THE BIRD MACHINE

I ease along at 30 mph, a bare 300 feet beneath the roiling, rain-laden clouds. A thousand feet below, stretching to the west, fir trees flank a freeway that disappears into the mist called Seattle.

A thin stalactite of cloud hangs in the sky ahead, and I elect to fly under rather than around. I swing my body slightly forward in the canvas harness, pitching the nose down 5 degrees to glide under the white wisp. The 23-hp Zenoah engine behind me loudly sings its relentless tune.

Despite the weather, which is awful, and my cold, which is worse, I've come to Issaquah, Wash., to fly Steve Grossruck's phenomenal little ultralight, the Kasperwing. It is my first experience with a weight shift ultralight, and conditions couldn't be much worse.

The beautifully scenic airport at Issaquah is grass, and on the day of my flight it was also part water. I had to dodge puddles on the runway as I made a series of taxi runs up and down the strip in order to familiarize myself with the Kasperwing's control response. Fortunately, the main body of rain and turbulence passed through, although the hills were still shrouded by low overcast and occasional light sprinkles.

My first takeoff had been something of a surprise because the airplane seemed willing to fly long before I was. After sitting in the machine for 10 minutes and making several taxi runs to light, crow-hop landings, I'd suddenly found myself flying somewhat involuntarily. Weight shift, I learned, can surprise you because the airplane's response isn't necessarily linear to CG position. On takeoff, you may shift your weight farther and farther aft with no apparent response, then have the airplane leap off the ground more abruptly than you'd planned.

A little more experience with swinging my 190 pounds forward and aft inside the Kasperwing's weather-proof pod made the pitch system more friendly, though I'm not comfortable with the control technique.

The Kasperwing certainly looks futuristic enough to have attracted 300 buyers. With the small fiberglass pod slung under a 180 sq.ft. single-surface airfoil, the Kasperwing is a bird-like configuration. It's a neat little package of airplane, unusual enough to grab the interest of even the least avid ultralight flier. Buildup time from the kits provided by Grossruck is about 40 hours. The finished airplane can be transported on a car top, and may be assembled for flight or disassembled for transport in normally 30 minutes.

Grossruck had pulled out all the stops and mounted virtually every available option on the prototype airplane that I flew, electric starting, an enclosed pod, a 5-gallon fuel tank (in place of the standard 2.5-gallon container) and even wheel pants. The result was a colorful ultralight that was bound to attract attention wherever it went. A shock-absorber system may be available by the time you read this, and a two-seat version is in the works for later this year.

The finished airplane weighs 160 pounds without the pod, 20 pounds more with the fiberglass enclosure. Total loaded weight of the 180-BX is about 465 pounds with a 220-pound pilot aboard. The 23-hp Zenoah translates to a power loading of 20.2 pounds per hp.

The first time you see a podded Kasperwing, you have an almost irresistible urge to call it "cute." The guppy-like pod mounted beneath the wide, tapered, constant-chord wing lends a certain impish character to the airplane.

You climb aboard through either of the two side doors, neither of which latches to anything. (The doors close at a slight down angle and hinge at the front, so a combination of gravity and the normal airflow of flight keeps them shut.) You step into the enclosure, which sits directly on the ground because the Kasperwing pod has no floor. It also has no brakes, so the lack of a floor turns out to be an advantage rather than an oversight. Climbing into the sling takes some agility, but is much easier the second time. You can adjust the sling position inside the pod by taking the weight off of the canvas and sliding the entire hammock forward or aft on an overhead tube. When the airplane is on the ground, you place your feet against a rudder bar, which is directly connected to the nosewheel. For that reason, steering is exactly backwards from normal aircraft rudder pedals. Pushing on the right side of the bar deflects the nosewheel to the left rather than to the right. This is essentially a sled steering system, and because it's been a long time since I drove a sled and not so long since flying normal production airplanes, it took some thought to avoid turning the wrong way.

Other controls consist of a dragster-style, butterfly control yoke for roll control, mounted at chest level; a yoke-mounted kill button; an electric starter that functions through a motorcycle battery (the Kasperwing has no electrical system) and a throttle. Engine start with the benefit of electric starting is obviously effortless; otherwise, it requires merely pulling a starter cord. Ventilation on the ground or in the air is excellent, almost too good, through the bottom of the airplane and an adjustable sliding overhead vent in the pod. The seating position in the sling is surprisingly comfortable, and there's more room than you might expect. Visibility is good in every direction, except straight back.

