

eFlight Journal

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Special 2024



UL eVTOL on Sale : **Pivotal Helix**



RX4E - 4 place Part 23 aircraft: Batteries and Hydrogen

MGM Compro, Safran, Rolls-Royce e-Power for Fixedwing and eVTOL



eVTOL Cargo and Medivac



Guide: Sustainable Aviation Trail



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E-Mobility -

Is history repeating itself?

Recently in Europe there were many complaints that although industry was leading in some technologies like renewable energy (with solar cells and windmills) and electric cars, for a long time now the major players have come from other parts of the world.

People here have been talking about electric cars for more than three decades. At that point in time, the German car industry dominated the world market in combustion engine technology. Electric car newcomers like Tesla were only mildly ridiculed. This attitude of German industry and politics changed only slightly over the next two decades. There was talk of electric cars, but in practice people often simply installed electric motors in existing combustion engine models and were then surprised that the performance remained rather modest. Investments continued in the development of combustion engines and government funding for truly innovative ideas remained rather modest as well. This resulted in record profits on the group balance sheets. The almost perfect SUVs and sedans with diesel and gasoline engines sold brilliantly and the emerging Chinese became the largest single market for car imports "Made in Germany".

But times are changing quickly, too fast for the board members in Wolfsburg, Munich and Stuttgart. Tesla began its triumphal march around the world and in the boom after the Corona crisis, Chinese manufacturers continue to surprise with new models that are often superior in many areas. The result can be summarized in one number: When it came to combustion engines, Volkswagen and its brands in one point in China – their most important market - had a market share of up to 40%. For electric cars last year it was just 2%.

One of the many reasons: In the Chinese cities plagued by smog, it became almost impossible to register a new combustion engine and the Chinese manufacturers, who had always lagged behind when it came to cars with combustion engines, had, thanks to government funding and clever management decisions, concentrated fully on the development of "eCars" and simply overtaken the established manufacturers in terms of price and performance. But enough of ground-bound mobility. Let's look up – into the air. And the development could repeat itself. Pipistrel from Slovenia had already registered the first CS-LSA

training aircraft three years ago after the first fully electric motor glider Taurus, but since the takeover by Textron we have been waiting for news from the e-world such as a Velis Electro in the UL-class or an electric- or at least hybrid - Panthera.

Likewise, aviation in the Far East is also being electrically upgraded. After the world's first approval for a Chinese eVTOL by the CAAC (eHang in autumn 2023) and the certification of the eVTOL Cargo by AutoFlight (in March 2024), things continue quickly in the Part 23 class: Liaoning GA from Shenyang had gotten approval for its LSA RX1E according to CAAC-LSA years ago and now wants to attack the European Training market with this aircraft. At the same time, a four-seat version - the RX4E - is in certification for Part 23 and a prototype version of the aircraft flies with a hydrogen combustion engine and generator as an energy source. All three machines will be on display at the e-flight-expo at AERO in Friedrichshafen / Germany 2024.

But luckily there is also new e-news from the west. The company Pivotal (formerly: Opener) completed its UL-eVTOL according to FAA Part103 and began selling it last summer. The manufacturer from Silicon Valley would also like to have the aircraft approved and sold as an Ultralight in Germany. The company, which is majority-owned by Google founder Larry Page, introduces itself in the e-Connect Area at e-flight-expo.

But there are also some bright spots in Europe, such as Elektra Solar, which has taken into account in its electric plane that such an aircraft should be as efficient as possible if you want to fly as far and as long as possible with the low energy capacity batteries. And H55 and BRM show their electric Trainer.

The world premiere of the Medivac drone from the German manufacturer Avilus at the TU Munich stand should also be very interesting.

Of course, it will take some time before these electrical developments populate the sky. But as you can see from the development of the car markets in countries like Norway and China, things sometimes happen faster than you think.

But no matter whether conventional or electric – a visit to AERO 2024 is definitely worth it.

Willi Tacke



Cover eFlight Journal 1-2024



We the **eFlight Journal (eFJ)** founders are a team of aviation journalists and enthusiasts who created Flying-Pages. Publishing several aviation publications around the world. It started with the interest in electric flying in 2009.

We co-founded the e-flight-Expo in Friedrichshafen/Germany as part of the AERO, and established it as the largest show for electric aviation worldwide.

The eFJ is supported by FACC, Rolls-Royce, Rotax and many others.

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Approved production organisation EASA 21/G
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Airbus presents the CityAirbus NextGen

During of the opening of the new CityAirbus test center in Donauwörth / Germany at the beginning of March, Airbus presented the prototype of its fully electric CityAirbus NextGen flying taxi to the public for the first time. In the new center, various technologies related to electrically powered air taxis are tested.



Airbus is aiming for the first flight of its CityAirbus NextGen this year

The production version of the eVTOL aircraft has wings that provide some of the lift during cruise flight. The eight rotors of the CityAirbus NextGen cannot swivel, that is a difference from other air taxis. The Rotors are driven by brushless electric motors from MAGiCALL. MAGiCALL was founded in California in 2004. The range of the Airbus air taxi is said to be 80 kilometers (50 miles) and the cruising speed is 120 km/h (75mi/h).

www.airbus.com

Volocopter gets it's DOA and POA certification

German e-VTOL developer Volocopter has received an extension of its Production Organization Approval (POA) from the German Federal Aviation Authority (LBA), which enables series production of the VoloCity. Volocopter is the first and only eVTOL company worldwide, which has both approval as a development organization (DOA) and approval as a



manufacturing organization (POA). In addition, Volocopter, through its subsidiary Volocopter Air Services, is now also the first company in the eVTOL sector to be an Approved Training Organization (ATO) of the German LBA. This certification allows the Volocopter company to train pilots for its future products. Under the EASA certification category "SC-VTOL (Special Condition VTOL) En-

hanced", the VoloCity will be the first commercial eVTOL with the world's highest aviation safety standards. Achieving this safety standard enables the VoloCity to fly quietly and emission-free even over densely populated areas, thus expanding today's urban traffic mix with an attractive variant in the 3rd dimension.

www.volocopter.com.



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The 100. Velis Electro has been delivered

The 100th Pipistrel Velis Electro reached its new owner. The buyer is the French company Green Aerolease, which makes aircraft available to air sports clubs and flight schools as part of long-term leasing. Pipistrel is part of Textron eAviation and had already signed a contract for the purchase of a total of 50 two-seat electric Velis Electro with the French company in 2021. After the Velis

Electro was certified by EASA (European Union Aviation Safety Agency) as the world's first electric aircraft in June 2020, the US Federal Aviation Administration (FAA) has now also approved the model in the Light Sport Aircraft (LSA) class, so that student pilots in the USA can also be trained on the Velis Electro. www.pipistrel-aircraft.com

eCopter instead of eVTOL



In contrast to most eVTOL developments, which are often reminiscent of larger quadcopter drones or, as a lift-and-cruise design, aircraft with pivoting propellers, the Austrian startup FlyNow Aviation takes a different approach with its air taxi concept. The Austrians are working on an autopiloted eCopter that has a coaxial electric drive train with two counter-rotating rotors and, due to this configuration - according to FlyNow - can be classified as an electric helicopter by EASA, which would make certification much easier. In addition, the coaxial drive train contains fewer moving parts and less hardware overall, which reduces weight, material costs and complexity. FlyNow plans to offer the aircraft as a one- and two-seat passenger version as well as a cargo model. Although FlyNow does not yet have a flying prototype, the company has successfully conducted ground testing with a fully equipped, scale proof-of-concept model. The company estimates that all three versions of the eCopter will ultimately have a range of up to 50 km, a cruising speed of 130 km/h and a maximum payload capacity of 200 kg. www.flynow-aviation.com



Joby and Archer march in step

Just one day after American eVTOL developer Joby Aviation announced that the company had received Part 145 cert. from the FAA, competitor Archer, developer of the five-seat lift and cruise design Midnight, followed suit according to an identical message. Under FAA regulations,

the two publicly traded companies are now authorized to perform specialized aircraft repair services while maintaining the highest level of safety, an important requirement for operating a commercial aviation company. www.jobyaviation.com + www.archer.com

