

# ELECTRIC AIR TAXI FLIES OVER SINGAPORE

**Volocopter conducts first test flight in an urban environment**

▶ **Beneath a rainy October sky, Singapore's business district looked listless.** The glass skyscrapers didn't glitter and no sunlight dappled in the bay. But that didn't matter much because the crowd had come to gawk at something else.

At noon, from a promontory across the bay, a speck of white rose into the air. With a lawn-mower-like hum, an electric taxi approached, drawing a swell of cheers.

Volocopter's 3-minute test flight was not the first time the German aircraft manufacturer has flown its full-scale prototype publicly. But the demonstration marks its first test flight in Asia and the first time the aircraft operated in an urban environment.

"In the next 10 years, we hope to see Volocopter integrated as an addition to existing mobility methods in megacities," says Christian Bauer, who is in charge of the firm's business development. Volocopter aims to be the first company in the world to offer commercial electric-air-taxi services to the masses.

More than 215 electric air taxis, also called electric vertical takeoff and landing (eVTOL) aircraft, are being devel-



**GOOD NEIGHBORS?** Each Volocopter has 18 rotors, which the company claims give the air taxis a "pleasant sound signature."

oped worldwide. But only a handful of Volocopter's competitors have actually flown prototypes.

Volocopter, which was founded in 2011 and counts Daimler, Intel, and the Zhejiang Geely Holding Group (which owns Volvo) among its investors, has

raised close to US \$95 million. That cash has allowed Volocopter to present its third generation of lithium-battery-powered, two-seater air taxis. Its next prototype, VoloCity, will launch by 2022 and have an estimated range of 35 kilometers and a top speed of close to 110 kilometers per hour.

The Volocopter in Singapore was flown by a pilot, and Volocopter's first stage of commercial operations, scheduled »

to happen within five years, will likely involve piloted flights. But the company's ultimate vision is for its electric air taxis to operate autonomously. In 2017, the company completed an uncrewed test flight in Dubai.

"Volocopter is focused on serving the inner-city mission," says CEO Florian Reuter. With one-way fares in the "hundreds rather than thousands of dollars," Reuter says the service's target customers fall into three categories: business professionals looking to get quickly from point A to B, commuters who want to beat rush-hour traffic, and tourists.

Electric air taxis could also serve as corporate campus shuttles and help shift cargo between depots and distribution hubs, says Roei Ganzarski, CEO of magniX, a Seattle-based firm developing motors for electric planes. "I don't think we will see thousands of these flying around each city as some companies would like the public to believe...but I believe eVTOLs will play a significant part in the future of mobility."

However, it could take 10 to 15 years for this vision to become reality, says Ganzarski. Among the hurdles he cites are battery power, regulatory issues, and the ability of fully autonomous aircraft to handle emergencies.

Pilots act as a fail-safe in many respects, says pilot and aviation professor emeritus Jason Middleton from the University of New South Wales, in Sydney. "Weather is unpredictable; it can quickly develop from nothing into a raging thunderstorm," he says. "Who's going to predict where [air taxis] can or can't fly? And what happens when they're in the air and can't go to their destination?"

One answer is unmanned aircraft system traffic management plat-

forms, or UTM for short, which are already in place for drones. Volocopter is looking to use UTM to govern its air taxis. "You can take most of the airspace-management techniques we use in drones and apply it to air taxis," says Pamir Sevincel, who leads urban air mobility strategy at AirMap, which counts Volocopter as a client.

AirMap has developed UTM capabilities for drones, such as digital flight plans, aircraft surveillance and monitoring, and dynamic rerouting during emergencies. The California-based company plans to enable pilots or fleet managers for drones and electric air taxis to update flight trajectories based on an automated assessment of risk and potential safety issues along planned routes.

Infrastructure—vertiports with passenger lounges, as well as battery-charging and aircraft maintenance stations—must also be built before electric air taxis can become a commercial reality. Volocopter has partnered with Skyports, a British infrastructure firm that recently unveiled the first prototype of its VoloPort—the air taxi equivalent of a helipad—in Singapore.

Volocopter's Reuter says his firm is working closely with global aviation authorities, and he's well aware that public acceptance of autonomous transport will be key. "Many people picture the skies becoming dark and aircraft whizzing around the city without any control or rules. That's a very negative and chaotic image," he says. "But let's take it step-by-step and evaluate how it goes." —SANDY ONG

*An extended version of this article appears in our Cars That Think blog.*

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# AT LAST, WAVE ENERGY TECH PLUGS INTO THE GRID

**A buoy will feed power to Oahu this month**



**Ocean waves are powerful and perpetually replenished.**

But unlike the wind and sun, waves remain a largely untapped source of renewable energy, despite their enormous potential. A slew of projects is starting to change that, with large prototypes launching near coastlines worldwide.

In Hawaii, the OceanEnergy Buoy is slated to connect to the island of Oahu's electric grid this month. The 749-metric-ton device was recently towed from Portland, Ore., to the U.S. Navy's Wave Energy Test Site, where the bright yellow buoy will undergo a year of performance tests. The project builds on a decade of research and several smaller iterations, including a quarter-scale model that was tested for three years in Ireland's Galway Bay.

"The difficulty has been in developing a technology that actually survives in the marine environment, which can be very harsh," said John McCarthy, CEO of the Irish buoy maker OceanEnergy.

To limit seawater effects, McCarthy's team designed a device that puts mechanical parts above the surface. The "oscillating water column" system features a semi-submerged chamber, inside of which an air pocket is trapped above a