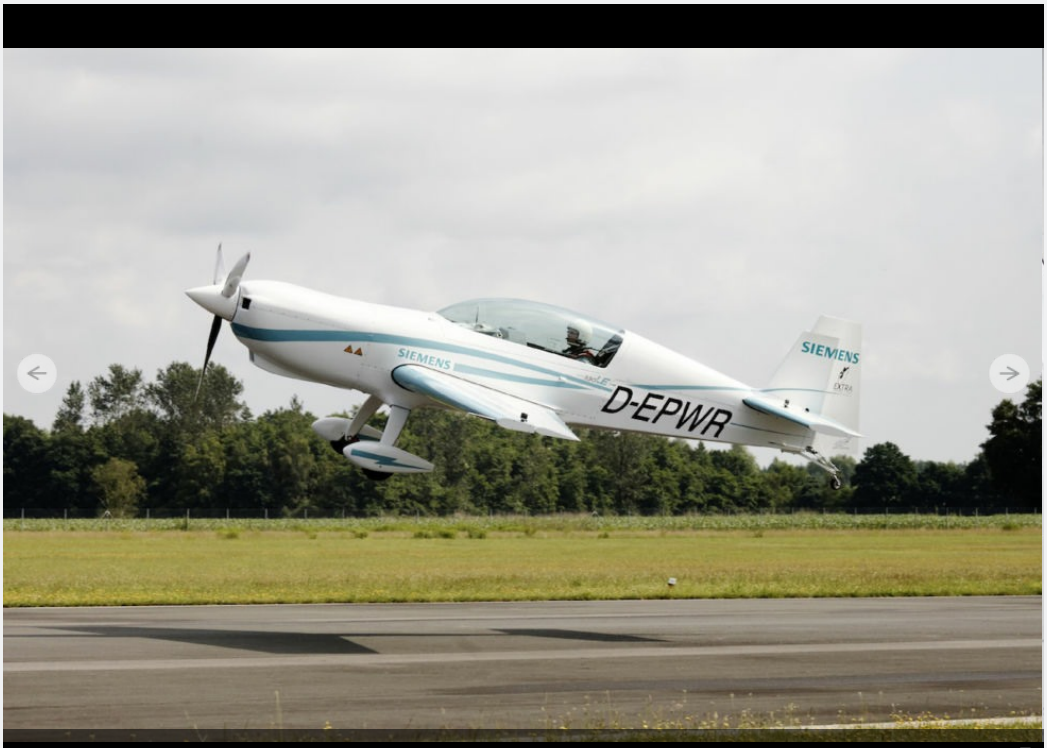
UP UP AND AWAY —

This Extra 330 is the fastest-climbing electric-powered airplane ever

It's not quite Ludicrous Mode for the skies, but we're getting there.

ERIC TEGLER - 12/16/2016, 5:52 AM

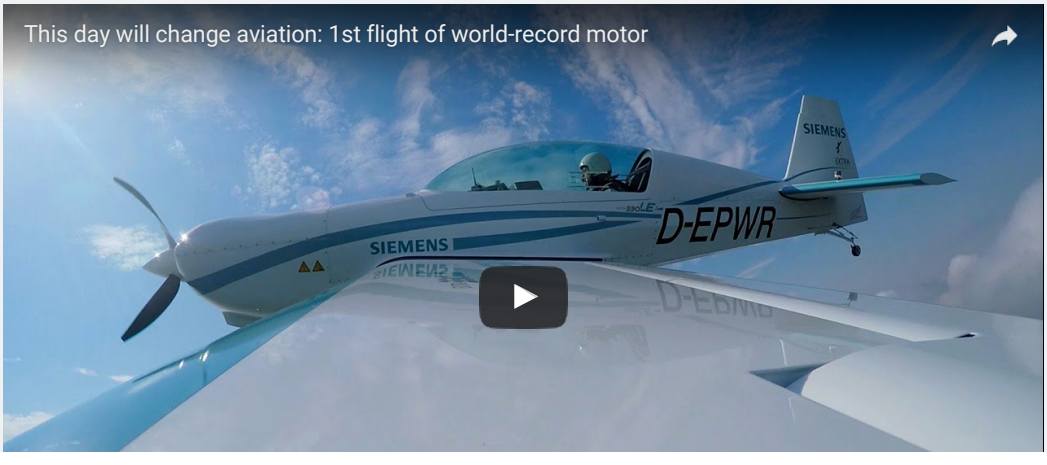


The Extra 330LE is powered by a 260kw (348hp) electric motor. Siemens




While we've become accustomed to seeing electric cars demonstrate serious performance—Tesla's Model S P90D can accelerate to 60mph in 2.8 seconds—the mere idea of electric-powered airplanes is unfamiliar to most of us. But the development of electric powertrains for aircraft is starting to gain momentum.