AJW Group in charge of spare parts supply for Lilium Jet

German eVTOL developer Lilium has reached an agreement with AJW Group, the world's leading independent provider of components, repair and supply chain solutions: The AJW Group is the world's exclusive spare parts distributor for the Lilium Jet. The contract is a very comprehensive agreement that also covers the management of Lilium's spare parts inventory, the provision of warehousing and logistics services, as well as repair and asset management. Following approval as a development organization (Design Organization Approval,

DOA) by EASA, Lilium began production of the Lilium Jet at the end of last year, with entry into service scheduled for 2026. www.lilium.com

Hybrid Assistance System for Helicopters

The Italian company Konner Helicopters is announcing its Hybrid Assistance System (HAS) as a "breakthrough in flight safety" for single-engine helicopters. HAS consists of a high-torque brushless motor that automatically activates in an emergency, providing an additional 90 horsepower to the main gearbox. This gives the pilot a secondary, reliable source of power in the event of a loss of main engine power. The immediate and autonomous activation of the HAS extend the time the pilot has to react in case of an emergency; for example, to initiate autorotation. According to Konner, research has shown that an increase in reaction time of two seconds could have prevented 80 percent of all accidents following an engine failure with late-initiated autorotation.

www.konnerhelicopters.com

EH216-S for just 332,000 Bucks

The Chinese eVTOL developer eHang, whose autonomous flying air taxi EH 216-S has already been approved for commercial use in China, has now announced the official sales price for its two-seat aircraft: From April 1, 2024 you can buy the EH 216-S, which is designed for distances of up to 30 km (19 miles), for the equivalent of \$332,304. After debuting at CES in Las Vegas in 2016, the aircraft received a standard airworthiness certificate in December 2023, leading to initial deliveries of the eVTOL to corporate customers, reportedly using the EH 216-S in scenarios such as low-altitude sightseeing and urban tourism.

www.ehang.com



Sikorsky develops hybrid-electric VTOL

Now a well-respected helicopter specialist has joined the ranks of eVTOL developers: Sikorsky, which belongs to the defense and technology group Lockheed Martin, is developing a hybrid-electric tilt-wing demonstrator for vertical take-off and landing. The goal of Sikorsky engineers is to combine high speed with a range of almost 1000 km. The finished demonstrator will have a maximum gross weight of 4,000 kg and feature a 1.2 MW class turbo generator. Sikorsky Innovations and GE Aerospace are currently completing a hybrid-electric propulsion system test rig to test a 600 kW electric motor for hover performance.

www.sikorsky.com.



Integral E from Aura Aero completes successful rolling tests

The French company Aura Aero, designer and developer of the Integral family of two-seat training aircraft, has now successfully put the prototype of its fully electric Integral E into operation and carried out the first rolling tests. Integral E is driven by the ENGINEUS electric motor from Safran. The first test flights are scheduled to begin in a few weeks. The Integral Trainer will then be available in three versions: as a Taildragger R (which first flew in 2020), with a nose wheel landing gear as a Tricycle-Gear S (which completed its first flight in 2023) and in the future also as a fully electric version Integral E. Integral E was first presented at the 2023 Paris Air Show.

Certification of the conventionally powered variants is expected this year, after which the first customer deliveries will begin. Certification of the Integral E is scheduled to be completed by 2026. A towed variant of the electric plane is also being developed in collaboration with the French Gliding Federation (FFVP).

www.aura-aero.com



H1-X by Droni Aerospace

After its first manned eVTOL flight last June, Florida-based Droni Aerospace has announced its next model: The H1-X, which has four coaxial ducted propellers housed in the wings for vertical flight movements and two additional ducted propellers for forward thrust. Droni Aerospace said it will reach a cruising speed of 120 mph (200 km/h) and a flight duration of up to 40 minutes. The two-seater H1-X weighs just over 600 kg and has a payload of 200 kg. Control via a centrally mounted joystick is largely automated. It is understood that Droni plans to sell the H1-X as a light sport aircraft that requires pilots to complete only 20 hours of training in the United States. Full-scale prototype flight testing is expected to be conducted by the end of this year. The H1-X is scheduled to go into series production in 2026. The price should then be somewhere between \$300,000 and \$400,000. A lot will depend on whether Droni manages to convince investors of the – literally and commercial – viability of his very futuristic-looking concept. www.droni.io





HOME VISIT TO PIVOTAL IN PALO ALTO

A helix at the coast of Oregon.

The Future of Ultralights

Helix looks like something out of a science fiction film from the end of the last century. But the single-seater eVTOL flies in real life and not in a computer animation. And it is the first eVTOL that you can buy privately and fly legally - at least in the USA - fully electric, of course. Willi Tacke visited the pioneering company in Palo Alto, which will soon be selling its products to other countries.

On the occasion of the “Transformative Vertical Flight” event in Silicon Valley, I thought I would stop by Pivotal (formerly Opener). You can still find the company in Google Maps under Opener in Palo Alto, but when I drive past the address shown on Sunday after arriving in San Francisco, I’m not sure if I’m in the right place. A small two-story industrial building, no nameplate, no notice on the mailbox and no aircraft can be seen even when looking over the fence.

Pivotal boss Ken Karklin explains to me on the phone the next day: “That’s right. We’re still in stealth mode for a bit, but we’re changing that with the start of sales. For example, we are now building a showroom here and have set up a room for simulator training. We can also be clearly seen at the nearby airfield where the practical training takes place.”

The story of Pivotal began under the name Opener in 2010 in Canada. Engineer Marcus Leng developed his dream of flying in the province of Ontario. After selling his production company, he devoted himself to his hobby, flying, in the early 2010s and developed the idea of a “different” eVTOL aircraft. The three existing concepts “Multicopter”, “Tilt Rotor” or

“Tilt Wing” and “Lift and Cruise” did not really convince him. It should be possible without too much mechanical effort, he thought, to take off and land vertically with multi-propellers, but then fly forward with wings (which is up to four times more effective, i.e. energy saving). His solution, after endless attempts, was the “tilt aircraft,” in which the aircraft rotates around the pilot. Leng developed the motors, controls and also the structure from carbon fiber reinforced plastic and in 2011 he took off for the first time with his opener Blackfly.

Decisive impulse

Prototype followed prototype and then there was a big push in 2014 thanks to Larry Page. The Google co-founder, who has long been interested in electric flight and especially eVTOLs, and who visited Pipistrel in Slovenia more than 15 years ago, invested in various eVTOL developers and founded the companies ZeeAero and Kitty Hawk, agreed to make start-up funds available on the condition of maintaining confidentiality.

The secrecy surrounding his holdings was one of the hallmarks of Larry Page's aviation investments. American friends I had known for years were not allowed to reveal where they worked after they started at ZeeAero. And Page, who had a small apartment on the upper floor of the company in the early years, was only respectfully referred to as 'the man upstairs', who was not allowed to be mentioned, but was always very interested. Another thing the investments had in common was that all the companies in and around Palo Alto were located in Silicon Valley, where Google has its headquarters and where Larry Page also lives.

Some activities at ZeeAero (later Kitty Hawk) were discontinued or sold to Boeing. But Mr. Google continued to be heavily involved in the electric aviation sector.

He finally emerged from self-imposed anonymity with his company Opener about two and a half years ago. The company exhibited in Oshkosh and began selling its first product - the Opener Blackfly - last summer. In autumn 2023, the company was renamed Pivotal. The name - derived from pivoting (in German: rotatable, swiveling) - better describes the characteristics of the aircraft than the old company name Opener. The rotation as a decisive feature can also be found in the new name of the aircraft, which is now no longer called Blackfly (German: Griebelmücke) but rather Helix (German: Wendel, Spirale), which is certainly better for marketing reasons, because who wants to like to identify with a little bloodsucker. The essential and somehow ingenious thing about Pivotal aircraft is that with Pivotal the aircraft basically revolves around the pilot. In addition to the advantage of reduced complexity, this also has the advantage of saving weight. Which brings us to the crux of the matter: The Pivotal Helix can legally fly as an ultralight aircraft in the FAA Part 103 UL class. Without registration and without a pilot's license! And that in turn enables early market entry.



In hover mode, all propellers point upwards.

The first flying prototype in 2011.





Series production has started.

