You'll flip tail-over-nose for this new aerobatic steed

Hot Stuff

PITTS S-2C

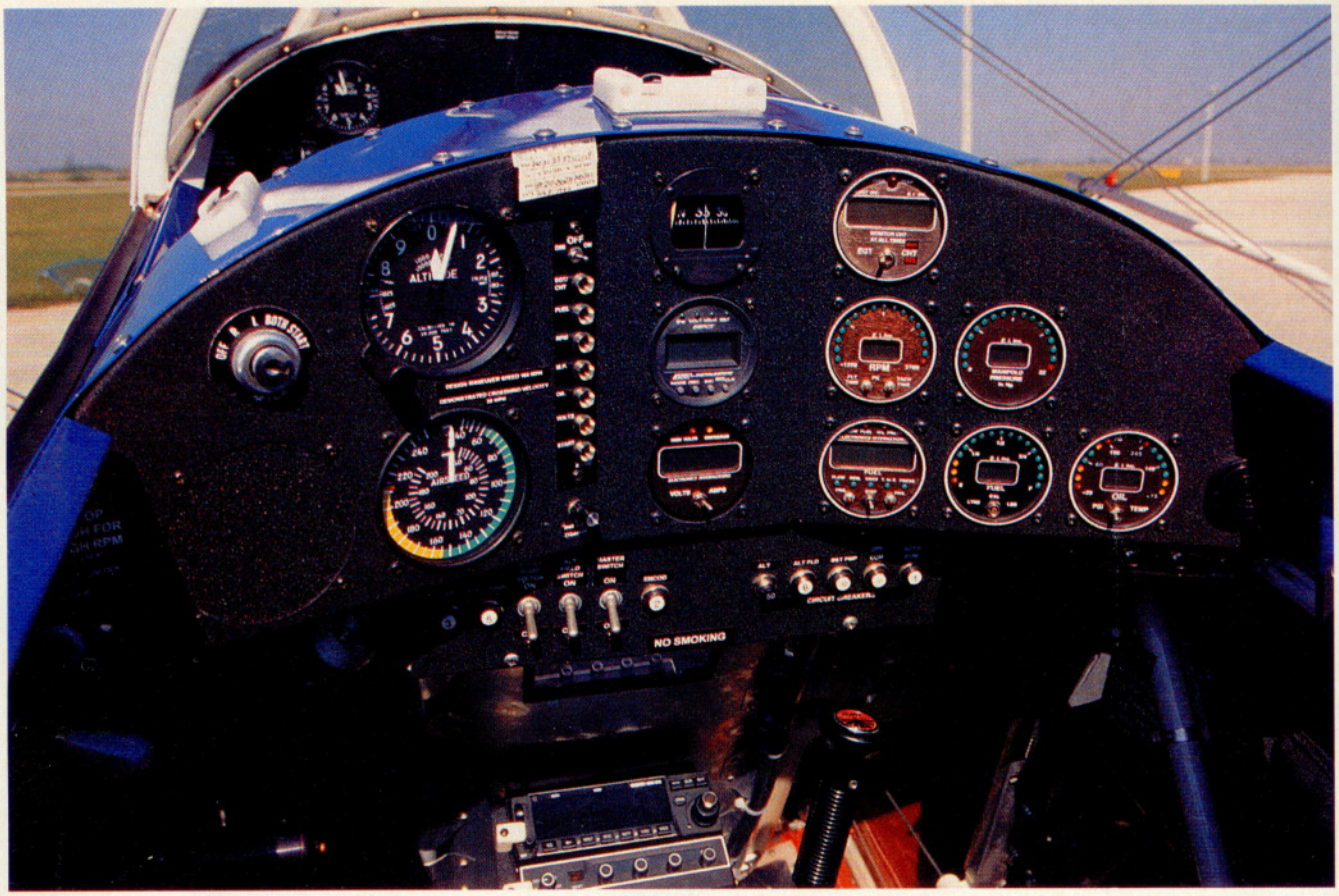
BY ALTON K. MARSH

IN the beginning, there was Curtis Pitts and a set of drawings, and they were good. In 1946, soon after assembly of that first airplane that would make him famous, Pitts knew that he had something special. His single-seat Pitts Special biplane went on to conquer the world in aerobatic competition.

In the 1980s there emerged from the Aviat factory in Afton, Wyoming, a tandem-seater, the S–2B, which became America's premier aerobatic trainer. The Pitts ruled the highest levels of competition and of training, but the reign over Unlimited category competition was not to last. There came upon the land a pestilence of high-G monoplane muscle machines—all of them capable of rolling 360 degrees a second and more.

