

Solar power reaches for higher goals

Limits of clean energy in aviation tested by Sunseeker II aircraft

MILAN

BY MICHELE TRAVIERO

Sitting in the tiny cockpit of a self-designed and self-built solar-powered aircraft, surrounded by the silky whisper of air flowing around the fuselage and watching the majesty of the Alps unfold beneath you is "more than exhilarating," Eric Raymond said. "Actually, it was the most beautiful flight I've ever made."

On Sept. 23, 1910, Jorge Chávez, a French-Peruvian aviator, became the first man to fly over the Alps, crossing the Simplon Pass from Switzerland to Italy in his Blériot XI monoplane.

On April 14 this year, almost 100 years later, Mr. Raymond, a Californian in his 50s with an engineering bent, repeated the epic flight in his solar-powered aircraft, the Sunseeker II.

The plane, as the name implies, is the development of an earlier model, in which Mr. Raymond crossed the United States in 21 flights in 1990. Basically a glider, the Sunseeker II can take off autonomously, driven by a foldable bat-

The ability to fly surveillance missions without refueling interests security and military forces.

tery-powered push-propeller. Once airborne, it can cruise using nothing more than available solar energy.

The Sunseeker II was supposed to fly last week in an informal contest during the World Air Games, the Olympics of air sports, in Turin, but the contest was called off after the rival Icare II, a German machine, pulled out to undergo a monthlong electronics upgrade.

Mr. Raymond, a former hang glider pilot, is an alumnus of AeroVironment, the engineering firm that was founded by Paul MacCready, a legend in the industry for having built the first solar-

powered aircraft, the Gossamer Penguin, and the first human powered one, the Gossamer Condor. But the heart of the Sunseeker has been masterminded by Alan Cocconi, the father of most of the electronics control systems found in electric and hybrid cars and founder of AC Propulsion, the leading manufacturer of such systems. Together with Mr. Raymond, Mr. Cocconi designed, developed and flew a remote controlled aircraft that was able to fly for 48 hours, or two consecutive days and, most importantly, nights.

Another larger, better-funded project, for which Mr. Raymond provided some of his experience, is the Solar Impulse. Originally conceived by Bertrand Piccard, the third generation of a family of Swiss explorers famed for their exploits in the troposphere and the deep oceans, the Solar Impulse project aims to fly a solar airplane around the world by 2011. The plane, with a wingspan of 61 meters, or 200 feet, on par with an Airbus A340, is scheduled to be unveiled at the end of this month.

Solar — and, by extension, electric — flight requires neither new, groundbreaking technology, nor complicated engineering. Solar cells, batteries and electric motors have been around for decades. Still, the know-how involved in building and operating a very light airframe, propelled by an electric engine that uses stored energy extracted from sunlight, is state of the art.

The technical challenges mostly relate to weight, wiring and components. Since almost all solar flight designs rely on battery power for takeoff, the battery system is one critical component. Another is the photovoltaic cell array required to convert light into electrical energy.

Progress in developing more efficient photovoltaic converters is steady,

The electric-powered Sunseeker II during a flight over Italy. The aircraft provides an easily deployed test-bed for technologies that could revolutionize the aviation industry over the coming quarter-century.

will be more advanced, with better batteries, cells and motor, it will also be less experimental. Intended to be more like a typical light aircraft, it will have a roomier cockpit and some cargo-carrying capacity and has been conceived for an extended lifespan and potential factory production.

Mr. Raymond, meanwhile, is also acting as a consultant on other advanced solar aviation projects, including Solar Impulse. He was recently invited to Shanghai to visit a British-Chinese venture, Yuneec, that is developing a two-seater, electric-powered aircraft.

While commercial flight using electric

propulsion is at best a distant dream, other applications of the know-how are more immediate. Commercially viable electric-motor gliders are already available, for example.

At the air games in Turin last week, an electric-propelled light aircraft piloted by a former NASA astronaut from Italy, Maurizio Cheli, reached a speed of 250 kilometers, or 155 miles, an hour, the Italian daily La Stampa reported.

Perhaps more significantly, the ability to fly slowly, with little or no vibration, for long periods without having to refuel is a capability sought for surveillance and intelligence missions by the security and

military forces of many countries.

Unmanned solar aircraft, circling slowly at an altitude of 50,000 feet, in the thin, calm atmosphere high above airline routes, could serve as surveillance and telecommunication platforms, relaying mobile phone and TV signals at a fraction of the costs of satellite networks, and returning to earth with relative ease for maintenance and upgrades.

An official with the World Air Sports Federation said Mr. Raymond last week reported setting an altitude record for a manned electric aircraft of 20,387 feet. Official ratification by the federation is pending.



PHOTOGRAPH BY SOLAR FLIGHT



Eric Raymond, above, flew the electric-powered Sunseeker II across the Simplon Pass of the Alps almost 100 years after the trip was made for the first time in an airplane.

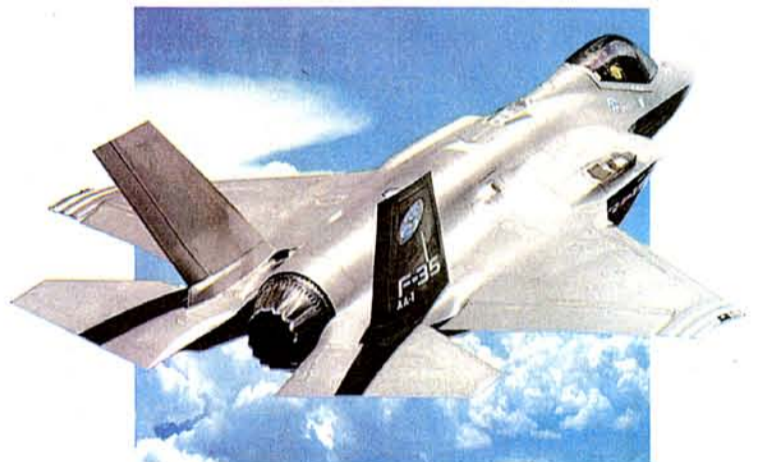
rather than exponential, with an energy conversion efficiency of about 25 percent now achievable.

"There's a form of black magic in dealing with electronic circuitry" said Eric Lentz-Gauthier, a member of Mr. Raymond's team. Stacked arrays of dozens of batteries and cells need to be individually monitored and precisely fine-tuned, he said.

Given that challenge, Mr. Raymond's achievements have been twofold. Not only has he designed and built a test-bed concept vehicle for technologies that may revolutionize general aviation over the coming quarter-century, but he has done so in the form of an extremely practical, easily deployed machine. Sunseeker II requires minimal preflight preparation, little ground crew support, no special operating equipment; like any conventional self-launching glider, it can be readied for takeoff within minutes of opening the hangar doors.

Nor is it particularly fragile or delicate, unlike many earlier experimental projects.

A third-generation version of the Sunseeker is under development by Mr. Raymond and his crew. The new design will be a two-seater plane, and while it



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