Part 103: The trick with the floats

The class of ultralight aircraft in the USA is also called “Part 103” according to the regulations of the American aviation authority FAA. This rule from 1982 states: An ultralight aircraft may have a maximum fuel capacity of 5 gallons (approx. 19 liters), fly no faster than 55 knots (approx. 100 km/h) in level flight at full throttle and must have a stall speed below of 24 knots (approx. 44 km/h). And the crucial point: It must not be heavier than 254 lbs (approx. 115 kg).

But why can the Pivotal Helix call itself a “legal ultralight”? The trick lies in an additional rule regarding weight. It says: 254 lbs “excluding floats and safety devices”. In plain language: Swimmers and rescue equipment are not counted in the weight). You are allowed to weigh an additional 30 lbs (13.6 kg) per float (or buoyant hull) and 10 lbs (4.5 kg) for each auxiliary swimmer and another 24 lbs (10.8 kg) for the rescue system. In the case of the Helix, this makes 30 lbs for the hull and 40 lbs for the four auxiliary swimmers plus 24

lbs for the rescue system, which in total gives a permissible empty weight of 348 lbs (157 kg). In order to claim the weight exemptions with the FAA, the manufacturer had to demonstrate water takeoffs and landings. “We did that, of course,” said Karklin, “but the possible ditching is a safety option and launching from the water is not a regular launching option that we recommend.”

“After more than 80 prototypes, we finalized the design and delivered the first Helix to a customer in the summer (wing 182-04-2023),” says Pivotal boss Ken Kahrlin. “All systems in the Pivotal are triple redundant.” For example, there are three “flight control computers” that enable “fly-by-wire” via the motors. But how do you prevent someone from simply buying such a device and then having an accident? “Although there is no legal requirement for a pilot’s license, we only sell the aircraft with a complete 10- to 14-day flight training course. Anyone who has not successfully completed this will not receive a device. In addition, the customer must personally

UL feeling: the Helix can be packed away in the trailer in 20 minutes.





Simulator training with VR goggles.

identify themselves before each flight,” says Karklin. If someone else is to fly the aircraft, they must also complete the complete training. The devices are also equipped with “geo-fencing,” which means you can only fly in certain areas. Buying a Helix in the USA and then simply flying to another country doesn’t work.

Most of the training takes place in the self-developed simulator and initially only directly at the manufacturer in Palo Alto. A tilting chair simulates the rotational movement when taking off and VR glasses provide a realistic impression of flight. The device is controlled via a joystick, of which there are two, but of course only one is used depending on whether you are right- or left-handed.

Self-experiment in the simulator

A little self-experimentation in Palo Alto showed me that the controls - at least in the simulator - are quite simple. After taking my seat, I select my joystick, put on the VR glasses and off we go. After taking off, I can initially fly the “machine” vertically upwards in hover mode. Pressing the stick fully and unlocking causes the machine to go into forward flight. All important displays such as altitude, climb rate, speed, battery level and engine temperature are displayed in the VR glasses. To save energy, go into horizontal flight as quickly as possible after take-off, because the energy consumption here is less than 30% of the consumption in hover mode. When taking off, you just tip slightly onto your back from the normal sitting position and then, after taking off, quickly turn into the regular horizontal flight position, with the aircraft accelerating forward to the minimum horizontal speed.

When turning around, climbing and descending, the little plane behaves intuitively. To land, you go into vertical mode about 10 meters above the landing point, the pilot’s seat turns backwards and you look at the sky. In the supine position and after confirming the intention to land again, the pilot sits gently on the ground. You can watch over your shoulder, but the slow lowering is automatically controlled by the computer using radar and laser measurement.

Finally, I can say: When I saw the BlackFly for the first time, I thought “No way. As a pilot, landing on your back with just a look over your shoulder – that’s not for me.” But after the sim-

ulator flights, I have to say that I can also very well imagine a real test flight and definitely have to plan this in my calendar for later in the year. Also contributing to this decision was the realization that when flying a multi-engine eVTOL you have to rely on computer controls anyway. After all, who is able to manually maneuver an aircraft using, for example, eight propellers? And if a company has computer expertise, it is certainly one with a “Google connection”.

By the way, the simulator is just one of the safety features of the Helix. In addition to the multiple redundancy - even if an engine or propeller fails, the flight can continue until a safe landing - another is an overall aircraft-rocket rescue system.

Helix also in Germany?

So far, apart from two prototypes with UL-VVZ (Provisional Traffic Approval), there are no ultralight eVTOLs in Germany and the best-known and only one that so far flies regularly in Germany is the Volocopter. But the company from Bruchsal has long since said goodbye to the ultralight idea, which was not exactly well received by DULV, which made these flights possible with a lot of effort. Because as a pilots’ association you only want to invest time and money in aircraft that can then be flown by the members at some point. At Pivotal, this is the clear intention and with the first delivery of the first devices, the manufacturer has shown that it is serious about it. A blueprint for UL approval in Germany could be the introduction of other UL device classes over the last 40+ years. For gyros, paramotors and UL helicopters, there was initially a testing program for which several manufacturers and an association came together to develop safety, operation and approval requirements for type certification. After completing the program, it was clear how and with which licenses the aircraft could be flown in Germany. Pivotal says it is ready for such a collaboration. And history shows that many other European and non-European countries later copied/adopted the German regulations.

Once this hurdle has been overcome, there would still be another obstacle: The Pivotal Helix costs a whopping \$240,000. But in return you get an aircraft that flies fully electric and can do more things than other aircraft. There would certainly be customers for it. ✓

AERO 2024 Preview

30 years of packed information for the GA

The AERO in Friedrichshafen / Germany is the global platform for all fields of general aviation. This year it celebrates its 30th anniversary. At this jubilee show, which will be held from April 17 to 20, 2024, visitors will be able to view the entire diversity of aviation from gliders, microlights, powered aircraft and helicopters to business

aviation up close in twelve exhibition halls and the static display. With more than 700 exhibitors from 38 countries as well as visitors and journalists from all over the world, AERO Friedrichshafen is the annual meeting place for the international aviation community.

Airshow and special exhibition

An anniversary must of course be celebrated in a proper manner. A one-hour airshow is thus planned for Saturday, which will spectacularly illustrate the broad spectrum of topics at the international aviation trade fair between innovation and sustainability. A special exhibition will also provide insights into the history of AERO Friedrichshafen and present milestones, innovations and pioneering developments that have shaped general aviation.

Event-Premiere: AERO Fly-In

In the anniversary year, there will even be a second highlight later on in the year: With the AERO Fly-In, an event premiere will take place at the Aalen-Elchingen airfield. In cooperation with trade fair partner Luftraum Süd and Luftsportring Aalen, the traditional airfield festival in Baden-Württemberg's Ostalbkreis district will be conceptually expanded under the motto 'Future Meets History'. From historic to electrically powered aircraft, on the ground and in the air: On the summer date of August 31 to September 1, 2024, the new AERO Fly-In will bring together the general aviation community and all aviation enthusiasts in an outdoor environment with simple fly-in regulations and attractive forms of participation.

Gliding Expo

The AERO Gliding Expo will take place in Zeppelin CAT Hall A1, the largest hall on the exhibition grounds. A large number of exhibitors from the gliding sector will present their products and services there. For the first time, Hall A1 will include a dedicated conference area for gliding, where top-class presentations and panel discussions on future gliding topics will be held on a stage and in dedicated conference rooms in cooperation with air sports associations. This platform offers the ideal opportunity to discuss the latest developments and challenges in the gliding industry. As you can see, there are many reasons to travel to beautiful Lake Constance. www.aero-expo.de ✓

e-flight-expo + Flying Pages (booth A7-100)

The dominant theme of the AERO in 2024 will once again be the transformation of aviation towards greater sustainability. An important part of this is the e-flight-expo, co-initiated by the publishing house Flying Pages (FLÜGEL - das Magazin and FLÜGEL - World Directory of Light Aviation), which was launched in 2009 as the world's first exhibition for electric flying. The show within AERO focuses on innovative solutions and projects in electric flight and brings together exhibitors and visitors from the field of sustainable aviation. A symposium on the use of hydrogen as an aviation propulsion system, which was held for the first time in 2023, will also be expanded to include battery technology: The AERO Hydrogen & Battery Summit will start on Tuesday afternoon (April 16) and continue on the first day of the trade fair. The Sustainable Aviation Trail offers a "green thread" for trade fair visitors: all exhibitors who are intensively involved with the topic of sustainability are marked with a green balloon.

