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LIGHT AVIATION



WINGS of the WORLD



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& Helicopters

170



Trikes

198



includes Light Sport Aircraft

Instruments

230



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Yesterday's Fantasy

If you watched any of the James Bond movies made in the last fifty years, you were usually treated to visions of amazing futuristic toys like wristwatches with built-in radio-communication or glasses that could be used to observe something happening somewhere else in the world. Transportation was normally conventional, but you still saw cars that could ski over snow, dive under water and sometimes even fly.

The electronic part of the Bond-universe has already been realized and in some cases overtaken by technical developments in the last ten or twenty years. With today's smart-phone you can do everything movie-makers dreamed of and even more.

Transportation is very slowly working to match the vehicle dreams of the last century. For example, automakers are now working on and testing self-driving electric-powered cars.

Certification barriers have been one of the reasons why technical developments like fuel injection for gasoline engines and LCD instruments have taken a long time to reach aircraft. Avionics have always been years behind the state-of-the-art of modern electronics. But regulating bodies around the world are moving to adapt easier and faster certification systems that were developed and work well for noncertified aviation classes like European ultralights and American Light Sport Aircraft (LSA).

In the following 270 pages you will be able to see the state-of-the-art in personal flying today as well as a few James-Bondish examples like the Car-plane, the Terrafugia and the Volocopter. They show where the technological journey may go.

But when you observe that top executives of the IT world like market-leader Google are studying personal air transportation (see image) and global players like Siemens and Bosch are working to develop electric drives for general aviation aircraft - we may see that the new reality within the next decade will be far beyond our imaginations of today.

Willi Tacke
Publisher



Google founder Larry Page
 visiting Pipistrel Aircraft



What to fly!

People have been flying for fun ever since the first experiments with gliding in the 19th century. Traditional gliding had become the main focus of sport flying well before WWII and it retained this position right through till the 1970s, when the upstart hang glider challenged its supremacy. And it is the hang glider which spawned the wonderfully diverse industry revealed in these pages. So although there are no footlaunch aircraft in this publication – that's the job of its sister title, *World Directory of Paraglider and Paramotor* – we need to look back 40 years if we are to understand sport flying today.

The modern competition glider, to which WDLA devotes two sections (ultralight gliders and certified gliders) is probably the most elegant flying machine ever created and offers a truly remarkable level of performance. Even by the 1970s its flying abilities had reached a very high order. No hang glider could hope to compete, certainly not the crude designs of 40 years ago. But the hang glider had one crucial advantage: independence. A traditional glider cannot get airborne without help – from a tow, a bungee, a winch or a small auxiliary engine – so you need an airfield, and friends, and a trailer (or hangar). But the hang glider pilot just needed a roof-rack, a slope and a breeze in the right direction. It was a revolution. Not everyone approved, but no one could ignore it. Towards the end of the decade, flatland pilots were getting envious of their hillside brethren and started thinking 'maybe if it had an engine...' They too soon discovered the joy of flight, by developing the powered hang glider, but they also discovered that attaching a power unit to a hang glider created certain technical difficulties. These have long since been solved, but at the time they were serious enough to prompt the development of the trike, where instead of being attached to the wing, the power unit was suspended below it, in a simple three-wheeled framework which also accommodated the pilot. Trikes have since become a hugely

successful breed of aircraft in their own right, capable of circumnavigating the globe and operating in very demanding environments, and these are conceptually the simplest aircraft in WDLA.

For the sake of completeness, we must mention some other breeds which are not in WDLA, in particular the paraglider. With its inflatable wing, the paraglider has no place in this directory, but since its development in the 1980s it has become the most popular breed of flying machine bar none and in recent years has eclipsed the hang glider. You can read all about paragliders in the *World Directory of Paraglider and Paramotor*, along with their powered derivatives, the paramotor (footlaunched), and the paratrike (with an undercarriage).

Hang glider, powered hang glider and trike all owe their existence to the innovative delta-shaped wing developed originally for NASA by Francis Rogallo. Get rid of the space in Collectively, they are known as flexwings, because the wing is designed to flex in flight – indeed, the pilot makes use of this tendency to control the craft, moving the entire wing relative to his body. This is in contrast to traditional aircraft, known as fixed-wings because the wing is fixed to the fuselage and control is via moveable surfaces, one for each axis: rudder for yaw, elevator for pitch and aileron for roll.

Until the hang glider burst on the aviation world, the fixed-wing was the only form of heavier-than-air flying machine, apart from rotorcraft like gyroplanes



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ADVERTISING

China, Ashley Guo Evergo Media • Tel +86 10 / 5907 1345 • Fax +86 10 / 5907 1346 • ashley@flying-pages.com
France, Géraldine Galland, Ciel & Plume Tel +33 (0)4 77 72 32 25 • geraldine@flying-pages.com

Germany & other Countries, Rosi Berkemeier Tel +49 (0)30 / 3470 9123 • Fax +49 (0)30 / 3470 9124 • rosi@flying-pages.com

