IT'S NOT A DRONE

As this unmanned aerial vehicle does not have more than two rotor-blades, it is not a drone but more like a helicopter. Heidi Gibson, editor *World Airnews* spoke to an Austrian company called FlyNow CEO Jurgen Greil about their UAV.

WAN. Can you tell me about the company, when was it founded, who are the key personnel and how many people are employed?

FlyNow: FlyNow Aviation was founded in 2019 with its headquarters in Salzburg, Austria, with the aim of making 3D mobility accessible and affordable for the general population and to significantly reduce the resources and energy requirements per passenger kilometre compared to existing, ground-based transport systems on vehicles as well as on the infrastructure side. We consider all our internal team members as key personnel and right now we are 15 people internally and in the process of growing. In addition to this, we have a high-profile team of external experts and development partners.

WAN: Let's talk about the two different eVTOL UAVs that FlyNow is designing; the motors, the actuators, the drive train, and how you achieve stability?

FlyNow: We are designing a modular family of cargo and passenger versions which we call Cargo Air Vehicle (CAV) and Personal Air Vehicle (PAV) for a payload of up to 200kg and a range of 50 kilometres. All variants share the same drive train, which basically consists of the four batteries that supply the two-quadruple redundant electric motors with power and drive the two counter-rotating coaxial rotor propellers.

The two e-motors are situated in one housing, which sits on a gimbal joint. With this configuration a tilting head mechanism is established, which enables the total drive train via two actuators to roll and pitch. Yaw is controlled by the torque difference of the two e-motors and by increasing and decreasing motor rpm you can climb and descend.

Since the centre of gravity of the cabin is below the gimbal joint, mother nature contributes to static stability with the help of gravitation and dynamic stability due to the aerodynamic form of the cabin. The rest is accomplished by our dynamic control strategy.

WAN. Can you tell our readers more about the overhead coaxial rotors and what was the thinking behind this design choice?

FlyNow : For VTOL aircraft – especially if they have batteries as energy carriers – efficiency is an absolute must! Since coaxial rotor systems with a low disc loading are known to have the best 'lift to power-ratio' it was clear from the beginning to follow this path, which results in a second big advantage and a prerequisite for urban air mobility – low noise emission. Due to the tilting head mechanism and direct drive train described above we could eliminate the biggest disadvantage of conventional coaxial rotor systems - the high mechanical complexity. So we have the best of both worlds without the negative constraints – high efficiency and low noise with a simple and robust drive train.

WAN. How will the signals be interconnected for feedback loop and the PID control? How will this work?

FlyNow: Our vehicle uses advanced 2-DoF control comprised of a feedforward and a feedback controller. While nonlinear feedforward control aims at proactively moving the PAV along a desired trajectory, feedback control is used the eliminate the remaining error. The feedback controller is based on a cascaded structure.

WAN: I understand that the company has recently received your electric motor – who manufactured it? What is its size, weight and power? How will it be integrated with the other components?

FlyNow: The electric motor was developed together with Compact Dynamics, a company that enjoys a good reputation for its expertise, especially for special powertrain solutions in the field of racing and aviation. The total weight of the drive train including all components is 50kg. The peak power is 52 kW. As described above the e-motors are sitting in one housing mounted on the tilting head mechanism.

WAN: I understand FlyNow is way ahead of other eVTOL companies in terms of certification. Can you tell our readers your progress so far – as EASA regulations in this sector are pretty strict?

FlyNow: Even before the company was founded, we showed our concept to the aviation authorities and asked them for their opinion and asked for their support. Probably the most important difference to most of our competitors is the fact that our CAV and PAV is by definition not a drone, but rather a helicopter, allowing us to design the aircraft following existing EASA regulation CS 27 and CS VLR, rather than SC-VTOL. This is obviously a big advantage since many aircraft have been certified following CS 27 and CS VLR, but to our knowledge no aircraft has been certified following SC VTOL so far.

WAN: Can you explain in simple terms what the certification in SAIL II means for your company and for our readers?

FlyNow: Concerning certification we are following a three-step approach, which has been co-ordinated with the aviation authority. The first milestone was achieved at the end of last year when we were issued a certification in the "specific category".

SAIL stands for the Specific Assurance and Integrity Level and the number 1 to 6 describes the organisational effort to be allowed to operate the aircraft. The higher the number the lower the effort. SAIL II is for testing the Proof of Concept (PoC) and includes many constraints. In the second milestone, we will increase the SAIL number so we are then allowed to commercially operate our CAV over low and unpopulated areas. Then for the third milestone, we can then transport people over populated areas in the certified category.

WAN: When are you expecting your prototype to be completed and approved for your first flight test?

FlyNow: We finished the process of testing and assembling all components right now, started implementing the components and intend to start testing and flying the PoC this summer. The required permits have already been issued.

WAN: How will it work once it is operational? Will people be encouraged to buy and their own, or do you envisage this as part of a government/privately owned UAM service?

FlyNow: The first commercial application will be for the Cargo Air Vehicle transporting goods over non-populated areas. Possible fields of application are the supply of hard and difficult-to-reach areas, urgent or time-critical deliveries, natural disaster relief, but also the supply of everyday goods or important spare parts. In the beginning, the business will B2B, since besides the aircraft itself you also need to establish the necessary ecosystem, which will most likely be built by private-public partnerships consisting of operators and authorities.

WAN: Can you estimate its end cost and who would you be targeting as customers?

FlyNow: We are aiming for a purchase price comparable to a mid-size car and a cost of operation between a public transport ticket and a taxi ride. First customers will be either government entities or mobility companies with experience in the aviation industry. From there our concept would grow in pretty much all directions associated with mobility.

WAN: As you are aware most of our readers and circulation are based in Africa. Our continent has a number of challenges in terms of infrastructure such as the supply of electricity, the Internet and other related services. Do you believe such a solution would be able to function in Africa? What are the basic necessary components that need to be in place for it to function properly?

FlyNow: African countries have been leap-frogging in many areas such as communication infrastructure and thus have turned a supposed disadvantage into an advantage. With 3D mobility, the necessary infrastructure requirements are only a fraction compared to existing ground-based transport systems. This is an advantage that should not be underestimated, especially in countries with poor or missing transport infrastructure. I, therefore, believe that 3D-mobility - done right - will not only contribute to increased economic growth and boost the creation of high-value jobs.