Extended Career Days

Due to the great success of the Career Day last year, the event is being expanded this year: The AERO Career Days 2024 will take place on Friday and Saturday, April 19 and 20, at Übergang Ost and offer a unique platform to bring together young talents and experienced industry representatives. The AERO Career Days concept is designed to appeal to young people, school graduates, students and experienced professionals interested in career opportunities in the aviation industry. The event will feature a large number of exhibitors from the aviation sector as well as a varied stage program.



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e-FLIGHT-EXPO

Ultralight Trainer, e-air show and Medivac Drone

This year, the e-Flight-Expo will once again be the largest exhibition for electric aircraft and aviation engines of all kinds. The trend towards trainer aircraft continues, new players such as the Chinese RX4E are also likely to win customers in Europe.

For anyone interested in e-Flight, the Flying Pages stand directly at the entrance to Hall A7 with its e-Flight Journal is of course the first port of call. Diamond Aircraft and BRM are continuing to work on the approval of their Part 23 EASA aircraft, as is Jean Botti from Voltaero with his Casio 330. Some of the planes will also be seen in flight on Saturday morning. The new trend is the use of eVTOLs as rescue transport vehicles, such as the Avilus Load & Fly, which will have its world premiere at AERO. In line with this is the GoAERO competition, which was endowed with \$3 million in prize money by Boeing and NASA and is being presented for the first time in Europe at AERO.



Sustainable Aviation Path

With the three e-keywords Electric, Ecologic, Evolutionary, the e-flight Expo set out 15 years ago as part of AERO to document the revolution in light aviation.



Voltaero Cassio 300



Electra Trainer

At the start of the e-flight Expo, the electric planes and developments still fit in the Forum West. Then they moved to Hall A7. Suppliers of products and aircraft in the area of climate-neutral, ecological flying can now be found in almost all exhibition halls. The AERO e-flight-Expo has therefore created the "Sustainable Aviation Path", which leads interested visitors to the relevant manufacturers. The starting point is of course in Forum East, Hall A7. All e-exhibitors are marked with a large green balloon.

Ecologic Trainer

Due to the short range due to the low battery density, battery-electric machines are not yet suitable for long journeys. But with electric training aircraft, especially for traffic control training, progress is being made in all classes: UL, LSA and Part 23. The Pipistrel Velis received EASA CS-LSA approval years ago and is also selling very well worldwide under the new owner Textron. With the acquired expertise, Textron will of course also electrify machines from its other brands sooner or later.



eVTOL study of the German DLR


Avilus Load & Fly Rescue RPA

The Elektra Trainer, which received its 600 kg UL approval last year, can be seen this year as a mid-wheel glider and a tail-wheel version. Diamond Aircraft has now completed its first flights with its eDA 40. BRM and H55 want to have the Part 23 approval for their Bristol Energic completed soon. Jean Boti takes a different approach with his Casio. Since the battery density is not yet sufficient for a business aircraft, he initially installs a hybrid power source consisting of a combustion engine from Kawasaki and an electric motor from Safran in his electric Voltaero. "Later, when the batteries are significantly better or fuel cells can be approved, we will be open to all of these possibilities. As well as for burning hydrogen directly in our hybrid engine."

Important supplier

On the supplier side, the e-Flight Expo is expanding further: in addition to companies such as MGM Compro and Geiger, the French company Safran is presenting its electric drives for the first time. Safran is now already represented in several e-flight projects: from eVTOLs, such as the one from Bell, to the eDA 40 training aircraft from Diamond or the Casio hybrid travel machine from Voltaero. And where the engines are, propeller manufacturers are not far away: the Ultralight specialists Helix from Aachen and DUC from Lyon are at the start of many e-projects.


Pipistrel Velis

Ikarus C42 with fuel cell and electric motor

Hi Fly |Dornier - Seaplane

BRM | H55



AIR Atos Wing



Geiger's 60 volt motors power a wide variety of ultra-light aircraft: from the small trike to the UL glider Wing from AIR and the two-seater Elektra Trainer.

E-FLIGHT EXPO PRESENTATIONS

As every year, a whole series of lectures will once again take place as part of the AERO / e-Flight-Expo in 2024. In addition to the four sessions of the e-Flight-Expo, which, like the presentation of the e-flight-expo Award, will all take place on the large stage in Forum East directly adjacent to e-Flight Hall A7, AERO has also expanded the AERO Hydrogen & Battery Summit. This year, it will take place on April 16 and 17 in the Berlin area of the East Conference Center on the second floor. All e-lectures and forums will be held in English.

Wednesday April 17.

01.15-01.15 pm

Freight, Medivac - Leisure - the first commercial eVTOL activities

Nicolas Bär / COO Avilus GmbH
 Sky Sartorius / GoAERO Price / Boeing
 Andreas Thälmann / Airbus (tbc)
 Ken Karlin / Pivotal
 Nadine Doerge / DLR Drone Challenge

Thursday April 18.

9:30-10:30 am

The first electric fixed-wing aircraft on their way UL and Part 23

Jean Botti / Voltaero (CEO)
 Calin Gologan / Elektra Solar (CEO)
 Kang Guiwen / Liaoning GA RX1E
 Axel Lange / Lange Aviation (CEO)

03:15 - 04:15 pm

Hydrogen as an energy source for e-flight projects

Karl Kaeser / Kasaero GmbH (CEO)
 Qinying Zhang / Rolls Royce (Head of fixed-wing aircraft)
 Michael Friend / Hydrogen flight expert
 Kang Guiwen / Liaoning - RX4E HY (Project Lead)



Friday April 19.

01:00-01:40 pm

Airspace Regulation for eVTOLs and others ATC for Advanced Air Mobility

Li Shipeng / IDEA Research
 Daniel Sülberg / DLR – Cochstedt

01:40-02:00 pm

Theion - Lithium-sulfur batteries for aviation

Dr Ulrich Theion (CEO)

02:00-02:20 pm

Fuel cell drive for an UL seaplane

Kasaero Karl Käser (CEO)

02:20-02:40 pm

Motorized flying for 0 Euro -

Uwe Nordmann / Elektra Solar

02:40-02:55 pm

RX_E: A family of electric airplanes

Kang Guiwen / Shenyang University

02:55 - 03:00 pm

2024 e-Flight-Expo Award

The current status of all presentations is available on the AERO website:

AERO: www.AERO-expo.de

Flying-pages: www.aero.flying.pages.com

E-FLIGHT-EXPO AWARD

As has been the tradition for 15 years, the coveted e-Flight Expo Award will also be presented in 2024. This oldest international prize for electric flying honors outstanding developments in electric flying, from propulsion to trikes and triaxles to eVTOLs. Previous winners include Jean Botti (Voltaero), Ivo Boscarol (Pipistrel), Tian Yu (Autoflight), Michael Kugelgen (eMagic), Calin Gologan (Elektra Solar) as well as propulsion specialists such as Frank Anton (Siemens Electric Aircraft) and Martin Dvorsky (MGM Compro).

This year the e-Flight-Expo Prize will be awarded on Friday, April 19 at 02:55 pm on the stage in Forum Ost. ✓



