SOLARIMPULSE

AROUND THE WORLD IN A SOLAR AIRPLANE

SOLVAY OMEGA Schindler ABB

EXPLORATION TO CHANGE *the* WORLD

1st ROUND-THE-WORLD SOLAR FLIGHT

Aboard their silent airplane, able to fly day and night without fuel, Solar Impulse's founders and pilots are making history with clean energy.

From inspiration to execution, they combined their skills and set off down the risky pathway of all explorers to push back the boundaries of knowledge, and attempt what many deemed impossible only a few years ago.

The clean technologies in their solar plane offer hope and innovative solutions in the fields of materials and lightweight structures, as well as energy storage and efficiency, for tackling the challenges of our century.

This adventure aims at inspiring all generations and encouraging leaders of opinion to commit to a more sustainable world order.

An idea born in Switzerland

www.solarimpulse.com

MAIN PARTNERS

SOLVAY OMEGA Schindler ABB

OFFICIAL PARTNERS

covestro altran Swiss Re Corporate Solutions

Google™ swisscom MoëtHennessy

OFFICIAL SUPPORTERS

VICTORINOX CLARINS AIR LIQUIDE Creative Oxygen BKW SIG

DASSAULT SYSTEMES McKinsey&Company Nestlé Research

OFFICIAL SUPPLIERS

SUNPOWER SolarMax VAC VACUUMSCHMELZE

DECISION NestléHealthScience

Lantal SIEMENS PLM SOFTWARE SIEMENS ETEL MOTION TECHNOLOGY +STROMER-

MEYER BURGER HIRSLANDEN

INSTITUTIONAL PARTNERS

EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

IRENA International Renewable Energy Agency

AERONAUTICAL PARTNERS

DASSAULT AVIATION IATA esa EMPA EUROCONTROL

ACI AIRPORTS COUNCIL INTERNATIONAL skyguide ICAO

AROUND THE WORLD PARTNERS

ABU DHABI UNITED ARAB EMIRATES Masdar A MUBADALA COMPANY Gouvernement Princier PRINCIPAUTÉ DE MONACO FONDATION PRINCE ALBERT II DE MONACO

SOLARIMPULSE

PSE-C, EPFL SCIENTIFIC PARK
CH-1015 LAUSANNE, SWITZERLAND
TEL.: +41 (0)58 219 24 00
FAX: +41 (0)58 219 24 91
INFO@SOLARIMPULSE.COM
WWW.SOLARIMPULSE.COM

VISION

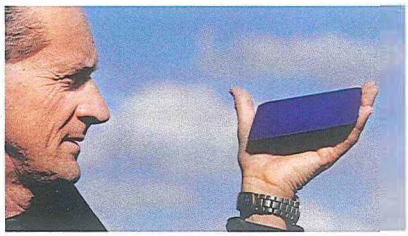
An adventure for progress and sustainability

Solar Impulse believes in the power of symbols. By writing new pages of aviation history using solar energy, including even a round-the-world flight with no fuel and no polluting emissions, Solar Impulse is demonstrating the enormous potential of clean technologies for energy saving and renewable energy production. Bertrand Piccard's vision is both scientific and innovative. It also has a philosophical dimension, with its concern to raise society's awareness of the need to be sparing with the planet's energy resources.

CHALLENGE

A showcase for clean technologies

To produce an aircraft that will take off and fly autonomously day and night, propelled only by solar energy, was a tremendous challenge. It required the optimization of new kinds of technology and a drastic reduction in energy consumption. Solar Impulse's 80 engineers and technicians, under André Borschberg's leadership, have had to apply highly innovative technological solutions. Whilst Solar Impulse is not the first solar aircraft project, it's certainly the most ambitious. By flying 5 days and 5 nights over the Pacific Ocean between Nagoya and Hawaii, Solar Impulse 2 became the first airplane to come close to perpetual flight.

