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The Sport
Performance

Panther

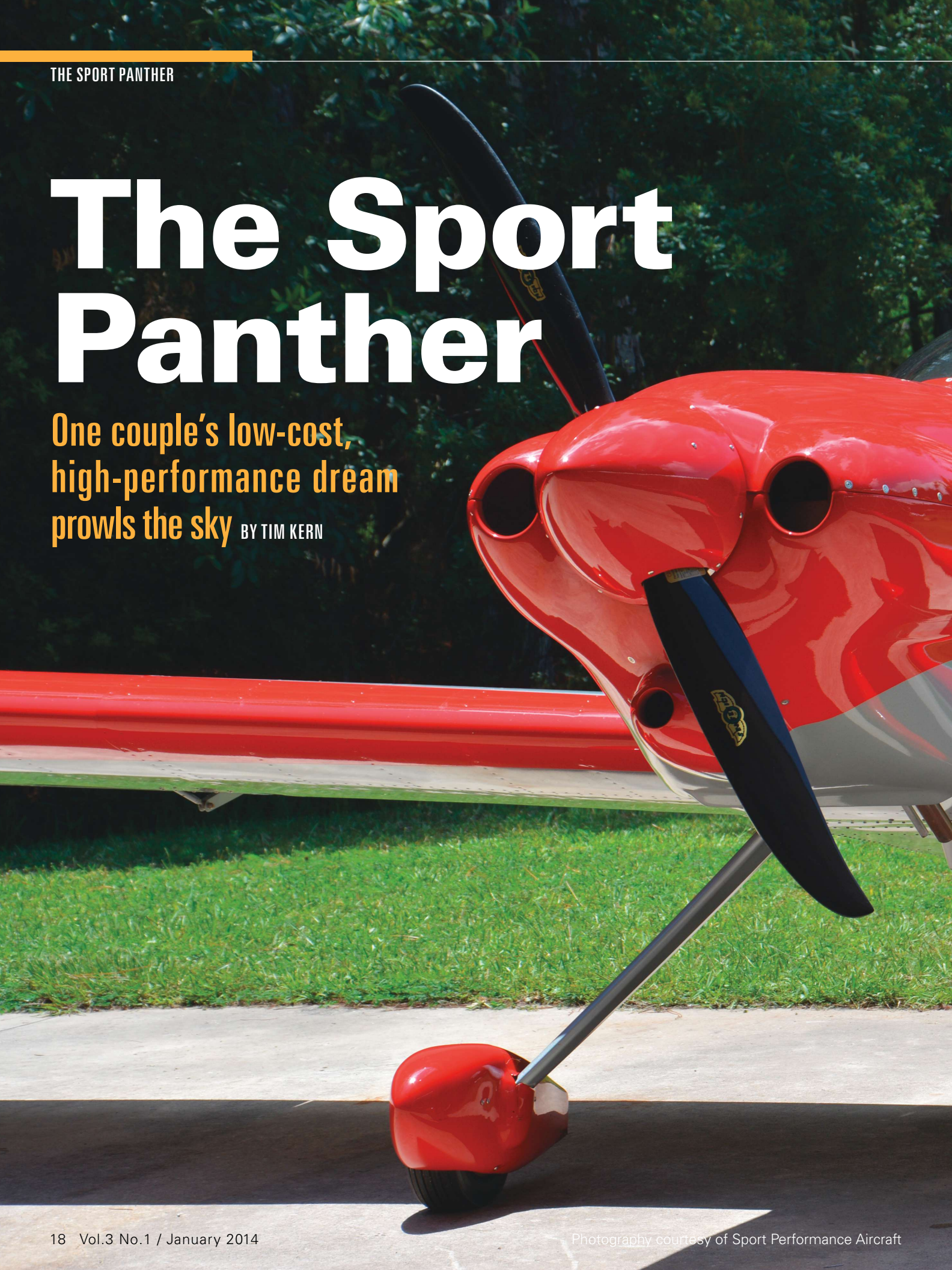
A Corvair-powered delight



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The Sport Panther

One couple's low-cost, high-performance dream prowls the sky BY TIM KERN





THE SPORT PANTHER

FOLLOWING A PROJECT TO completion takes dedication, brains, and a bit of luck. The more brains and dedication, the less luck is needed. Such is the case with the Sport Performance Panther, shown in complete and flying form at EAA AirVenture Oshkosh 2013.

