

HAIL A COPTER



FLYING TAXIS? THE CONCEPT SEEMS FAR-fetched until you remember laughing initially at the idea of self-driving cars. In fact, the technology needed to place passengers on lightweight drones already exists.

Dubai has been running a pilot project to use drones as flying taxis since late 2017. Volocopter, a German tech startup devoted to building air taxis, was chosen to develop the technology. Volocopter's investors include Intel, which is contributing technological expertise, as well as Daimler, which owns 11 percent of the new company and has experience in manufacturing at large scale. Last year, Volocopter had a successful autonomous test flight, launched by Dubai's Crown Prince Sheikh Hamdan bin Mohammed bin Rashid Al Maktoum.

The main body of a Volocopter looks like a helicopter. But on top it has a rotor ring with 18 propellers to give it lift and keep it stable, rather than a single rotor. Classed as an ultralight craft in Germany, it looks like an oversized hobby drone but has space enough for two passengers. It has been granted a pro-

Volocopter
CEO **FLORIAN
REUTER** is
betting on a
highway in the
sky. He tells
Brunswick's
FELIX MORLOCK
about the
future of the
flying taxi.



In September 2017, an unmanned Volocopter flew for eight minutes in Dubai - the first demonstration of an autonomous air taxi in an urban area. The towers of the JW Marriott Marquis, one of the world's tallest hotels, are in the background.

visional certificate of airworthiness by German aviation authorities.

Safety is paramount for the drone's designers. More than one backup is in place for every critical component. A ballistic rocket-fired parachute is also aboard in the event of an emergency. The battery-powered aircraft can travel for up to 27 minutes at a speed of 70 kilometers per hour on one charge. Battery performance is sure to improve further down the line. And with smart infrastructure in place to enable a quick battery swap, the Volocopter can be powered up and ready to lift off right after it lands.

Volocopter isn't the only company seeking to develop air taxis in response to traffic jams. But no actual competition will exist until the various players overcome not only the technological challenges inherent in constructing the aircraft, but also the regulatory and infrastructure measures that are required for the service to take flight.

Costs will come down per Volocopter once production has scaled up to thousands of aircraft every year. Volocopter has already prepared a concept for



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the infrastructure: a network of rooftop "Volo-Hubs" where up to 1,000 passengers could board and disembark on personal flying taxis every hour. That translates to 10,000 passengers per station per day.

Volocopter CEO Florian Reuter is an eager advocate for the fledgling industry. He spoke to Brunswick about the role he hopes his company can play.

Tell us about Volocopter's origins and how you came to join the company.

The Volocopter story starts with Stephan Wolf and Alexander Zosel. Stephan Wolf's background is in industry software development.

Alex Zosel is a serial entrepreneur and aviator. He was a paraglider and is licensed to fly gyrocopters. That made him our designated pilot for the first Volocopter. He's a big guy. Those maiden flights were all the more impressive with his 130-kilo payload.

Around 2010, the two saw more and more toy drones taking to the skies. Stephan Wolf liked their ease of use and started thinking about scaling this concept up to a larger manned aircraft.

They made the most of drone technology's classic features such as distributed electric propulsion, and found a way to build an incredible level of redundancy into the system. They built the first Volocopter, the VC1, famously known as the flying yoga ball. Our video about its maiden flight went viral with more than 20 million views on YouTube. NASA called us and the Australia's Civil Aviation Safety Authority published a rave review in their safety bulletin.

Flying high on this euphoria, Stephan and Alex sought and received €2 million funding from the German Ministry of Economic Affairs. This gave them the financial clout to reach out to potential partners in a bid to build a serious aircraft. That plan panned out rather quickly – by 2013, they had developed the first VC200 prototype. Today's structure looks quite similar, but its inner workings are a lot more advanced.

In late 2013, Stephan and Alex set out to raise half a million euros on the German crowd-funding platform Seedmatch. They had it within 2.5 hours. Reaching their extended target of €1.2 million on the third day, they froze the offer for the time being.

Volocopter was an R&D project, and before our founders gave up their full-time jobs they knew it would need to become a serious company with professional structures. So they went looking for someone with experience in setting up a startup.

