

# eFlight Journal



Quarterly Vol. 1-2018

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## The EU is extending the range – and so are we.

The new EU regulation proposal that would allow an increase in ultra-light aircraft take-off weight to 600 kg opens the door even wider for innovative drive technologies.

Come and discuss the possibilities with Siemens eAircraft at AERO 2018 in Friedrichshafen, Hall A7.

[siemens.com/eAircraft](http://siemens.com/eAircraft)

# 600 kg Ultralight standard and e-aviation develops hand-in-hand

**T**he highly anticipated new 600 kg UL weight limit will not only benefit the ultralight industry, but also will have significant impact on the electric airplane development in a positive way. First there is a brief wrap-up of the 600 kg UL regulatory situation update: the formal adoption of the new 600 kg regulation by EU Parliament is currently pending, but is expected in the summer 2018. Thereafter, the new rule will be published in the Official Journal and will enter into force on the 20th day after publication. Currently it can be assumed that UL in compliance with 600 kg rules shall have no more than two seats, a stall speed in landing configuration of not more than 45 knots (83 km / h) and a maximum take-off mass (MTOM) not exceeding 600 kg. These aircraft are thus regulated in the so-called “opt-out” way, which means that these aircraft are subject to the national law of the individual country in Europe, but it is safe to say that many EU countries such as Germany, the Czech Republic, Italy, Holland, etc. will likely go along with the new 600 kg rule which will become the prevailing UL standard in Europe in this case.

The impact of the new 600 kg UL rule has been well discussed, but its side effect on electric aviation and further, the profound and long-term impact on general aviation at a whole must be fully understood. Though the 600 kg rule was not initially proposed in favor of electric aviation back then, now it seems that electric aviation will take a advantage of the new rule. The current 472.5 kg UL MTOM limits the flight duration of electric UL to about one hour in practice. The weight gain from 472.5 kg to 600 kg will have an extra 127.5 kg. This extra weight, even by conservative estimate based on current average packed battery density, should give over 20 kwh worth of electric power which can extend one hour of flight duration for most 600kg UL. An electric UL with over two hour flight duration at reasonable altitude will become practical for applications such as flight training, local sightseeing and hop flight. The benefits of quite, emission-free and low-cost flight that electric aviation has promised may eventually come true firstly among UL. As a consequence, more student pilots, flight schools, private airplanes, flight activities will come along. The relevant technology and products will become more mature in practice. A virtuous circle will be created. In addition, the extra electric power will be even more critical for the application of eVTOL aircraft, which consumes much more energy than UL. The electric aviation era may begin with UL and 600 kg weight increase will be the spearhead.

**Willi Tacke  
Xin Gou**



## Categories

editorial	3
Imprint	4
eNews	5

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 the GAMA EPIC committee and many others.

- 5 • **eNews around the world**
- 10 • **Norway: E-Commuters on Track**
- 12 • **Norway: Equator Aircraft P2 Xcursion**
- 14 • **Sportstar EPOS**
- 16 • **Airbus: eVTOL Programs**
- 20 • **Larry Page's Cora: Test Flight**
- 24 • **Siemens**
- 28 • **AERO 2018**
- 600 Kg - arrives at e-flight-expo**
- 29 • **e-flight-show**
- 30 • **e-flight-expo**
- 34 • **e-flight forum**
- 38 • **Pure Flight**
- 40 • **GAMA**
- 44 • **Uber Elevate Summit 2018**
- 46 • **China: Electric to PPL**
- 48 • **Skyleader sl 400 electric**

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## Sun Flyer 2 Made Maiden Flight

On April 10th, Sun Flyer2 two-seat electric airplane, developed by the American company Aerospace since 2014, successfully took off for the first time in Colorado. The planes energy storage system was provided by California-based Energy Power Systems, and includes battery modules, a battery management unit, and power distribution unit. The battery cells are LG Chem “MJ1” lithium-ion battery cells

with a 260-watt-hour-per-kilogram energy density. The company is undergoing the FAA certification of Sun Flyer 2 which is aimed at the flight training market. Another prototype the four-seat Sun Flyer 4 is also under development targeting the pilot-owner market segment.

## Eviation Selected Kokam For Battery Supply

In February the Israeli electric airplane startup Eviation signed a contract worth of one millions USD with British company Kokam for battery supply for Eviation’s commuter prototype. The prototype will have one propeller on each wingtip and one thrust propeller at the tail for the best efficiency. The prototype is designed for commuting purpose to accommodate 9 passengers, to cruise at 240 knots and to fly 1000km on one charge. Eviation plans to complete the prototype by the end of 2018.





## Two-seater VTOL “aEro 2” will Reach 320 km/h

The Swiss company Dufour Aerospace announced in March 2018 that it intends to develop a hybrid VTOL aircraft with the “aEro 2”. Building on the success of the electric aerobatic aEro 1, the “aEro 2” will have VTOL features and an integrated, modular hybrid electric energy system. Thanks to its tilt-wing design, the aEro 2 should not only be able to take off and land like a helicopter, but also fly as fast as an airplane at speeds of up to 320 km / h. In its

fully electric configuration, the two-seater should have a range of 120 km. An optional auxiliary power unit is to be installed in a hybrid configuration to extend the range to up to 800 km. According to Dufour Aerospace, a 1: 5 scale remote-controlled model has confirmed the handling and versatility of the aEro 2.

Info: [www.dufour.aero](http://www.dufour.aero)



The Slovak company AeroMobil, which so far focused on the development of a flying car, cannot escape the trend towards the electric VTOL vehicle and has announced the AeroMobil 5.0 VTOL. It is an autonomously flying, electrically driven four-seater, which has rotors at the ends of its retractable wings to allow vertical takeoff and landing, while a thrust propeller in the rear provides propulsion

in the air. “Our strategy solves the limitations of alternative VTOL concepts tied to dedicated landing sites rather than using existing road infrastructure,” said AeroMobil CEO Juraj Vaculik. However, according to the CEO, it will still take at least seven to ten years before the project can be realized.

Info: [www.aeromobil.com](http://www.aeromobil.com)

## Pipiestral's Alpha Electro Obtained Approval in Canada

In February the Canadian civil aviation authority issued the airworthiness approval of Advanced Ultralight to Pipiestral's Alpha Electro electric airplane. This approval paves the way to use Alpha Electro for flight training in Canada. Advanced Ultralight in Canada is permitted with 560kg maximum takeoff weight which is close to the light sports aircraft (LSA) standard but does not require a full design and production certificate. Besides Canada, Alpha Electro has obtained approval or permit to fly in Australia, France, Switzerland, USA, Slovenia since last year and has been in serial production.



## Joby eVTOL Made Demo Flight and Attracted New Investment

American eVTOL company Joby announced in February that they have obtained a new round of investment worth of 100 millions USD led by Intel with participation from Toyota, JetBlue Airline, Paul Allen Fund, Singapore's EDBI sovereign fund, AME Cloud Ventures, Ron Conway and others. Joby's five seat eVTOL fixed wing airplane is reportedly to have made

successful demo flights in secrecy. Joby plans to use the new investment for certification. Founded in 2009, Joby has kept a low-profile status in the founder's farm, and all test flights have been done at private airfields. The prototype has multiple foldable tilt rotors on wings and tails to provide VTOL thrust.

## Electric Air Race From England To Australia Planned



Ross Smith with his prize money. 1919  
(NSW Library)

In order to commemorate the centenary of the air race in 1919 from England to Australia, Australian businessman and aviator Dick Smith initiated a new air race on the same route in 2019 but only with participation of electric airplanes. Dick claimed to have earmarked 1 millions AUD as the

prize. Dick believes that this new era air race can promote the development and acceptance of electric aviation and the overall technology innovation in Australia. This initiative has obtained support from several high-profile individuals and institutes, including John Storey, emeritus professor of

physics at the University of NSW, one of the country's leading experts in battery and solar technology. Professor Storey believes that the battery technology and electric airplane designs have reached tipping point to make this air race feasible.

## Porsche Seeking Urban Aerial Mobility Solution

In an interview with the German magazine "Automobilwoche" in March, the sales director of Porsche Detlev von Platen claimed that the company is seeking an aerial mobility solution for urban transportation. von Platen said "It would take three and a half minutes to fly the plane," referring to how long it would take him to fly a passenger drone from Porsche's Zuffenhausen manufacturing plant to Stuttgart Airport. A typical drive would take him "at least half an hour." Meanwhile, Porsche's mother company VW group has worked with Airbus on a modular eVTOL design called Pop.Up



Pop.Up Next

## Embraer Launched eVTOL design website

In March Embraer launched a self-service eVTOL design website. Visitors can use the simply interface to design their own customized eVTOL aircraft after defining the usage scenario and selecting a series of options such as the number of passengers, if wings or rotors are preferred, tilt wings or tilt rotors and so on. This effort is the first substantial work that Embraer has done since becoming the partner of Uber's Elevate program last year. Embraer has not yet disclosed their eVTOL design in details. You can try out the eVTOL design at: <https://embraer.com/embraerx/evtol-configurator/>



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**EMOTION IN THE HIGH NORTH**

Will Norways Dash 8 soon be replaced by electric commuters like the eViation Alice



# Electric -Commuters from 2025 on Track

Airbus has been making various efforts working towards the same. In the last year Norway surprised the aviation scene with the announcement that the country wants to become a leading force in electric Aviation. Now the state owned Aviation company

Avinor invited specialist from around the world governmental and industry representatives to a one day kick off summit to Oslo. Among the specialists are top representatives from Airbus, Siemens, Embraer and Pipistrel.

The most surprising statement of the day came from Stein Nilsen, Managing Director, Widerøe a partially state owned regional carrier which connects a net of small Airports in Norway with aircraft of the type Dash 8 with a regional network. "We want to do the decision which electric aircraft we will use and tryout in our Network by 2025. And we think starting regular service by 2030". Then turned to the manufacturers from Airbus over Embraer, and Pipistrel to Zunum and asked when can you deliver which aircraft". He continued : "The Dash 8 fleet comes to the end of life soon. We can prolong it until 2025 or 2030. And by then we think we have aircraft available."

The environment in Norway has very challenging conditions like icing, high minus temperatures and strong winds. But apart from these difficulties on the climate Norway also has some great advantages.



Pipistrel: Ivo Boscarol is not only first with an electric trainer on the market he is also in the Uber-VTOL Program and announced in Norway a Fuel Cell Commuter in 2025.



**Antonio Campello (EmbraerX), Ivo Boscarol (Pipistrel) und Olav Otto (Siemens eAircraft (v.l.n.r.))**

## 4 reasons for eAircraft in Norway

1<sup>st</sup>: 98% of the countries electric energy production comes from renewable energy sources. Most are from hydro turbines. So here the argument, which is used in many countries against electric mobility - the energy does not come from renewable sources is not really environmental friendly in Norway it is near 100 % environmentally friendly.

2<sup>nd</sup>: Norway has experience with electrification in mobility - over the last 15 years Norway by state incentives became the leading country of automotive electrification. Also the many ferry boats over the many fiords have been electrified over the last decade.

3<sup>rd</sup>: Changing an infrastructure is expensive - Because of his North Sea Oil Norway is relatively rich and as the oil income is reduced over the last year the government looks for programs to create new energies.

4<sup>th</sup>: In Norway is the regional transport aviation an essential part of the governmental transport program as the country is quite large (385.203 km<sup>2</sup> in comparison with Germany 357.022) and the population is small (5,5 Million in comparison with Germany 82,6 Million) so it does not have neither a good road nor a railway system in the countryside.

Taking all these factors together with the vast development which has been done in the electric aviation it's a logical decision to combine economy and ecology as Stein Nilsen and the Avinor Dag Falk-Petersen stated the first investment in the new aircraft technology and Infrastructure will be higher but the benefit over the lower operation costs.

