INTERVIEW: JURGEN GREIL OF FLYNOW AVIATION GIVES A TECHNICAL OVERVIEW OF COMPANY'S EVTOL FAMILY

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FlyNow Aviation's eVTOL aircraft, which the company describes as an efficient, automatically flying, electric modular eVTOL family. Credit: FlyNow Aviation.

The Advanced Air Mobility market is getting crowded, with the latest number from the Vertical Flight Society's World Aircraft Directory now standing at more than 700 eVTOL concepts.

The database features many different designs which are at various stages of their development, and we were given the opportunity to speak with Austrian startup FlyNow Aviation CEO Jurgen Greil in detail.

His company is developing what it describes as an efficient, automatically flying, electric modular eVTOL family consisting of cargo and personal air vehicles. Our content writer, Boris Sedacca, asks the questions.

eVTOL Insights: *Can you tell us about your experience and background at Opel, Porsche, BMW Group and Great Wall Motors?*

Jurgen Greil: "I graduated from the Technical University of Vienna in Austria with a degree in Mechanical Engineering. Beside skills in various vehicle propulsion technologies and architectures, I gained insight into general mobility concepts and set the

basis for a general understanding of many aspects of traffic as such.

“After five years as a designer in aerospace, I changed to the automotive industry where I was active for more than 20 years in various design and management roles at Opel, Porsche and BMW. I was responsible for innovative vehicle concepts with alternative drive trains. Within BMW’s ‘Project i’, I conceived and led the electric drive models i3 and i8. Later to evolve the Hydrogen Fuel Cell Vehicle Project where I started to work on innovative Hydrogen storage integration solutions.

“During this time, it became clearer and more visible to me the futuristic limitations and bottlenecks of urban mobility especially in megacities. At the same time, I held commercial licenses for airplanes and helicopters with instrument- and multi-engine ratings, which forced me to think about the limited possibilities of ground-based solutions.

“Given my passion and expertise, both in ground and air mobility, it motivated me to put together my idea into reality of facilitating 3D-mobility for everyone. Today I am glad to see that what was a dream to me, became more and more a valid option for mobility rather than an absurd idea.

“After having left BMW in 2016 I became Head of Vehicle Architecture at Great Wall Motor (GWM) in China in the Fuel Cell Electric Vehicle project. However, after two years I decided to leave the big automotive companies behind to give wings to my idea and founded FlyNow Aviation in 2019.”

Q: What were the main reasons for setting up FlyNow Aviation?

JG: “Besides having the drive and passion for 3D air vehicles, we became more aware of the existing air vehicle market dynamics, where nearly all the competitors/ existing

players offer air vehicles for a premium market segment. We found the gap in the market and realised that large majority of the population is deprived/ excluded from the attaining the benefits of 3D Mobility.

“This in return, also leads to problems in acceptance and missing political support. We saw this as history repeating itself, as this was the same mistake the automotive industry did with electric cars.

“So the main reason why we founded FlyNow Aviation was to develop a modular eVTOL family consisting of a cargo and a single- and twin seater passenger version using less resources and energy to produce and operate than any of the existing competitors, in the market, today.

“We want to successfully implement a new means of transport that is safer, more comfortable, faster and above all cheaper than existing solutions and is available and affordable for everyone – is our mantra.”

Q: ***How will it work once it is operational? Will people be able to buy and own one themselves, or will it be used as part of a UAM service?***

JG: “Flights are booked via an app and carried out by applying a specifically created flight plan, which is automatically flown from the take-off to the landing site via predefined waypoints.

“The cargo version will be operational first. An eVTOL with a payload of 200 kg, it can be applied in real life in several ways; starting with the transport of food and other essential goods for daily needs to more remote areas, through time-critical medicines or technical equipment, to civil protection and rescue service tasks.

“In the second phase, the passenger variants will be introduced, which can be used in cities and municipalities as public transport, taxi and air carriers, by hotels or manufacturing units with several locations for internal factory transport and logistic companies.”

Q: ***What are the electric motor and drive-train components?***

JG: “The lift is generated by two counter-rotating two-bladed rotor propellers, which are each driven by a quadruple redundant, permanently excited synchronous e-motor. Each e-motor drives one rotor propeller via coaxially arranged shafts. The entire unit is connected to the cabin via a universal joint and forms a so-called tilting head mechanism.

