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Forget self-driving cars. A CMU spinoff is helping to make self-piloted, flying taxis.

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By Courtney Linder / Pittsburgh Post-Gazette

Sure, you can hail a self-driving Uber with the tap of a button, but in the not-so-distant future, you could be hailing an electric, self-piloted air taxi in much the same way.

Building on the ballooning list of self-driving transportation efforts in Pittsburgh, a Bloomfield-based Carnegie Mellon University spinoff called Near Earth Autonomy announced Wednesday that it would partner with Toulouse, France-based Airbus to develop landing zone assessment technology for a self-driving passenger aircraft being built in California.

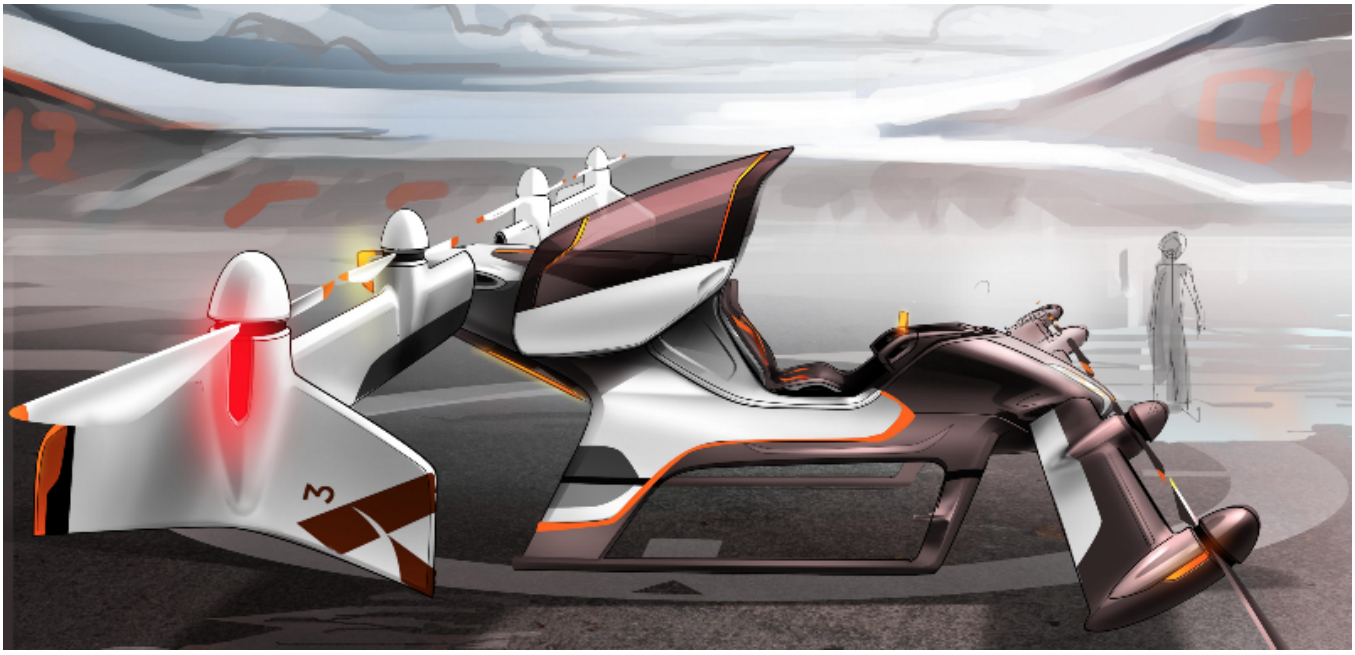
Vahana — the self-piloted taxi created by the innovative projects and partnerships arm of Airbus in Santa Clara, Calif., A^3 (pronounced "A cubed") — is a vertical take-off and landing aircraft, which means the vehicle can hover, take off and land vertically. In Sanskrit, "Vahana" translates to "mount" or "vehicle."

A^3's project began in late 2016 and is designed to carry a single passenger or cargo. By the end of the year, the company hopes to have a full prototype in the air.

That's not an impossible task, considering A^3 and Near Earth Autonomy completed a series of flight tests in June.

