

Around The World In A Solar Airplane



Technology advances and mode of transportation has not only made the reach of people swift and easy, but has also shortened the distances. But these advances come at a cost. It is little over 100 years when the first engine-powered airplane was flown by the Wright Brothers. The vision and invention of the two brothers changed the face of aviation forever so much so that Aircraft emissions related to global warming has now become an issue of concern. With aircraft manufacturers working towards 'greener' alternatives, a revolutionary concept called Solar Impulse is writing the next pages in the history of aviation with solar energy - a flight around the world without fuel or pollution.

Aircraft emissions currently one of the fastest-growing contributors, is predicted that by 2050 will become one of the largest contributors to global warming.

The aviation sector is responsible for about 4 per cent of the world's carbon dioxide emissions, according to European

Commission studies, though other estimates vary from 2 to 9 per cent.

According to reports, Air traffic controllers are expected to handle 95 million flights by all types of airplanes in 2025.

A grim future situation is the result of aircraft manufacturers looking

for cleaner, quieter and more efficient airplanes using 'green' technology. The race to make the world's cleanest jets has begun. Boeing and Airbus are the forerunners with Boeing pitching its 787 dreamliner claiming to use 20 per cent less fuel than today's similarly sized airplane and Airbus says its A380

Solar Impulse President-Bertrand Piccard and CEO-André Borschberg who will be the pilots of the solar airplane tells *Masooma Jariwala* about the project and its future outcome.

The construction of the first prototype of solar-impulse was scheduled in 2007. What has been the progress in the project?

The construction has started indeed in April 2007. It will be finished in summer 2008 and then the first test flights will take place in autumn 2008. The prototype's design will be presented on November 5, 2007 in Duebendorf, near Zurich, in Switzerland.

What are the challenges faced in the construction of this project?

The main challenge will consist in flying up during the day to 12,000 metres to load the batteries and cruise down to 3,000 metres during the night using the energy reserves accumulated in the batteries. Indeed it is crucial to be able to store enough energy to 1. be able to fly throughout the whole day 2. to store enough to be able to fly throughout the night until the next morning.

Furthermore, this airplane has to be very light although it has to be extremely solid in order to be able to resist extreme conditions.

Another challenge is the length of the wingspan: 80 metres makes the plane difficult to manoeuvre. Firstly, a longer wingspan allows the improvement of its aerodynamic efficiency by reducing the importance of induced drag. This produces a weaker airplane sink-rate and thus reduces the power of the motors required to maintain it in a horizontal position. The second advantage of a large wingspan is the benefit from a greater surface on which to place the solar cells.

Solar Impulse is a one-seated glider project. In course of the project, do you foresee solar plane with more seating capacity?

(The Solar Impulse is not a glider, it looks like one but it actually is an airplane.)

No, not for the moment. We don't know if there will ever be solar airplanes that will be able to fly with 300 passengers and solar energy alone. Look for example at the Wright Brothers who didn't foresee that men would fly to the moon...

Concerning the Solar Impulse, our



Bertrand Piccard and Andre Borschberg

main challenge is the energetic density of the batteries. Their stocking capacity is still limited and their influence has a great bearing on the total mass of the airplane. By doubling their storage capacity, it would be possible to allow a second person on board and therefore carry out longer flights.

What is the capacity/output of the solar cells on the plane?

The output of the cells reserved for the project is about 20%. Two criteria are used for this selection: the output, but also the weight. The cells chosen are made of silicon mono-crystalline of a fine thickness. Today there exist more high-performance technologies with up to 30% output, but they are also heavy. It is obvious that a significant improvement of this output would also improve the airplane's performance and reduce its wingspan or increase the payload.

Is there any provision for the plane to run on alternate fuel/energy in case of breakdown or emergency?

No we'll use solar energy only since this is the challenge.

When can one see the actual flight-taking place and what will be the estimated duration of the flight?

In 2008, the first test flights will take place with the prototype which is designed to make the 36 hour flight in 2009 and demonstrate the capability to fly in a manned solar airplane by night, which already is a premiere.

In 2010, we will start the construction of the record airplane that is meant to fly around the world in 2011 in 5 legs. Every leg will last from 4 to 5 days, which is considered as the maximum a pilot may stand in such a small cockpit. There will be 5 legs, so the flight around the world should last a bit more than 3 weeks.

What are special provisions made to ensure safe night flight?

Once again, this is the challenge of this project. As the night flight will be at 3000 metres height, we will have to be very careful at the relief.

Another challenge will be to store enough energy to be able to fly again with the next sunshine. Every morning, the plane needs to be in a sky without

any clouds in order to refill in an optimal manner the batteries. This mission will be taken care of by the weathermen.