Taxiing demands a significant shot of power to get the Kasperwing rolling, but once the wheels begin to rotate, you can pull the throttle back to near idle. The aforementioned sled-style nosewheel steering system proves to be positive, almost too positive for a pilot who is unaccustomed to sled steering. Initially I was out of sync with taxi characteristics. At moderately high taxi speeds, you can use the tip rudders for steering, driving the butterfly control yoke like a car.

Inevitably, there was a slight crosswind blowing, enough to acquaint me with one of the peculiarities of ground control in a tailless airplane. Rudder control in a crosswind proved nonexistent because there's no rudder. When the wind became too strong, it simply pushed the Kasperwing sideways. Without a vertical stabilizer to destabilize the airplane on the ground, there was no tendency to weathercock into the wind, which is both a good and bad characteristic. On one hand, directional control isn't much of a problem, as the airplane continues to roll in the general direction in which it's pointed. Yet you might need a slightly wider runway for a Kasperwing than with some other airplanes if you expect to fly in strong crosswinds.

With Grossruck coaching from the sidelines and as the wind velocity gradually dropped to an acceptable level, I rapidly ran out of excuses not to fly. I taxied to the far end of Issaquah's grass strip, turned down the runway and pushed the throttle to the stop for one final series of short hops. The airplane was ready to FLY, however, and a little more aft weight shift than planned caused the Kasperwing to leap into the sky.

Holding the airspeed at about 25 to 30 mph, my vertical progress was impressive, partially because of the slow forward speed. I'd guess my ascent was about 600 to 700 fpm. Rate of climb is almost as important as angle of climb, and the Kasperwing has truly impressive vertical penetration. For example, if you accept 500 fpm at 25 mph,

DESIGNING — THE KASPER WAY

Steve Grossruck is an expert at weight shift, so much so that the system comes almost automatically to him. A former helicopter and foreign car mechanic, he's been jumping off mountains for fun in hang gliders and foot-launching ultralights since long before it became fashionable. Grossruck taught himself to fly in a Quicksilver 10 years ago, in the days when the hobby was regarded as an avocation for those pilots without "both oars in the water." Today, his sport has suddenly become legitimate, and he no longer finds himself among the lunatic fringe. He is, if not a celebrity, at least one of the better known figures in the rapidly expanding sport of ultralight flying.

The shift in pilot opinion from notoriety to acceptance didn't happen overnight, although you might think so considering the incredible proliferation of ultralights in the last few years. Grossruck first became interested in developing his own airplane in 1976. He'd been flying a Manta Fledgling hang glider when he met Witold Kasper, four-time Polish sailplane champion and a Boeing Aircraft aerodynamicist who'd previously worked with Canadair and at various companies in Poland. Kasper is an innovator with a particular interest in slow-speed flight, and like so many other aeronautical engineers, he is fascinated by the flight capabilities of birds, particularly their ability to hover and land vertically. Before emigrating to Canada, he had studied several species of birds in Europe in order to learn the secrets of their ability to land independently of forward speed. Kasper designed and built a tailless, aerobatic sailplane known as the BKB. The BKB wasn't your average home-built. It incorporated several impressive innovations, including triangular stabilizers at the trailing edges of the wing tips plus an unusual combination end plate/tip rudder. The vertical rudders that Kasper mounted on the wingtips doubled as flow fences and could be deflected outboard individually for roll control. Both can be deflected at the same time to kill lift and act as spoilers.

Using this system and a comparatively large wing on a 1963 version of the BKB, known as the BKB-1A, Kasper found that he also had some exotic sink characteristics. The airplane had a sink rate of 200 fpm at 54 mph (24:1 glide ratio) but reducing speed to 40 mph resulted in a descent at 600 fpm. Slowing to a stall at 15 mph, the descent slowed to 200 fpm again.

