

# Travel beyond 2020

## Electric-powered flight

### Key themes

- The age of electric flight is here, but only for small aircraft with limited range.
- Investment from major aviation companies is boosting the development of electric aircraft.
- Larger aircraft, relying on hybrid systems, are already drawing airlines' interest.
- Electric aircraft can help open air services to underserved business travel destinations or connections between small and medium-sized communities which would otherwise prove unprofitable.
- An electric solution for long-haul travel could still be many years away.

Aerospace firms are working together to tackle the industry's growing contribution to greenhouse gas emissions. One solution is to power aircraft using electric engines. A prototype of the world's first commercial all-electric passenger aircraft is already flying.

Aircraft electrification represents the beginning of a third era in aviation; the first being the start of powered flight; the second being the introduction of the jet engine.





## Airlines are backing electric

### Sustainable air travel

Sustainability is now top of the agenda for many of the world's airlines.<sup>1</sup> This is not just because of the lower fuel burn and potentially higher profits that can result from reduced CO<sub>2</sub> emissions. Airline passengers are also demanding a more sustainable aviation industry.

A number of airlines are directly backing the development of electric aircraft. Some have even placed orders for them. European low-cost airline easyJet believes the industry will progress to electric flight via hybrid aircraft. It doesn't believe the industry could cope with an incremental leap in technology; evolution via a hybrid solution will make it easier for airlines to adjust.

### A huge commercial opportunity

The market for small electric passenger aircraft could be huge. According to Roei Ganzarski, chief executive at electric motor company MagniX, each year two billion tickets are sold for flights of under 500 miles. Electric flight makes business sense—for a 100-mile flight, an electric aircraft will use \$8-\$12 of fuel; a conventionally powered aircraft, like a Cessna Caravan, uses \$400.

Highly-efficient electric aircraft can help open air services to underserved destinations or connections between small and medium-sized communities which would otherwise prove unprofitable.

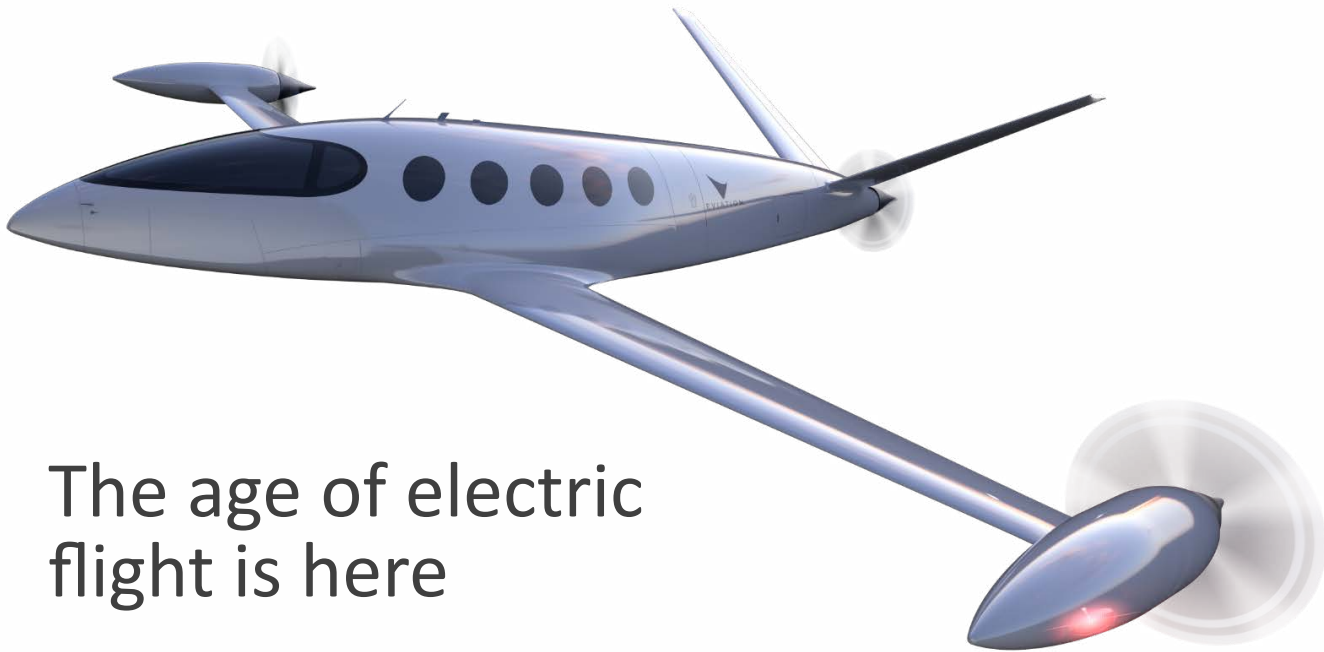
### From niche to mainstream travel

Developers are trying to strike the right balance between ambitious emission reduction targets and realistic economics. A fully electric-powered aircraft is a great goal in principle, but until they can be produced at scale, electric aircraft risk remaining a niche product only for the very wealthy.

Electric flight is going mainstream as established aerospace industry players like BAE Systems and Rolls-Royce and governments take an interest. This is helping to drive the technology forward faster. With major suppliers now taking a keen interest in investing in electric technology, startups have a growing support network helping them to advance the technology.

One such startup, Wright Electric, believes it can have a 180-seat aircraft flying by 2027-30, but it may still be some time before it starts commercial service. The rules for approving even a partially electric-powered civil airliner don't yet exist. IATA (International Air Transport Association) will start by helping to develop rules for smaller aircraft to ensure the certification process is manageable. It will also help build confidence in the new technology before it is applied more widely and to larger aircraft.