If the pilot wastes his energy during the night, he will have to interrupt the flight before the next sunrise. But isn't it also the case of our generation that runs the risk of not being able to hand the planet to future generations without a major human and technological catastrophe? The pilot will be equipped with a parachute, but our world doesn't have any such protection to face climate change! In other words, the greatest risk is not to fly

on board the Solar Impulse, but to keep on wasting in our world the energy and raw materials!

Do you intend to go commercial after the success of the actual flight?

This is not out of the question but it still very premature to think about this question since it is not the main goal of this project.

What is the estimated cost of entire project?

Euro 70 millions.

Do you think solar impulse can bring revolution in air travel? What has been the response from the aircraft manufacturers on this project?

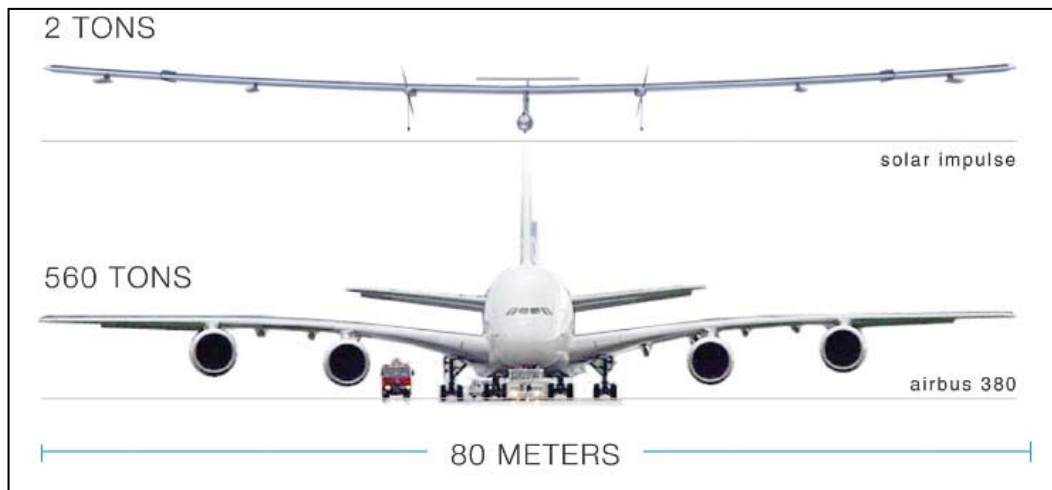
The aircraft manufacturers are so interested by our project that a lot of them are working on the project. Dassault Aviation provides Solar Impulse with critical and expert advice on the definition and development of the solar airplane.

We don't think there will be solar airplanes in a close future, but we are exploring new routes and we'll see what happens!

superjumbo is the first long-haul aircraft to consume less than three litres of fuel per passenger over 100 km, a rate comparable to an average economical car.

Environmental groups have tapped public concern about air travel's contribution to global warming. Alternative jet fuels have gained greater credibility in recent years, but still played only a minor role. The only solution is to fly less, but the option is not even worth discussing in today's scenario.

Now imagine a flight around the world without fuel or pollution. Though it may sound impossible, but a team of more than 45 people supported by more



Wingspancomparison

than 100 scientific advisors are working on the construction of the first prototype

plane called Solar Impulse, where a plane will be propelled exclusively by solar energy; will take off under its own power and fly night and day, and achieve a round-the-world flight without fuel or pollution!

The ambition of Solar Impulse project is to contribute in the world of exploration and innovation to the cause of renewable energies.

The wingspan for the Solar Impulse is slightly wider than that of the new Airbus A380 double-decker super jumbo jet (80 metres). But the solar Impulse will weigh just 2 tons, versus the 560 tons for the A380. The project is presently at the prototype design phase of the project. If all goes according to schedule, the team expects to fly around the world some time in 2011.

Never before has an aircraft as large and light been constructed, never before has such an efficiently performing propulsion system been optimized –is no

SOLAR PLANE-AROUND-THE-WORLD: SUCCESSIVE STAGES OF THE PROJECT

- Construction of the first prototype started in April 2007
- Test flights in 2008.
- Mission: to achieve the first night flight in 2009.
- A second plane will then be built to enable the rewriting from 2010 of some of the "firsts" in aviation history in the name of solar energy, such as the crossing of the United States and the Atlantic.
- The round-the-world will be the highlight of this series.
- May 2011, take-off for the flight around the planet along the Tropic of Cancer.
- One stop-over is planned on each northern continent, to change pilots and present the adventure to the public and the scientific and political authorities.(Each flight leg will last from 4 to 5 days, which is considered the maximum that a single pilot can sustain.)
- Once the efficiency of the batteries enables a reduction in their weight, the airplane will be able to carry two pilots on long-haul flights, and a non-stop round-the-world flight then becomes a possibility.

