Solar-powered craft aims for perpetual flight

Jason Lomberg, Technical Editor

The solar-powered Impulse HB-SIA [1] completed its maiden voyage [2] on Wednesday. The 90-minute flight reached an altitude of 5,500 feet, over a mile above the Swiss countryside, with an average speed of 44 mph (70 kph). This is the first step towards an ambitious goal: travel around the world by 2012. Ultimately, Solar Impulse aims to achieve perpetual flight, or come close to it.

Helmed by Bertrand Piccard (who copiloted the first nonstop round-the-world balloon flight), Solar Impulse is going where few men have gone before (pun intended). The company is shooting for a round-the-world voyage with a vehicle that doesn't use a drop of fuel.

HB-SIA makes its first "flea hop" on 3 December 2009 in Dübendorf. Credit to Matth1 of Wikipedia.

"The goal is to fly day and night with no fuel. The goal is to demonstrate the importance of renewable energies, to show that with renewable energies we can achieve impossible things," Piccard said.

Just don't expect to see solar-powered commercial aircraft anytime soon. The HB-SIA [3] is powered by 11,628 monocrystalline silicon cells (each 150 microns thick), with energy conversion efficiency of 22%. Weight is an issue: the efficiency % could've been higher, but it would've made the plane heavier.

Obviously, to achieve night flight, some sort of battery storage mechanism is necessary. According to the company, the biggest constraint of the project is storing energy in the lithium polymer batteries. And while the maximum energy

density is 220 Wh/kg, the accumulators needed for night flight weigh 400 kg (881.8 lbs), equal to ¼ of the total weight of the aircraft.

“Solar energy does not have enough 'energy density' to power regular airplanes that are supposed to fly somewhere in a reasonably short time,” said Hans Weber, president of San Diego-based aviation consulting firm TECOP International, Inc. With solar planes, “the objective is only to stay aloft, not to go anywhere fast.”

The craft itself has a wingspan of 63.4 m (208 feet, equivalent to an Airbus A340), a length of 21.85 m (71.68 feet), and a height of 6.4 m (21 feet). Beneath the wings are four gondolas, each containing a 10 HP motor. The HB-SIA has a take-off speed of 35 km/h (21.7 mph), with an overall average of 70 km/h (44 mph), and a weight of 1,600 kg (3,527 lbs).

The HB-SIA won’t win any beauty contests, or displace commercial transport anytime soon. But it’s an interesting technology demo, and I eagerly await the first solar-powered round-the-world flight.

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