So the Norwegians have a challenging time schedule by 2025 they want to have the first test aircraft operating. They would accept that at the beginning it would be only 10 seaters operating instead of the 40 seater Dash. So when they asked the Manufacturers the answers was quite different Matt Knapp, CTO and Co-founder of Zunum said that they want to have their 9 seat proof of con-

cept very soon and that they could meet this timeline depending on funding and on the certification situation for such a plane. Antonio Campello, President and CEO of the new founded EmbraerX stated that they are working very concentrated on their electric project but that there are very many obstacles so that they believed that 2015 was to close for operations. Glenn Llewellyn, General manager Electrification at Airbus who manages all the electric project sees the timeline challenging but stated that he knows that the Innovation cycles must be shorter and that they are with the EfanX on the right path. Olaf Otto from Siemens explained their development and that they are on track for the large drive they want to develop with Airbus. They are sure that the CityAirbus will have its maiden flight probably at the end of this year. Finally also Ivo Boscarol – Mr. Electric from Slovenia answered this question in his own way, and it wouldn't be Ivo if he just would announce another Hybrid Project with Jet fuel engine or turbine. "I believe that we will have our VTOL Project flying by 2020 and for the larger aircraft we are working with a collaboration partner on 19 seat hybrid electric where the energy is not produced by combustion engine or turbine but by fuel cells." As preparation for the Fuel cell development he is working as the partner of Professor Josef Kallo of the Hy4 project.



**Glenn Llewellyn, Airbus Electrification General Manager**



**Matt Knapp, CTO and Co-Founder of Zunum Aero**

## EQUATOR P2 XCURSION ELECTRIC AMPHIBIAN



Equator P2 Xcursion at AERO in 2017. In the front is the Wankel hybrid engine jointly developed with Engiro.

# Continues to evolve

Equator Aircraft P2 Xcursion hybrid electric amphibian from Norway was certainly a show star when it made the debut at the AERO and e-flight-expo in 2017. It was on the cover page of e-

flight-journal and drew a continuous crowd at their booth in Hall A7. One year later what has happened to this futuristic-looking electric amphibian?

### MAKING STEADY PROGRESS TO THE MAIDEN FLIGHT

The Equator Aircraft founder and the CEO Tomas Brødreskift and the project team have been busy with the prototype building and components testing in the past year, and have made some considerable progress milestones. Due to the ongoing extensive ground test of the prototype, P2 Xcursion project could only attend AERO and e-flight-expo in April 2018 with a scale model but without the full size prototype. Hopefully a flying prototype would come to AERO and the e-flight-expo in 2019.



Equator P2 Xcursion has made three taxiing tests

As of today the P2 Xcursion electric amphibian had made the first taxiing test by its own power at the end of January and has been in continuous testing and tweaking ever since including: battery pack, electric motor, retractable nose gear and so on. Right before AERO 2018, it underwent high speed taxiing test and is almost ready for its maiden flight. So far the airplane has made several taxiing tests at various speed where all systems ran for up to about 35 minutes. Considering the complex and novelty of this electric amphibian such as the electric system and unique single-stage hull design, it is not surprising that it needs extensive ground test before the first flight. The project team expects to have the first flight within this year. The prototype uses conventional rudder control system instead of the intended fly-by-wire directional control system to simply the design and to speed up the progress.



The panoramic view from the large cockpit should make flight at fjords very enjoyable.jpg

### WELL SUITED FOR ELECTRIC AVIATION AMBITION

The team is determined to design, build and fly a environmentally friendly, economical and quiet amphibian airplane. It was clear to Tomas that flying freedoms between the Norwegian fjords can only be enjoyed with an airplane that can operate both on land and in the water. The first test stage will be battery only, but in the long run a hybrid power system will be installed utilizing a KKM 352 Wankel engine as generator combined with Engiro motor, and another Engiro motor driving the propeller.

Not only the engineering progress was made during last year, but also something positive was happening on the policy side. During the past year the Norwegian government has been actively pursuing the opportunity of electric aviation for the country. Avinor, the wholly-owned state limited company under the Norwegian Ministry of Transport and Communications, is responsible for 45 state-owned airports in Norway. In the electric aviation conference in March 2018, organized by Avinor, high-profile Norwegian politicians announced Norway's ambition to have all domestic aviation to be electrified by 2040. Equator Aircraft's design mission and P2 Xcursion's profile happen to fit into this vision nicely. An electric airplane designer cannot possibly ask for a better policy environment. The unique geography of Norway with long coast line and numerous islands should have some interesting application of electric amphibian like Equator P2 Xcursion.

### THE HISTORY AND THE PRESENT MET AT AERO

The P2 Xcursion project was inspired by Günter Pöschel's modular amphibian design which traced back several decades. Tomas met Günter in the summer of 2008 and was impressed with the original Equator's design potential. Tomas made the first sketches and models of P2 Xcursion in 2009, and founded Equator Aircraft two years later.

At AERO in 2018 P2 Xcursion prototype did not present, Günter Pöschel's original Equator airplane, however, appeared. The two amphibian's streamlined fuselage and especially the single stage hull share similarities. Though Günter's original Equator design uses conventional combustion engine, the original Equator's pusher engine is put on a pylon on top of the fuselage as an embedded modular feature in the design. In this means the engine compartment is totally separate from the fuselage and wings and thus can be easily adopted to different types of engines and setup configurations such as: push-pull, single or twin engines etc. Therefore in term of electric aviation, the original Equator can be an ideal test platform of hybrid electric. The original Equator's heritage is inherited in the electric P2 Xcursion, but you never know if both amphibians' evolution will meet again in the future of electric aviation.. ✓

**Günter Pöschel's original Equator can be an ideal platform for hybrid electric configuration.**



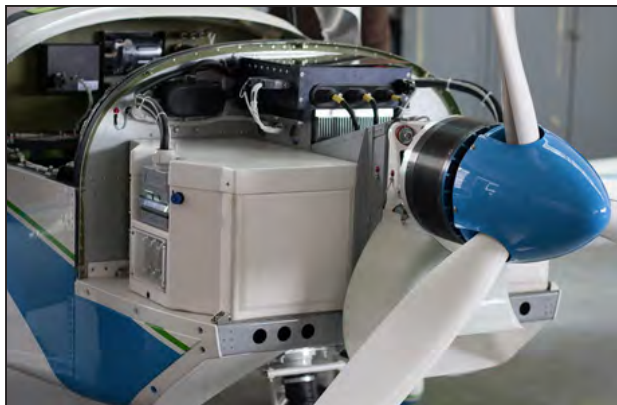
## THE FUTURE VERSION OF SPORTSTAR

# Sportstar EPOS



The electric aviation project Pure Flight from the Czech Republic will celebrate its premiere at the AERO and the 2018 e-flight-expo. At the fair, the project will present the electric aircraft EPOS, an electric version of the Sportstar from the manufacturer of Evektor. Evektor was one of the first companies to set up an electric version of its Sportstar model more than three years ago. Because of the well-known weight problem, Evektor chose the EPOS electric version to comply with not the UL but the LSA standard, which weighs 600 kg. The higher takeoff weight offered the option of higher battery payload and associated longer flight time.

**The sports star EPOS was one of the first electrified ULs. The motor drive unit (below) is from MGM Compro**



### ELSA-THE CZECH APPROACH

Evektor was fortunate that the company is based in the Czech Republic, because the local UL association LAA, which - as in Germany DAeC and DULV - on behalf of the government manages the ultralight, anticipated the 600-kg UL class back in 2011, and set up a national experimental class with 600 kg takeoff weight called ELSA. This class is currently limited only to the Czech Republic, but it could be a key advantage in the electric aircraft, because today with the Phoenix, the EPOS and the SL400 E there are already three e-planes in this class which are approved. Since the approval is based on UL approval and the approval requirement is based on the ASTM rules, it will probably be possible to adopt these machines in the new 600 kg UL category as soon as it is established. The EPOS project goes back to an initiative of the company Evektor, which also obtained support from the Czech Republic Technology Promotion AG TACR.

The RE REB 90-5 liquid-cooled motor, as with most Czech projects, comes from the manufacturer Rotax, the engine and battery control unit are from MGM Compro. The aircraft can be equipped with two battery units with two batteries each. Each individual battery consists of 45 lithium-polymer cells. The motor control pilot interface was developed by Brno University of Technology together with AEROworks. The engine has a peak output of 100 hp and a continuous output of 75 hp and



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# W I R L I E F E R N I H R 6 0 0 K G R E T T U N G S S Y S T E M



## MAGNUM 601

### Technical specifications:

Maximum permitted load: 759 kg

Maximum Speed: 320 km/h

Rescue system weight (including rocket): 12,4kg

Dimensions  
(L x B x H)  
245x195x430 mm  
250x170x490 mm  
200x195x510 mm  
410x180x280 mm

Opening time at maximum speed: 5 sec.

Maximum overload with maximum load: 35,81 kN

Descent with maximum load: 7 m/s

Slider: yes



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can therefore be in comparison of performance with the normally installed Rotax 912S, so that the flight performance is similar to those of the version with internal combustion engine. In the construction it has also thought of the operation and the battery storage. An integrated charger makes it possible to „recharge“ on a standard 220 V connection. Charging via an external device with 400 volts, the charging time can be reduced by 50%. The flight time with the maximum possible four batteries is one hour. The machine flew for the first time in March 2013, making it one of the first ULs that has been converted to an electric drive. Unfortunately, the development is currently stalled, because the company sees no market for mass production. But in the advent of the 600 kg

UL regulation in many European countries, the situation could be changed, especially since in the battery sector since 2013 has improved a lot and thus today a significantly longer flight duration is possible. ✓

#### TECHNICAL SPECIFICATIONS:

- Maximum speed: 260 km / h (cruising at 160 km / h)
- Maximum take-off weight: 600 kg
- Empty weight of the aircraft: 285 kg (without batteries)
- Engine: Rotax Electric, RE REB (liquid cooled) 100hp
- Propeller: VZLU 3blade (composite) 1.6 m diameter
- Motor controller: MGM COMPRO HBC 400400,
- Max. Voltage peaks: 300 A
- Aviation Battery Management System: MGM COMPRO
- Battery Pack: Kokam 80 Ah, 90 S
- Balanced charger 6 KW: MGM COMPRO





# eVTOL Programs on Track

Airbus has been making various efforts working towards the same vision of urban aerial mobility and to create the viable ecosystem of eVTOL operation. In the past year these separate programs, each of which has a distinctive mission and aircraft profile, are all making steady progress and set important milestones. In the light of the latest development, it is likely that the schedule of Airbus's eVTOL trial operation set for 2020 is on track.

## VAHANA

The single seat eVTOL prototype, dubbed "Alpha One" designed and produced by three dozen engineers over two years at Airbus's Silicon Valley outpost A<sup>3</sup>, made its first flight on January 30, 2018 right on schedule. The test flights took place at the Pendleton Unmanned Aerial Systems Range in Oregon. The first hover flight lasted only 50 seconds and reached 5 meters, but it was good enough to prove the integrity of the basic design. Vahana utilizes tilt wing design for cruise efficiency and has autonomous flight control, which is essential as it is a single-seater. The prototype weights 745kg including batteries. The team will continue with further flight and system tests in 2018. Next big milestone

The first flight was hover only and was quick and low, but it paved the way for the future (photo on top); Vahana prototype in the hanger in Pendleton (photo below).





**CityAirbus configuration explanation (photo above);  
 A computer generated graphic of the urban aerial mobility future  
 envisioned by Airbus (photo below)**

**CITYAIRBUS**

The multicopter sibling of Vahana is scheduled to have the maiden flight in 2018. It is different from Vahana in that, first it uses only multi-rotors without wing area, which makes it mechanically simpler while having potentially shorter range and slower cruise speed. Second, it seats four passengers which means that it could have the safety pilot or “flight operator” on board at the initial stage and can still haul three passengers. The extra safety pilot besides autonomous flight control can certainly help in the certification process. Third, CityAirbus is much larger and more powerful than the single-seat Vahana. It has eight propellers and eight specially designed Siemens SP200D (100kW operating power, direct-drive) drivetrains with exceptional torque to weight ratio. The next big milestones include the “power on” test scheduled for the first half of 2018, meaning that all motors and electric systems will be switched on for the first time. The first flight is scheduled for the end of 2018. In the beginning, the test aircraft will be remotely piloted; later on a test pilot will be on board.