The BKB-1A also could demonstrate a maneuver unheard of at the time: The airplane could be tumbled end over end under control and recovered at will, making it one of the few airplanes capable of performing this maneuver. (Today, the nearest equivalent to Kasper's controlled tumble is the Iomcevak, a maneuver developed by Czechoslovakian aerobatic pilot and ex-world champion Ladislav Bezak; the Iomcevak is far from a controlled maneuver. As airshow pilot Art Scholl describes it, "Basically, you learn the entry technique for the Iomcevak; then, to recover, you merely wait until the airplane does something that you recognize.")

With Kasper's blessing and active participation, Grossruck adapted the BKB-1A's control system to the Manta. The process took almost three years of testing, trying one change at a time, flying it, modifying the airplane until each change was adequately refined.

When Grossruck and Kasper were finished, they had a true world-beating hang glider, capable of out-flying the competition. Utilizing a phenomenon known as vortex lift, the Kasperwing's unusual pitch-and-roll control system allowed Grossruck to perform a near-vertical mush at 800 to 1000 fpm with almost no forward speed. Even more significant, the airplane's outward-canted winglets allowed him to fly 360-degree turns during the maneuver.

With such capabilities, Grossruck won many hang-glider competitions in the late '70s. A switch to powered flight was inevitable, and in 1979 Grossruck tried several engines on the Kasperwing. After experimenting with everything from a 7.5-hp Soarmaster to a Honda, Grossruck finally chose a 242cc Zenoah powerplant, to deliver 23 hp.

As a precursor of his success, the Kasperwing won the EAA's Best New Design Award for 1980 at Oshkosh. Since then, Cascade has produced about 300 of the airplanes, of which at least 275 are currently flying.

that's an angular ascent of over 1200 feet per mile. There's no production airplane that will do as well, though many offer higher rates of climb.

Grossruck called the Kasperwing the closest thing to a bird, and the weight shift system of pitch control certainly makes you feel as one with the machine. But because you're not securely strapped to the airplane, even the slightest turbulence lets you swing from side to side, an inch or so each way inside the pod.

You can take some consolation from the fact that Grossruck has designed the Kasperwing to take gust loads that you're unlikely to encounter. Load limits have been established at +7 and -4 G's, greater than normal aerobatic stresses.

Roll control is through asymmetric deployment of tip rudders that droop outboard at a 45-degree angle. Turn the yoke to the right and the right tip rud-

Kasperwing 180B

SPECIFICATIONS

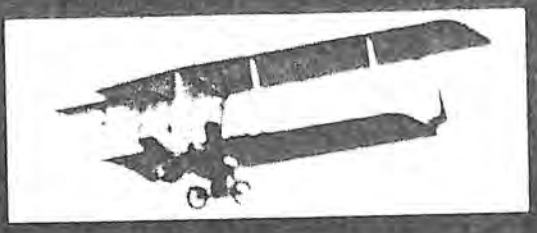
Manufacturer: Cascade Ultralights
Base price: $4,450
Price as tested: $5,665
Engine make/model: Zenoah 242cc
Horsepower: 23
Propeller make/type: 54 x 27 Aquaprop fixed wood
Landing gear type: Aluminum tubing
Max empty weight (lbs): 215
Gross weight (lbs): 465
Equipped weight (as tested) (lbs):215
Payload (full std fuel) (gals): 220
Fuel capacity (gals): 2.5
Wingspan (ft): 35
Overall length: 12 ft 8 in
Height (in): 90
Wing area (sq.ft): 180
Wing loading (lbs/sq.ft.): 2.6
Power loading (lbs/hp): 20
Wheel base: 62

PERFORMANCE

Vne (max safe speed) (mph): 60
Indicated stall speed (engine off) (mph): 22
Best climb rate (fpm): 900
Estimated service ceiling (ft): 15,000
Takeoff ground roll (ft): 50
Landing ground roll (ft): 50

DEAD STICK FACTORS

Glide ratio: 10:1
Sink rate (fpm): 200



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der deflects to drop the left wing. Should you need to come downhill in a hurry, you can arc the yoke full forward and slightly up to simultaneously deploy both rudders.

Cruise airspeed is listed as 35 to 45 mph, and I'll take Grossruck's word for that, as there was no way to verify the figure on the day of my flights. The airspeed indicator was bouncing around and providing strange readings so that locking onto a single number was difficult. It's interesting to note, however, that with the 5-gallon tank installed and enough resolve to sit in the harness for four hours, you could probably fly the Kasperwing over 150 miles without refueling.