That made the S–2B's roll rate of 240 degrees per second seem rather tame. The Pitts had other problems, too. The spades, flat plates attached below the ailerons to aid in control movement, were always

PHOTOGRAPHY BY MIKE FIZER



Avionics are mounted in a fashion similar to the S–2B (above). Gone is the visual fuel indicator of the S–2B, a clear plastic tube that ran down the right side of the instrument panel to the floor. Instead, a sophisticated fuel totalizer and a fuel quantity indicator tell the pilot how much fuel is available and how much time remains prior to fuel exhaustion. The sagging, football-shaped belly has been flattened (below).

cracking. During landing, the S–2B reacted like a badly behaved child when told to go to bed. It kicked and struggled, requiring the pilot to kick back with the rudders to keep it straight on the runway.

Now there is a new Pitts in town, the S–2C. It rolls at better than 300 degrees per second. The ailerons are so finely balanced that spades are no longer needed; stick forces are not only equal in all directions, they match the force required to operate the rudders. And greater tail area has given the Pitts better directional stability during landings.

Everything on the aircraft has changed to achieve the higher performance. "It's not just a fresh coat of paint," Aviat President Stuart Horn said. "All the performance numbers, the climb rate, the roll rate, the cruise speed, the flying characteristics, are enhanced. This will be our main production aircraft in the near future."

The two major enhancements are balanced stick forces, equal to the rudder pressures, and improved trim. The aircraft can fly inverted with hands off the controls.

Horn hired structures and systems engineers from Boeing and Raytheon and gave them a computerized engineering department in which to work. The aircraft wasn't built by the computer whiz kids alone; there was also a collaboration with one of the boys from Potlikker's Restaurant. Perhaps an explanation is in order. The rough design for the beefed-up wings on the S–2C, which the company dubs Hot Stuff, came from Curtis Pitts. Pitts, Pat Ledford, and several other friends have devoted their retirement to airplane building. They meet at Potlikker's Restaurant near Pitts' home in Homestead, Florida, where they discuss engineering problems with various projects, doodle a bit on the napkins, and go back to Pitts' shop for another try.

Their past efforts include the aerobatic Super Stinker and Macho Stinker. Many of the features, such as the wings, included on the Super Stinker are now incorporated into the S–2C. Details, though, were handled by the factory back in Wyoming. Pitts, now 82, jokes that "I just did those [S–2C] wings to keep me out of the bars.

"The Super Stinker has an extremely high roll rate and real light ailerons without pooper scoopers on them," Pitts said. "Those are the main things you want." By pooper scoopers, he refers to spades.

There are two major enhancements, according to Aviat engineer Ed Saurenman. First, the stick forces are squared, as Saurenman explains. "There are 15 pounds of stick force [required] at 4 Gs, and the aileron full deflection is 15 pounds. That's why we've got that little logo on the side of the aircraft that has four arrows and 'SS'. It means squared stick. The outside stuff [negative G maneuvers requiring forward stick pressure] in the [S–2]B is brutal, because the stick force is 35 pounds. On this one, whether it be right side up or upside down, at 4 Gs the stick force is 15 pounds.

"The other enhancement is in trim," Saurenman said. "You can trim this airplane for level flight, right side up; and when you roll upside down, you have to move the trim handle only about a quarter of an inch. And you can let go, inverted. When you roll inverted with the B, you need a lot of forward stick pressure. And there's not enough down trim to keep the thing level."

Those are the major results, but there are many others. Even the shape of the aircraft is different. The belly has been flattened (there is no football shape). The canopy has been moved forward and reshaped to provide seven degrees more visibility to the sides. The cowling opens down, instead of upward as on the S–2B, where it often scrapes the wing fabric. The landing gear has less exposed area and therefore less drag. The fuselage truss system is strengthened, which should help the aircraft to withstand longeron-torturing gyroscopic aerobatic maneuvers. The wing tips are squared off and no longer spill air the way the rounded wing tips on the S–2B do. Finally, there is a fuel-quantity gauge and a fuel totalizer (sensors measure the fuel burn rate and predict the time to fuel exhaustion), instead of the S–2B's tube filled with fuel that is diffi-

cult to see when fuel is critically low. Instruments from Electronics International and a G meter from Eze Instruments reduce pilot work load.

No, those are not all of the changes, but that's enough to give you the idea that this is an historic model change. Let's go flying.