“Counter rotation coaxial rotors are known to be the most efficient arrangement. Downsizing of this efficient concept by substitution of fully articulated coaxial rotors by fixed pitch rotors and rpm control instead of complex coaxial swash plate assembly results in affordability and electrification of the drivetrain leading to simplifying and potential to cut down the cost further, manifold.”

Q: What about the actuators: where and how are they powered?

JG: “In order to roll and pitch the aircraft, there are two electrically powered actuators positioned between the e-motor housing and the cabin manipulating the tilting head mechanism. Yaw is controlled by the torque difference of the two electric motors where climb and descend is achieved by increasing and decreasing the rotor rpm. This is the simplest means of controlling six degrees-of-freedom in 3D space.”

Q: ***How do you achieve stable flight characteristics due to low centre of gravity?***

JG: “If you have a multicopter system and one of the propellers fails, you also must shut

down the opposite side propeller to avoid instability. In our case, the cabin centre of gravity is way below the gimbal joint. So, the aircraft stability behaves like a pendulum in the stable position.

“The motors are large in diameter because we need high torque at low RPM to have a low rotor tip speed and therefore reduce noise emissions. The air mass accelerated by the two rotors is high and combined with a low downwash velocity and a low disc loading helps to further lower the noise particularly over urban areas.

“We expect that flights will be at 500-1,000 feet in most cities and countries to avoid other air traffic above 1,000 feet, while below 500 feet there may be fireworks and small drones. With low noise emission, we are talking about 55 dB(A) at 500 feet, this is 5-10 dB(A) lower than you have from background noise in cities at around 60 to 65 dB(A).

“Noise emission is on a logarithmic scale, so every 3dB equates to a doubling of sound pressure level (SPL), but it is not only about SPL – the audio frequencies also need to be kept low, and since we have low speed of 650-750 RPM, this leads minimising the annoying high frequency whine drastically, even of higher speed rotors.

“To the contrary are multicopters, which have smaller rotor diameters and therefore need to increase their rotor speeds to some 2,500-3,500 RPM. Even if SPL would be the same – which they are not – the higher frequencies are more annoying.

“The automotive industry works on modular vehicle concepts to be able to produce different profitable variants according to different customer requirements. This is why we develop a modular family of a single-seat, twin-seat and cargo aircraft using the same drive-train with the batteries at the bottom of the cabin, because they make up almost half the weight of the aircraft.

“Apart from battery power, we also have incorporated the ability to swap to hydrogen fuel cell power because we believe that by the year 2030 there will be demand for such applications, given the infrastructure has been built. FlyNow has now built three prototypes.

“The cargo version, which uses a roll-on, roll-off concept with an 800 x 1,200 mm Euro pallet with one cubic metre volume. It uses a matrix conductive charging system which consists of a stationary pad and matrix connector on the vehicle.

“The upper part is in the vehicle and the lower part is stationary, which can charge up to 30 kW, so you do not have to plug in and out manually. Since the energy consumption is around 500 – 800 W per minute, we have evaluated based on customer feedback, that most flights will be between 10 – 25 km and will take between eight and 15 minutes. This entails an average energy consumption of 6 – 8 kWh per flight. By charging at 30 kW, the turnaround time is about 12 – 15 minutes.

“We do not use hydraulic power and as the electric motor is air-cooled, it does not use any fluids. At the same time, at FlyNow, we have designed the air vehicles without the need of a gearbox, as toothed wheels are known to create problems. The electric motor is directly driving the shaft of the rotor blades.”

Q: ***How are the signals interconnected for feedback loop & PID control?***

JG: “FlyNow air vehicles use model-based control system which has a PID loop that pre-defines the actuator positions, so that the actuators have to make minor changes only. It has sensors for the aircraft position in space, so the control is achieved by using two feedback loops, big and small.

“The big loop is a macro type to keep actuators and rotor RPM within range, while the

small micro loop is making the small adjustments whenever required to react in the event of gusts and changes in wind direction, to provide a smoother ride."

Q: ***Why do you use overhead-positioned coaxial rotors?***

JG: "The rotors should be located outside the reach and movement of the users to avoid both injuries and damages. This arrangement of the rotors including the drive train above the cabin also enables a very space-saving footprint.