Again, the weather precluded any checks of service ceiling during my test. Grossruck has climbed the airplane to some tall heights and has photos to prove it. He's cruised above the Sawtooths and soared the Sierra Nevada to 15,000 feet.

I wasn't up to trying Grossruck's deep-stalled vertical mush, but the technique doesn't appear to be too difficult. Cut power to idle and slowly start shifting your weight farther aft. When airspeed drops to about 15 mph, you push the yoke full forward, which opens the tip rudders. At the same time, shift your weight all the way back to the rear of the pod. Pull the yoke back slightly to close the tip rudders and you're locked into the vortex mode — a nearly vertical mush. Because descent rate is 800 fpm or more, you can't take a vertical mush to the ground. To recover, you merely move your weight forward again to recover airspeed, add power and push your weight back to level the airplane.

I tried several stalls in the Kasperwing and found them to be docile. The airplane likes to drop to the same pitch angle down as you had entering the stall nose up, so stall the Kasperwing with the nose 10 degrees above the horizon, and you'll recover with the nose 10 degrees low.

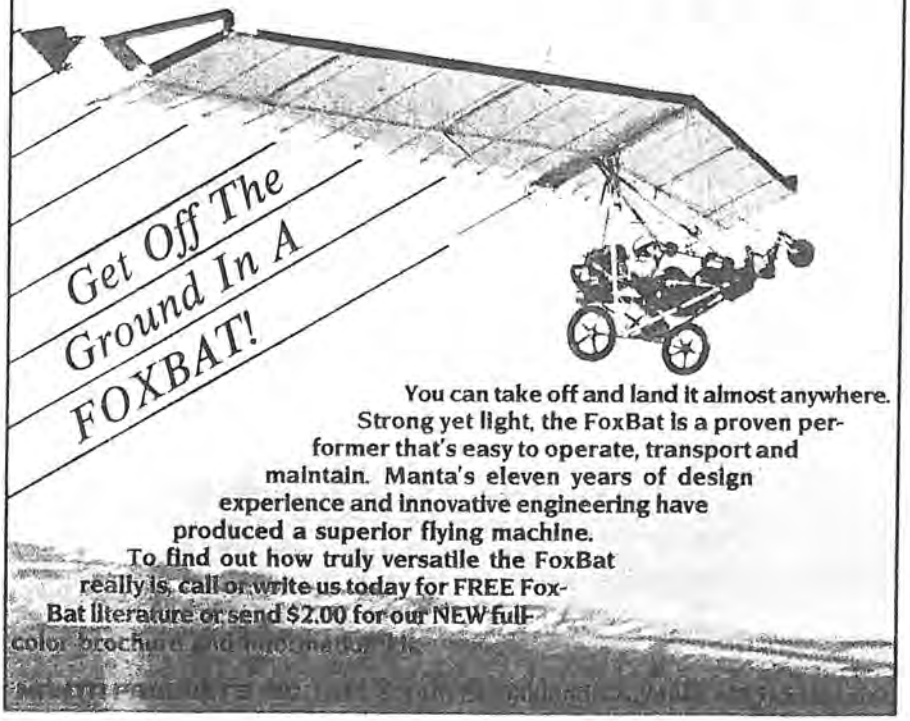
After stalling for as long as possible, it was eventually time to return for landing. Slowing to 30 mph, I found airspeed control relatively easy in the pattern. The flare wasn't quite so simple, though, and I wound up making two aborted attempts before starting to get the hang of it. If the speed is right and you shift your body to the rear exactly the right amount at exactly the proper time, the Kasperwing will touch down smoothly and roll out to a stop in less than 100 feet.

As we go to press, Cascade has a price tag of $4,450 on the basic 180-B airplane. Of course, as with production airplanes, you can spend a lot more on options, probably another $1,200 or so for the deluxe 180-BX model. The kit provided by Grossruck is fairly complete, and as mentioned earlier, it's rather easy to assemble.

Grossruck and company won't sell a Kasperwing to just anyone. In addition to $4,450, you must have some proof of flight training. Like most ultralight manufacturers, Grossruck is cautious concerning liability.

But if you do have the money and the inclination, Steve Grossruck and Witold Kasper may not be wrong when they claim that the Kasperwing is the closest thing to a bird. •

FOXBAT



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