The front cockpit, from which I made several dual aerobatic flights with Saurenman, is entered inelegantly. It takes a moment to drag all the body parts inside. Seat belts seemed to slide out of view at the wrong moment, but Aviat Aircraft is thinking of having them redesigned.

Since engine controls are in the rear cockpit, where the aircraft is flown solo, Saurenman took care of the engine start. Taxiing was similar to any Pitts; visibility is restricted from the front cockpit. Look downward left or right and all you'll see is the wing. Look ahead and the taxiway disappears, making S-turns a necessity.

Once you know that the taxiway is clear ahead, the neophyte will benefit from letting the aircraft track the centerline briefly. A common technique is to lean the head back and move only the eyes in a sort of all-seeing, all-knowing gaze—to make up for the lack of forward visibility on the runway.

The technique worked well on takeoffs, even though wind direction at Homestead (Florida) General Aviation Airport required using the more narrow, 75-foot-wide Runway 9. Wider runways provide more peripheral information. It took only three takeoffs to get comfortable with the technique. But the Pitts is only on the runway 4.5 seconds from the application of power through raising the tail and lifting off; you needn't use the technique for long.

It was a quick flight to the practice area at more than 165 KIAS. Saurenman saw that speed during most of his ferry flight to Florida and had an average ground speed with wind of more than 175 knots. Actual performance speeds had not been determined at the time of the flight in February. The aircraft is expected to be certificated this month.

Saurenman asked whether I had ever done a lomcovàk aerobatic maneuver. The answer was no. Airshow announcers tell the crowd that the lomcovàk is named after the Czech word for headache. They're wrong. The Slovak Republic Embassy in Washington, D.C., says that it's a Slavic word for a very, very stiff drink. Either way, you get the idea. Seen from the ground, the aircraft appears to stub its toe and somersault along the flight path tail-over-nose-over-tail-over-nose, yawing 45 degrees between tumbles. The aircraft even appears to fly backward for an instant. At least, that's what it says in the book *Aerobatics*, by Neil Williams.

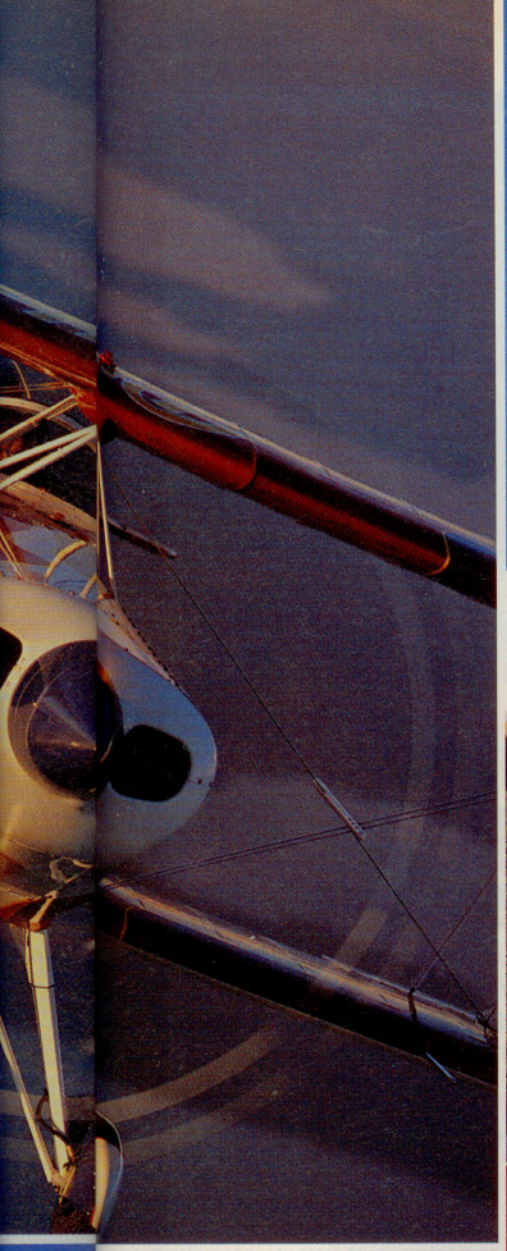
Then it was my turn to actually perform a lomcovàk.

First the aircraft is pulled into a 45-degree climb. Stabbing the right rudder to the floor, I pushed the stick toward the left cabin wall and continued shoving it as far forward as possible. (Fortunately, most general aviation airplanes lack both the performance and power to do the maneuver.)