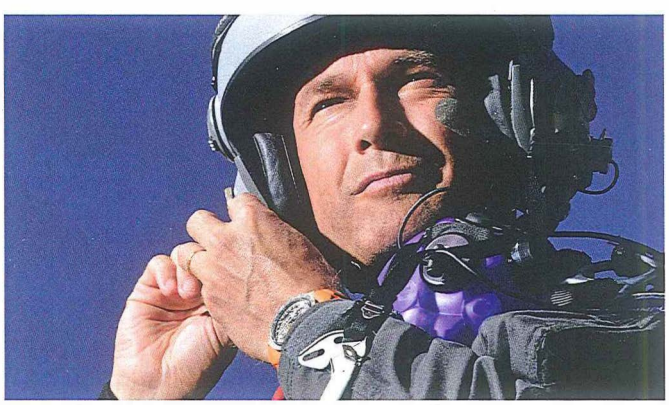


SYMBOL

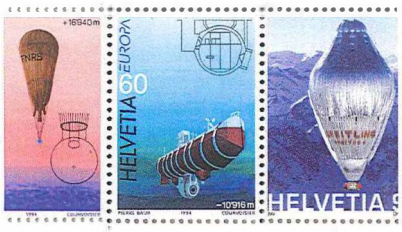
Ambassadors for sustainability

Si2's record flight from Japan to Hawaii, when André Borschberg was airborne for 5 days and 5 nights, lent credibility to Bertrand Piccard's message: "If governments had the courage to promote clean technologies on a massive scale, our society could simultaneously reduce its dependence on fossil fuels, create jobs and stimulate sustainable growth." This success captured the imagination of many political authorities, who began using Solar Impulse as an encouraging example to motivate implementation of more ambitious energy and environmental programs.

THE CLEAN TECH REVOLUTION



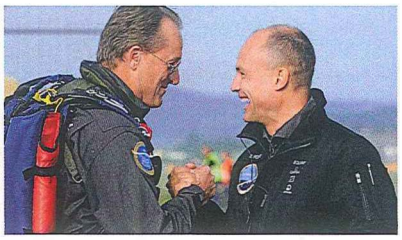
"Solar Impulse was not built to carry passengers, but to carry messages. What we can achieve in the air, anyone can do on the ground. Let's replace old polluting devices with modern and efficient technologies. Our world needs to find new ways of improving the quality of human life. Clean technologies and renewables are part of the solution." **Bertrand Piccard**



TRAJECTORY

Pioneering spirit to achieve the impossible

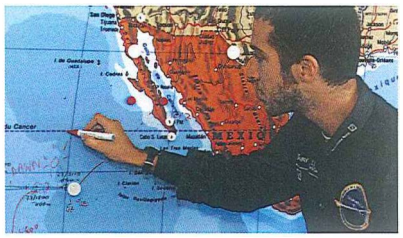
Solar Impulse carries forward Auguste and Jacques Piccard's family story of exploration, adventure and scientific development to preserve the planet. By initiating this challenge, Bertrand Piccard is perpetuating the family saga, following on from the exploration of the stratosphere and the ocean depths to his own round-the-world balloon flight. For him, an adventure like this must serve to motivate society to face up to the challenges of our time by using clean technologies and renewable energy.



DUAL CONTROL

Explorers for a sustainable future

Two men, both pioneers and innovators, came together to drive forward Solar Impulse. Bertrand Piccard, a psychiatrist and explorer who made the first ever non-stop round-the-world balloon flight, is its initiator. He brought together the partners to fund the project and develops its symbolic and political reach. André Borschberg, an engineer and graduate in management science, is its co-founder. His aviation experience and his interest in innovative solutions have enabled him to form the technical team and direct the project. The former's avant-garde vision and skills as a communicator and the latter's entrepreneurial and managerial experience complement each other ideally.