“I’ve been involved in aviation my whole life,” said Dan Weseman, co-founder with wife Rachel of Sport Performance Aviation LLC, as we sat under his awning at Oshkosh.

Twenty feet away, covered by showgoers, was their baby—a single-place, Corvair-powered, low-wing monoplane that features monocoque and steel tube construction, with aluminum skin and a fiberglass cowl that sits behind a Sensenich composite prop and spinner. It’s called the Panther, and its engineering is stealthy; it looks simple and is simple to build, but it wasn’t simple to design.



The Panther in flight. It can be built as either a tail dragger or tri-gear.



The single-place Panther has a sturdy roll-over structure.

Dan and Rachel Weseman have spent several years on this plane, which they first showed to the public at the 2012 Sun ‘n Fun International Fly-In & Expo. It is the result of a lot of thinking and firsthand experience. In Dan’s aviation life, he’s been a draftsman (both pencil and CAD); he has run and programmed CNC machinery; and he’s a self-educated engineer who tempers his own experience and ideas with those of an aerospace engineer friend. Dan said, “I taught myself CAD some five years ago; and I’ve read and reread Chris Heintz’s book [*Flying on your Own Wings*], John Roncz, and others.” In addition to having built a Corvair-powered Sonex (irreverently called a “Cleanex”), he has also built an RV-4 and parts for a Harmon Rocket; he currently owns a Glasair.

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Dan is perhaps best known as a supplier to top-line Corvair engine builders, with his bolt-on “fifth bearing” setup, billet crankshafts, and alternator options now powering hundreds of homebuilts. Dan won the Cherry Grove trophy in 2009, which is given annually to the pilot who makes the greatest contribution to the Corvair movement. As pointed out in *EAA Sport Aviation* (January 2011), “A solid, safe, well-built Corvair can fit your firewall for well under \$5,000. So can a crummy one, so it’s important to learn a few things first.” Dan is one of the people who makes the parts and has the know-how to help build the good ones. And so his Panther was designed to use the smooth six-cylinder Corvair as its primary engine.

Still, Dan wanted to build, using an engineer’s explanation: “my own set of compromises. I wanted to do *my own*.”

FROM CONCEPT TO COMPLETION

Looking at his dream not only as a fulfillment of his own ideas but also as a commercial kit from the start, he notes similarities between his Panther and other well-known kits. “We [designers] all started at about the same place,” he said. “You might think of this as a cleaned-up and rounded Sonex, using only about 60 percent of the parts count of an RV-4.”

Continuing the comparisons, Dan said, “You could also think of it as an inexpensive, uncomplicated RV-3.”

“Uncomplication” takes a lot of thought. The folding wings emulate those of many sailplanes, with overlapping spars at the center section; four pins (two forward, two aft) are safetied. Folding or unfolding the wings is a 5-minute, one-person job. The dry-break fittings between the wings keep assembly and disassembly dry. And the tanks incorporate “flop tubes” in case the builder wants to do some aerobatics and has the powerplant to do it.

For everyday storage, the Panther's wings fold. Using a combination of Navy and sailplane technology, Dan has a setup that can go from folded to flyable in about 2 minutes. An additional plus is that the tanks can be filled when the wings are folded.

Although folding the wings is the usual footprint-reducer of choice, the wings are also easily removed for hauling. The Panther can be trailered in a 7-foot by 7-foot by 19-foot-long trailer "with half an inch left side-to-side," Dan said. "From wings-off in the trailer to flyable takes two guys 15 minutes."

Dan also noted that this is one of the only modern kit planes where you can get great performance by building your own engine. For about \$7,000, you can have an AeroVee (80 hp) or Corvair (100 hp) engine ready to make your day.

Other details show a lot of thought: The cable covers and map pockets are also stiffeners. The 2-cubic-foot forward luggage compartment provides enclosed storage usually provided by the second seat. (There is also a luggage compartment, aft.)

WHY A SINGLE-SEATER?