<sup>1</sup>Cirium, Sep. 11, 2019



(Image credit to Eviation)

## The age of electric flight is here

### Starting small with Alice

Israeli firm Eviation unveiled the prototype for the world's first commercial all-electric passenger aircraft at the 2019 Paris Air Show.<sup>2</sup> Called Alice, it's capable of carrying nine passengers for up to 650 miles (1,040 km) at 276 mph (440 kph). It could enter commercial service as soon as 2022.

U.S. regional airline Cape Air, which operates a fleet of 91 aircraft, has already agreed to buy a "double-digit" number of Alices. Most of its existing aircraft are six to 10 seat Cessna 402s. The Alice more than matches the 266 mph top speed of the Cessna 402, but still falls a long way short of its 1,465-mile (2,358 km) range.<sup>3</sup>

Electric power doesn't necessarily require the creation of bespoke airframes. Electric motor developer MagniX, which is helping to power the Alice, is also working with Vancouver-based Harbour Air to convert its existing fleet of seaplanes to electric power.

Both MagniX and Eviation are majority-owned by Singapore investment group Clermont, which is developing a portfolio of clean-technology firms. Clermont has pledged to transform electric flight from a vision into a commercial reality.

### Heart gets airline backing

Sweden's Heart Aerospace aims to produce and certify a 19-seat aircraft by 2025. The company claims the aircraft's range of around 250 miles (400 km) means it could be deployed on one third of the country's domestic routes.

Scandinavian airlines SAS, BRA and Wideroe have expressed an interest in Heart Aerospace's ambitions, which include plans for a 48-seat aircraft. The three airlines are reported to have provided letters of intent for 86 aircraft. Early adoption of the technology is consistent with Wideroe's long-term strategy to be emission-free.

<sup>2</sup>BBC, July 3, 2019

<sup>3</sup>Jane's All the World's Aircraft



## Dante Aeronautical pursues hybrid solution

Madrid-based Dante Aeronautical is working with Spanish low-cost carrier Volotea to develop a hybrid electric regional aircraft. Dante is already working on a 19-seat plane, the DAX-19, with a 460-mile (736 km) range. While it ideally wants to develop an all-electric aircraft, in order to produce a 35-seater aircraft, it's had to compromise by developing a hybrid solution, using internal combustion to extend the aircraft's range.

Though not the perfect solution, hybrid power will at least reduce emissions in the short term. With Volotea's help, Dante hopes to make a hybrid aircraft a commercial reality by 2025.

## EasyJet backs Wright Electric

U.S. firm Wright Electric has more ambitious plans. It will soon debut an aircraft capable of carrying nine people, but it has set its sights much higher. Wright Electric is already wind-tunnel testing a 50-seater plane as part of its efforts to bring a full-sized passenger airliner to the market. The startup has partnered with easyJet to develop a solution for short-haul electric flight.

With a proposed range of 340 miles (540 km), the 50-seater plane could cover 20% of the seats flown by easyJet today. EasyJet could use it on routes like London-Amsterdam or London-Paris. The nine-seater variant could be used for island hopping, flight schools, skydiving and crop dusting. EasyJet expects to operate electric planes within 10-20 years.<sup>4</sup>



(Image credit to Wright Electric)

<sup>4</sup>BBC, Sep. 27, 2017

## A different approach for mid- and long-haul flights

### Hybrid power for mid-haul

Most electric aircraft under development will be able to travel no further than the average family car. Aircraft operating at mid-haul ranges of more than 500 miles would need to use a mix of conventional and electric power. Even by deploying electric power at key points in a flight, these hybrid-powered aircraft could still deliver a big reduction in CO<sub>2</sub> emissions.

Several demonstration projects will soon have prototypes ready to fly.

- Rolls-Royce and Airbus are working on the E-Fan X, mounting a two megawatt (2MW) electric motor on a BAE 146 regional jet. It is set to start flight tests in 2021.
- Rolls-Royce is also working with aviation engineering company APUS and Brandenburg University of Technology on the APUS i-5, a hybrid-electric demonstrator light aircraft, which could make its first flight in 2021.
- Under Project Fresson, Roll-Royce is also developing a hybrid-electric engine for a nine-seat Britten-Norman BN-2 Islander. Using an existing airframe reduces development risks, and Rolls-Royce believes the concept is scalable to 20-seat aircraft. Existing Islanders could be retrofitted with the new system.
- United Technologies, owner of aero-engine maker Pratt & Whitney, is working on Project 804, a hybrid electric demonstrator offering fuel savings of 30%. Project 804 should make its maiden flight in 2022 and be ready for installation on regional airliners in the mid-2020s.



### Long-haul needs a solution

While there have been major advances in electric motors, battery technology hasn't progressed as far. Even making today's batteries 30 times more efficient and "energy-dense," an Airbus A320 would still only be able to fly one-fifth of its current range and with just half its payload, e.g., carrying 90 passengers 690 miles (1,105 km).

A radical leap forward in energy storage technology is needed to make long-haul electric flight a reality. With passenger flights over distances exceeding 940 miles (1,500 km) accounting for 80% of aviation emissions, an environmentally sustainable aviation industry needs an airliner capable of flying further. This may provide the impetus needed to develop the technology, but a solution may still be many years away.

Do you have questions or comments regarding this report? Please email [Mike Eggleton](mailto:mike.eggleton@bcdtravel.com) to share your thoughts.

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