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# The aircraft that will put schools on the grid

Slovenian airplane maker Pipistrel has **just received EASA certification** for its Velis Electro – we take a look at how it could **revolutionise training**...

SYCAMORE RETURNS Henry Simpson reports on the Bristol Sycamore that returned to British skies

PIPISTREL

AIRSPACE CHANGES Nick Wilcock discusses the changes to airspace regarding Air Cadet glider sites ONLINE TRAINING AOPA has launched a

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aircraft

PIPISTREL

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WORDS David Rawlings **IMAGES** Pipistrel

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A. 573 TCDS). It is a twoseat, single-motor version of the Pipistrel Virus SW 121, which first flew in 1999 and is powered by a Rotax 912 S3 engine. Pipistrel has worked on electric aviation for many years, and flew its first electric two-seater in 2007. Pipistrel went on to win the NASA Green Flight Challenge in 2011, and has produced nine different experimental and serially produced electric aircraft (the Velis Electro is a certified successor of the Alpha Electro). "The Velis was conceived as part of Pipistrel's Velis Training system, designed to reduce carbon footprint and cost" The Velis was conceived as part of Pipistrel's Velis Training System, designed to electrify flight training and reduce both carbon footprint and cost. The switch to electric power (stored on board in lithiumion batteries that Pipistrel designed and produced) reduces the complexity and maintenance cost of the aircraft.

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"The type certification of the Pipistrel Velis Electro is the first step towards the commercial use of electric aircraft, which is needed to make emission-free aviation feasible. It is considerably quieter than other aeroplanes and produces no combustion gases at all," said Ivo Boscarol, Pipistrel's founder and CEO, when he spoke to AOPA UK. "It confirms and provides optimism, also to other electric aircraft designers, that the Type Certificate of electric engines and aeroplanes is possible. The engine, which Pipistrel type-certified separately, is also available to other aircraft OEMs. For Pipistrel, this achievement injects additional motivation for the future eVTOL and multiseat hydrogen-powered projects."

The European Union Aviation Safety Agency approved both powerplant and aircraft in less than three years, a remarkable feat in itself because no regulator in the world had previously certified either an electric-powered aircraft or any aviation powerplant.

#### **TECHNICAL INNOVATIONS**

The Velis Electro was designed to be simple to operate and maintain, without compromising safety. Employing the Pipistrel's type-certified electric engine, the Velis Electro delivers power instantly and without hesitation – using a simplified user interface in a cockpit that maintains the same look and feel of its conventionally powered siblings. The reduced number of moving parts dramatically decreases maintenance costs and the risk of malfunctions is further minimised thanks to its built-in continuous health-monitoring system. This enhanced reliability allows the Velis Electro to have more than double the lifespan of powertrain elements in comparison to the previous generation of electric airplanes.

"The Velis Electro was designed to be simple to operate and maintain, without compromising safety" Tine Tomažič, Pipistrel's Director of Research and Development told AOPA that the aircraft is full of innovations: "The aircraft features an entirely liquidcooled powertrain, which not only allows it to operate in hot, cold and rain, but also much improves longevity and durability of component life. In addition, the battery has demonstrated compliance to the stringent DO-311A standard, is HIRF and lightning-strike resilient and crashworthy as demonstrated by drop tests."

Boscarol was quick to explain why the Velis Electro trumps traditional trainers. "The main difference between this aircraft and other concepts and previously non-type-certified aircraft around the world, is that piloting this aircraft is very similar to piloting a fuel-powered one. The cockpit is the same, the controls are identical, instrument panel view is the same. The pilot doesn't need to be an electric



The two-seat high-wing Velis has been conceived to reduce pollution and save schools money

The Velis has 50 minutes endurance plus reserve

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32 COVER STORY Pipistrel Velis Electro

A charge time of more than an hour might make the Velis uneconomical for schools

## VIELIS

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Pipistrel states that more than 30 Velis Electros will be delivered before the end of 2020

engineer to understand the systems and fly the aircraft. All the propulsion management and the interface between the engine and pilot is done by the aircraft and the pilot can concentrate only on flying."

#### **CHARGE ON**

The main goal for the Velis Electro is to be sold to schools, and those in a highlypopulated area will be pleased as the new aircraft creates just 60 dBA of noise; with no pollution, the complaints should drop, but there is an issue as most lessons last for an hour and the problem for the Velis is that the battery life is currently 55 minutes, plus reserves. Boscarol said that the Velis is "designed as a trainer for the initial training process, mostly to fly in traffic patterns. The endurance is sufficient for a standard 45-minute lesson, and then during the debriefing, changing the student and briefing of a new one, the aircraft can be fully recharged

"Pipistrel hasn't developed a quick swap system, stating that to maintain superior longevity of the battery it developed a system employing liquid cooling for the batteries which precludes quick battery swapping" and continue its mission."