**CityAirbus**  
 A multi-passenger, self-piloted electric vertical takeoff and landing (VTOL) demonstrator designed for urban air mobility with cost efficiency, high-volume production and a low environmental footprint in mind.

**AUTONOMY**  
 18 minutes

**ENGINES**  
 • 8 fixed-wing propellers powered by direct drive engines  
 • 8 x 100 kW operating power electric motors

**SIZE**  
 • Compact size for ideal integration into urban landscapes

**BATTERIES**  
 • 100 kWh power, 4 batteries  
 • 110 kWh range in all 4 batteries

**CAPACITY**  
 • Transport up to 4 passengers  
 • Avionics and cockpit built for optimized urban air traffic management

**CRUISE SPEED**  
 180 km/h

**Distorted high lift propellers** designed for efficiency, low acoustic footprint and safety

**Making CityAirbus a reality**

2015	2016	2017	2018	2023
<b>Feasibility study</b> Study confirms that CityAirbus will meet operational and regulatory requirements to be certified for public use	<b>Full scale component testing</b> Key technologies demonstrated at full size	<b>Flight testing with small scale drone</b> Control algorithms and flight performance completed	<b>Demonstrator team created</b> Collaborative team of highly diverse and experienced engineers set up	<b>Full scale demonstrator</b> Full-scale in-flight demonstration and verification of a full demonstrator with multi-certified sensors and testing (VTOL)

**Benefits of adding the third dimension to urban transport networks**

- URBAN DEVELOPMENT**  
The City Airspace manages the development of the vertical and horizontal urban space of the city
- HIGHER SPEED**  
Full-scale flying includes an increase of three times the speed of the vertical take-off and landing compared to conventional road vehicles
- ENVIRONMENTAL FOOTPRINT**  
Sustainable flying solution can be fuelled by electric and solar energy efficient

**AIRBUS**

**Leo Jeoh (design office head at Airbus Helicopters Southeast Asia, seen at center), and his team pose around the Skyways (next page) unmanned aerial vehicle, on the first demo day in the National University of Singapore.**



A closer look of the parcel station after the parcel was retrieved from the drone, which can lift up to 4kg package.



## SKYWAYS

This drone delivery system is program and managed by Airbus Helicopter. Though the vehicle is unmanned, it plays an important role in the overall eVTOL strategy of Airbus. Many subsystems and components such as autonomous flight control, detect and avoid sensors, beyond-line-of-sight (BLOS) datalink, multiple vehicles air traffic management and so on are all critical to manned eVTOL aircraft design and operation as well. In February Skyways successfully completed its first flight demonstration at the National University of Singapore (NUS). Airbus launched Skyways project with the Civil Aviation Authority of Singapore (CAAS) in February 2016 to develop an urban unmanned air system to address the safety, efficiency, and sustainability of the air delivery business in urban environment. The collaboration was subsequently extended in April 2017 with Singapore Post becoming the local logistics partner to the project. Scheduled in 2018, NUS students and staff will be able to make use of Skyways to have small parcels between 2kg and 4kg delivered to designated parcel stations within the campus. CAAS has been working closely with Airbus on the project, with an emphasis on co-developing systems and rules to ensure that such aircraft can operate in an urban environment safely and optimally. ✓



During the demo flight, the drone took off from its dedicated maintenance center and landed on the roof of a specially designed parcel station where a parcel was automatically loaded via a robotic arm. Once successfully loaded with the parcel, the Skyways drone took off again and returned to land, demonstrating its automatic unloading capability.

# DE HAVILLAND

WATCHES FOR PILOTS BY PILOTS



## LOGBOOK

block off – take off – landing – block on – total time

## ALTIMETER M / FT

QNH, QFE, FL, barometer

## CHRONOMETER

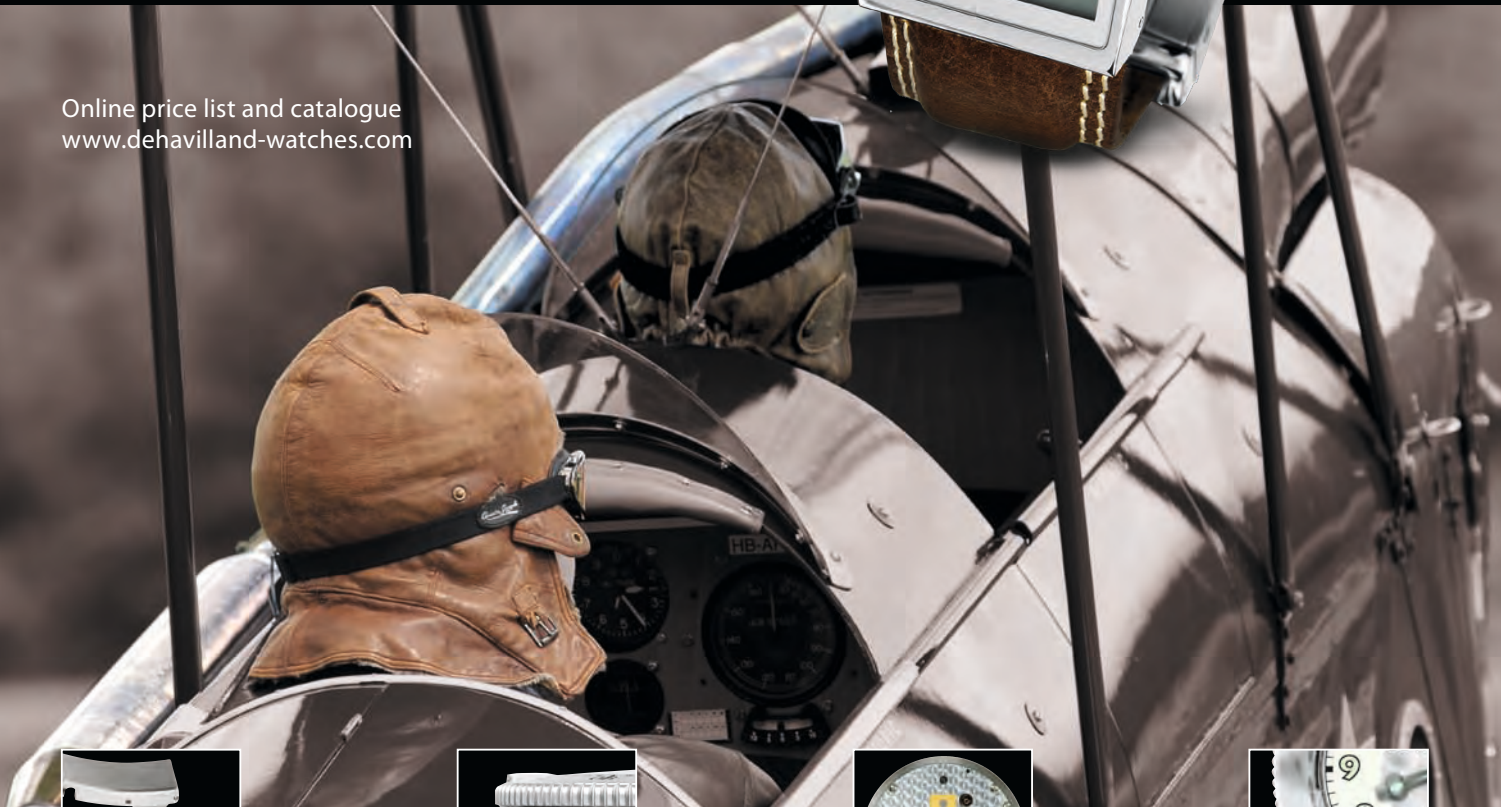
standby chronograph

## UTC

alarm, 2 time zones



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SWISS MADE



# eVTOL Test Flight in New Zealand

Kitty Hawk, the electric airplane company funded by Google's Larry Page, released a video presentation its Cora eVTOL in March 2018. The Cora prototype was built California and shipped to New Zealand in October 2017. Currently the prototype is test flying in New Zealand.



The first flying proof of concept in 2011 with three control surfaces (photo above); A top view clearly reveals the boom and rotor layout. Note that rotors have different spin directions.

## DEVELOPMENT TIMELINE

After founded in 2010, Kitty Hawk has gone through a series of design improvement. Several prototypes of Kitty Hawk and Larry Page's other electric airplane company Zee Aero have been spotted over the years but Cora is different from all of them. Zee Aero filed for the patent for a three-surface fixed wing eVTOL design in July 2010, which was believed to be the basis of the following designs. A similar configuration proof of concept prototype made an unmanned hover test flight in December 2011 and made the first unmanned transition flight from hover to cruise in February 2014. An improved prototype with smaller overall size and with conventional main wing and tail configuration made the first manned transition flight in August 2017. Afterwards the current prototype with six booms and large size were built and test flown.



The proof of concept in 2014 with similar configuration with Cora



A close look at the rotor and boom indicates that the rotors are tilted toward different directions.

### A DIFFERENT PROTOTYPE FROM PREVIOUS PROOF OF CONCEPT AIRCRAFT

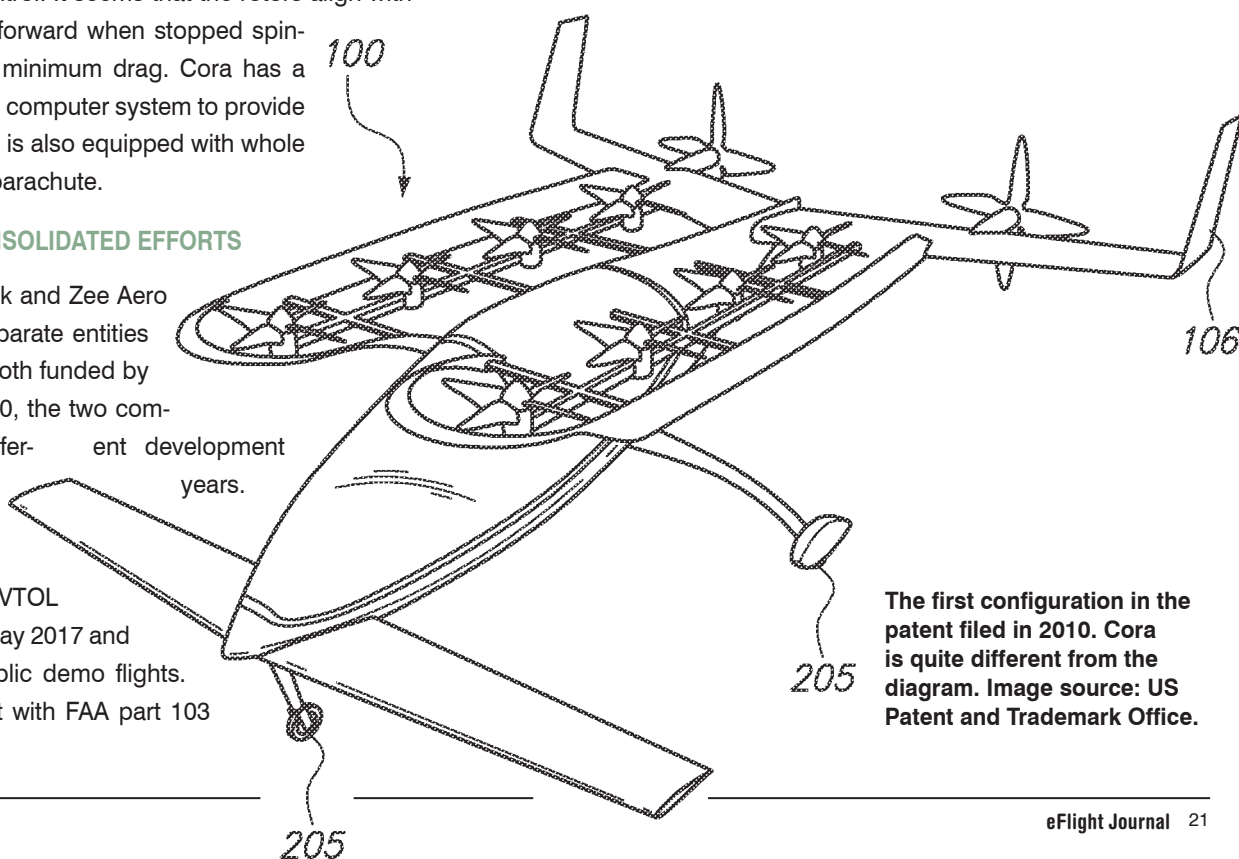
The latest revealed Cora prototype has quite different configuration from Kitty Hawk's previous proof of concept aircraft. Cora has conventional fixed wing airplane basic layout with main wing, tail section and tricycle landing gear. There are three booms on each side of the airplane to accommodate two rotors on each boom, so totally Cora has six booms with 12 rotors to provide VTOL lift. A motor and a pusher propeller at the rear of the fuselage provide power for cruising flight. The rotor blade has small diameter and long chord, possibly for quicker reaction and noise reduction. An interesting feature is that the two booms on the outboard of each wing are tilted towards outward and the two booms on the inboard of each wing are tilted towards the fuselage, possibly for better stability control. It seems that the rotors align with the boom facing forward when stopped spinning at cruise to minimum drag. Cora has a three flight control computer system to provide redundancy. Cora is also equipped with whole airframe ballistic parachute.



