The sky's the limit: Innovations that could transform air travel

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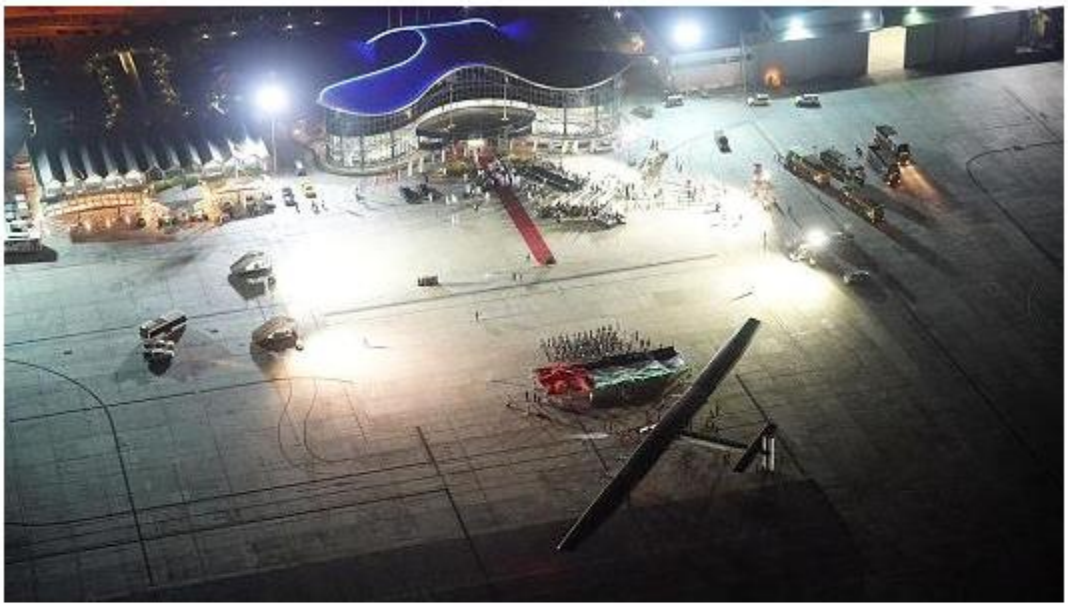

Solar Impulse-Bertrand Piccard | Anadolu Agency | Getty Images

Aviation has come a long way since 1903, when the Wright brothers took off in their flying machine.

Just this week, the Solar Impulse 2 became the first plane to travel round the world using only solar power.

Here, Sustainable Energy takes a look at some of the ideas – and attitudes – that could help to transform the way we think about air travel.

Solar Impulse 2

The solar powered Solar Impulse 2 has landed in Abu Dhabi more than a year after taking off from there on its epic and historic round-the-world journey.

The overall goal of its mission was to fly around the world using only solar power, a feat that was finally achieved this week when pilot Bertrand Piccard touched down in Abu Dhabi after a 48 hour trip from Cairo.

Last summer, Solar Impulse 2 became the first solar plane to have crossed an ocean when it flew from Nagoya in Japan to Hawaii.

The plane – which was flown in turns by pilots Bertrand Piccard and André Borschberg – has a 72 meter wing span, around 17,000 solar cells covering its wings and weighs 2.3 tons.

While not the first solar plane, the team say Solar Impulse is the first to "fly day and night, without any fuel, only using energy stored in its batteries."

Speaking to CNBC shortly after completing their historic trip, pilot and chairman Bertrand Piccard said the round-the-world voyage had "some

elating moments but also difficult moments, setbacks even, and this is the definition of adventure."

Hydrogen fuel cells:

Lucas Schifres | Getty Images AsiaPac | Getty Images

Earlier this year, European airline easyJet unveiled its plans for a zero-emission hydrogen fuel system, which it says could save about 50,000 tons of fuel per year.

The concept is based around the idea of stowing a hydrogen fuel cell in the hold of the aircraft, with energy captured while the aircraft brakes during landing.

This energy would then be used to charge batteries while the plane is stationary.

Biofuel:

Lex Lieshout | AFP | Getty Images

KLM Royal Dutch Airlines is attempting to lessen the environmental impact of air travel by investing in biofuels to help aircraft fly.

In March, the airline announced it was launching roughly 80 biofuel flights between Oslo and Amsterdam.

"KLM believes that sustainable biofuel is important for the airline industry," Boet Kreiken, managing director of KLM Cityhopper, said in a news release at the time.

Waste biomass:

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Heriot-Watt University in Edinburgh has embarked on a project to "develop low carbon aviation fuels from captured CO2 and waste biomass."

Engineers and scientists at Heriot-Watt will lead the project – which is funded by the Engineering and Physical Sciences Research Council – "in conjunction" with researchers at Aston University, Oxford University and the University of Edinburgh.

"Our project aims to produce low-carbon synthetic aviation jet fuel using renewable energy from agricultural waste and forestry biomass and captured CO2," Mercedes Maroto-Valer, director of the Energy Academy at Heriot-Watt University, said in a news release last December.

Electric hybrid:

Eduardo Mueses | EyeEm | Getty Images

At the end of 2014, the University of Cambridge announced that its researchers, together with Boeing, had successfully tested a plane with a "parallel hybrid engine." This, the university said, represented the first ever aircraft "to be able to recharge its batteries in flight."

The system used both a petrol engine and electrical motor, with the university stating that its demonstrator aircraft used "up to 30 percent less fuel than a comparable plane with a petrol-only engine."

"Although hybrid cars have been available for more than a decade, what's been holding back the development of hybrid or fully-electric aircraft until now is battery technology," Paul Robertson, from Cambridge's Department of Engineering, said at the time.

"Until recently, they have been too heavy and didn't have enough energy capacity," Robertson added. "But with the advent of improved lithium-polymer batteries, similar to what you'd find in a laptop computer, hybrid aircraft – albeit at a small scale – are now starting to become viable."

The world's cleanest carrier?

Markku Ulander | AFP | Getty Images

In April of this year, Warwick Business School announced the results of a seven-year study into greenhouse gas emissions produced by the airline industry.

It found that Finnish airline Finnair had the "smallest carbon footprint in 2014."

"Finnair perform best due to the age and type of its planes, the routes it flies and the overall number of connections it offers," Warwick Business School's Frederik Dahlmann said in a statement at the time.

"Plus it is probably among the most advanced when it comes to accounting for and managing its emissions over time."

For its part, Finnair has set what it describes as "ambitious" targets when it comes to sustainability, chief among them the aim to cut emissions by 41 percent between 1999 and 2017.