On November 25, a German-made electric-powered Extra aerobatic aircraft took off from Dinslaken, Germany and climbed from the ground to 9,842 ft (3,000m) in 4 minutes and 22 seconds. The Extra handily beat the previous electric aircraft 3,000m time-to-climb record of 5 minutes, 32 seconds set in 2014. Some analysts expect to see electric-powered passenger aircraft carrying up to 100 people on short-haul routes of up to 600 miles (965km) by 2030.



Those aircraft won't likely be pure EVs. They'll be series-hybrids similar to the Chevrolet Volts that we've seen on the road. The Volt has one electric motor to send power to the wheels and a second that acts as a generator to make electricity, driven by a petrol engine. Hybrid-electric aircraft would employ electric motors to drive propellers or ducted fans and generate power with gas turbines (jet engines).

To do that, reasonably sized lightweight electric motors will need to produce a lot more power than they do now. Companies like Boeing and Airbus are working on electric drives with the power-to-weight ratio needed for transport aircraft. German electronics firm, Siemens, is doing the same and actually has a lead on the big airframers. In 2015, it unveiled the SP260D, an electric motor that weighs 110lbs (50kg) and produces 260kW (348hp)—a power-to-weight ratio of five kilowatts per kilogram.

"That's a world record in this class," Dr. Frank Anton, Siemens head of eAircraft confirms. "Powerful electric motors used in industry have a power/weight ratio of, at most, one kilowatt per kilogram, and in the automotive industry they reach two kilowatts per kilogram at best."

Impressive, but to improve electric aviation drives further, Siemens needs test platforms. That's where Extra comes in.

If you've seen the Red Bull Air Races on TV or in person, you've seen Extra's small, propeller-driven aerobatic airplanes zipping through race courses 50 feet above the ground. Founded by German aviator Walter Extra in the mid-1980s, the company began as an outgrowth of Walter's desire to compete in the World Aerobatic Championship (WAC) with an aircraft of his own making. A series of Extra's super-agile low-wing monoplanes have become serious competitors in and winners of the WAC as well as Red Bull competitors.

Siemens approached Walter Extra with the idea of using one of his airplanes to develop its electric motor in 2015. Its rationale was straightforward. High performance aerobatic aircraft are relatively cost-efficient to operate, fully certified by airworthiness authorities like the FAA, and their typical tubular lattice frame construction makes installing and modifying components easy. Above all, their capacity to push a powertrain to its limits in flight by making sharp accelerations in three axes induces the kind of stress Siemens needs to prove the performance and reliability of its electric drives.

After a design review, Siemens and Extra chose to adapt an electric drivetrain to Extra's two-seat 330LX, a fully aerobatic 10G two-seater normally powered by a 315 hp horizontally opposed six-cylinder Lycoming AEIO-580-B1A engine. In its place the team installed the SP260D electric motor and an inverter from Siemens paired with batteries from Slovenian maker Pipistrel. Thrust is courtesy of a three-blade propeller by German firm MT. (Interestingly, Pipistrel and Siemens were at odds last year over an electric airplane flight across the English Channel; evidently everyone has made peace now.)

While the SP260D weighs just 110lbs, thanks to super lightweight filigree aluminum components, the batteries—in the engine compartment and in the front cockpit—weigh an additional 330lbs, making the unit comparable to the Lycoming in terms of weight. All up, the 330LE weighs about 2,200 pounds, about 700 pounds more than the conventional 330.

Walter Extra took the 330LE aloft for the first time in June of this year. Subsequent flights made sure all systems functioned, including critical cooling for the motor/batteries. With the electric drive, the 330LE can reportedly stay airborne for a little less than 20 minutes. It didn't need that long to set the new time-to-climb record from the ground to 3000m but the margin was close since the SP260D can operate at maximum power for just five minutes.

As for the sensation of the 330LE, Walter Extra said that in the air without a combustion engine, the experience is "almost silent." The Extra set its record in the FAI's (Fédération Aéronautique Internationale) C-1b class for aircraft weighing between 500kg and 1,000kg. The outright time-to-climb record holder in the class is the Bohannon B-1, a modified RV-4 with a Lycoming IO-540 engine that climbed to 3,000m in just 2 minutes and 20 seconds in 1999.

Obviously, electric powertrains will have to improve significantly to match that, and they'll have to be electrifying indeed to produce the 10 megawatts of power that electric airliner motors will require. They'll also have to surmount high-altitude temperature and pressure challenges. But engineers are working to make them practical—one climb at a time.

Listing image by Siemens

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