Cora has conventional fixed wing airplane layout with twin boom fuselage, pusher propeller and tricycle landing gear. The rotors on the booms providing VTOL lift make all the difference.

### A POSSIBLE CONSOLIDATED EFFORTS

Though Kitty Hawk and Zee Aero was set up as separate entities when they were both funded by Larry Page in 2010, the two companies took different development path over the years. Kitty Hawk first revealed a single-seat multicopter eVTOL called "Flyer" in May 2017 and made several public demo flights. Flyer is compliant with FAA part 103



The first configuration in the patent filed in 2010. Cora is quite different from the diagram. Image source: US Patent and Trademark Office.

ultralight rules and thus can be legally sold and operated immediately. In fact Kitty Hawk has been accepting security deposits for Flyer orders since last year. In contrast, Zee Aero remained a more covert status except a multiple electric aircraft tail number registration. It seems all Kitty Hawk's previous prototypes were registered with FAA through Zee Aero, so now as the Cora is revealed; it is reasonable to expect a consolidation of Kitty Hawk.

### WHY NEW ZEALAND?

New Zealand has many factors to be the ideal test ground. First, New Zealand is an island country with less than 5 million population, thus it would have less disruptions and would be easier for the Cora team to concentrate on the flight test. Second, New Zealand Civil Aviation Authority (CAA) is well recognized and its certification can be validated with EASA and FAA. Third, New Zealand is an English-speaking country with well-educated local and regional engineering labor force within close approximation to Australia. Therefore, though both the US and New Zealand do not have existing regulations upon eVTOL, New Zealand's regulatory environment may be presumably more encouraging for the test flight, certification and even trial operation in the future. In fact Cora team has met relevant ministry and the Prime Minister of New Zealand and had positive feedback. Simply meeting with the head of the state may not be easy in many other countries.



The rotor blade has short length and long chord.

### CORA EVTOL SPECIFICATION:

- motor: 12 mounted on six booms, one at the rear
- battery: unknown
- Seat: two
- Cruising altitude: 500 ft to 3000 ft
- Wingspan: 11 meters
- Range: about 100 km
- Speed: about 180 km/h

### CERTIFICATION DOWN THE ROAD

Cora has admitted that they are working with the CAA on further certification goals to bring an air taxi service to the commercial market, so would New Zealand be the contender to be the first country in the world to witness eVTOL operation? However, do not get too excited, Kitty Hawk has made it clear that Cora will not be available for consumer sale. Cora will be a part of a service similar to an airline or a rideshare, a vision that fits perfectly into Uber's Elevate program. ✓

The Cora prototype in production reveals some inside look.



# World directory of Light Aviation 2018/2019

4 Languages: English, French, German, Chinese



## Welt Index UL & Flugzeug 2018-2019

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## eFusion Hybrid takes off

Highlight of this year's e-flight-Show is for sure the Siemens/Magnus formation flight with the eFusions: for the first time two or three electric Aircraft of the same type are flying in Formations. The Siemens and Magnus Test pilots practiced this Formation in the last month at the Magnus facilities in Hungary.

Now it is clear that not only in Slovenia where the serial production of the Alpha Electro is ramped up to one Aircraft a week, also in other places serial production of electric aircraft has begun.

### MAIDEN FLIGHT - MADE JUST IN TIME

Five days before the AERO/e-flight-expo - the most important show for General and Electric Aviation world wide - Siemens achieved another milestone: the take off for the maiden flight of the eFusion Hybrid.

### SERIES-HYBRID PROPULSION SYSTEM:

Although the aircraft is flying at the moment as an Experimental aircraft at a little more than 600 Kg, it could fit in the new 600 Kg Ultralight Class and could be sold in most European countries as an Ultralight which would lower the price and raise sales chances of this interesting aircraft for ultralight training. We hope that Hungary will join the 600 Kg "Opt-Out Club" started by Germany and Czech Republic.

#### TECHNICAL SPECIFICATION:

- Siemens SP55D Propulsor motor: max 72 kW take-off (2 min.) and 55 kW max continuous power @ 3000 RPM.
- Siemens SP55G Generator motor: max 72 kW (2 min.) and 55 kW max continuous @ 3000 RPM
- FlyEco Diesel engine as a range-extender: datasheet attached
- Engine generator set (genset): 35 kW max power @ 3000 RPM, 30 kW max. continuous power @ 2500-3000 RPM controlled to charge batteries back to cca. 95 % SoC with max. 7 kW charging power.
- High power battery pack ensures taxiing, taking-off and climbing electrically: 4 swappable modules, 7 kWh nominal energy, max 60 kW take-off (2 min.) power.
- Fault tolerant hybrid propulsion control provides about 2...3 flight hours considering initial 25 liter gasoline and 95 % SoC with the hybrid eFusion (real values to be investigated).

Three times Fusion 2 electric (front) + one with Rotax 912 - soon the new Hybrid will join the formation.



**Gergely Gyorgy Balazs (Siemens) and Ermin Wegener (Fly Eco ) proudly presented the Hybrid solution for the eFusion.**

Originally it was planned to fly with three Siemens eFusions at the e-flight-show at AERO in 2018. Due to bad weather conditions in Hungary in the three weeks before the show this goal was just missed: in record time Siemens realized the project Hybrid eFusion together with its partner Fly Eco. Fly Eco, a small company from Germany, has modified the small three cylinder Diesel engine from the Mercedes Smart into an aviation engine for UL / Light sport Aircraft and Motorgliders. Based on the full electric eFusion a large part of the Batteries were replaced by the Diesel Motor, a fuel tank and a Generator. As a generator a modified version of the Siemens SP 55 G is used.

“But due to the weather we could not fly enough test hours with the Hybrid eFusion together with its full electric sisters at the AERO show,” stated Siemens e-Aircraft CEO Dr. Frank Anton. “Safety must be first in Aviation that’s why we decided to show the running Hybrid system at the AERO only on the ground and not in the e-flight Formation“. Anton was piloting one of the two full electric eFusions in the formation flight; he confirmed that the eFusion will be flying at different airfields over Europe this summer to give more pilots the practical experience of electric flight. ✓

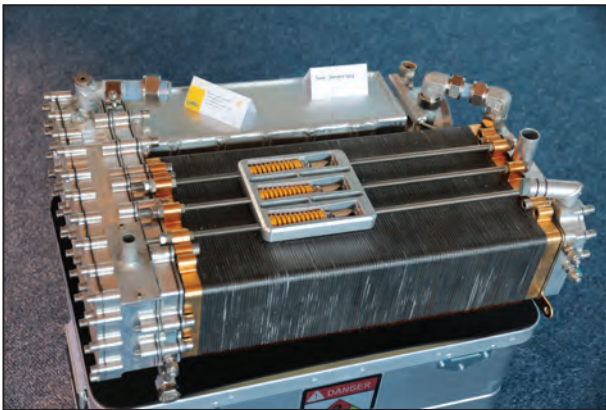


**Michael Coats from Pipistrel USA and Marc B. Corpataux, Pipistrel dealer in Switzerland, announced that the Alpha electro has received LSA certification in Australia. The training courses will start this year in Switzerland and France with a permit to Fly, in USA with a special permission. The EASA CS-LSA certification is expected to be released for the Virus electro by fall 2018. At the same time there will be an Ultralight Version in some European countries as soon as the 600 Kg MTOW are implemented in those countries.**



The Antares E2 (photo above) from Lange Research is based on the Lange Antares motorglider (photo right down) which is the first certified electric aircraft commercially available and has been sold more than 80 times over the last passed years. The research aircraft is driven by 6 e-motors - the energy comes

from hydrogen which produces the energy over a fuelcell (photo left down). The aircraft is able to stay in the air more than 40 hours, has a range of 6000 kilometers, 200 Kg payload and can be flown either piloted or later as well as an unmanned UAV. The Antares E also participated in the e-flight-show.



The Skyleader 400 SL was ready to fly at Friedrichshafen Airport to participate in the e-flight-show. But when the Phenix, another electric aircraft from Czech Republic, which was supposed to fly before the Skyleader in the e-flight-show blocked the runway due to a break failure, the Skyleader could not take off because the time for the Flight show was over and could not prolonged due to the high traffic situation.

## AERO 2018

# AERO in the Sight of KG Discussion

**Weight gain is usually something that worries us. This year, however, raising the maximum take-off weight to 600 kg for ultralight aircraft is the cause for joy and hope. Because this topic is so important, Flügel has organized several informational events at the AERO.**

600, that seems to be the magic number of this AERO, because about 600 exhibitors from all over the world have registered. Although some well-known exhibitors are not present this year, the number of 500 exhibitors became clearly exceeded. For the UL industry, it is now important that the maximum weight rises as fast as possible. "The pending weight increase meant that many pilots have postponed their purchase decision," said one manufacturer. This put pressure on sales on many manufacturers. Because the weight was not uniformly increased in Europe, there are still a number of points that need to be clarified with the associations and regulatory authorities as soon as possible. For this reason, many pilots including ourselves expect the events that we have organized with the various associations to be within the framework of the AERO (more in the schedule from page 62). The weakness in the UL market has given projects in the EASA certified CS-LSA area a boost. So the Elixir from France will make its maiden flight and Pipistrel plans to certify Alpha and Alpha Electro as CS-LSA after the Virus (more on page 52). Even if the 600 kilos come true for the ultralight, the CS-LSA certification, which is also fixed at 600 kg, has the advantage that these

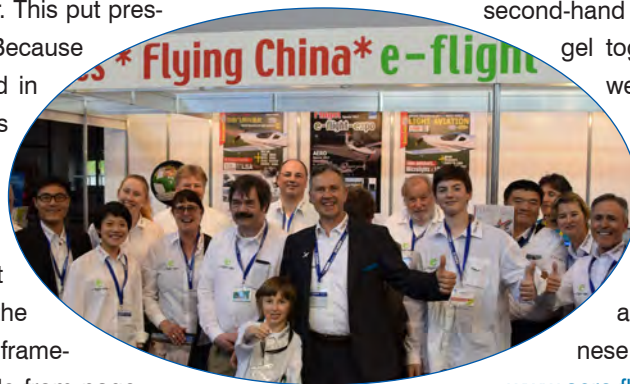
machines are fully approved for PPL training in several EASA countries. The extra kilograms will open up some new options. For example, the new, more powerful Rotax 915IS will soon be seen in ULs for towing, as well as new safety instruments for cockpit simplification especially by the VTOLs, there is now scope in the UL cockpit.