There is just one seat, with a five-point harness. Why, when the vast majority of light-sport aircraft (LSA) are two-place? First, a solo machine can accommodate nearly any size pilot without compromising aerodynamics. The Panther fits a wide range of pilots, courtesy of 6 inches of rudder pedal adjustment and 8 inches of seat adjustment. A single (or tandem) configuration's frontal area is constrained more by the engine than the cockpit, and the ballistics of the fuselage can be superior to that of a wider airplane, as well. This allows higher speed on lower power, which is another way of saying "economy." Center of gravity is more easily controlled (and therefore optimized). Additionally, a single-seat design in a weight-constrained class allows a lot of fuel capacity and a strong structure. Rollover protection and ballistic parachute mounts (the ballistic chute option is being developed) are built into the welded 4130 chromoly structure.

Light weight also gives a light wing loading. Dan said, "We've tested a 45-knot stall at 1,115 pounds."

SOME SPECIFICATIONS

The Panther, available as an amateur-built "Sport" model or as an LSA, can be built as either a taildragger or as a tricycle gear on an aluminum 6061-T6 monocoque fuselage forward of the seatback, with aluminum-skinned 4130 chromoly steel tube, aft.

Both models are rated for +6g and -4.4g; both incorporate four-position flaps, with up to 40 degrees of travel. The 1,115-pound LSA can carry engines of 80 to 120 hp; the Sport can handle up to 160-hp engines.

The LSA wingspan is 23 feet, 6 inches, yielding just under a 12 pounds/square foot wing loading. The 1,150-pound Sport has a 21-foot, 6-inch span and consequent 13-1/2-pound loading.

The LSA's claimed top speed of 140 to 180 mph can far exceed that of the LSA rule. Dan said, "Our intention was to



Inset, the isolator used for the automatic connection of the fuel sender unit in the wing. It's created by the 3D "printer."



Rachel and Dan Weseman.

install a large engine to provide excellent takeoff and climb performance, coupled with the prop to not exceed the continuous power at sea level LSA requirement of 138 miles per hour." The LSA's VNE is listed as 200, and the Sport's cruise is pegged at 160 to 200, with a VNE of 220 mph, at which the prototype has been tested.

The Panther holds 27-1/2 gallons of fuel in two tanks; fuselage and wing fuel lines mate through quick-connect fittings. The fuel tanks are removable via nut plates, or they can be riveted—it's the builder's option. The seat sits low; there is room for a parachute, and the canopy has a quick-jettison design. A taller canopy is offered, suitable for extra tall pilots, and open-cockpit testing is underway.

BUILDERS HAVE REAL OPTIONS

Another advantage that light weight brings is the ability to use other engines and stay within design limits. "The airplane is

ADDITIVE MANUFACTURING

MAKING PARTS WITH 3D PRINTING, BY PAUL SALTER

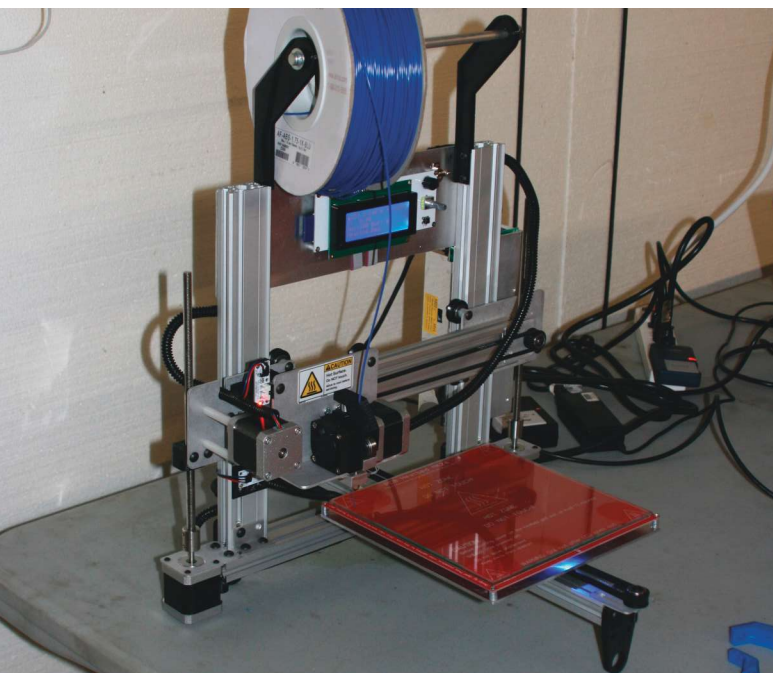
Additive manufacturing is a relatively new type of manufacturing that has been evolving over the last 15 years, and it promises to revolutionize manufacturing techniques. Current machining processes require the purchase of large pieces of material, and then everything that is not needed for the part you are making is cut away. This generates an enormous amount of scrap material.

