

PRESS RELEASE

Solar Impulse: A flying laboratory for EPFL

Can a plane really circle the Earth non-stop, powered only by the Sun? The Ecole Polytechnique Fédérale de Lausanne (EPFL), Official Scientific Advisor to Solar Impulse, is committed to helping make Bertrand Piccard's dream a reality. The School's relationship with the aeronaut goes back to the 1990s, when EPFL participated as scientific partner in his successful around-the-world balloon flight in the Breitling Orbiter III.

The project's goal, to permit the plane to fly continuously even though it can only tap about 8 hours of direct sunlight in each 24 hour period, is a formidable technological challenge. Materials, energy storage and retrieval systems, flight trajectories, human-machine interface – the Solar Impulse adventure involves several multidisciplinary research areas at EPFL.

A few highlights from current projects in development:

An ultralight, high-performance Solar Skin

To optimize its sun exposure, Solar Impulse's wingspan is nearly the same as the new Airbus 380. But the whole plane weighs only about as much as a car. Every gram counts. The solar cells are not attached to the wings, they are the wings. EPFL's Laboratory of Polymer and Composite Technology is developing a "solar skin" in which the energy-collecting cells are integrated into the ultralight composite material of the plane where they will play both a structural and a functional role.

Optimizing the energy path in extreme conditions

The precious solar energy collected on the wing eventually ends up turning the plane's propellers. In the process, more than 100 variables come into play, and they must work together as efficiently as possible. EPFL's Integrated Actuators Laboratory has taken on the challenge of optimizing this huge nonlinear system. Part of this task is to make the most of the extreme conditions in which the plane will fly. For example, the energy output of the propulsion system can be optimized by taking advantage of low atmospheric temperatures (-55°C) to cool the motor.

Symbiotic communication between pilot and plane

The plane flies at very high altitudes and for long periods of time, extreme conditions for both pilot and plane. The Autonomous Systems and Intelligent Systems Laboratories at EPFL are developing devices for communication between the pilot and the plane and between the pilot-plane system and the support team on the ground. They are putting together a symbiotic system that would allow the pilot to "feel" the machine, and in turn the machine will detect when the pilot nods off or takes the plane outside safety limits and make necessary compensations.

Solar Impulse, research catalyst at EPFL

It takes a multidisciplinary, innovation-friendly environment to tackle these and the other complex technological challenges that must be met if Solar Impulse is to succeed. EPFL has the perfect profile for the task: an institutional emphasis on transdisciplinary research and a track record with high-tech adventure. Combining technological innovation, respect for the environment and high-stakes human adventure, the Solar Impulse Project will stimulate research and serve as inspiration throughout EPFL.

For further information

<http://solar-impulse.epfl.ch> et <http://www.solar-impulse.com>