478
LIVES SAVED

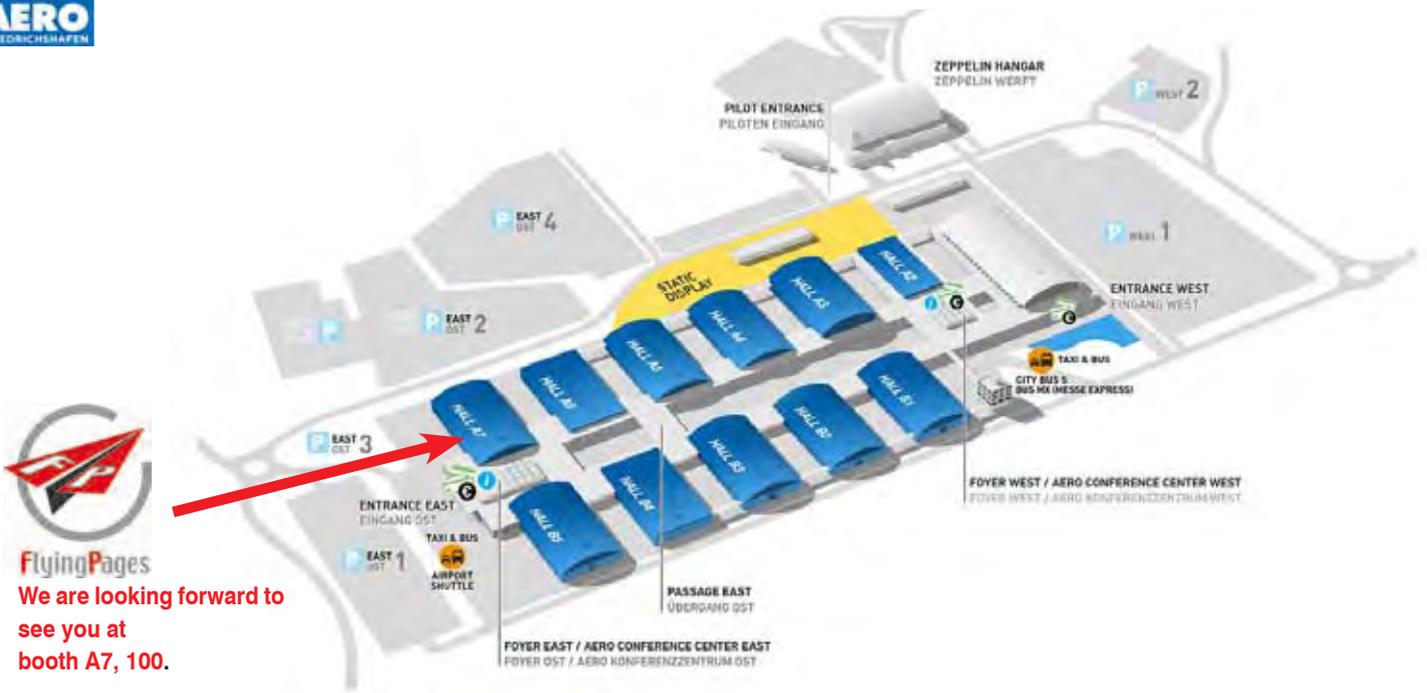
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We are looking forward to see you at booth A7, 100.

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AERO Gliding Expo (Gliders), Indoor Camping Area

HALL A2
AERODrones for Emergency and Rescue Services
only from /nur am April 17 – 19, 2024

HALL A3
Business Aviation, General Aviation, Services, Equipment

HALL A4
Business Aviation, General Aviation, Services, Equipment

HALL A5
General Aviation, ENGINE AREA, Maintenance, Propulsion Systems, Pilot Supplies

HALL A6
Avionics Avenue, Cockpit and Onboard Systems, Flight Simulator Area

HALL A7
e-flight-expo, e-VTOL, General Aviation, e-connect area
booth 100: **Flying Pages** with partners **Aviation et Pilote** **Powered Sport Flying Magazin**

HALL B1
UL, VLA, LSA

HALL B2
UL, VLA, LSA

HALL B3
UL, VLA, LSA

HALL B4
Gyrocopters, DAeC, DULV

HALL B5
Helicopter Hangar, Heli-Forum

STATIC DISPLAY
Business Aviation, Second hand aircraft

FOYER WEST
AERO Conference Center West, Be a Pilot, MRO Area, Forum Stage West

FOYER EAST
AERO Conference Center East, Forum Stage East, 30th Anniversary special exhibition (Heritage Trail)

PASSAGE EAST
AERO Career Days - only from April 19 & 20, 2024

Subject to change.



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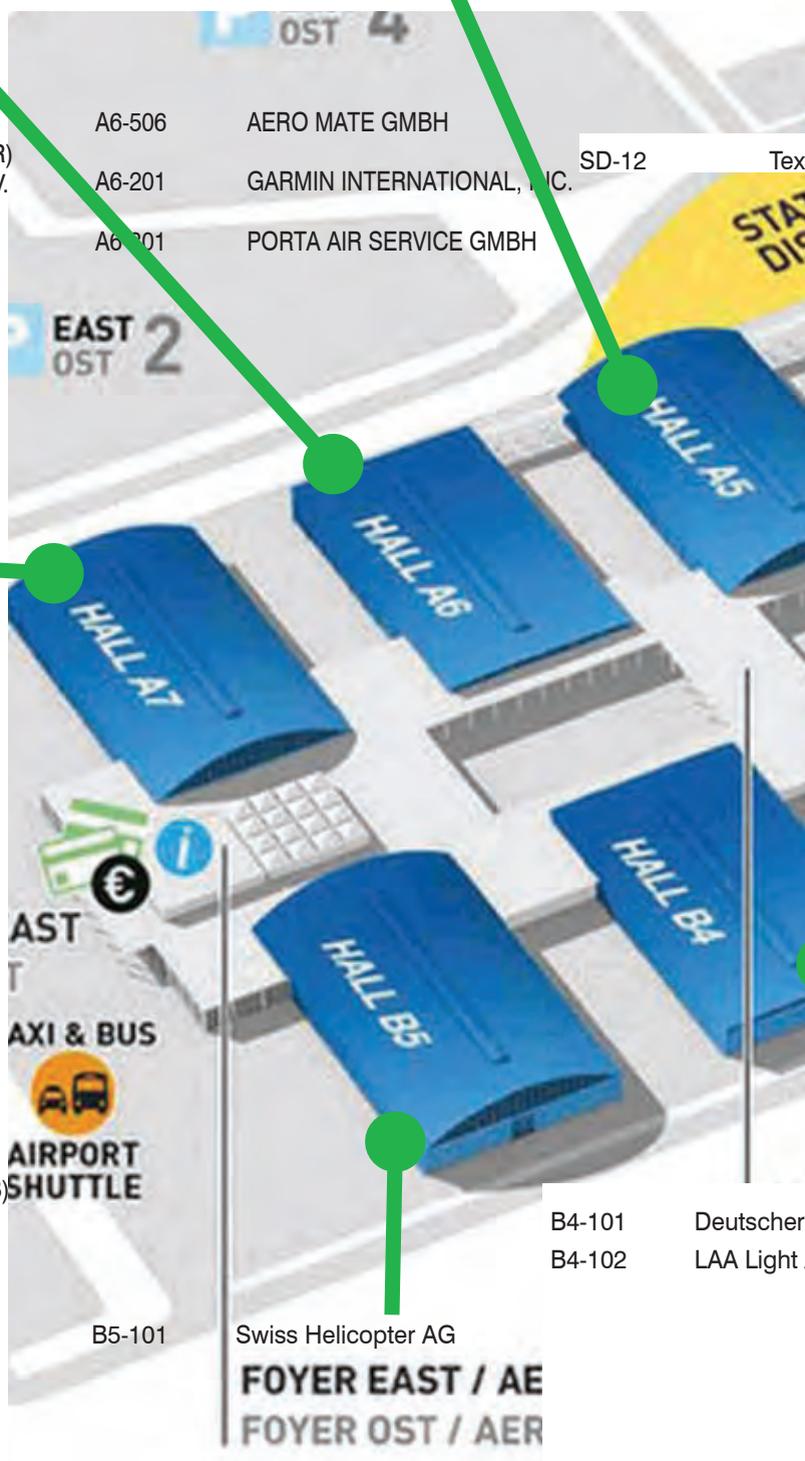


