

# FLYING CHINA

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**Special Edition: eFlight Forum Changsha**

2018国际(长沙)电动航空论坛

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Continental Motors Group

# 创新 强劲动力 安全可靠

## - 业界翘楚的大陆航煤发动机

截止目前为止，大陆公司旗下的航煤发动机的飞行小时已经超过了500万。作为全球通航领域应用最广泛的航煤活塞发动机，很多航校及主流的飞机OEM厂商已经把配装大陆航煤发动机作为首选，例如塞斯纳 (Cessna®)、钻石 (Diamond Aircraft®)、Glasair®、派珀 (Piper®)、Robin等。大陆航煤发动机是科技创新的结晶，良好的操纵性、高可靠性、易维护等特点使它成为飞行员依赖的伙伴。

大陆航煤发动机使用的燃料是在世界各地都有供应的航空煤油，并取得了包括FAA 和EASA在内的全世界80多个国家的认证。2015年12月1日之后出厂的CD-135 及CD-155系列发动机，其换发间隔时间提升到了2100小时，并且所有的发动机都纳入了大陆公司在行业内拥有良好声誉的质保体系。由于有着创新科技、强劲动力以及高可靠性等特点，难怪很多飞行员愿意每天驾驶搭载了大陆航煤发动机的飞机。

如果您想了解更多的关于大陆航煤发动机的信息，请致电010-84989885，或800-284-2551，您将得到大陆公司专业团队的帮助。

# 从地到天、全民参与的交通创新

## From Earth to space, an “all in” transportation innovation

October is the season for Oktoberfest, as well as expos and tradeshows. I went to Oktoberfest for the first time (for work really, believe or not), as well as to two events recently: the 69th International Astronautical Congress in Bremen, the largest space-related event in the world where Elon Musk announced his Mars project in 2016. There were over 6,000 registered attendants this year. Another event is called eRUDA at a small airport in Greiling in southern Bavaria. eRUDA was founded by a group of local electric car owners in 2013. It was originally an electric car rally around the Ammersee Lake in the region but this year for the first time it hosted a fleet of electric aircraft and airshow. These two events were far apart from each other in more than one sense, from dress code to cuisine, but in my view they both showed the same trend: air and space technology innovation are becoming a “cool” thing, and are gaining an “all in” popularity across different industries and in society.

There may have never been such enthusiasm about space and air industry from all walks of life. Probably that's because space and personal air travel haven't been so close to everyone's life. Everyone can participate and benefit from it, no matter if it's space travel, around-the-moon tour, nano satellite, Mars, or electric cars, auto driving, electric airplanes, eVTOL and urban air mobility. I saw a large number of commercial space start-ups in Bremen. United Arab Emirates, Luxemburg, Israel and many other countries which may not be viewed as a competent player in traditional space race, are evolving into important players. The disruptive way of thinking rooted in Silicon Valley is spreading across the spectrum into space and air industries which are historically very government-related and conservative. Since the Apollo project era, people again believe “impossible things can happen” and even more important the “I can do it too” spirit.

It's good to see this is a global “all in” movement in the world's space and air industries. At IAC event in Bremen, the Chinese commercial space start-up Landspace was the gold sponsor together with UAE Space Agency and Northrop Grumman. There have been several electric airplane and eVTOL projects initiated in China. Global cooperation is the key to create a favorable technological, a regulatory and market environment for new air and space technologies and applications. The sky is big enough for many players, let alone the outer space. This is the best time in decades for space and air industries. This is an “all in” game. So let's look upward at the stars and begin flying, because if you want to reach the stars, you've got to leave the ground first.