As in recent years, our stand for Flügel and Flying Pages is in the heart of the A7 (Stand 101), in the middle of the e-flight Expo hall next to Siemens and directly at the Forum in the Foyer East. As in previous years, we will also be the starting point for the German EAA Chapter - EAA President Jack Pelton has also announced his visit this year. A7-101 is also the basis of the partner magazines Vol Moteur and Flying China. This makes the stand the first stop for all guests from China and the manufacturers seeking contacts to China.



In addition, there is also the official AERO second-hand market, organized by the Flügel together with the AERO and the website UL-Scout / Aircraft-Scout. You can attach the offer of sale of your machine on site to the bulletin board, put it online, or see what is offered.



For the exhibition guide available in German, English and Chinese languages:

[www.aero.flying-pages.com](http://www.aero.flying-pages.com).

**Jo Konrad from the DULV (left) and Jan Fridrich from the Czech LAA were the driving force behind the weight increase (photo on top). The LSA Elixir from France (photo middle) had its maiden flight last summer. The Flying Pages Team (photo below) awaits you in Hall A7 Stand 101!**



# Series-ready UL e-Trainer thanks to 600 kg



**The increase in the UL maximum weight is certainly an important topic for the European e-flight scene at this fair, but there is still much more interesting to discover as you stroll through the halls and especially through Hall A7 or listen to the lectures and panel discussions in Foyer East.**



**AERO Chief Roland Bosch is looking forward to welcoming you at his AERO show, which will be held from April 18 -April 21, 2018.**

Not a week goes by right now when you don't read or hear about air taxis anywhere in the media. In action, however, you can see them currently rarely or not at all, apart from the Volocopter, who has a provisional approval as UL by the DULV. Although there are a few other whiz-fanciers flying around the world, most manufacturers such as Joby or ZeeAero/Kitty Hawk (the companies of Google founder Larry Page have been featured and recently merged) do this in secrecy. Those who do it in public, such as the Chinese manufacturer eHang, currently have no approval, so you will not see them flying at AERO. However, because Volocopter has to comply with an obligation in California at the same time as the AERO, the e-flight show, which is scheduled for the AERO Media Day on Tuesday April 17, unfortunately cannot have an e-VTOL machine present. Several manufacturers like Volocopter have promised a flight demonstration for next year. Unfortunately, there will be no flight demonstrations of the HY4 and the eGenius as both machines are currently being rebuilt for new tests. The eGenius gets a hybrid unit and the HY4 has a completely revised drive. Of course, next year they both want to be part of the e-flight show again.

Nevertheless, the flight program on Tuesday will have some new products present. Siemens, for example, will make a formation flight with three eFusions. The Siemens motor, of one of the three machines, is powered not only

by a battery set, but by a hybrid unit, which in turn is powered by an Ecosmart diesel engine with energy. In addition, if the Permit to fly from Switzerland arrives on time, a Pipistrel Alpha Electro will also be on the grid, along with a Phoenix Aircraft D14 and as a world premiere in front of an audience, the Skyleader SL 400 Electro, which has just recently had its maiden flight. In addition, the world's most popular electric glider, the elegant Lange Antares, will make its rounds over the Friedrichshafen airport. Another guest from the Czech Republic is the EGO Trike, which has been in great demand among e-flight fans for several years now; will also be admired in flight in Friedrichshafen. The same development is reflected in the exhibition in Hall A7: only a few eVTOL machines, but all the more so with two-seat machines that can finally go up in the air as a legal UL with the expected new weight limit. Although increasing the maximum take-off weight to 600 kg is beneficial for almost all ultralight aircraft, it is of vital importance to the electrically powered ULs, because at 472.5 Kg you cannot easily accommodate the battery load for a flight time of 1.5 to 2 hours. So it is not surprising that the technology leader in the e-flight sector, Pipistrel, has decided to go for CS-LSA approval. "I expect the completion of the EASA approval for the Alpha Electro before the end of the year," said Pipistrel CEO Ivo Boscarol confidently from the sidelines of an e-flight meeting in March in Norway. The sale in different countries has already begun. In Australia they have a com-

plete LSA approval and use the plane in the training, in the US, the first group of the airplanes were delivered already. The training with a special permit in California should start in the next few days. For France, the first machine to go to the French AERO Club was granted a permit to fly and is also due to operate in Switzerland. There is a general permit to fly, as the Swiss importer Marc B. Corpataux revealed. On Friday in a lecture on the stage in Foyer East all these activities will be presented. Overall, most e-aircraft are in Hall A7, but some e-flight "finds" will also be on display in other halls.

## e-flight-expo

### AEROS LTD. / A7-208

The Ukrainian manufacturer has already been able to sell some of its electric-powered Nano trikes in Germany.

### AIR CREATION / B1-117

The French world market leader in trikes shows in addition to some Trike models with internal combustion engine and an electric version of its pixel trikes.

### A-I-R GMBH / A7-015

B-Felix Rühle shows different versions of their first-class Atos with trike or motorized kite harness. Combined with highly efficient Atos series wing and equally efficient electric motor, electric powered trikes has gained solid foothold in electric aviation.

### DUC HELICES PROPELLERS / B2-211

The French propeller manufacturer has recognized the electrical sector as a future market some time ago and is represented from Siemens to Airbus.

### ELECTRIC AIRCRAFT CONCEPT / A7-310

Last year, the French manufacturer surprised with its two-seated Multicopter Wisper. Now visitors to the trade fair can assess the progress of the work. Multicopters of this type look similar, while Wisper has a smaller diameter. Wisper has not yet test flown.

### EQUATOR AIRCRAFT (AS) NORWAY/ A7-007

Tomas Brodreski arrived after the thrilling world premiere at the AERO last year without his plane, because he is currently on the way to the first flight in the far north. Due to bad weather, the flights planned for the winter have been delayed. In addition, some technical changes had become necessary. Thus, the water flier is now no longer controlled on the principle of "fly by wire" but rather conventionally on mechanical stick and pedals.

### EVIATION TECH LTD / A7-206

The Israeli start-up surprised last year in Le Bourget with its all-electric six-seater Alice. The prototype will be powered by three Siemens motors with 260 kW each and will be able to transport 9 passengers for almost 1000 kilometers at a speed of up to 440 km/h and all with energy from batteries. "The technology already exists today. The secret is integration and lightweight construction. Up to 60% of our total weight of 6.3 tonnes are batteries," says Eviation boss Omer Bar-Yohay.



e-Flight-Show  
- again this  
year part in the  
AERO program.



**Marc B. Corpataux, Pipistrel Switzerland representative, in an Alpha Electro which will begin with the flight training this year.**

**FLYING PAGES GMBH / A7-101**



At the Flying Pages stand, it's not just hot coffee and the hottest information from the e-flight scene, you also have contact to the creators of the e-flight-Expo-Forum. The documentary film "The true cost of flying", by the Dutch author Kasper Verkaik, will be premiered this year in the fall of 2018 in front of and during the e-flight forum Beijing and in Europe with Pipistrel and Siemens filmed. The film provides an interesting insight into the imminent transformation of aviation through e-flight.

**GEIGER ENGINEERING GMBH / A7-015**

Dr. Werner Eck and his partner Joachim Geiger are rightly regarded as pioneers of electric flying. Hardly anyone has blown up so many aircraft with electric motors, from paragliders to skid steers and three-axle airplanes.

**HARTZELL PROPELLER INC / A3-124**

The Americans not only have 100 years of experience in the construction of propellers but have been involved in various e-projects for two years. Their extensive experiences in propeller designs for various applications over time will help bring quieter and more efficient propellers specifically designed for electric aviation application.

**HELIX-CARBON GMBH / B2-104**

Richard Krüger-Sprengel has been contributing propeller products to electric application for more than 10 years. The company's products can be seen on many electric airplane projects.

**LANGE RESEARCH AIRCRAFT GMBH / A7-219**

The research division of Lange Flugzeugbau has developed an electric motorglider called Antares E2 with six electric motors and fuel cell power supply, which should remain in the air for up to 40 hours for manned or unmanned research flights. This will be the prototype's world premiere. The company current produces two electric self-launch sailplanes models both with 42kw motor.

**MAGNUS AIRCRAFT / B2-315**

The cooperation partner of Siemens has now developed eFusion into a product ready for series production and intends to market it from AERO 2018 onwards. Magnus also brings three Siemens motor-powered eFusion to the e-flight-show on Tuesday AERO Media Day. This will be the first formation flight airshow of three electric airplane of the same model.

The most prominent protagonists of the e-flight scene: Frank Anton (Siemens) (left) and Ivo Boscarol Pipistrel in the film by Kasper Verkaik.



#### MODERN WINGS GERMANY GMBH / B4-201

The electric version of the Swan will soon go into the approval. The interest is huge. The electric Swan fits into 120KG ultralight. The airplane also has a conventional internal combustion engine as an option.

#### MGM COMPRO S.R.O. / A7-307 / 301

The enterprising manufacturer of electric drives from the Czech Republic is on board in countless flight projects worldwide. Some such as: the Phoenix d15, the Skyleader, the Gramex Song and the Ego Trike can be seen at the booth in Hall A-7.

#### MT-PROPELLER ENTWICKLUNG GMBH / A3-309

Not only eGenius and Siemens' Extra aerobatic demo plane fly with MT propellers. Even with some eVTOL projects, the propellers from Bavaria provide propulsion.

#### PIPISTREL D.O.O. AJDOVSCINA / A7-107

Pipistrel has already been mentioned with their Alpha Electro. The Slovenian company are currently selling their complete system for flight schools worldwide, which currently produces more than one Alpha Electro per week in Slovenia. Alpha Electro has obtained permit to fly or approval in North America and several European countries. It is by far the best sold electric fixed wing airplane.

#### REINER STEMME.AERO GMBH/ A7-201

The founder of Stemme Flugzeugbau shows the electric motorglider RS 10 with his new company. The elfin is a complete new development and is not based on the previous motorglider models.

#### SPORT PROP S.R.O. / A7-301

The Czech propeller manufacturer not only manufactures propellers for some e-projects, but is also involved in the Pure Flight project with MGM PRO and PhoenixAir.



Back this year at the e-flight expo: the Whisper from France.



**Lange Research E2:**  
 40 hours flight with  
 fuel cells

**SIEMENS AG E-AIRCRAFT / A7-201**

As leading force of the electric aviation in the world, Siemens now has a whole series of projects powered by its electric motors: from the UL / LSA eFusion to the Extra 300 LE, to the Airbus Citycopter, which is set to take off this year with eight Siemens 200 kW engines. Siemens has also formed partnership with Airbus and Royce Rolls to jointly develop a hybrid single-aisle regional airliner electric airplane. If you want to know what the electric future will look like, you should definitely drop by here.

**SMARTFLYER-CHALLENGE / A7-001**

The Swiss organizer of the first e-Fly-In are now working together with the AERO and want to let as many as possible fly in 2018 in the foothills of the Alps near Grenchen.

**STERNA COMPOSITE AIRCRAFT INC. / A7-120**

The Chinese propeller manufacturer has some e-projects in the works and wants to specialize further. They set a joint-venture with the American aeronautical consulting firm DARcorporation last year to explore further into airframe integration and basic research.

**ULTRALIGHT DESIGN SRO / A7-307**

The manufacturer of the EGO Trikes is present at the booth of MGM Compro. Their electric powered trike uses high-performance Atos wings.

**VOLOCOPTER GMBH / A7-100**

Although the e-VTOL pioneers from Bruchsal are showing no new prototypes this year, they have promised to be back next year after being spotted by the e-flight-expo on their successful way into the air. The company has carried out test flight in Dubai and are in talks with more cities for test flight.

**ZALL SKYLEADER A.S. / B3-301**

The Czech manufacturer with a Chinese investor shows their electric SL400 on the ground and in the air. The electric SL400 just had the first flight recently.