USA, Jacob Peed • Tel +1 800-247-2000 Ext. 266 • jacob@aviatorshotline.com

EDITORIAL

Robby Bayerl, Martin Berkemeier, Roswitha Berkemeier-Raskop, Noël Bertrand, Marino Boric, René Coulon, Dimitri Delemarle, Martin Hardung, Klaus Köhnstedt, German Larrarte, John McCullagh, Werner Pfändler, Christian Tacke, Julia Tacke, Willi Tacke, Philippe Tisserant, Dave Unwin; Roy Beisswenger, Jacob Peed, Peter Raab, Thomas Painchaud-Roy, Qinyin Zhang, Xin Guo, Dan Johnson, Renée Larrarte

Managing editor Bettina Cosima Larrarte

English translation Norman Burr, Thomas Painchaud-Roy
Widola online design Iliia Krilov

Widola database Andrey Serechkin

Cover & content design Cynthia Busse

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and helicopters, which each have their own sections in WDLA. But the focus of its development had been largely military and commercial: if you wanted a powered, winged aircraft and were not seriously rich, the only option was to construct a homebuilt lightplane of your own. Despite the huge changes in sport aviation during the last 30 years, building your own aircraft remains a very popular route into the air, and WDLA devotes a complete section to it.

Just as the 1970s turned unpowered flying on its head, so the 1980s did the same with powered flight. Throughout the decade, as Europeans busied themselves with turning Rogallo's wing concept into the versatile trike, Americans and Australians borrowed the same materials – basically aluminum tube and Dacron fabric – but applied them to traditional fixed-wing concepts. The result was a worldwide explosion of new designs which revolutionized leisure aviation, and whose positive effects are still being felt a quarter-century later. The rules surrounding them varied from country to country, as did their name: most of Europe called them microlights, the US called them ultralights, but everywhere the effect was the same: powered aviation was revitalized.

It took a long time for these developments to impact on established manufacturers of certified light aircraft. Years of restrictive regulation had stifled their market and bred a 'can't do' attitude, with designs scarcely changing from one decade to the next. Moreover, lightplane makers could point with some justification to the tendency of some early microlight manufacturers to let their customers act as test pilots, something which they, vulnerable to product liability lawsuits

in a way that cottage-industry microlight manufacturers were not, dare not risk.

Another factor was that, although microlight airworthiness standards were gradually being established, their application was patchy and largely restricted to Europe, where a microlight could have one or two seats. By contrast, its US equivalent, the ultralight, was only permitted to have one. Adding a second took it into a legal semi-limbo which did nothing to encourage lightplane makers to get involved.

Eventually, the FAA in the US resolved this confusion by creating the highly successful Light Sport Aircraft category. The latter became fully operational in 2008 and takes the European two-seat microlight concept, expands it a little by permitting empty weights up to 600kg (microlight maximum is 450kg), and administers it through a type-acceptance system similar to that already used by some European countries, including the UK.

At last US lightplane pilots could downsize with confidence. Suddenly, a top-of-the-range European microlight, perhaps beefed up with a bigger engine and stronger landing gear, looked a credible rival for the traditional lightplane – cheaper to buy, less expensive to operate, more fun to fly. Lightplane makers have been forced to react, both by producing LSA models themselves, and by improving their own certified aircraft.

It's all a long way from a bunch of 'aviation hippies' having fun with a makeshift glider on the Californian sand dunes. But the hang gliding pioneers threw a pebble into a stagnant pond. And not only are the ripples continuing to spread, the waters seem to have taken on a new life of their own. ■

The editors



Welcome!

Welcome to the 20th annual edition of World Directory of Light Aviation (WDLA). Together with its sister publication World Directory of Paraglider and Paramotor (WDFP), launched in 2009, it has become the default point of reference for aircraft which fly for fun. If you want to know which flying machine to buy, or simply want to understand a little more about the wonderful world of air sport, these directories are the place to start.

They are produced every year by a multinational team of aviation professionals and published by the franco-german company Flying-Pages Europe, in conjunction with Evergo Media in China.

WDLA is specifically for fixedwing ultralights and LSA aircraft, plus homebuilts, certified aircraft, ultralight gliders, certified gliders, gyroplanes, light helicopters and trikes. It is

published in English, French, German and Chinese and is divided into sections, one for each breed of aircraft, with additional sections covering services, equipment and accessories. World Directory of Paraglider and Paramotor has a similar structure and covers paragliders and other footlaunch and related aircraft, including paramotors, paratrikes and foot-launched ultralight gliders. It is published in English, French and German.

Within each section the coverage is alphabetical, in order of the trading name of the manufacturer. Technical data is provided for each machine, along with photos, prices, contact details and a text describing each constructor's range or in some cases each individual model. At the start of each section is a brief discussion of the recent developments in that sector of aviation, plus a summary of the abbreviations

used. There is a more comprehensive listing of nomenclature at the back of the book.

All data is in metric units and prices are quoted in Euros, US Dollars or Pounds Sterling. Where the currency quoted is not that of the manufacturing country, the price may have come via an importer (these are listed towards the end of the publication). Remember that all prices are pre-tax and that delivery charges are usually extra.

We have worked hard to make World Directory of Light Aviation as complete and comprehensive as possible, but there is always room for improvement. If you find something wrong, tell us. Go to our online database at <www.widola.com> or get in touch via the contact details on page 3. Like World Directory of Light Aviation, we are at your service.

We wish you many pleasurable hours with our publication!