After studying industrial engineering and several years in management consulting, I joined Siemens in Munich, where my job was to commercialize new

technologies. Part of that was getting startups off the ground and translating technology into products.

Eventually I realized that what I really wanted was to join a startup. That's just when Volocopter came knocking. The idea of an electric helicopter – a drone scaled up for humans – that clicked with me. If I was going to put my heart and soul into a startup, it would have to pursue something as exciting as this.

On January 1 2015 I joined the company as the third managing director and fifth employee. Our headcount is now fast approaching the 100 mark.

Is Volocopter part of a larger effort to transform mobility in society?

New alliances and new competitive situations are emerging in rail, road and air transportation. Everyone who has anything to do with transportation – and we're talking about a lot of industry sectors here – is nervous. They all need to get their bearings, face up to a new reality and figure out what role they're going to play in it. These changes are mostly tech-driven. Digitalization, for instance, is one trend that is engendering new business models.

Another driver is the autonomous vehicle. Then there's ever smaller and more powerful electronic circuitry. The same goes for batteries. The technology is out there, and we're at a tipping point for big changes in transportation and aviation.

We'll soon see new ways of flying, with great innovations to come, particularly in inner-city aviation. Volocopter is spearheading this development. Every type of carrier will have a different mission in terms of long, medium and short distances and the number of runs. The best aviation concepts will rise to the top for each application. We focus completely on short distances with a highly redundant model. For that mission, our concept is the most convincing.

We're gearing up to take on a completely new form of transportation with Volocopters serving the inner city area. Our brand of mobility, particularly in urban aviation, will have a lot more in common with the fast-changing car industry than with the traditional aviation industry. That's why Daimler is our partner. They know how to develop cars and manufacture at large scale unlike anything aviation has ever seen. Innovation cycles, regular facelifts, new product variants and the like are all part of this.

At the same time, we're also doing business in the highly regulated aviation industry. We are prepared to deal with regulations that may only be slightly amended; after all, it is human life we are talking about. It's a balancing act. We're shaping up to make this work and preparing for a world where airborne



Volocopter CEO Florian Reuter, left, attributes the company's promise to the vision of its founders, including Alexander Zosel, shown below airborne in a company prototype.



urban transportation is part of everyday life and a smart supplement to other means of transport.

Why do we need air taxis if self-driving cars are just around the corner?

We believe autonomous vehicles will use legacy infrastructure more efficiently. Existing roads will probably be able to handle more vehicles per hour with preset speeds and clearly defined distances between cars that put an end to stop-and-go traffic. If autonomous vehicles are safer, cheaper and let you work on the go, they are going to be very popular. Parents can send their children to and from dance class without

leaving the house. Older people with limited freedom of movement will be far more mobile.

This is why we expect demand for transportation services to actually increase. Vehicles will make more efficient use of the infrastructure, but the number of miles that each vehicle travels will also increase dramatically. This increase may actually outstrip efficiency savings. Rather than reduce congestion, it may exacerbate traffic problems. Populations and urbanization are also on the rise, so alternative transportation concepts are very much in demand.

Do you think we'll see taxis in the air before autonomous cars hit the road?

It's going to take some time before air taxis are rolled out *en masse*. We can realistically expect to see the first air taxis on commercial routes around the same time or even earlier than autonomous vehicles on commercial routes.

You can reserve a certain amount of space in the air because you don't have to make allowances for non-cooperating participants. It is much easier to provide a safe environment in the air than on the ground. We expect to offer the first commercial routes soon after the first testing and demo routes are up. However, it is a completely new means of transport and it will certainly be a while before it becomes an everyday thing for the masses.

How many passengers will flying taxis have to carry before they become affordable for the general public?

It's less about passenger numbers and more about production numbers. The Volocopter's structure is all carbon. That material is relatively hard to work with. BMW's all-electric car i3 goes to show that it is possible to mass manufacture a carbon vehicle, but costs are still very high. They're even higher for aviation specifications. We will have to build many Volocopters to eventually arrive at manufacturing costs comparable to those for an automobile. But that's entirely conceivable. The battery is also an operating cost driver. Its performance and acquisition costs are not such a big concern. But batteries' lifecycles are short, so we need many of them to keep a Volocopter operating. If we manage to tackle both of these issues, I can see us offering air taxis at a cost comparable to that of a taxi today.