**Z-PARK SKY INNOVATIONS GA ALLIANCE / A7-112**

The merger of several aviation companies from China indicate that the Chinese investors have good overall appetite with general aviation new technology including electric aviation. Z-park Alliance is the organizer partner of Flying Pages last year at the e-Flight-Forum in Beijing. As one of the major general aviation industry association in China with dozens of member companies, the Alliance plans to be more active in the e-flight sector between Europe and China in the future. ✓



**Ego Trike with  
 the power  
 from MGM  
 Compro.**

## E-FLIGHT-FORUM AERO 2018



e-flight-expo discussion 2017 with Pipistrel, Uber, Siemens, Volocopter, EASA and Bauhaus Luftfahrt.



## Autonomous flying, e-VTOL, 600 Kg and e-flight-expo award

**The e-Flight events on the AERO are indispensable. And so again this year, Hall A7 will be dedicated to the e-flight-expo, and the AERO 2018 will once again be accompanied by a series of lectures at the e-flight-forum, which this year will focus on e-VTOL and Autonomous Flying.**

The e-Flight events will start again before the official opening of the AERO. On Tuesday, GAMA EPIC will once again hold its eight-hour long manufacturers' yearly meeting in Friedrichshafen. Unfortunately, the "Electric Propulsion & Innovation Committee" meeting will be a close-door event, but during the lunch break there is a treatment for everyone who has already traveled to the AERO: the e-flight show, an airshow of various electric aircraft.

### WEDNESDAY, APRIL 18

The first day of the AERO starts, at least from the e-Flight point of view, with the three-hour session of the "ASTM Electric Propulsion Committee" from 9 am to 12 noon in the Conference Center East. In cooperation with aircraft manufacturers, aerospace companies and regulators, this establishes the standards of e-aviation, according to which aviation authorities only issue cornerstones as generally agreed specifications. The session is for members only, but anyone interested can be a so-called

“high-ranking member” in advance. At 10.30 am, Tom Gunnarson will give a talk on developing standards for batteries and other storage method.

The official e-Flight-forum will start at 9:30 am in the Foyer East with a discussion of the veined condition of UL weight. Jo Konrad from the DULV and Jan Fridrich from the LAA (Light Aircraft Association) will discuss this topic on the podium.

This discussion will be followed by a lecture by John L. Petersen of the Charles A. and Anne Morrow Lindbergh Foundation on the theme of new approaches in aviation, which also extends to the field of new propulsion systems (Forum Ost, 10:30-11:30).

At 12 o'clock, the GAMA press conference will start with a podium discussion led by Pete Bunce in the Conference Center West, Room Austria. Topics are about e-Flight and Autonomous Flying. Also, results of the EPIC discussion will be made public.

In the afternoon at 1:45 pm, the first e-VTOL session will take place in the Foyer East. Dr. Frank Anton (Siemens), Thomas Mager (Volocopter) and Tom Gunnarson (Kitty Hawk / Zee AERO “CORA”) will present and discuss different approaches. Just a few years ago, every visionary who announced a whiz-starter with electric drive was rid-

iculed. The performance of batteries or other power supplies was too low to seriously entrust VTOL requirements to an electric motor. The fact that there are already quite a few successfully flying VTOL prototypes shows how quickly visions can become reality.

#### THURSDAY APRIL 19TH

Thursday starts at 9:30 am with an approximately one-hour podium discussion in the Foyer East with the theme “Autonomous Flying”. Speakers include: Alex Zosel (Volocopter), Greg Bowls (GAMA), Ph.D. Frank Anton (Siemens) and Professor Florian Holzapfel of the TU Munich. Due to the flying complexity and the integration of a number of devices required for this purpose, the VTOL idea automatically combines autonomous flying. Only then will the challenges be mastered when hundreds of VTOL air taxis and VTOL delivery drones simultaneously populate the airspace. The e-drive is not only a prerequisite for the self-stabilizing upright starters with their computer-controlled electronic control, but also the ideal prerequisite for the necessary development steps from assisted flying with control pilot to the fully autonomously flying air taxi. Currently, not only the regulatory authorities, but also small companies like Volocopter and global corporations like Daimler and Siemens are working on the de-



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Frank Anton, the winner of 2016 award, congratulates Marc B. Corpataux, the winner of 2017 award.



velopment of the necessary control systems, without which mobility in the third dimension in the urban area will not exist.

At 3 pm, Magnus Aircraft will present its eFusion two-seater in the Berlin area (Conference Center East).

At the same time, the e-Flight forum will continue in the Foyer East with the presentation of the Smartflyer, a hybrid electric cruising aircraft. At 4:00 pm, a presentation by the Norwegian Government and its company Avinor will follow, which will replace a fleet of Dash 8 commuter aircraft with 9 to 20-seaters electric or hybrid-electric airplane by the middle of the next decade. Jan Otto Reimers presents the Avinor program and its challenges to manufacturers. The Scandinavian country, with its large reserves of clean electrical energy (hydropower), plans to take the program as a leader in the world of e-aviation. Tomas Brodreskift then reports on the current status of the Equator project, an electrically powered flying boat from Norway, which celebrated its premiere last year at the AERO.

#### FRIDAY 20 APRIL

Friday starts at 8:30 am with the China Breakfast of the publisher Flying-Pages, its partner Zpark GA-Alliance and the AERO (until about 9 o'clock). This event is not limited to e-Flight contacts to China. There is also a general focus on contacts with Chinese authorities and companies, but e-flight issues in recent years have also been a significant contributor to the development of e-aviation, due to the increasing Chinese attention and participation. Attendance by invitation only - please contact us at the Flying Pages stand (Hall A7 - Stand 101)!

Afterwards, the focus on the stage of the Foyer East will be on Friday morning from 9 am to 10 am on the topic "Flight training with e-planes". Michael Coats (Australia / USA) and Marc B. Corpataux (Switzerland) will present Pipistrel's approach here.

At 10 am, a discussion forum will be held in the Berlin area on the topic of ultra-light weight control, which will present the state of affairs in Germany, Czech Republic and France.

At 2 pm Eugen Schneider will explain EASA regulations in the Conference Center East (Oslo area). Although the focus here is not on e-aviation, it plays an increasingly important role in the framework of these regulations too. At the same time, EASA will be explaining the design of the new Part 21 / T4S controls in the Berlin area, which, like the newly regulated Part 23, is of high relevance to all light planes.

#### SATURDAY 21 APRIL

On Saturday at 10 o'clock Jan Fridrich will talk about "UL / LSA Statistics and Trends" in the Bern area. Noon follows a brief summary of what happened in the last year in light aviation and what to expect in 2018/19.

Finally, at 11 am at the Flying Pages stand in Hall A7, Stand 101, there will be the presentation of the e-flight-expo-Award. E-Flight pioneers such as Tian Yu, Eric Lindberg, Ivo Boscarol and Frank Anton have already received the most prestigious and latest electric flight award, which is awarded by Messe Friedrichshafen together with Flying Pages. ✓

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**Continental Motors**

## PURE FLIGHT:

# A New Electric Aviation Ecosystem

The ONIX “Pure Flight” project from Czech Republic made its world premier at AERO and e-flight-expo 2018. At the show the project presented an electric aircraft, electronics of electricity management, chargers up to

superfast version, and planned infrastructure construction at selected airports. The project intends to bring all critical components of electric aviation together and to streamline the electric airplane operation.

### AN ECOSYSTEM WITH FOUR PARTNERS CONTRIBUTING TO KEY COMPONENTS

Pure Flight Project Solutions started officially in September 2017. The mission of the project is to offer electro-flight as an affordable and modern alternative. As electric aviation operation is still relatively novel, the project attempts to integrate all links of electric aviation operation into one closed loop to provide a one-stop solution for customers. As a solution the project’s four partners bring together their expertise in each of their line of work including a long-lasting electric aircraft, a fast-charging management system and communication infrastructure and an airport infrastructure. By this partnership the project tries to create an electric aviation eco-system that is accessible to everyone, universal and gives space for its own rapid development and collaboration.

In the partnership Phoenix Air specializes in electric aircraft design and manufacturing. MGM COMPRO is the leader in electronic control and regulation, PEG is superior in heavy-current and chargers, SPORT PROP has years of experience in aviation and prototyping. The most difficulty of the project was to convince and find the way to realization in two stages. The first stage is to introduce a pure electric aircraft with a more than 2 hours endurance, a superfast charger and a communication module between the aircraft and the charger. The second stage is to implement the electric aviation infrastructure at airports.

### THE U15 E ELECTRIC AIRPLANE

The U15 e electric airplane designed for Pure Flight project has the heritage of the Phoneix Air’s motorglider, however they are not exactly the same. Phoneix Air has been in electric airplane design for quite a while. Back in 2011, Phoneix Air motorglider had its electric version debut at AERO and e-flight-expo. Since

the debut in 2011, the electric Phoneix Air prototype has accumulated over 400 hours in flight time and paved a solid ground for the design of U15 e electric airplane. The U15 e electric airplane plans to make first flight in summer soon after AERO and will have 2 hours of normal flight duration with power reserve, which will make it on a par with other advanced electric two-seat light airplanes. The airplane uses MGM COMPRO RE80 electric motor with 80 kw maximum power. The airplane will have a quite inter-changeable outer wing panel so that customers can fly with either 11 m or 15 m wing span to fit their mission requirement. In addition to the longer 15 m wing, U15 e electric airplane has 1:32 glide ratio at 130 kph making it a very efficient motorglider. MTOW is 600 kg which puts it right at the threshold of light sports airplane category in many countries or into the upcoming new 600 kg UL category in many European countries. Currently, U15 e electric airplane is under the Czech Republic LAA CR certification in the ELSA category. It is a category that gives maximum room for development and implementation.



The specially designed FNIX AERO supercharger can charge 80% battery capacity in 18 minutes.



**U15e has 11 m and 15 m changeable outer wing panels. In the photo is the 11 m wing configuration. On the ground is the 15 m outer wing panel.**



**U15 e cockpit is clean and simple**

### THE VARIABLE CHARGING SYSTEM FROM BASIC TO SUPER CHARGER

The project plans to use three types of power charger systems to provide a board selection, varying from 2.5 KW all the way up to 100 KW super charger depending on the local infrastructure condition and customer requirement. The power connector to the airplane will use three standards: CHAdeMO, CCS2 for cars and the third standard ÖNIX AERO, which is a specially developed connector using the Phoenix Pure Charger module for aircraft for optimized charging. Using the 100 KW super charging system, it will only take 18 minutes to charge to 80% of battery capacity.

At the power input, the charger can be powered from any source with 3 x 400/230 V power from traction lines up to 1000 V. It may also obtain power from weak power supplies such as solar panels with battery storage. The chargers will be fully compatible for automotive directly, for aircraft using the Phoenix Pure Charger module. This means that a superfast charger can recharge cars and aircraft. One charger may have multiple dispensers. One for cars and the other for airplanes. There are many power options, charging up to 2 x 500 V and 120 A at the moment. This is to say that higher charging power is possible, but the charging system is limited by the current parameters of the commercial available battery cells.

### TRIALS TO BEGIN THIS YEAR IN CZECH REPUBLIC

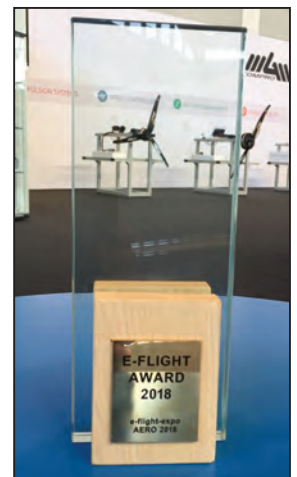
Development and implementation are planned for the beginning in the Czech Republic in the summer 2018. The plan is to install five superfast chargers at selected airports, but the project team is willing to discuss with any potential clients who would like to fly cleaner at lower cost.

Like similar electric airplane projects, flight schools have significant potential interest in such end-to-end electric airplane solution.