Companies at the SAT



- A7-307 A.I.R. & Co. GmbH
- A7-103 AeroDelft
- A7-103 Aircraft Maintenance College 66
- A7-103 Ampaire
- A7-301 AURA AERO
- A7-100 **Aviation et Pilote / Flying Pages GmbH**
- A7-311 Blanik Aircraft CZ s.r.o.
- A7-310 BRM AERO, s.r.o.
- A7-201 Deutsches Zentrum für Luft- und Raumfahrt (DLR)
- A7-103 Dutch Pavillion/ Jomec int. Business Support B.V.
- A7-311 EAF protect s.r.o.
- A7-103 E-Flight Academy B.V.
- A7-103 E-Flight Academy B.V.
- A7-103 Electric Flying Connection
- A7-103 ELECTRON aerospace B.V
- A7-304 ELEKTRA-SOLAR GmbH
- A7-100 Flying Pages GmbH
- A7-305 Geiger Engineering GmbH
- A7-103 Hangar One B.V.
- A7-103 Hedgehog Applications B.V.
- A7-103 InHolland University of Applied Sciences
- A7-206 Jetpel GmbH
- A7-103 JetSupport Holding B.V.
- A7-321 Kasaero GmbH
- A7-304 Landeplatzgesellschaft GmbH Kempten-Durach
- A7-118 Liaoning General Aviation Academy
- A7-223 Martin Steffen Song-Electro
- A7-300 MGM Compro
- A7-103 NAG
- A7-103 nlr
- A7-103 NRG2FLY B.V.
- A7-205 Parker Lord
- A/-207 Pivotal
- A7-321 PS-HyTech GmbH
- A7-103 Qualitair Aviation Holland B.V.
- A7-118 Ruien Aircraft Industry Co., Ltd.
- A7-105 Safran Electrical & Power
- A7-103 Saluqi Motors B.V.
- A7-103 Special Air Service B.V.
- A7-321 Technische Hochschule Würzburg-Schweinfurt
- A7-208 Tianjin Santroll Electric Technology Co., Ltd.
- A7-209 TU München - L.f. Flugsystemdynamik
- A7-323 Universität Stuttgart Institut für Flugzeugbau (IFB)
- A7-101 VOLTAERO maria.feklyunina@voltaero.fr
- tbcb XAEROS AvioPower GmbH

- A5-201 AOPA Germany, Verband der Allgemeinen Luftfahrt e. V.
- A5-105 Avidyne
- A5-301 Berlin- Brandenburg Aerospace Allianz e.V 2
- A5-228 Bundesamt für Zivilluftfahrt BAZL joerg
- A5-110 Concorde Battery Corporation
- A5-211 Deutscher Wetterdienst (DWD)
- A5-300 EASA - European Union Aviation Safety Agency
- A5-131 Reck Solar & Elme Elektromechanik GmbH
- A5-126 VSE Aviation
- A5-215 ZHAW Zürcher Hochschule / Zentrum für Aviatik
- tbcb Lukasiewicz – Institute of Aviation



- A6-506 AERO MATE GMBH
- A6-201 GARMIN INTERNATIONAL, INC.
- A6-301 PORTA AIR SERVICE GMBH

SD-12 Tex

B4-101 Deutscher
B4-102 LAA Light

B5-101 Swiss Helicopter AG
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A4-501	TOWFLEXX GMBH	A3-205	BRP-ROTAX GMBH & CO. KG	A2-105	ABZ Innovation Ltd.
A4-117	XYLENE GMBH	A3-303	Continental Aerospace Technologies	A2-305	BORMATEC
		A3-113	Hartzell Propeller Inc.	A2-307	Bosch Sicherheitssysteme GmbH
		A3-110	Honeywell Aerospace Technologies	A2-210	Dipolo GmbH
		A3-402	Piper Aircraft, Inc.	A2-303	Droniq GmbH
		A3-111	Pratt & Whitney Canada	A2-113	HIGHCAT GmbH
		A3-305	Rheinland Air Service GmbH	A2-400	SAB GROUP SRL
		A3-119	Textron Aviation		
		A3-109	TotalEnergies Marketing GmbH		



Textron Aviation

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A1-201	Alexander Schleicher GmbH & Co.
A1-302	Allstar PZL Glider Sp. z o. o.
A1-205	ASO srl. Aerial Solution Opportunities
A1-204	Breezer Aircraft GmbH & Co. KG
A1-210	Deutscher Aero Club e.V.
A1-202	DG Aviation GmbH
A1-105	HPH Ltd.
A1-206	HPH Ltd.
A1-111	Idaflieg e.V. c/o Akaflieg Stuttgart
A1-203	Jonker Sailplanes GmbH
A1-306	Lange Aviation GmbH
A1-305	Light Wing AG
A1-303	LZ design d.o.o.
A1-307	Ohlmann Klaus
A1-301	Schempp-Hirth Vertriebs GmbH
A1-006	SkySight Weather Pty Ltd
A1-211	Stefan Langer / SteFly
A1-303	VOCUS GmbH
A1-308	Zaklad Szybowcowy "Jezów"

FOYER WEST

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B2-303	DUC Hélices Propellers
B2-102	Helix-Carbon GmbH
B2-302	Turbotech

B3-301 Pipistrel d.o.o.

B1-101	Flight Design general aviation GmbH
B1-106	DYNON AVIONICS, INC.
B1-201	Breezer Aircraft GmbH & Co. KG
B1-301	COMCO IKARUS GmbH
B1-204	Zall SKYLEADER a.s.
B1-405	Zonsen Aero Engine Manufacturing Co., Ltd.
B1-505	FFPLUM Fédération Française d'ULM

Ultraleichtflugverband (DULV) e.V.
Aircraft Association of the Czech Republic

Text: Xin Gou, bc. Photos: Xin Gou, Manufacture

Electric Planes from China

-RX1E-

A full electric airplane is coming to Europe

People in Europe have been getting used to seeing Chinese electric cars on the road. European pilots may soon see electric airplanes designed and produced by a Chinese manufacturer flying in the sky in Europe.



One of the variants of the RX1E: as a version with floats (below) and as a four-seater (small photo on the right)





RX1E is the world's first certified Electric Light Sport Airplane (LSA) to receive type certificate from CAAC in 2015.



An ambitious Chinese manufacturer little known outside of China, Liaoning Ruixiang General Aircraft Co., Ltd (RGAC), together with their marketing partner, will display three airplanes at AERO 2024: the full electric two-seat RX1E-A which will do a demo flight on 20 April; the full electric two-seat RX1E-S float plane; and RX4E, a full electric four-seat airplane by design. However, the one for display at AERO is a hydrogen powered demonstrator with an internal combustion engine burning hydrogen as fuel, and they plan to run the engine on hydrogen for demonstration. RGAC is actively looking for distributors in Europe and plans to apply for the proper certification and to sell in Europe soon.

A founder from a surprising background

RGAC was established in October 2013 as a subsidiary of Liaoning General Aviation Academy (LGAA). The founder of RGAC is Prof. Yang Fengtian, the chief designer of the F8II fighter of the Chinese air force which helped him get elected to be a member of the Chinese Academy of Engineering. This is the highest-ranked position an engineer could dream of reaching in China.

With the achievement and privileges from his previous career under his belt, Prof. Yang set off to pursue his new goal (at the age of 70) of making aviation sustainable. Having spending decades in designing fighter jets, Prof. Yang realized that he must start with something small in electric aviation. He is also an advocate for recreational flying so a two-seat electric airplane in light sport airplane (LSA) category is a natural fit of these two goals. Prof. Yang proceeded to become the president of Shenyang Aerospace University, a position which helped him found RGAC and LGAA and to set sustainable aviation and electric airplane design and manufacturing as the main goal of these two entities.

Two “world’s first” titles

RX1E-A

It’s a little-known fact that RX1E was the world’s first certified electric light sport airplane (LSA) when it received the type certificate under LSA category from CAAC, the Chinese civil aviation regulator, in 2015. And for that matter, the second certified electric powered aircraft of any type in the world after Andares 20e electric self-launch