Tomažič added that the battery charge time is "typically 45 to 80 minutes, depending on initial battery temperature when charging is initiated. If the battery is very cold, the system will first warm it up, hence the charging time is adjusted."

This causes another disadvantage, that for every hour of flight, the aircraft has to be grounded for an hour whilst it recharges. Pipistrel hasn't developed a quick swap system, stating that to maintain superior longevity of the battery, it developed a system employing liquid cooling for the batteries, which precludes quick battery swapping. "Consider that each of the two batteries weighs approximately 70 kg; quick swapping would necessitate additional ground-handling equipment and introduce potential safety hazard associated with battery dropping on the floor," explained Tomažič. This could

cause schools to think twice about whether the Velis is right for them.

#### **FULL ORDER BOOKS**

Despite these concerns, Pipistrel has already filled its order books. "At this moment we are approaching 50 orders, mainly for schools but also aero clubs and environmentally-friendly organisations, who want to demonstrate quiet and emission-free flight. The largest initial order we have from Switzerland. In the past year and half, 25 pilots of AlpinAirPlanes made more than 400 flight hours with Velis's predecessor aircraft, the Alpha Electro. AlpinAirPlanes will distribute 12 Velis Electro aircraft over their daily flight schools on 10 airfields all over Switzerland with the goal to offer the most environmentallyfriendly training possible. The FFA (Fédération Française Aéronautique, French Civil Aviation Authority) as the

French launch-customer will receive their first Velis Electro in the next few weeks; as well as the Swedish Aeroclub of Goteborg."

#### PHILOSOPHY AND BELIEFS

Pipistrel is no stranger to innovation in aviation. It's been the company's philosophy to make aviation more environmentally friendly. "I have dedicated 30 years of my life to making the aviation cleaner and quieter," said Boscarol. "If you look at the Earth from space, you will see a tiny light-blue belt around it.

This is our atmosphere. We can survive a few weeks without the food, several days without water, but only a few minutes without air. So, it is a duty of everybody who can contribute to it in any way, to make sure that our atmosphere remains as clean as possible. Aviation is the type of transport which is one of the biggest polluters in the world. Making it emission-free will contribute to cleaner mobility."

Making aviation cleaner is only half of Pipistrel's attitude,

"We are bringing flight training back, even close to populated areas and even during weekends, because the aircraft only produces 60 dB of noise" noise reduction is the other. "Think of this," said Boscarol. "In European countries such as Austria, Germany, France and Switzerland, there are almost 100 small GA airports, where the flight training is forbidden during the weekend because of noise! And honestly, who has time to go to lessons during the working day? But we are bringing the flight and training back, even close to the populated areas and even during weekends, because the aircraft only produces 60 dB of noise – which is only slightly more than the basic environmental noise - it's practically inaudible. You don't know that aircraft is in the air if vou don't see it.

We try our best to satisfy all the needs of pilots and students. But we must understand also the people on the ground, who don't care about aviation at all. They just like their peace and quiet. So we must make sure that they are not disturbed by the aircraft in the air above their heads – and that's why we made an aircraft which produces minimum noise and no pollution."

Tomažič added to Pipistrel's beliefs by stating: "The Velis Electro is a technological springboard to Pipistrel's future electric flight products, which include cargo-delivery and air-taxi eVTOL vehicles, as well as larger, zero-emission hydrogen-powered 19-seat miniliner and microfeeder commuter-class aircraft."

Production is going to start ramping up. Pipistrel's plan for the rest of 2020 is to deliver four Velis a month, then from Janaury next year, it will ramp up to six aircraft a month. The plan is to eventually raise that number to 10 per month. And should their order books continue to fill, Pipistrel can double their shifts and push out 20 a month.

It remains to be seen what additional testing the FAA might require before issuing a type certificate for the Velis, or if Pipistrel will pursue that. The company noted plans to deliver aircraft to 31 customers before the end of the year.

#### TECH SPEC Pipistrel Velis Electro

#### PERFORMANCE

Cruising Speed(35 kW): 90 KCAS Stall Speed With Flaps: 45 KCAS Stall Speed Without Flaps: 51 KCAS Max Climb Rate: 3,3 m/s (647 fpm) Take-off Run (grass): 246 m (807 ft) Take-off Run (asphalt): 241 m (791 ft) Service Ceiling: 3,660 m (12,000 ft) Endurance: 50 mins (plus VFR reserve) Max Load Factor @ (1.875): +4g -2g

POWERPLANT Engine: Pipistrel E-811 EASA Max power: 57.6 kW MTOP **Propeller:** Fixed-pitch composite threeblade, 1.64 m diameter

WEIGHTS Empty Weight: 428 kg (941 lbs) MTOW: 600 kg (1320 lbs) Payload: 172 kg (378 lbs)



Pipistrel remains one of the most innovative aviation companies in Europe

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