The cost of the system will be divided into two parts, the airplane and the charger setup. As expected, the purchase price of electric Phoenix will likely be higher than the model with an internal combustion engine, but the project team claims that the price is going to be competitive enough. The charging system price will depend on the selected specification and local conditions. ✓



**U15 e uses MGM COMPRO RE80 electric motor.**



**The project partner MGM COMPRO won the prestigious e-flight-prize at 2018 AERO**

**GAMA** (GENERAL AVIATION MANUFACTURERS ASSOCIATION)

# Multiple Efforts to Promote Electric Aviation



Global Player at one table: Discussion during the EPIC-Conference 2017 in Friedrichshafen /Germany.

As the largest general aviation industrial organization in the world, GAMA has been spearheading the efforts to promote electric aviation ever since it set up the Electric Propulsion & Innovation Committee (EPIC) at the end of 2015. Since then, over 50 predominant companies and startups both in traditional general aviation sector and new cross-over players have joined EPIC. Three new subcommittees have been established to better coordinate work efforts: Electric Propulsion Subcommittee (ELC), Simplified Vehicle Operations Subcommittee (SVO) and Infrastructure Ad-Hoc Committee (INF). GAMA has maintained a summary of the regulatory environment relevant to electric aviation to date, and has made headway into the current state of the regulatory environment for the certification of electric propulsion and simplified electric aircraft operation in key global markets.

EPIC and the subcommittees holds several member meetings during the year in the US and Germany. A meeting in China may be also in pipeline depending on

the market appetite and the regulatory development. In January 2018 EPIC and ELC held a meeting in Washington DC, USA to address the keys issues including eVTOL minimum energy reserve for aircraft design certification, the development of global consensus standards which can serve as means of compliance for the design certification of several key components in the electric propulsion powertrain, ASTM relevant standards regarding “propulsion energy storage systems” and “electric propulsion units”, charging and battery storages at the airports and so on.

In March SVO held a meeting in San Francisco USA discussing development of an SVO roadmap, which would shape the implementation of increased automation across the aviation landscape globally, a path to certification, and defining requirements for SVO. Electric aviation, especially eVTOL, is inevitably interconnected with automation flight control and simplified airplane operation and share many common certification requirements.



**GAMA's Vice President for Global Innovation & Policy and EPIC-Chef Greg Bowls (left) and GAMA President and CEO Pete Bunce at the e-flight-show 2017.**

In April 2018 at AERO Expo in Germany, EPIC and SVO will hold meetings respectively. EPIC will continue to discuss activities, which enable hybrid & electric propulsion, increased automation and other key innovations into general aviation design, production, and maintenance among the global aviation regulators in key states of design. The EPIC will also support concepts and changes to operational and licensing obstacles, which may exist in key markets. At AERO, SVO will continue to discuss the evolution of design and operational requirements that will enable simplified operations and the increased automation of GA aircraft systems and manned flight without traditional pilot skills.

SVO at AERO committee will continue to discuss the evolution of design and operational requirements that will enable simplified operations and the increased automation of GA aircraft systems and manned flight without traditional pilot skills. ✓



**Kyle Martin, Director of European Regulatory Affairs at GAMA, during his presentation at the e-flight-forum in Beijing.**



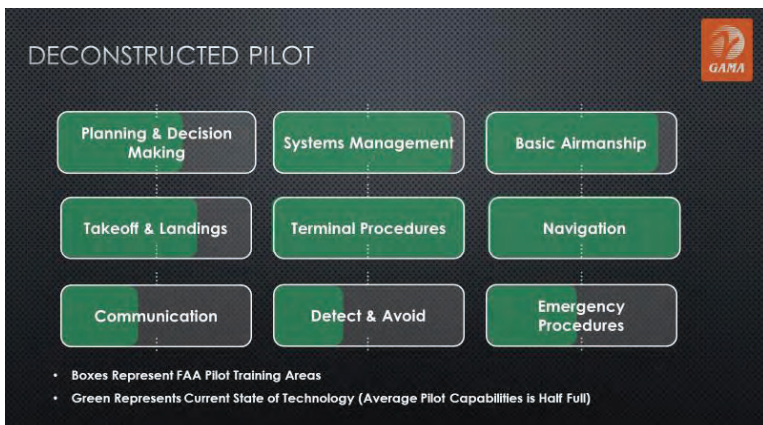
**Pete Bounce with the Chinese RX1E team in Friedrichshafen.**



This year at the e-flight-expo GAMA did not only hold a meeting of the EPIC committee but also of the Simplified Vehicle Operations Subcommittee (SVO). Pete Bunce and Greg Bowls also did take the chance to explain the GAMA route to urban mobility and the committee prepared the whitepaper which will be release at the Dallas SVO meeting. GAMA also is preparing activities with the EPIC committee in ASIA this fall. ✓




European Gama Team : Brian Davey and Martin Kyle



## 5 ACTIONS TO MAKE URBAN AIR MOBILITY A REALITY

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### APPROPRIATE DESIGN REGULATIONS



Innovative designs require safety regulations to keep pace with the market, so as not to hold back new, safer technologies. With the roll-out of electric & hybrid propulsion and increased automation, our regulators need to update certification rules to specifically address new technologies, such as electric vertical take-off & landing (eVTOL) aircraft. A harmonised global approach is essential.

---


### MODERNISE PILOT LICENSING



Traditional ways of regulating pilot capabilities will no longer work. Today we associate having two or more combustion engines with more complex aircraft. However new electric/hybrid designs can mean up to 10-20 small engines, controlled in a highly automated way. A pilot of an eVTOL aircraft would manage a highly simplified cockpit, either on-board or remotely.

---


### THE RIGHT OPERATING ENVIRONMENT



eVTOL aircraft promise highly efficient, environmentally-friendly ways to directly move people in urban areas. However they will need to operate in airspace shared by many other forms of aviation - from small cargo-carrying drones to helicopters. Careful planning is vital so no category of aviation is disadvantaged or exposed to unnecessary risk.

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### INFRASTRUCTURE & URBAN PLANNING



European mobility plans will need to take more account of aviation for multi-modal transport solutions, as we seek ways to limit emissions and time lost in traffic. Cities who plan ahead to incorporate urban air mobility vehicles will see the benefit in the coming years - from air taxis to medical emergency capabilities.

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### FUTURE-PROOF EU DRONE POLICY



As the EU prioritises building a framework for drones, it cannot overlook the forthcoming overlap of 'manned aviation' and unmanned drones. The European Commission's U-Space framework must not hinder the development of passenger air travel where a pilot may not need to be on board, or even directly fly the aircraft.

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FOR MORE INFORMATION:  
[www.eaircraft.aero](http://www.eaircraft.aero)



## 一个联盟就是一个产业集群



Tim Archer, the Alliance's US representative and veteran general aviation expert, presented at the Alliance's forum in Beijing.



Host of the first Chinese electric aircraft forum with high participation.



The Alliance has set up booth at EAA Airventure for two consecutive years.



The Alliance's booth at Beijing Aviation Expo.



Mr. Jin Qiansheng, the Chairman of the Alliance, gave a speech at the Alliance forum

Z-Park Sky Innovations General Aviation Industrial Alliance is a nonprofit, non-government organization co-founded by numerous corporations and organizations representing the broad GA ecosystem in China including leading operators, research institutions as well as institutional investors. The Alliance is headquartered in Zhongguancun Science Park (known as "Z-Park), an area on the north side of Beijing known as "China's Silicon Valley".

Since the foundation, the Alliance has been active in membership services, coordination between commercial sector and relevant government agencies, and global cooperation, including setting up the Alliance booth at EAA Airventure for two consecutive years,

hosting the first "China General Aviation Forum in Beijing", the 2017 China International General Aviation Innovation and Startup Competition, and planning and organizing the National Flying Car Design Competition together with Qinghua University General Aviation Technology Research Center.

The Alliance is aggressively promoting the general aviation development in China through the integration of the industry and finance, aligning the unique strengths and values of individual members. The Alliance is also committed to support technological innovation and crossover development of technologies in Beijing as well as in over 200 industrial parks developed by Z-Park group. WWW.ZPARKGA.COM





Mark Moore, Director of Engineering Uber Elevate Vehicle Systems, will lead through the technical sessions in Dallas

**Second Uber Elevate “on-demand mobility” Summit 2018,  
Los Angeles, CA May 8-9**

# Uber goes LA

**When Uber announced their Elevate Summit in Dallas in 2017 some people believed that this was just a initiative to keep the “taxi Service” in the headlines. The interest of investors around the world did not expect this as an initiative which will last.**

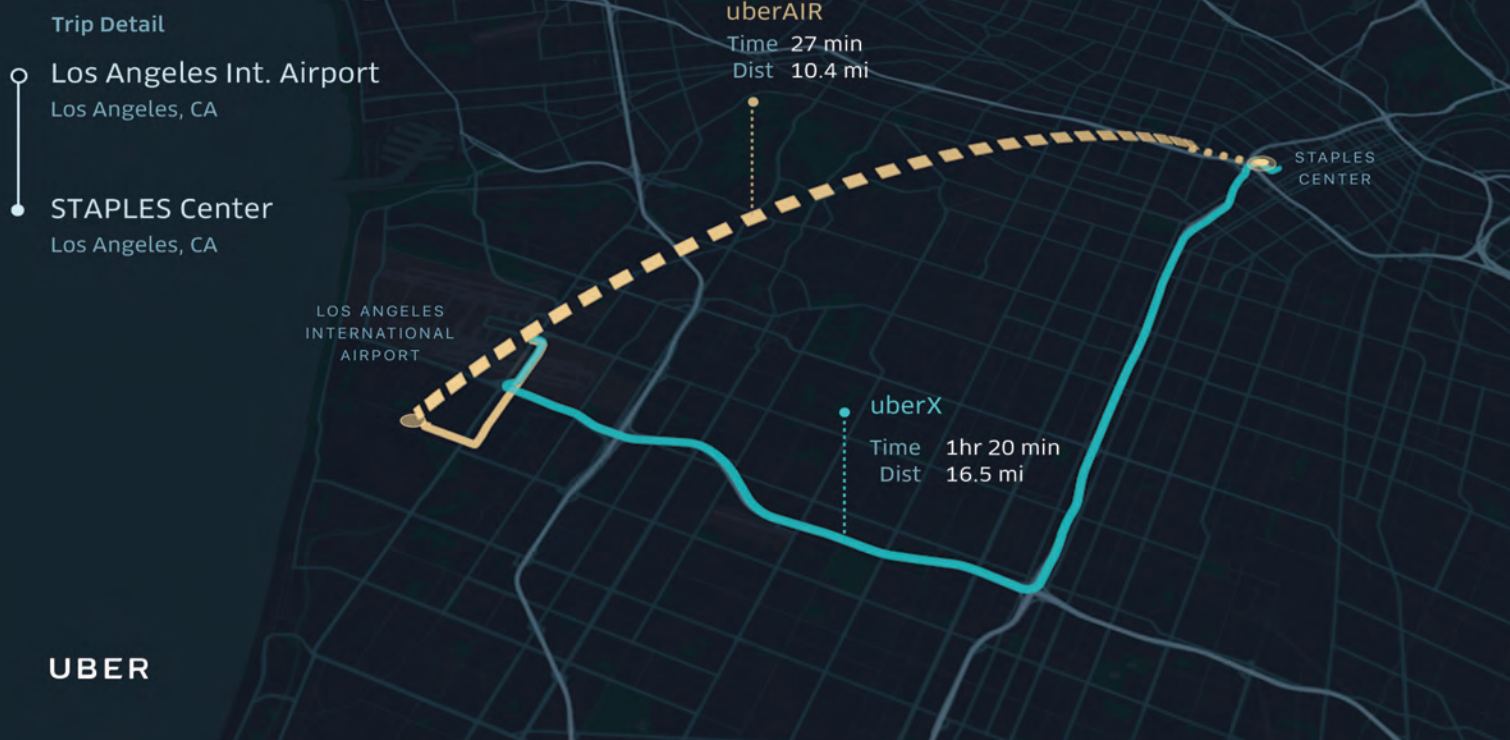
Now one year later the initiative is still there and the interest world wide has grown a lot. The number of visitors, which was 300 at the last years UBER event in Dallas, is expected to be more than 700 and high ranked speakers Elaine Chao (Secretary of Transportation of United States of America), Dan Elwell (Acting Administrator Federal Aviation Administration) are among many others who have announced their coming.