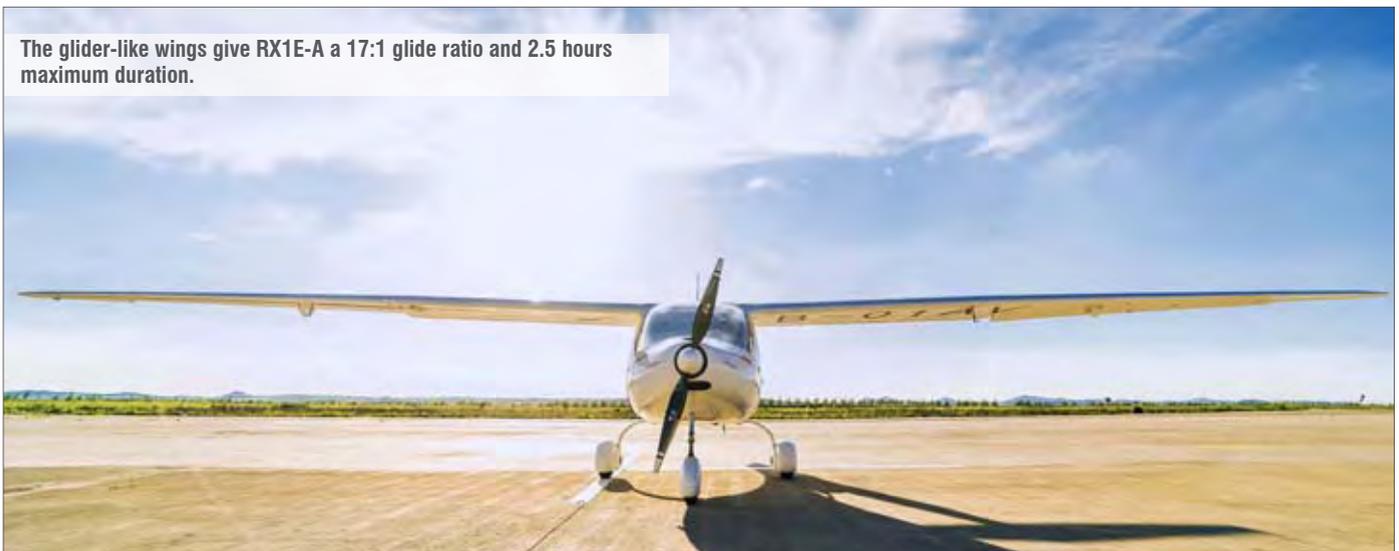


All RX series airplanes have removable batteries for continuous operation and upgrade potential. Shown here are the batteries of RX1E-A.

TECHNICAL DATA RX1E-A

Size	
Length	6.58m
Height	2.45m
Wingspan	14.5m
Weight	
Max takeoff weight	630kg
Payload	160kg
Battery weight	165kg
Electric propulsion system	
Peak power	50kW
Rated power	30kW
Battery capacity	34.56kWh
Performance	
Takeoff run distance	281m
Landing distance	208m
Max climb rate	3.2m/s
Stall speed	83km/h
Cruising speed	120km/h
Duration	2h30min
Range	280km

The glider-like wings give RX1E-A a 17:1 glide ratio and 2.5 hours maximum duration.





The cockpit of RX1E-A has large doors.

sailplane of Lange Aviation in Germany under Part 22 by EASA in 2004. The same as EASA, LSA is a certificated category in China.

It is also a fact that RX1E has very limited duration of about 40 minutes due to the battery technology available for aviation adoption back then and a battery capacity of 8.8kwh due to 500kg takeoff weight limit. As a natural evolution, an upgraded model called RX1E-A was designed and obtained LSA type certificate from CAAC in 2018.

With the battery capacity increased to 34kwh and a lighter carbon fiber airframe to increase the takeoff weight to 630kg, as well as a 17:1 glide ratio, the flight duration of RX1E-A can reach 150 minutes which should be good enough for most use cases of LSA, and with the removable battery packs design, the airplane can be ready to fly again in less than 10 minutes. The depleted battery packs can be recharged to full in 1.5 hours. RX1E-A is now also equipped with a ballistic whole airframe parachute. The total flight hours of RX1E and RX1E-A have reached more than 15,000+ hours.

RX1E-S

Perhaps not satisfied with just one “world’s first” title of RX1E, RGAC headed out to replace the landing gear of RX1E-A with a pair of straight floats to create the world’s first certified electric float plane, RX1E-S, in 2021. With heavier empty weight RX1E-S is upgraded to an 80kW electric motor. It has a flight duration of 100 minutes. One of the benefits of RX1E-S is that since it is full electric with zero emission, it may be able to use more lakes for operation where traditional float planes with combustion engines are not allowed.



Prof. Yang Fengtian started his entrepreneurial journey of electric airplane when he retired, and he is still ambitious till today.

TECHNICAL DATA RX1E-S

Size	
Length	6.78m
Height	2.94m
Wingspan	14.5m
Weight	
Max takeoff weight	650kg
Payload	160kg
Battery weight	165kg
Electric propulsion system	
Peak power	80kW
Rated power	60kW
Battery capacity	34.56kWh
Performance	
Takeoff run distance	235m
Landing distance	207m
Max climb rate	4.5m/s
Stall speed	82km/h
Cruising speed	110km/h
Duration	1h40min
Range	150km

The float plane model of RX1E-A may have advantages which will permit to operate at more lakes.





TECHNICAL DATA RX4E

Size	
Length	8.4m
Height	3.05m
Wingspan	13.5m
Weight	
Max takeoff weight	1260kg
Payload	320kg
Battery weight	330kg
Electric propulsion system	
Peak power	150kW
Rated power	120kW
Battery capacity	69.12kWh
Performance	
Takeoff run distance	338m
Landing distance	283m
Max climb rate	4.2m/s
Stall speed	109km/h
Cruising speed	157km/h
Duration	1h30min
Range	235km

According to RGAC the three models altogether have several dozen in use and have received 400 orders. The listed price of RX1E-A starts from a little over 1 million RMB or about 130,000 euro with basic avionics and instrument to over 1.2 million RMB or 150,000 euro with optional avionics.

Four-seat model on the way

RX4E

Where should RGAC go next after the two-seat LSA? Of course, a four-seat Part 23 electric airplane! RX4E designed and produced by RGAC made its maiden flight in October 2019 and is currently undergoing Part 23 certification at CAAC. Considering the progress of the certification and CAAC’s support for electric aviation, it would not be surprising if RX4E soon becomes the first certified Part 23 electric airplane in the world.

RX4E-S

Of course, RX4E will also have the float plane model which will almost certainly take the title of “world’s first certified four-seat electric airplane”.

RX4HE

Not only focusing on full electric, RGAC has been developing hydrogen technology for aviation use. A RX4E prototype was retrofitted with a hydrogen-burning combustion engine converted from an automobile engine for using compressed hydrogen at 70Mpa as fuel. The hydrogen powered RX4E is currently for demonstration purposes only and is not on the way to certification, but with the diversification of RX1E series and the ambition of now 82 year-old Prof. Yang, it will be very exciting to see what RGAC will bring to AERO next time. ✓



The four-seat RX4E is on its way of becoming the first certified Part 23 electric airplane.



GTX YXUX
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NOVEMBER 2024
ZHUH X| XHXA



**TRADE SHOW FOR
GENERAL AVIATION**



**INCLUDING
E-FLYING**

XXXX XX XXX

Text and Photos: Willi Tacke

eVTOL in Asia

Premiere in Shenzhen

On January 27, two AutoFlight Prosperity eVTOLs took off from the Vertiport in Shenzhen ...

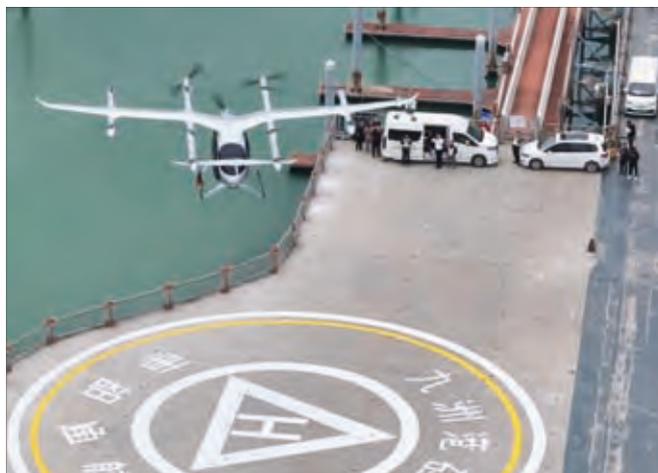
The Low Attitude Economy (LAE) Initiative in Shenzhen kicked off the Year of the Dragon 2024 with a world premiere. Two unmanned Autoflight Prosperity eVTOL took off at the Shekou Ferry Port in Shenzhen and after a circle over the harbor one continued with a local flight performance and the other one flew over the water to Jiuzhou Ferry Port in Zhuhai (about 50 Km away). This route is one of the multiple intercity routes which are now planned by the LAE Alliance, and which have the goal to start the world's first AAM operation area in the Pearl River Delta.

Precisely at 5 pm the sonar sound of the 20 large propellers of the two Prosperity aircraft filled the air as they lifted off from the improvised Vertiport Peer of the Shekou Ferry Port in Shenzhen. All the invited visitors are on two boats in the harbor in front of the pier. There was also the noisy sound of the Airbus 145 Helicopter which took off to get the video of the historic flight. After one round over the spectators the two eVTOLs split; one continued a flight performance in Shenzhen and then landed after about 20 minutes, while the other flew the 50 Kilometers to the second Vertiport installed at the Jiuzhou Ferry Port in Zhuhai.