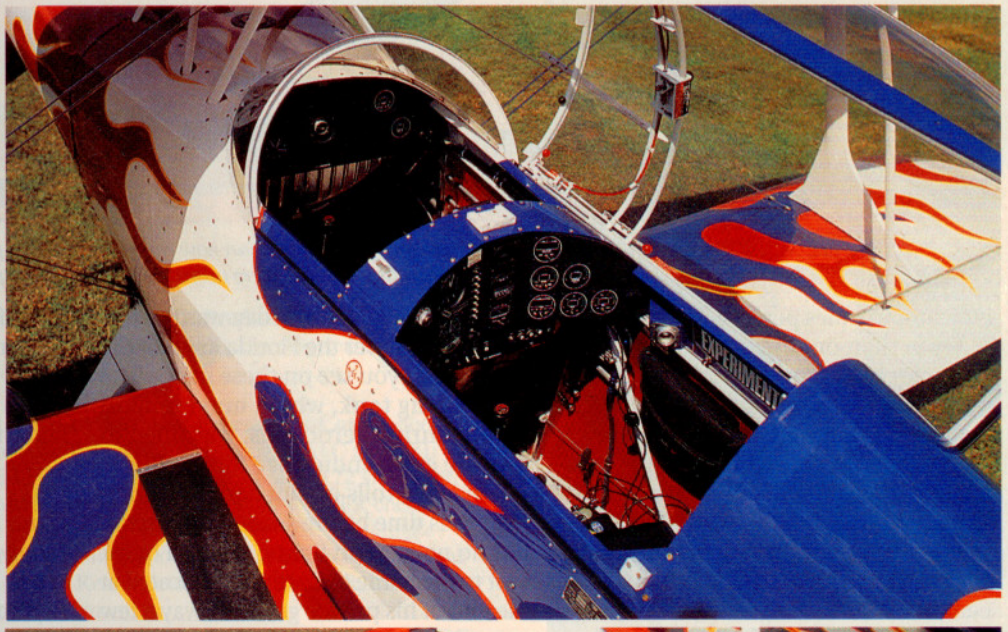
Instantly, the tail came up and described an arc, passing through where the nose had been. Power was still at cruise. The tumble was repeated twice more as I held the controls in place and waited. Finally, the blur in the forward canopy turned green—no, I wasn't sick. That was my cue to pull the power to idle and neutralize the controls, and to recover from the resulting dive. The forces inside the aircraft were relatively gentle, compared to how it looks to viewers on the ground. It felt as though I had just gone over Niagara Falls in a barrel.

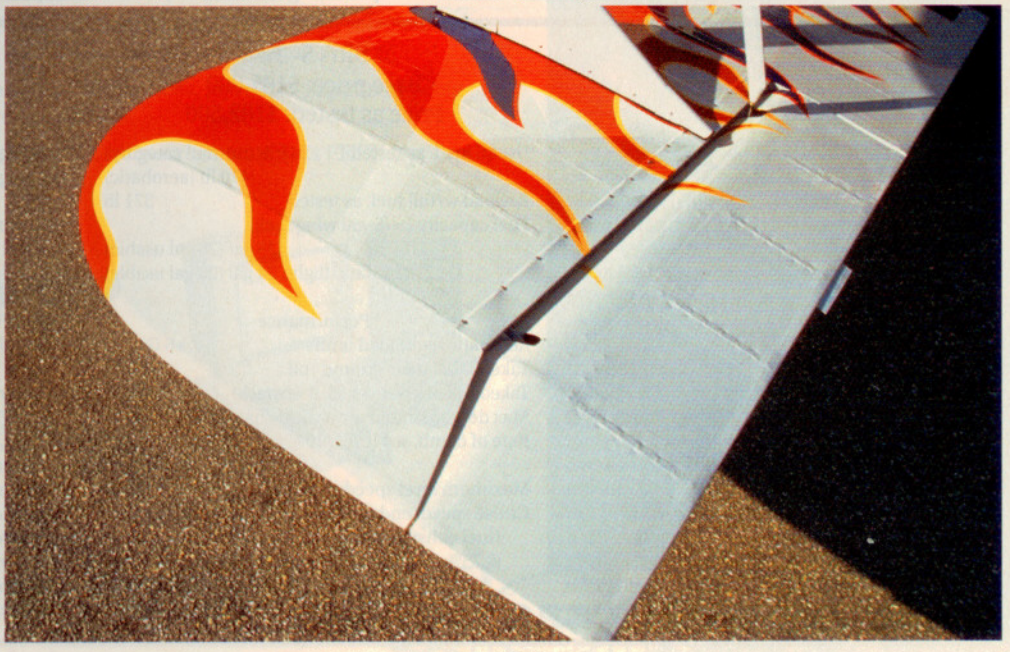
A lomcovàk tumbles the aircraft tail-over-nose several times, offsetting the maneuver by 45 degrees each time. Ever wonder how it feels? It's like going over Niagara Falls in a barrel.