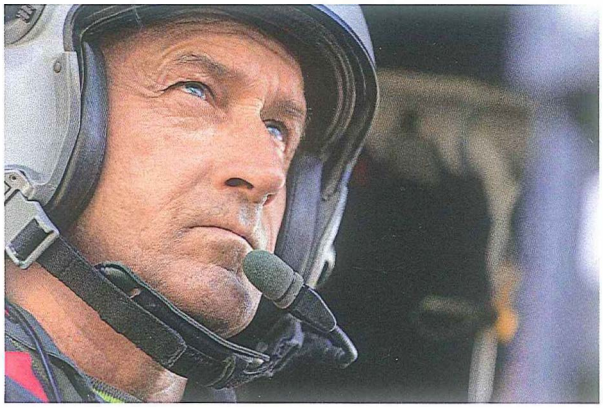
EPIC JOURNEY

Hope for every generation

35,000 km powered only by solar energy from Abu Dhabi, our departure and arrival Host City, via Oman, India, Myanmar, China, Japan, and U.S.A, and then on to Europe or North Africa. The landings planned for changing pilots are also an opportunity to organize events to raise awareness among citizens and opinion leaders about the changes needed for better use of energy resources and greater respect for the environment.

THE ZERO-FUEL AIRPLANE THAT FLIES DAY AND NIGHT

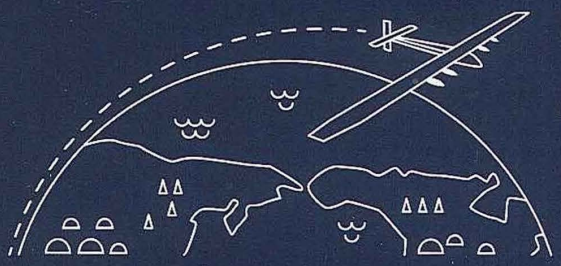
"Just imagine your energy reserves increasing during flight! To make this dream come true, you had to be creative, to find synergy between all the innovators, to show what could be achieved by pushing forward the frontiers of technology and exploring every possible strategy, right from the design phase to the mission itself. With an airplane, you cannot cheat, either it flies or it doesn't!"
André Borschberg



HISTORIC FIRST IN THE MAKING

Ten years' worth of calculations, simulations, building and testing, a multidisciplinary team brought together to overcome the technical, operational and human challenges of flying a plane day and night on solar energy:

Gathering enough energy to stay aloft day and night by using solar cells covering a wingspan greater than that of a Boeing Jumbo Jet.



Optimizing stored energy use at all stages of the propulsion chain by eliminating every surplus gram, so as to allow the maximum number of batteries on board. The result: an airplane with record energy efficiency and the weight of a family car!

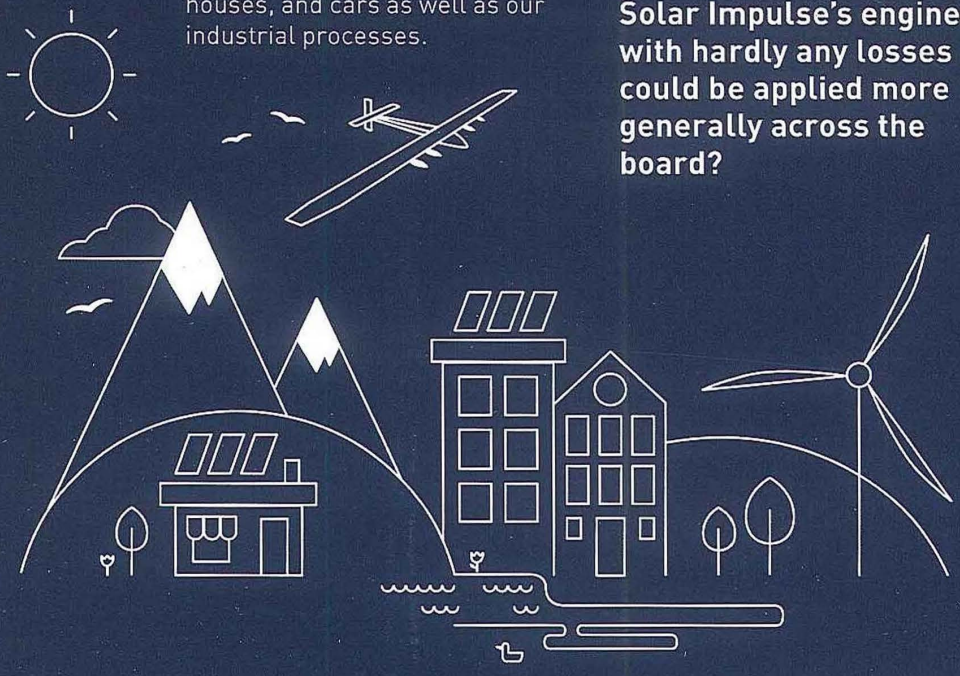
Simulating all possible routes depending on weather, and integrating into air traffic patterns a very slow experimental prototype (cruising speeds 46 km/h – 25 kts – at sea level and 74 km/h – 40 kts – at maximum altitude) with an unusual flight profile. Imagine a pedestrian on a busy highway!