"The First ever eVTOL intercity flight over water between 2 million-population cities was only possible because the support of the local operator as well as the Local-, Regional- and Central Government here in Shenzhen", said a very happy Tian Yu (CEO of Autoflight) after the flight was completed. For the flight the four international airports of Shenzhen, Hong Kong, Macau and Zhuhai were closed temporarily, and more than 15 international flights were delayed. The demonstration flight was uncrewed and fully autonomous, with cargo operations having started this year and the certification

for crewed passenger flights anticipated within approximately two years. Referred to as air-taxis, eVTOLs do not require traditional airports or runways. Similar to helicopters, they take off vertically and transit to fixed-wing flight mode in the air, cruising at high speeds like traditional aircraft. The aircraft delivers an electric-powered, safe, comfortable, sustainable and affordable performance at significantly lower noise levels than traditional aircraft.

... one landed at the same spot after twenty minutes flight show while the other landed at the vertiport in the port of Zhuhai, about 50 km away.



Why Shenzhen?

The demonstration flight took place in one of the world's most densely populated areas, home to around 86 million people. The flight could be seen as another demo flight of the upcoming air taxi, but it also can be seen as the starting signal of the operations in the world's first urban air mobility area with eVTOL- cargo-, medivac- and passenger flights as well as delivery drone operations. And it seems that the Chinese central government has realized that this new technology can only be developed and used if the infrastructure and the airspace are adopted accordingly. After opening the lower altitude airspace to general civil aviation in China in recent years, it did not develop as quickly as expected in China. The main reason may be because the air traffic control for general aviation is still handled by the military, and this did not work. A simple general aviation flight has to be filed and confirmed by the military ATC between 2 and 24 hours before the flight and this way of operation simply did not work for general aviation. Realizing this situation, a team of researchers around the former Microsoft SVP in charge of artificial intelligence (AI) Harry Shum created the state-owned IDEA research institute which, among other high-tech developments, created with partners the Low Altitude Economy (LAE) research center and is on the way to develop an ATC System for urban and regional AAM mobility. He also got the support of the government on this matter. The regional and central government not only financed for the buildup of the LAE but also managed to have LAE mentioned in the president's speech for the economic perspective 2024 and beyond.

Another reason why the Shenzhen - Guangdong - Hong Kong - Macao Greater Bay Area is an ideal spot is that it is a large high-tech development and manufacturing area with a focus on AI in



The route of the eVTOL (dotted line) took 20 minutes, by car it takes about three hours.

Shenzhen. And the core team of the IDEA institute is persuaded that if all these new intelligent and carbon neutral air vehicles will be successful operated, they must have an intelligent and capable ATC system which will have deterministic components with AI. More information on the LAE is available in our Flying China and e-flight-journal magazines and at the e-flight-expo at AERO where the IDEA team will present. ✓



The AutoFlight Prosperity on its way to Zhuhai vertiport.

Electric Propulsion



With Rolls-Royce and Safran, two heavy weights of the conventional Aviation Propulsion systems entered the field of electric Propulsion systems and are preparing certifiable electric and Hybrid electric solutions for different Manufacturers. They are competing with small companies like MGM Compro from Czech Republic with Motors in different power range and also started certification for those. But for getting the e-motor power in the Air special adapted propellers are needed as well with Duc Helices and Helix Carbon. Two European companies are dominating the market for conventional e-Flight and eVTOLs.



Rolls-Royce

Siemens Electric Aircraft started the development for e-Propulsion systems in 2015. Rolls-Royce took over the development in 2019 but decided last year - due to difficulties in the turbine core business - to sell Rolls-Royce Electrical. At the same time the development in Germany and Hungary continues. The 150 Kilowatt air cooled Motor for eVTOLs, developed with support of the "German Federal Ministry for Economic Affairs and Climate Action", made progress and delivered to the first customers. Another field of RR development is the propulsion system for commuter aircraft. Like many others they believe that in the first place, especially for larger aircraft, there will be Hybrid solutions for this. A brand new turbine was specially developed for this purpose in combination with a generator.

RR also developed a 320 KW direct drive machine, specially designed for the requirements of electric commuter aircraft. These include being as lightweight as possible, compact and adaptable to different configurations as well as meeting the highest possible safety standards required in aviation. Its air-cooling system helps to reduce the system weight and complexity of the design with its four-electric-lane architecture.



Rolls-Royce's Vision for a hybrid system for regional mobility (top photo) testing the unit in the German facilities (middle photo).

Direct-drive UAM Motor with 150 kW with corresponding power electronics and Transverse Flux topology.



MGM Compro

The company from Czech Republic was one of the first players to enter the electric mobility field. From small drones over electric Surfboards they also came to light electric aviation. They developed for the Airbus e-Fan, for several Ultralight and Light Aircraft manufacturers, and also several eVTOL players around the world. At the beginning of the last decade they started with power electronics e-Motor controls and battery management systems. In the last two years they started also their own motor development. After a 100 KW engine they now also have larger motors in the program. One of the big



projects in the past years was the development of an electric replacement of the PT 6 Turbine which is probably the most used turbine on the earth. With powers from 400 up to over 1000 Kw it drives aircraft like the Cessna Caravan, the Beack King Air and the Dornier Seastar. So an electric replacement will have a huge market. The development of MGM started with an EU Program and the prototype is running with full power. Obviously MGM is now working on the certification of this motor as well as for the hybrid drive which they developed for a motorglider in the last year.



Helic Carbon

Being a pilot and manufacturer of propellers for more than 35 years, Richard Krüger-Sprenglen was fascinated by electric power from the beginning. He was one of the first flying with an electric Motor Paraglider from the development of Propellers for ultralights in the noise sensitive German market. in the 80's he learned how to get propellers silent and when several customers went to the certified aircraft field Helix Carbon also started with the EASA certification for

its props. This know how and the experience of developing and producing fast molds and props made him one of the leading addresses when electric Aviation started and especially with the eVTOL development. "From the experience that a straight prop with the best performance is very noisy, so we thought about solutions for solving both problems," he tells **e-flight-Journal**.

He developed the idea: The leading edge of the Propeller is bending, but not backwards like a saber but frontwards towards the moving direction of the prop and the tip is bended backwards towards the Pilot (in a tractor prop). "The first results in test flights are promising," said Richard, "Now the noise is less but we have to prove that the performance is as good as a straight prop."



Safran

Compared with Siemens/Rolls-Royce Safran entered in the race for electric aircraft propulsion quite late, but since then the French company is catching up and now is working with several partners in the GA as well as in the eVTOL market. Especially in the field of the GA Trainer and entry market they could win several customers like Diamond aircraft, or VoltAero.

The ENGINeUS 100 electric motor is the intermediate product. It is designed as a propulsion source for eTrainers.

VoltAero

As former CTO of Airbus it was probably a short way to go to a leading Airbus supplier - Safran - when Jean Botti was looking for a propulsion system for his electric commuter aircraft, the Cassio 330. But with several other players he believes that for the next years especially for the medium and long range there will be hybrid solutions. So he found a second partner on the combustion side: Motorbike gigantic Kawasaki. They adapted for the first prototype a 4 cylinder motorbike and are developing a 6 cylinder version dedicated for aviation. This will not only drive the Hybrid unit of VoltAero but is also being sold independently as a pure combustion engine for other aircraft. Both the hybrid and the combustion engine will be EASA certified. The Motor will not only burn gasoline but hydrogen as well.



Kawasaki Aviation project manager Yuichiro "Jamie" Imai together with VoltAero Boss Jean Botti and the 4 cylinder motor which will drive the Cassio 330.



DUC Hélices Propellers

The french market leader DUC Hélices Propellers from Lyon started with propellers for ultralights. Nowadays they are developing and building Certified Aircraft props as well as Helicopter Rotors and more and more also propellers for electric fixed wing aircraft and eVTOL manufacturers from around the world. "The creation of a propeller for an electric motor is slightly different from those for combustion engines" owner Vincent Duqueine states, "and for the eVTOL there must be very different solutions as there are so many designs on the market."

Vincent Duqueine with one of the special blades, which the company from southern France is producing for eVTOL Manufacturers.





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