Opening the eyeball airflow valve in front of me to maximum ventilation, another improvement on the S–2C, we returned to the airport for landing practice. Horn had promised that the aircraft would track straight during the landing and would be easy to land—it did and was. From somewhere I had received enough information about sink rate to make a smooth touchdown. The aircraft approaches at 100 mph (the aircraft was certificated with an airspeed



Against this clear blue sky over the Florida Keys (above), the Pitts S–2C is upside down, a favorite mode of flight. The aircraft requires only a quarter inch of movement of the trim lever in the rear cockpit to fly inverted, hands off. The wing tips have been squared off (bottom), providing more wing area and allowing the aircraft to float more than the S–2B did during the landing.





The new Pitts, shown here at the start of a snappy breakaway maneuver, can now roll at 300 degrees per second, an increase of at least 60 degrees. Testing was not complete when these photos were taken. Certification is expected this month.

indicator in miles per hour).

From then on, the landings became bouncier as I struggled to obtain sink rate information. Obviously, the view is better from the rear cockpit; Saurenman admitted that landings are more easily done from that position. Still, the aircraft does track straight ahead during the final approach and through the flare; that is a great improvement compared to S–2B landings.

The final flight of the day was the formation flight over the Florida Keys for the photos that you see on these pages. The upper wing tank, which must remain empty during aerobatics, was filled to provide extra endurance for the flight. When all 20 rolls of film had been shot, there was time before sunset (the aircraft has no navigation lights) to pay a quick visit to the home of Curtis Pitts, located at the end of his private grass runway a few miles from Homestead General Aviation Airport. Saurenman's low fly-by ended with a pull-up and a look back; the house lights flashed on and off. Curtis was home from Potlikker's. □

Links to all Web sites referenced in this issue can be found on AOPA Online (www.aopa.org/pilot/links.shtml). E-mail the author at alton.marsh@aopa.org

Pitts S–2C

Base price: $165,000
Price as tested: $182,500

Specifications

Powerplant	Lycoming AEIO-540, 260 hp
Recommended TBO	1,200 hr
Propeller	Hartzell, constant speed, composite three-blade 78 in dia
Length	17 ft 9 in
Height	6 ft 5 in
Wingspan	20 ft
Wing area	127.5 sq ft
Wing loading	13.3 lb/sq ft (normal category) 12.7 lb/sq ft (aerobatic)
Power loading	6.59 lb/hp (normal category) 6.25 lb/hp (aerobatic)
Seats	2 tandem
Cabin length	6 ft 11 in
Cabin width	28 in
Cabin height	47 in
Empty weight, as tested	1,155 lb
Maximum gross weight	1,700 lb
Useful load, as tested	545 lb (normal category) 470 lb (aerobatic)
Payload w/full fuel, as tested	371 lb
Fuel capacity (w/5-gal wing tank)	29 gal (28 gal usable) aerobatic flight, 24 gal (23 gal usable)

Performance

Aerobatic flight load limits	+6 G/-5 G
Takeoff distance, ground roll	554 ft
Takeoff distance over 50-ft obstacle	860 ft
Max demonstrated crosswind component	17 kt
Rate of climb, sea level (minimum weight)	2,900 fpm
Maximum level speed, sea level	169 kt
Cruise speed/endurance w/30-min rsv, std fuel (fuel consumption) @ 75% power, best economy, 6,000 ft	150 KTAS/1.6 hr (84 pph/14 gph)
Landing distance over 50-ft obstacle	1,200 ft
Landing distance, ground roll	750 ft

Limiting and Recommended Airspeeds

V_Y (best rate of climb)	82 KIAS
V_A (design maneuvering)	134 KIAS
V_{NO} (max structural cruising)	134 KIAS
V_{NE} (never exceed)	185 KIAS
V_{S1} (stall, clean)	56 KIAS

For more information, contact Aviat Aircraft, Box 1240, 672 South Washington Street, Afton, Wyoming 83110; telephone 307/886-3151; or on the Web (www.aviataircraft.com).

Because flight testing is still in progress, these specifications are subject to change. 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.