Equipping and training the pilot who – alone in an unpressurized and unheated cockpit – has to display extraordinary powers of endurance. Climbing higher then Everest every day and then coming back down again to 1,500 m exposes him to extreme temperatures and pressures.

What if our world worked like this airborne smart grid?

CLEAN TECHNOLOGIES CLEARED TO LAND IN OUR LIVES!

By flying 5 days and 5 nights without a drop of fuel, Solar Impulse highlighted the enormous potential of modern technologies to utilize clean energy. The same energy-efficient solutions could already be used in our daily lives, in our electricity networks, houses, and cars as well as our industrial processes.



What if these clean technologies emerged from start-ups to revolutionize our industries?

What if the efficiency of Solar Impulse's engines – with hardly any losses – could be applied more generally across the board?

What if more efficient devices were systematically used in our elevators and our cars, as well as better performing insulation foams for our houses?

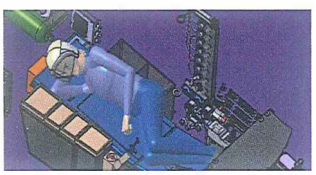
What if producing energy in the exact same place where it is consumed became the norm in our daily lives?

If this hope took wing in our society, polluting emissions would be cut by half.

PILOTING AND SAFETY

A monitoring system constantly checks the functioning of the autopilot and detects any anomaly or exceeding of safe limits.

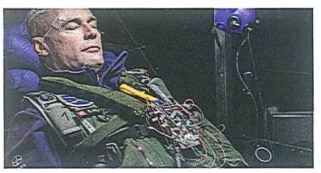
A man-machine interface provides the pilot with a sensory alert if the bank angle goes beyond the 5° limit.



The 3.8 m³ (134.2 cubic ft.) cockpit volume provides enough space on board for oxygen supplies, food and survival equipment, whilst also meeting the ergonomic requirements for flights lasting several days.

A multi-purpose seat functions both as reclining berth and toilet. A parachute and a life-raft are packed into the seat-back. When fully reclined, it allows the pilot to perform physical exercises.

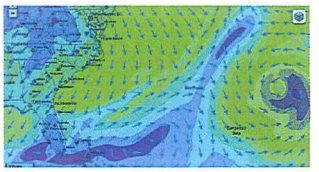
Self-hypnosis and meditation techniques allow the pilot to maintain his powers of concentration and vigilance.



In the absence of any heating, the cockpit and the pilot are protected against the cold outside (-40 degrees) by high-density thermal insulation.

A flight simulator developed specifically for Solar Impulse gives the pilots the opportunity to train for long duration missions and practice the delicate handling their aircraft requires.