"We are in talk with several logistic companies about the cargo version. Most players have a wingspan of around 10 m so they use up to 100 sq. m on the ground, while we can have 14 of FlyNow's eVTOL concept within the same space.

"FlyNow air vehicles can be transported in a conventional 20- or 40-feet container by taking the rotor blades off, but how do you get an aircraft with a 10 m wingspan to your customer if you cannot fly it? The aircraft must be disassembled and transported to the customers, who then have to reassemble the aircraft on site."

Q: ***What is simple-tilting head thrust vectoring?***

JG: "With the gimbal mechanism, the whole drive-train can be rolled and pitched in the X and Y axes using two actuators. By pushing them up or down, you can roll, pitch or both and therefore vector the thrust."

Q: ***Can you talk about battery power density and the size, weight and power (SWaP) trade-offs?***

JG: "The power density of the total battery system including everything is around 200 Wh/kg for the battery which consists of four independent units that supply power via four cables to the two electric motors. Since it is a simple drive-train, the wiring harness is

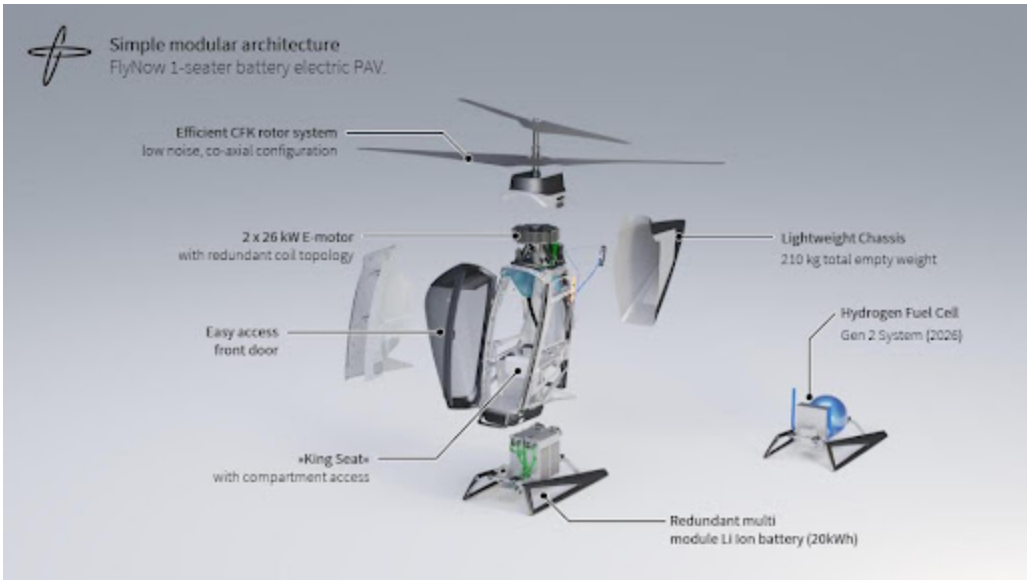
also simple.

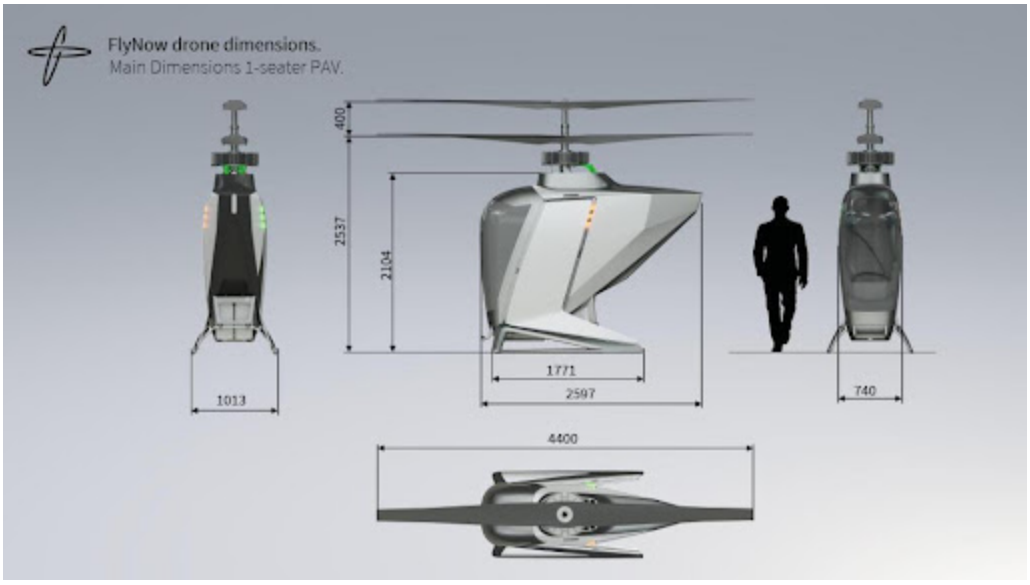
“The charging is at the front side and the energy supply to the motors is at the rear. The inverters are fully integrated into the electric motors, so there are no cables – only busbars of couple of centimetres from the inverter to the motor stator.

