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## BUSINESS

# Electric Airplanes Start to Take Off

Retrofitting existing planes draws interest from startups and big manufacturers, including Airbus



A Cessna Skymaster retrofitted with an electric motor by startup Ampaire on a test flight near the airport in Camarillo, Calif., in mid-June. The company has plans to make further modifications for a future production version of the aircraft. PHOTO: AMPAIRE

*By Mike Cherney*

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A five-passenger airplane took flight near Los Angeles recently with one important modification: an electric motor.

The nearly 50-year-old plane, retrofitted by California-based startup Ampaire, still used a normal combustion engine to spin a propeller in its nose for the test flight. But engineers replaced a second engine with the electric motor, which powered a propeller in the back of the plane.

“It’s kind of like a plug-in hybrid car,” said Kevin Noertker, the co-founder and chief executive of Ampaire, which used some parts initially designed for automobiles to modify the plane. “We

are really riding the coattails of ground electric vehicles here.”

Aerospace giants and startups are developing electric aircraft that can navigate autonomously and take off and land vertically, and potentially shuttle thousands of commuters around cities and suburbs in coming decades. Uber Technologies Inc. even plans to launch a transportation service using electric, vertical-takeoff aircraft in 2023.

But other entrepreneurs believe retrofitting existing airplanes could help electric aviation take flight even sooner. Ampaire said its planes could be ready for customers by the end of 2021.

Ampaire and others are betting that regulators will approve modified planes more quickly than new electric aircraft, and that retrofitted planes will still offer significant savings on fuel and maintenance for small airlines and charter companies. The first retrofitted aircraft, which could be either hybrid or fully electric, will likely carry fewer than 20 passengers and fly between 100 and 200 miles on a single charge. That is enough to connect small airports in regions where traffic or natural obstacles make driving time-consuming, Mr. Noertker said.

Fitting electrical components on an existing airframe is a challenge, and other industry players aren't sure that focusing on retrofits is a winning strategy. Planes retrofitted with heavy batteries and generators could quickly become obsolete with the introduction of newly designed, fully electric aircraft, which would be expected to be more efficient and have greater range.

“An aircraft designed around conventional propulsion typically struggles to realize the benefits of electric or hybrid-electric power,” said Eric Bartsch, CEO of electric-aviation startup VerdeGo Aero, which is based in Daytona Beach, Fla. “It was a relatively easy decision to focus on newly designed aircraft.”

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Approvals for design changes still can take many years, the Federal Aviation Administration said. Retrofits will “undergo a thorough evaluation where FAA will determine what new safety standards might be needed to address the new technology,” it said.

Still, investors, including the venture-capital arm of JetBlue Airways Corp. , have ponied up some \$250 million for electric-aviation startups since 2017, according to recent data from PitchBook. Ampaire has raised money from venture-capital sources, government grants and the

aviation industry, including engine manufacturer Continental Aerospace Technologies, Mr. Noertker said.

Dean Donovan, managing director at aviation-and-travel investment firm DiamondStream Partners, said regulatory hurdles for retrofits aren't insurmountable. His firm is considering investing in some retrofit concepts, he said.

For a retrofit, "you already know the airframe works," Mr. Donovan said. "All you're really doing is replacing the propulsion system."

Ampaire said it has received FAA approval to fly its plane for experimental purposes. It plans to take a retrofitted aircraft to Hawaii later this year for more tests, and will fly the plane between Maui's main airport in Kahului and a smaller airport in Hana, at the eastern end of the island. The 15-minute flight will follow a route similar to one operated by local carrier Mokulele Airlines, which is interested in retrofitting its fleet of nine-passenger airplanes for electric power, said Mokulele's president, Rob McKinney.

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Ampaire's Mr. Noertker estimates the hybrid plane, originally a Cessna Skymaster, would use 55% less fuel than an unmodified plane, cost up to 50% less to maintain and offer a range of 200 miles. Wright Electric, another venture-capital-backed startup in

California, wants to retrofit a nine-passenger plane with a hybrid engine that Chief Executive Jeff Engler said would be suitable for skydiving flights. He estimates fuel savings of up to 20%.

Big manufacturers are also studying retrofits. Airbus SE said it would replace one of the four turbofans on a short-haul jetliner with an electric motor, and plans to test-fly it by 2021. The aim is to demonstrate new technology, and Airbus doesn't plan to commercially produce that particular model.

Some small airlines, however, are already retrofitting their fleets. In Vancouver, Harbour Air Seaplanes took one of its aircraft out of storage to install a 750-horsepower electric motor developed by magniX, which moved its headquarters to the Seattle area from Australia about a year ago. The first test flight is planned for November.

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“In the next five years, you’re going to see a lot more retrofits than you do new aircraft,” said Roei Ganzarski, CEO of magniX, which is backed by Singapore-based conglomerate Clermont Group. “There are a lot of operators that need to fly short routes that could benefit from a retrofit.”

Greg McDougall, Harbour Air’s chief executive and founder, said electric motors have fewer moving parts and produce less heat than the turbine engines his airline currently uses, making them cheaper to maintain. Batteries in the near future should also provide sufficient range for the airline, given that the average flight is just under half an hour.

“I’m a businessman, I’m not just a dreamer,” said Mr. McDougall, whose airline flies to coastal locations around Vancouver. “If I can see economic viability in what we’re doing, then why wouldn’t I do that?”

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