases climb performance.

According to Alan, even complete asymmetric deflection of the cruise flaps causes such minor roll changes that a runaway cruise flap system on approach or takeoff would not cause the aircraft to be out of control. A more convenient location for the cruise flap switches would reduce the work load. On the prototype, the switches are mounted on the center console below the power quadrant. The main flap switch is located on the main panel. According to Alan, they are considering a yoke-mounted thumb switch for roll and pitch trim. Moving the switch left or right will activate the cruise flaps. Slide it forward or backward for pitch trim.

In addition to helping with roll trim, the cruise flaps can increase cruise speeds by about four to six knots, according to Alan. Of course, in the wrong position, they can reduce cruise speeds by an equal amount.

Once the flaps are properly configured, the airplane flies quite conventionally. We climbed at nearly 1,000 feet per minute while indicating about 130 knots. Leveling off at 3,500 feet because of clouds overhead, we headed in a roundabout way for Dane County Regional Airport in Madison, about 30 nm to the southeast, for some landings into the wind. The airplane is delightful in steep turns, climbs, and descents, with the controls just heavy enough to make it feel stable—like a good instrument airplane ought to feel.

Punch the nose over, and the indicated airspeed will quickly wind up past the redline of 215 knots if power isn't managed properly. Later models will have a never-exceed limit of 230 knots, Alan explained. The Klapmeiers say

To maintain a near-optimum angle of attack in cruise flight, the Cirrus employs cruise flaps on the trailing edge of the main Fowler flaps.

they are considering adding speed brakes to increase the descent rate. The problem is finding a place in the wings to stow the speed brakes. The wings are already filled with fuel, plumbing, wiring, and landing gear.

Even at our low altitude, we started slowing the Cirrus about 20 miles from the airport. The airplane took nearly a minute to begin slowing after I pulled the power back to about 17 inches of manifold pressure. With gear extension at 120 knots, the nose pitched up only slightly. At 95 knots, it was time for the flap routine again. First, cruise flaps up. Then main flaps down. Then cruise flaps down. I'm anxious to fly the number-two airplane with the simpler flap system. Alan explained that gear and flap speeds of subsequent airplanes will be at least 120 knots and possibly as high as 140 knots.

A Madison controller cleared us to land on Runway 31. The Cirrus descends in a flat attitude, and Alan recommended landing it like a twin. Just fly it onto the runway, he urged. I worked the throttle on short final to hold about 75 knots. Over the runway, a little tug up on the elevator, and the mains touched down, followed quickly by the thud of the nose gear. It wasn't elegant but not awful for the first time.

One of the best things about flying an unusual airplane is the attention it attracts. Once we cleared the active runway, the controllers asked if we could taxi back by the tower so they could get a better look at the Cirrus. Alan chuckled as if this weren't the first time he'd heard such a request, and we obliged.

While the controllers looked the airplane over, Alan explained that the Cirrus is not for everyone. For some, the price is prohibitive. At a cost of $42,500, plus another $2,000 for delivery, Cirrus kits are expensive.

Unlike some kit airplanes, however, the Cirrus is very complete when it arrives—in a semitrailer. The fuselage is in one piece. The wing, with a single-piece main spar and a 20-foot front spar—each made of carbon/graphite—is one piece and nearly complete. The builder must install the flaps and ailerons, fuel lines, wiring, and other systems.

All of the parts for the control and drive systems are included. Cirrus also supplies the control lines, yoke, and rudder pedals. The builder must supply the rest of the interior, avionics, engine and mount, propeller, and electrical system.

The composite materials needed to finish the kit are included. Cirrus completes all of the structural parts that require curing under pressure. The builder's work with composites is limited to putting down layer after layer of material and resin.

The Klapmeiers figure a basic IFR airplane with a used engine will cost about $70,000. A builder who opts for a new engine and a deluxe panel will spend about $112,000 overall, they project. Build time is estimated at 2,000 hours. The company offers a builder-assist program in which buyers can spend several days or weeks at the Wisconsin plant working under the tutelage of experienced Cirrus employees.

Options for buyers in a hurry are "ready to install" instrument panels and engines. The avionics and switches are prewired and ready for installation. The brothers are working with suppliers of converted automobile engines and with Teledyne Continental Motors to supply complete engine kits. Cirrus plans to install the new liquid-cooled, turbocharged Continental Voyager T-550 engine in its number-three airplane. The company has not set prices for those options, Dale said.

Cirrus testing has been patterned after a Federal Aviation Regulation Part 23 flight-test program, according to the Klapmeiers. James Patton, a research pilot and former head of flight operations for the National Aeronautics and Space Administration at Langley AFB, has conducted the flight testing of the VK30. Ground vibration testing and flutter analysis were completed a year ago at the University of Texas. Analysis of structural testing resulted in strengthening of the wing spar caps.

For all their practicality, professionalism, and business sense, the brothers are still dreamers, though. Over A&W root beers and hamburgers, they talk of pressurization, bigger engines, bigger cabins, more speed. A tweak here, and maybe a tweak there.

The enthusiasm is catching, and a listener can't help but wonder if the likes of Dale and Alan Klapmeier and their dream machine of the 1990s won't turn out to be the Dwane Wallace or Walter Beech and the Cessna 210 or Beech Bonanza of the twenty-first century. □

Cirrus Design Corporation
Baraboo-Wisconsin Dells Airport
S3340A Highway 12
Baraboo, Wisconsin 53913
608/356-2266

Cirrus VK30 Prototype

Base price: $42,500, not including engine, propeller, and avionics

Specifications	
Powerplant	Lycoming IO-540, 290 hp
Recommended TBO	1,400 hr
Propeller	Hoffman, constant-speed, three-blade, 74-in diameter
Length	26 ft
Height	10.66 ft
Wingspan	38.66 ft
Wing area	120 sq ft
Wing loading	29.58 lb/sq ft
Power loading	12.2 lb/hp
Seats	4
Cabin length	8.5 ft
Cabin width (front seat)	4 ft
Cabin width (rear seat)	4.5 ft
Cabin height	4 ft
Empty weight	2,200 lb
Gross weight	3,550 lb
Useful load	1,350 lb
Payload w/full fuel	780 lb
Fuel capacity, std	95 gal/570 lb
Oil capacity	12 qt
Baggage capacity	remaining useful load
Performance	
Takeoff distance, ground roll	1,800 ft
Rate of climb, sea level	1,500 fpm
Cruise speed/endurance w/45-min rsv, std fuel	
@ 75% power	211 kt/4.95 hr
5,000 ft	(16.7 gph/100.2 pph)
Limiting and Recommended Airspeeds	
Vfe (max flap extended)	95 KIAS
Vle (max gear extended)	120 KIAS
Vne (never exceed)	213 KIAS
Vr (rotation)	70 KIAS
Vso (stall in landing configuration)	59 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.