What are the biggest challenges for Volocopters and air taxis in general?

We have the aircraft and the technology to create a minimum viable product; that is, the first iteration of

an air taxi. You need infrastructure to operate an air taxi – designated landing sites, charging points, newly regulated airspace and next-generation air traffic management. We’re conducting test flights regularly. We’re part of projects and have alliances with the leading players in this arena. The technical issues are mostly resolved, but the individual countries have to agree to a standard.

We will need low-latency, high-bandwidth 5G to operate autonomous fleets of Volocopters, especially when this offering takes off in a big way. We also want to afford our passengers the opportunity to enjoy a seamless digital experience; that is, to chat, watch Netflix and write an email in the Volocopter. Today’s telecommunication networks aren’t designed for that. Transmission towers are aimed to provide terrestrial service. They have to be aligned horizontally to also provide coverage in the lower airspace.

What about air traffic control for air taxis?

Passenger drones will operate in lower level airspace, up to 1,000 feet or 300 meters. Will they fly in the same zones as smaller drones or will they operate in designated air corridors? Various proposals are on the table, but I expect that there will be a central entity that allocates 4D trajectories. It will assign coordinates in which a flying object may move within certain timeframes.

There are wonderful concepts like highway-in-the-sky displays that present an augmented reality tunnel for the pilot or autonomous aircraft to fly through. It stays green when I’m in my timeframe, but turns red when I’m lagging behind. It gives a very precise flight path to follow. Additionally, I expect there will be autonomous capabilities to detect and fly around obstacles. Drones of a certain size will have to have fully fledged sense-and-avoid capability.

What are the next steps on the way to the air taxi?

We are now building a small series of Volocopters to demonstrate capabilities next year, like we did last year in Dubai. We want to regularly stage these demo shows and test air traffic management, landing, take-off and other infrastructure. We want to fly in an urban setting, and are preparing for the commercial launch of the first routes in 2020–21.

Now it’s time to do our homework so we can get on with demos for next year. We have a fully trained business development team in place and we’re talking to cities around the world. Instead of just responding to cities that are reaching out to us, we’re reaching out to cities that we feel would be best suitable for air taxis. For the first time,

we have all the resources we need to address all interested partners.

What kind of political support do you need?

The political world discovered this topic only recently; now some German politicians are big backers. This deserves support for what it can become – an export-oriented business in the tradition of our successful automobile companies. Our aircraft have to be prepared to deploy worldwide. Wherever the regulatory door opens, we want to be there, ready to step in. Dubai and Singapore have made the greatest progress. It takes longer to set the stage in Germany, but we’re heading in the right direction.

I would be pleased if policymakers realized what a huge opportunity this is to build a new industry, and I’d be even more delighted if they started thinking about how to speed up development and commercialization.

This is a key competitive advantage. For example, if we were able to set up a closed airspace for testing with 5G infrastructure, but without a lot regulatory red tape, we could really make fast progress.

Do you need more capital and how are you going to get it?

We raised €30 million in our last round of financing. That was huge for us, but we still need more risk capital to commercialize our offering. As a venture capital finance startup, you are always fundraising. Air taxis are an unfamiliar business for investors. None can say “been there, done that,” so we have to talk to each prospect individually about risk potential. We expect to make a move in the months ahead. And an IPO is definitely a prospect. We’re preparing mentally for that scenario. But these are very turbulent times. It remains to be seen what the world will look like in three or five years.

Are you worried about emerging competition?

Air taxis have become a hot topic. Our design is a key advantage. It ensures safety always comes first. We’re also the industry benchmark for lowest noise. Those are two issues consumers really care about.

Right now we’re a classic venture capital-financed operation, but we also have two real heavyweights on board in our investors Daimler and Intel. We expect to find other sponsors who are excited about this topic and can see that we are in the pole position. With all that going for us, there’s no reason to fear the competition. On the contrary, the more serious players we have in the market, the easier it will become to raise awareness for urban air taxis. ♦



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