Despite many critics the move towards a new form of manned autonomous electric VTOL is getting stronger nearly every month. In November Uber signed a Space Act Agreement with NASA for the development of new Unmanned Traffic Management (UTM) concepts and Unmanned Aerial Systems (UAS) that will enable safe and efficient operations of small UAS at low altitudes. This initiative is one of the many around the globe which tries to pave the path for an aerodynamical infrastructure for hundreds and thousands of aircraft which will fly assist-

ed in the beginning and than later probably totally independent. Because the challenges which occur in this automatization of transport are similar in many cases for transport on the ground and in the air, many car manufacturers have invested in Urban Air mobility.

The afternoon before the event the General Aviation Manufacturers Association (GAMA) will organize a meeting of its “Simplified Vehicle Operations Subcommittee” in Los Angeles as well. As GAMA is persuaded that the way to autonomous flying in the future will lead over revolutionizing the whole aviation microcosmos from certification over pilots licensing infrastructure and so on.

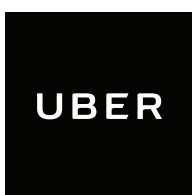
Among the topics in LA there will not be only talks on the latest development on the eVTOL aircraft sector but also on integration and the challenge of the growing demand of electric supply in large cities when all sectors on the ground and in the air will be electrified. ✓



Last year Uber's Chief Product Officer Jeff Holden announced that Los Angeles will be the second «Elevate» city in USA.



Uber does not want to design and manufacturer its own eVTOL aircraft but has a very precise catalog of the aircraft characteristics. Last Year a design idea of a possible reference model was released.



Watch the live stream:  
<https://www.uber.com/info/elevate/summit/>



Ivo Boscarol - CEO of Pipistrel, one of the UBER partners - explained last year in Dallas his vision of WTOL - flying from window at home to window at work.

## ELECTRIC TO PPL

# China CAAC Now Permits Light Sports Airplane for Private Pilot Training

According to a rulemaking directive document issued by CAAC head office on January 29th, 2018, light sports airplane (LSA) can now be used for a large portion of private pilot training syllabus. The document "The Directive of Trial Program of Sports Pilot License and Private Pilot License Training and Management" requires that after the pilot obtains the LSA license, the pilot can continue to train a minimum of 5 hours dual flight including no less than 3 hours of IFR training flight, and a minimum of 5 hours solo flight including a cross country flight. After these 10 hours additional training, if the pilot can pass the written and flight tests for PPL, the pilot can obtain the private pilot license (PPL). If the LSA pilot has already accumulated at least 10 hours pilot-in-command (PIC) flight time in LSA and has had a cross country flight which meets the PPL training syllabus requirement, then the 5 hours solo flight training can be exempted. Therefore, a LSA pilot can have a minimum of 5 hours additional dual flight training and then can take the PPL test. The additional training flights should be carried out in a Part 23 general aviation airplane.

This policy is believed to be implemented due to CAAC's pressure to quickly increase the number of PPL and pilots overall in China in order to meet the central government's general aviation development goal that by 2020 there should be more than 7000 PPL in China. At the end of 2017 there are a little over 3200 PPL in China.

As of today this is the first such policy among countries which have adopted LSA category. This policy is expected to largely lower the cost for PPL training in China because LSA's price is only about one-third to half of a Part 23 single engine airplane. This policy may attract more investment into flight schools due to lower initial investment and thus, may cause a chain reaction to further lower the PPL training cost as more flight schools come into place. At least two privately owned flight schools in China have already claimed to soon roll out a PPL program using LSA with "very special price". As of today in China the LSA pilot license costs at least 8000 euro and the PPL pilot license costs three times more.

An interesting side effect of this policy is that electric LSA has already obtained legal status in China for several years. CAAC issued type design approval (TDA) and production approval to RX-1E electric LSA designed and produced in China. RX-1E has been in serial production since 2016, and its updated model RX1E-A, which claims to have 2 hours duration time, had its first flight last October. Therefore, according to the new PPL policy, electric LSA can now be legally used for PPL training in China. If this becomes the case in real practice, it will significantly broaden the horizon of electric aviation. ✓



**Fly with the RX1-E - the first electric aircraft in China, which got CAAC approved - and the hours go towards your Private Pilot Licence.**



## *The Hartzell Propeller Top Prop Conversion Program*

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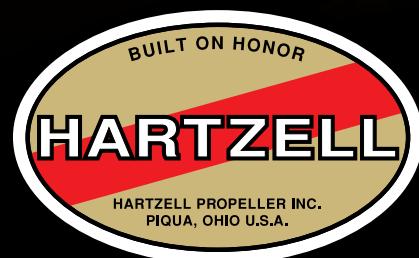
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## SKYLEADER SL 400 ELECTRIC:



WEITERE VIDEOS

Successfully the SL400 Electric has already made its first flight.

# e-Trainer for Europa and China

**Since the entry of the Chinese Zall Group as the investor in Skyleader, the electric version of the SL 400 has become even more important. Because thanks to the bilateral agreement, the machine could fly shortly after the approval in China.**

Like Evektor's electric Sportstar, the Skyleader SL 400 Electro is a metal low-wing based on the standard UL / LSA version. Actually the machine has a lot in common with the e-sportstar. The complete drive unit was also developed by MGM Compro. In contrast to Evektor, who have only one airplanen model in the UL / LSA class with the Eurostar / Sportstar, Skyleader can show not only the SL 400 but also the models Skyleader 600 with retractable landing gear and the uncoated high-performance plastic GP One.

### CHINESE INVESTMENT

Last year, Chinese industrial group Zall joined Skyleader. Thanks to the strong Chinese interest in electric flight, the e-plane from Skyleader has also made a huge impact. The machine, which was presented for the first time at AERO last year, not only completed its maiden flight in autumn 2017, but is also already ELSA-approved.



# The Future of Aviation

April, 10.- 13.2019

Friedrichshafen - Germany



## The e-flight-expo

is part of the annual AERO in Friedrichshafen / Germany.  
You will find the most advanced electric, hybrid, fuel-cell and solar aircraft and propulsion systems.



[www.e-flight-expo.com](http://www.e-flight-expo.com)



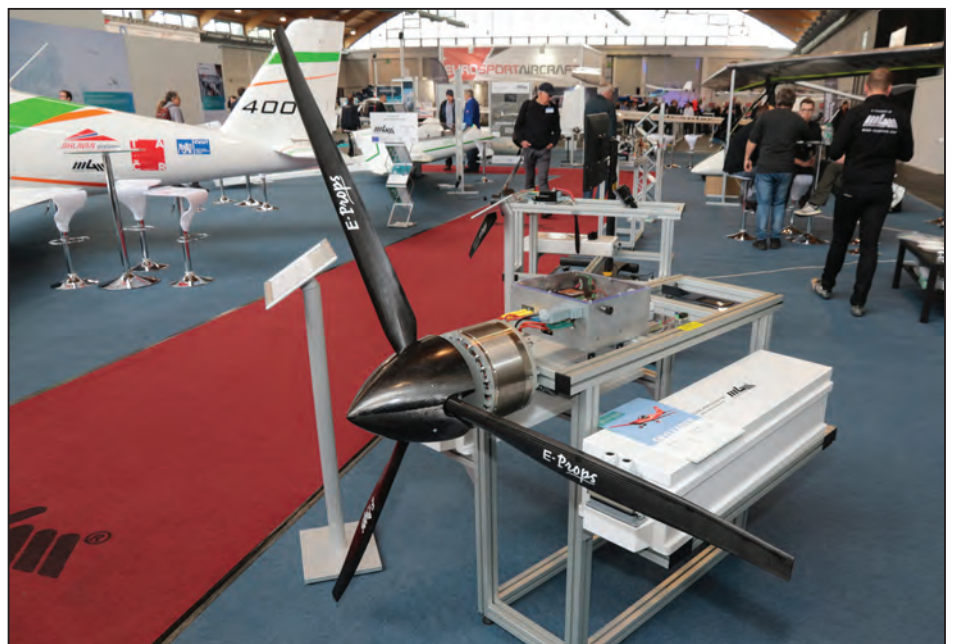


The Rotex engine is liquid cooled (left). The electric drive train was developed together with MGM Compro (below).

The Skyleader team got support from MGM Compro. Because the MGM experts have not only electrified the similar Evektor sportstar, but also have successfully brought into the air quite a number of other aircraft including the weight-controlled trike, the light glider Archeopterix up to the motor glider Phoenix. MGM Compro uses electric motor of the Czech company Rotex and adapts these for the different aircraft. MGM developed not only the motor-management system for the SL 400, but also the battery management system and the batteries, including a quick charger. The 80KW motor is liquid cooled and receives its energy from a set of four battery packs with a total of 45 kilowatt hours. The flight time should be over one hour. ✓

#### TECHNICAL SPECIFICATIONS:

Motor:	MGM RE 80
Power:	80 kW
Propeller:	E-props Durandal 100 M
Speed (IAS) VNE:	278 km / h
Max. Speed (VH)	230 km / h
empty weight (with 2 batteries):	355 kg / 785 lbs.
empty weight (with 4 batteries):	437 kg / 963 lbs.
Battery:	Sony VTC5, 110 Ah
Flight time:	1.5 hours
Range:	230 km
takeoff distance:	150 m
Landing distance:	250 m
Span:	9.2 m
Length:	6.4 m
Height:	2.4 m
Wing area:	11.3 sqm
Cabin width:	1.2 m



At the AERO 2017 the machine could be seen for the first time. Currently it is flying in the Czech Republic in the ELSA class. Once the weight for the ultralight is officially increased, it should be able to transfer to the UL class.

# PANTHERA



## WILDLY INNOVATIVE



Alpha Electro  
EASA CS-LSA pending

### PANTHERA

Powered by the 210-HP Lycoming IO-390 engine, Panthera is the statement of efficiency. Cruising at 200 KTS with a fuel consumption of only 10 gallons per hour, 1000 NM with full fuel and four people aboard. Featuring titanium retractable landing gear and parachute rescue system. Panthera sets the new standard!

### PANTHERA Electro

With its pure-electric powertrain the Panthera Electro is a treat for everybody who appreciates environmentally clean and high-tech designs. With zero emissions, low noise and virtually maintenance free, the Panthera Electro converts your dreams into reality.

### PANTHERA Hybrid

Finally an airplane running on multiple fuels, together with all advantages of electric flight. This revolutionary design enables quiet take-offs and realistic range for high-speed cross country touring. Packed with safety and performance enhancing features. Panthera Hybrid: driving the future of aviation.



TAURUS G4 / Hy4

Winner of 1.35 M USD  
at NASA GFC 2011

Worlds first  
Hydrogene powered 4 seater

Technology test-bed for  
Panthera Hybrid  
and Panthera Electro



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WWW.PANTHERA-AIRCRAFT.COM

# SkyView™ SE

SIMPLIFIED EXPERIENCE | SPORT EFIS | STREAMLINED EDITION

No matter what you call it, SE is Dynon's most affordable and intuitive SkyView experience ever.



Dynon is excited to introduce the newest member of the SkyView family. SkyView SE is made specifically for VFR aircraft and pilots who want the most intuitive flight and engine instruments on the market. They feature simple and clear displays, with almost no menus to navigate in flight. At the same time, SkyView SE retains modern, innovative Dynon EFIS capabilities like SkyView's revolutionary COM radio interface and 2-axis autopilot with single-touch controls.

Without mapping capabilities, even the 7" SkyView SE display has a large, easy-to-read Primary Flight Display, including pilot-selectable six-pack "steam gauges". With its simplified feature set and installation, SkyView SE is the successor to Dynon's legacy D100 series products.

