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Alice the All-Electric Commercial Airplane

The carbon in the exhaust from a gas turbine jet engine combines with the oxygen in our atmosphere to form the global warming gas

using cutting edge but still current technology, their airplane's battery pack weighs 7,800 pounds. By comparison the Tesla Model 3 long-range

Part of its distinctive look is the location where the engines are mounted (Photo 1). Two engines are located at the end of each wing and one is located at the back of the plane. Since the propellers are mounted behind the wings surfaces and at the end of the plane these propellers push the plane through the air to create the air currents and velocity necessary for the plane to fly.

The aerodynamic design of this plane has the main pushing force performed by the propeller at the tail of the airplane; this leaves the wing pushers the job of reducing drag and providing redundancy if the tail motor should ever fail. Since these engines are electric motors, it is easy to control the individual spinning speed of each propeller. This can be done to control the flight characteristics of the airplane and cut the noise level created by wind turbulence that each propeller creates down to a whisper when flying low over residential areas.

Since the plane doesn't burn off a physical quantity of fuel, its weight (14,000 lbs) stays the same from takeoff to landing. This lack of weight change during the flight is just one flying characteristic that



Images courtesy Eviation Aircraft

Photo 1—The Alice aircraft is powered only by its lithium ion batteries.

carbon dioxide. The United Nations Intergovernmental Panel on Climate Change (IPCC) indicates that this CO₂ plus the other global warming gases produced by commercial air travel is responsible for anywhere from 4-9% of the global warming that is directly caused by our industrial society. Every positive action that reduces the use of fossil fuels on the ground and in the air can reduce the catastrophic effects that global warming could cause in the near future.

Eviation is an Israeli-based company with a new all-electric regional airplane that can fly 621 nautical miles, at 240 knots, on a single electric charge, at the very low cost of \$200 per hour of flight time. After an hour's flight this all-electric airplane, that Eviation named Alice, can recharge its lithium ion battery back to full capacity in a half hour.

To accomplish this flying time

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lithium ion battery holds one twelfth (1/12) as much electrical current as the Alice battery and it weighs 1,058 pounds.

Photo 1 shows Alice at this year's Paris Air Show. Its shape is as radically different from conventional airplanes as the power source that

Photo 2—The engines on this airplane are electric motors that function the same as motors you have in your home.

drives its engines. Its three engines are actually three very powerful electric motors. Each of these supersized motors has the same working parts as the motors you find in your home, a stator that creates the magnetic field that turns electrical energy into mechanical energy, and a rotor that spins the propeller (Photo 2).



its advanced fly-by-wire technology doesn't need to process. The engineers that designed Alice's fly-by-wire system indicate that it is so advanced the pilot and co-pilot on board could literally sit back and relax and leave the flying to Alice's auto-pilot from takeoff to landing (Photo 3).

Eviation's Alice aircraft is now

ready to go through the US Federal Aviation Administration certification process so it can enter commercial use in the United States. It is expected to complete this process within the next two years. Cape Air is a regional airline that operates flights to places like Nantucket and Martha's Vineyard and they have already ordered a small fleet of this all-electric nine-passenger airplane (Photo 4). For further insight into the design and expected operation of this all-electric airplane, visit [youtube.com/watch?v=W0DHhiwvatQ](https://www.youtube.com/watch?v=W0DHhiwvatQ).

Taking it a Step Further

1. Is global warming related to human activity? Is it something that we need to be concerned about? Your teacher will provide you with the format you should follow while doing this research.
2. Build an electric motor.
Your teacher must approve all building plans before your group starts construction of its motor. All motors need to run on the power supplied by a single AA battery or

battery power determined by your teacher.
When all the motors are complet-

ed it is time to see which motor will run for the longest time before its battery power is exhausted. ©



Photo 3—Alice has the newest fly-by-wire technology so its autopilot can handle a flight from takeoff to landing.



Photo 4—The interior of the airplane's cabin

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