FLIGHT STRATEGIES

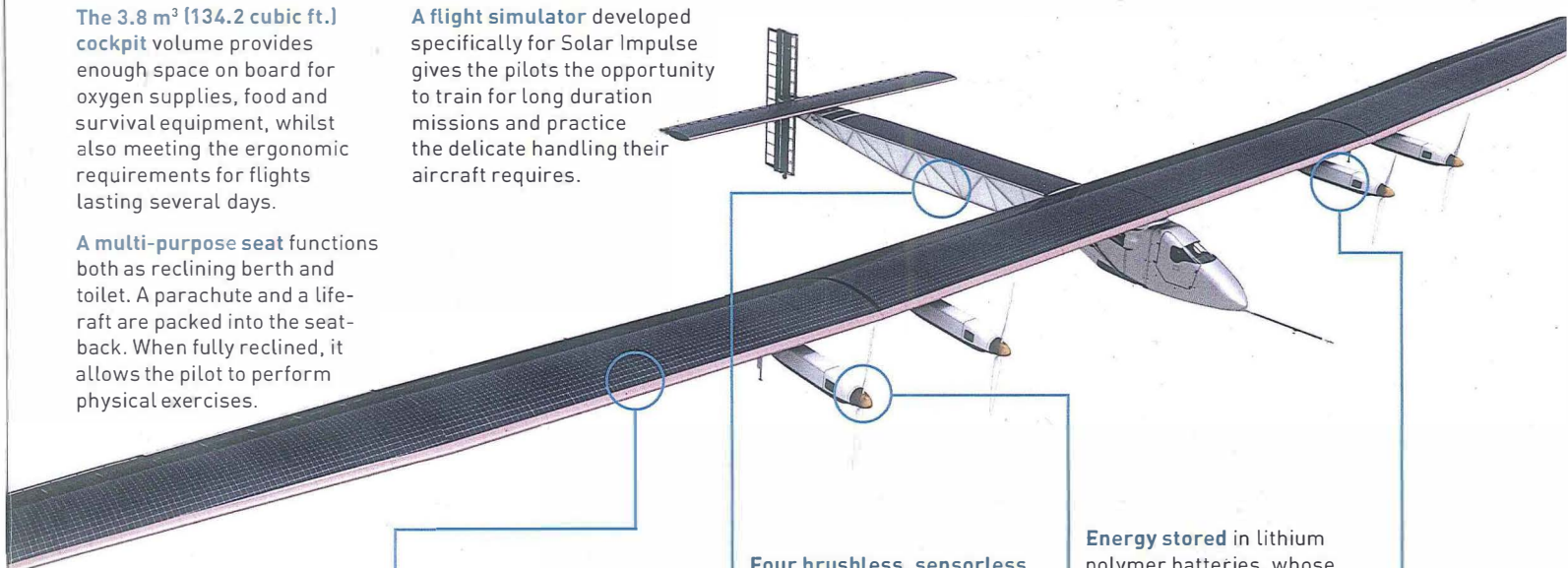


All possible eventualities simulated by a multi-disciplinary team to find the right combination of weather patterns, and pave the way for the solar airplane to enter controlled airspace and prepare for landings at international airports.

Takeoffs and landings at night to avoid turbulence and winds of more than 18 km/h (10 kts). Climbs to 9,000 m (29,000 ft.) during the day and descents to 1,500 m (5,000 ft.) at night to save energy.

Mandatory landings every few days to switch pilots.

Continuous transmission of hundreds of technical parameters via satellite data-link to mission control centre.



TECHNICAL SOLUTIONS

17,248 monocrystalline silicon cells each 135 microns thick (finer than a human hair) mounted on the wings, fuselage and horizontal tailplane, providing the best compromise between lightness, flexibility and efficiency (23%).

Upper wing surface covered by a skin consisting of encapsulated solar cells, and the lower surface by a high-strength, flexible skin.

140 carbon-fibre ribs spaced at 50 cm (20 in.) intervals give the wing its aerodynamic cross-section, and also maintain its rigidity.

Airframe made of composite materials (carbon fibre and honeycomb sandwich).

Four brushless, sensorless motors, each generating 17.4 hp (13.5 kw), mounted below the wings, and fitted with a reduction gear limiting the rotation speed of a 4 m diameter (13 ft.), two-bladed propeller to 525 rev/min. The entire system is 94% efficient, setting a record for energy efficiency.

Stimulating innovation in the field of sheets of carbon, which now weigh 25 g/m² (0.8 oz./11 sq.ft.), only a third as much as sheets of printer paper.

Energy stored in lithium polymer batteries, whose energy density is optimized to 260 Wh/kg. Batteries insulated by high-density foam and mounted in the four engine nacelles, with a system to control charging thresholds and temperature. Their total mass amounts to 633 kg (1,395 lbs.), or just over a quarter of the aircraft's all-up weight.

Prowess of the engineers, whose exceptional creativity allowed them to build this revolutionary aircraft and make it so energy-efficient.