Additive manufacturing reverses this process and starts with material in either a powder or filament form and only places material where it is needed to form the part. This saves a great deal of material costs and allows complex items to be made almost as easily as hitting the print button on your computer, with little or no scrap. Large aerospace companies are starting to use additive manufacturing techniques using metal powders that are heated with a laser to form jet engine blades, rocket engine injectors, and other difficult-to-manufacture items. Unfortunately the equipment for additive manufacturing with metal is very expensive and currently starts at prices of \$100,000 or more.

Fortunately, another type of printer has emerged using plastic filament on spools. The filament is heated nearly to its melting point and deposited in layers using the same technology as CNC milling machines. As the material cools, it bonds to the surrounding material, forming the part. These printers are now available in kits that can be purchased and assembled for as little as \$600 by a hobbyist. They are also available in pre-assembled versions starting around \$1,000.

Sport Performance Aviation has started to use one of these low-cost printers to manufacture some of the plastic parts for its folding-wing Panther aerobic aircraft. These include an isolator used for the automatic connection of the fuel sender unit in the wing and for a fixture to make the assembly of the rudder easier. These parts have a honeycomb internal structure and are essentially hollow. This allows the rudder fixture to be manufactured using approximately half of the material used by conventional manufacturing techniques.

The isolators and rudder fixture are only the beginning; there are plans to use this technology for other parts. Sport Performance Aviation is always looking for innovative engineering solutions along with inexpensive and practical manufacturing techniques.



The 3D "printer" that Sport Performance Aircraft uses to manufacture parts for the Panther.

Looking at his dream not only as a fulfillment of his own ideas but also as a commercial kit from the start, he notes similarities between his Panther and other well-known kits.

designed for 80 to 160 hp," Dan said. In addition to his favorite Corvair, the engine options include the Jabiru four- or six-cylinder engines, the AeroVee, O-200; and Lycoming O-233/235, O-320 for the Sport version, plus ULPower four- and six-cylinder engine.

Other Panthers are currently under construction, including a tricycle LSA with a Continental O-200, a Jabiru 3300 LSA taildragger, and an O-320 taildragger Sport.

Building the Panther should be on the easy side. In addition to a conscious effort to reduce parts count and include a jig-welded frame, all the machined parts are precisely made with CNC equipment; the 7075-T6 main gear is grooved for the brake lines; the sheet metal has matched holes. Builders can buy pre-cut, prepunched, preformed, powder-coated forward fuselage kits.

Though most of the sheet metal parts on the tail cone and fuselage are match-hole, some skin holes are necessary in final fitting.

WHAT ABOUT FLYING?

One airplane, the LSA taildragger version with a Corvair engine seen at Oshkosh 2013, and most recently seen flying at U.S. Sport Aviation Expo in Sebring, Florida, has completed flight testing. As tests were concluded, test parameters were widened until the design limits were all confirmed. "As of today (early December 2013), we have 80 hours on it and full positive-g aerobatic testing from 0 to 222 mph, with g-loads from -1.5 to +6, including deep stalls, spins, and aerobatic maneuvers," Dan said. "We have not been surprised."

Dan said, "It spins, but you have to make it spin. Hands-off recovery takes about one turn; assisted, half that."

So far, Dan's flying impressions tend to describe the Panther's flight characteristics "like a really light RV-4. The stick travel is long but crisp, and it's not twitchy. Long rudder travel gives a light feel there; it's easy to do full control-stop slips, with or without flaps."

PRICING

The firewall-aft kit sells for \$11,500. A kit for the cowling, pre-welded engine mount, and baffling for the Corvair goes for \$1,500, with prop and exhaust builder options.

For more information, visit www.FlyWithSPA.com. *EAA*

Tim Kern is a private pilot and has written for more than 40 different aviation magazines. He was a key builder on two aircraft projects and has earned the title of Certified Aviation Manager from the NBAA.



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