But vertical landing presents challenges, making Near Earth Autonomy an invaluable partner.

"These partnerships are essential to many aspects of our aircraft including our sense-and-avoid system," said Zach Lovering, a project executive for Vahana, in a release. "To that end, we have adopted Near Earth Autonomy's landing zone assessment technology for use on our aircraft."



A depiction of the single-passenger Vahana aircraft (Image courtesy of Vahana)

The flying taxi doesn't require a landing strip, but merely a cleared space. Near Earth specializes, in part, in landing zone assessment — using sensors to map the area around an aircraft and avoid obstacles upon landing.

Sanjiv Singh, CEO of Near Earth Autonomy, which employs just over 50 people, said the idea behind the company's technology is hardware and software modules that can be placed on an aircraft to keep the vehicles safe during flights.

"[Our system] is continually evaluating, is this a good place to land?" Mr. Singh said. "There's a landing spot, and then a circle of say, a 60-meter diameter, and as it comes down ... if the area is not clear, the sensor would tell the vehicle there is no good place to land and it has to move somewhere else."

Near Earth Autonomy's sensor system, called Peregrine, is not dissimilar to the sensor suite that self-driving cars rely on; aspects of both flight landing and autonomous driving require three-dimensional sensing to avoid collisions.

Light detection and ranging technology, called Lidar, is housed within the Peregrine package. Lidar is the coffee urn-looking spinner atop the self-driving Uber Volvos cruising through the Strip District.

An image of Near Earth Autonomy's future concept of a sensing and computing payload (Image courtesy of Near Earth Autonomy)

The Peregrine sensor system will mount beneath the aircraft's fuselage, or the main body of the vehicle, and is accompanied by inertial measurement units and GPS.

"It can operate like something that gives advice to the vehicle," Mr. Singh said. "Here's what you're going to run into."

In another configuration, Peregrine can also serve as a warning system, as is the case with Vahana.

Airbus and Near Earth Autonomy worked collaboratively to create a testing system. Mr. Singh's company uses a drone, which acts like A^3's aircraft, mimicking its specific descent pattern and rate.

In 50 consecutive trials, Peregrine had to detect a one-foot box effectively by the time the drone reached 20 meters from the ground.

"If there was a mistake, we'd have to do another 50 tests," Mr. Singh said.

Designed as a retrofit sensor suite, Near Earth Autonomy's Peregrine package can be affixed to aircraft on a modular basis, which could mean simpler, faster innovation in autonomous aircraft development.

"This particular format could be used by a large number of companies. This is not just for Airbus," Mr. Singh said.

Automation is key to A^3 and the company believes this strategic move will help it to distinguish itself from competitors.

"We see an opportunity to encourage manufacturing at scale for key components so that costs come down and performance increases," an A^3 spokesperson said.

While this may appear to be a fledgling industry, research into flying "cars" for consumers has been ongoing; there's an industry for autonomous aviation similar to the chess game-like competition for self-driving vehicles.

"We really have been working in this area since 2003," Mr. Singh said. In 2010, for example, he helped create technology that allowed a full-scale helicopter find its own landing place.

In Germany, Volocoptor is designing a manned vertical take-off and landing aircraft that is powered by 18 rotors, uses six batteries and can fit two people, though it only flies for a maximum of 20

minutes. EHang, a Chinese drone company, is also looking to fly its taxi drone as soon as federal regulations approve it.

Don't expect to see flying Vahana models anytime soon. While the prototype should be ready by the end of the year, it likely won't enter production until 2020.

A^3 added that the automated vehicle the company envisions does not have direct precedents, so there's no existing model for managing large-scale autonomous flight within urban environments.

"Airbus has ample experience getting projects certified. We are targeting certification as an end goal, and are already talking with the FAA," said a spokesperson.

The project adds to the growing visibility of Pittsburgh's work in autonomous transportation.

"Our device shows the Federal Aviation Administration that the [aircraft] vehicle is not just a mechanism that is launched, it doesn't just work in the best case, it will also work when things that are not anticipated come up," Mr. Singh said.

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