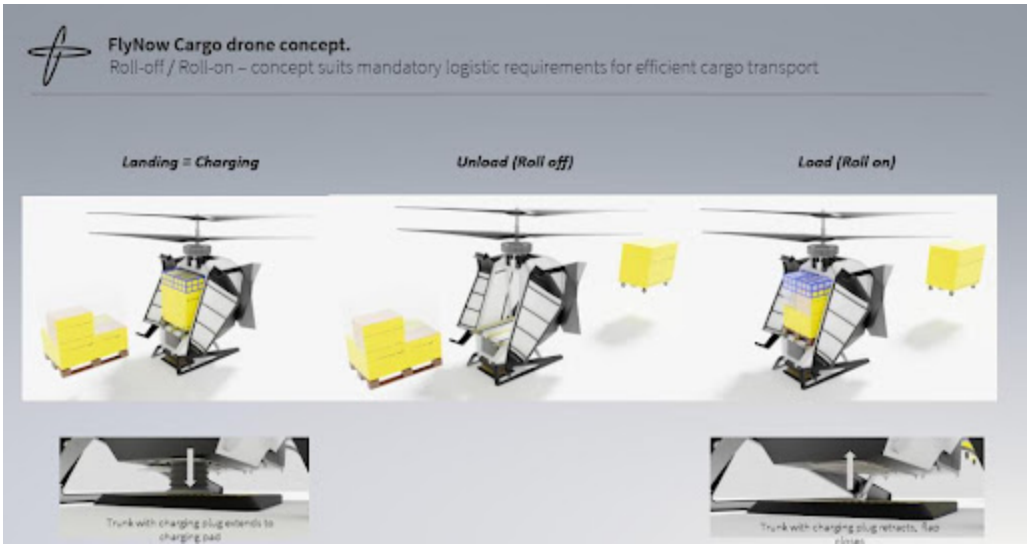
Q: ***Do you have an estimated timeline of when you expect the aircraft to be certified?***

JG: “We are following a three-step approach with the Austrian Aviation Authority as part of the EASA (European Union Aviation Safety Agency). Recently, just before the onset of the new year we got our Proof of Concept certified in the so-called ‘specific category SAIL 2’.

“In the second step we will certify the cargo version with a higher SAIL between 4 and 6 depending on the use case, to finally enable the commercial operation by the end of 2024. After sufficient experience with the operation of the cargo version by all stakeholders, we are putting step in the right direction to seek necessary certification of the passenger variants in the certified category by early 2026.”


Simple modular architecture
FlyNow 1-seater battery electric PAV.
Efficient CFK rotor system
low noise, co-axial configuration
2 x 26 kW E-motor
with redundant coil topology
Lightweight Chassis
210 kg total empty weight
Hydrogen Fuel Cell
Gen 2 System (2026)
Easy access
front door
»King Seat«
with compartment access
Redundant multi
module Li Ion battery (20kWh)


FlyNow drone dimensions.
Main Dimensions 1-seater PAV.
400
2537
2104
1771
2597
1013
740
4400


FlyNow Cargo drone concept.
Roll-off / Roll-on – concept suits mandatory logistic requirements for efficient cargo transport
Landing = Charging
Unload (Roll off)
Load (Roll on)
Trunk with charging plug extends to charging pad
Trunk with charging plug retracts, flap closes

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