10月是郊游的季节，也是展会的季节。最近我参加了两场展会活动，一场是在德国不来梅举行的第69届国际宇航大会（IAC），这是世界上规模最大的航天展会，今年登记参会来宾就有创纪录的6000多人，伊隆马斯克就是在2016年IAC大会上首次公布了火星计划。另一场展会是在德国巴伐利亚州美丽乡间的一个名为Greiling的小机场，当地民众从2013年开始自发举办名为eRUDA的电动车环游活动，今年首次增加了电动飞机飞行表演。这两个活动风格迥异，一个西装革履，一个T恤短裤，但在我看来，它们都展现了航空航天产业的发展趋势和前进动力：多个产业融合创新，各界参与热情高涨。

从国际宇航大会仅一天公众开放日的数万观众，到十里八乡的德国乡亲们扶老携幼前来参观电动车和电动飞机的巡游展示，全社会对航空航天技术创新的热情和参与前所未有，因为航空航天从未像现在这样离我们这么近，无论是太空游、绕月旅行、小微卫星、火星计划，还是电动车、自动驾驶、电动飞机、eVTOL电动垂直起降、城市空中交通，所有人的生活都会受到影响，每个人都有望参与，并共享发展。在不来梅，我看到了非常多的各类航天产品和技术应用的初创企业，阿联酋、卢森堡、以色列等按传统观念与火箭发射不着边际的国家正在商业航天发展中发挥越来越重要的作用。在Greiling机场，电动车主饶有兴趣地跟电动飞机飞行员讨论自动驾驶技术。来自特斯拉、spaceX、谷歌、优步的硅谷技术创新和行业颠覆精神正在蔓延到航空航天各个领域，为这一非常传统保守的行业带来了崭新的思维方式和技术突破，让人们从阿波罗登月时代以来再次重新燃起对太空探索和个人自由飞行的巨大热情，再次相信一切皆有可能，再次为我也可以做到而激动。

可喜的是，我国各类企业在这场全球航空创新和商业航天的百舸争流中并不落后，在IAC大会上，我国航天民企蓝箭空间科技占据了显要展位，我国有电动飞机的领军企业和开创性人物，并已经与国际开展了广泛的交流合作。在这场席卷全球、各界参与的航空航天发展浪潮中，航空产业是潮头，而电动和智能技术则是浪尖。毕竟，要进入太空，必须首先离地，而如著名航空航天器设计师伯特鲁坦所言“最难设计的是大气层内的东西，离开大气层，一切都容易了。”这是航空业继飞机发明和喷气时代以来的第三次技术革新，是航空业的又一个黄金时代，让我们与航天、电子、互联网、软件、汽车产业一道，与不来梅的大学教授和Greiling的乡亲们一道，共同仰望星空，脚踏实地，砥砺前行，迎接辉煌。



e-UTOL  
e-xpo  
-Flight

We the **eFlight Journal (eFJ)** founders are a team of aviation journalists and enthusiasts who created Flying-Pages. Publishing several aviation publications around the world. It started with the interest in electric flying in 2009. We co-founded the e-Flight-Expo in Friedrichshafen/Germany as part of the AERO, and established it as the largest show for electric aviation worldwide. **The eFJ is supported by the GAMA EPIC committee, Siemens, Rotax and many others.**

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e-UTOL  
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本刊由德国Flying Pages公司一群热爱飞行和航空创新的国际化航空编辑团队创立, 致力于宣介电动航空引领的航空技术创新, 搭建行业交流平台, 促进国际项目合作。Flying Pages公司以德、英、法、中等4种语言在全球出版7种航空刊物, 于2009年在德国与欧洲最大规模通航展会德国AERO通航展组委会共同发起主办了世界首个电动航展e-Flight-Expo, 已成为世界规模最大的电动航空专业展会。为迎接2018年国际(长沙)电动航空论坛的召开, 本期为本次国际电动航空论坛的专刊。本刊在编辑和出版过程中获得通航制造商协会、西门子公司、罗泰克斯公司及许多企业单位的大力支持, 在此衷心感谢。

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## Bye Aerospace's solar electric prototype makes its first flight

Bye飞机公司太阳能电动飞机首飞

At the end of August Bye Aerospace's solar electric "StratoAirNet" prototype completed its first flight at the Northern Colorado Regional Airport in Colorado. The piloted prototype is the solar electric technology demonstrator for the company's "StratoAirNet" and "Solesa" families of medium-altitude aircraft systems.

The aircraft systems are intended to provide support for long-endurance commercial and government security requirements, including patrol, observation, utility, mapping, agriculture, search and rescue and surveillance missions. The Solesa aircraft system will be piloted, performing similar patrol and survey missions for shorter flight durations. StratoAirNet is intended to be a longer-endurance unmanned aerial system. Bye Aerospace is collaborating with SolAero, integrating its high-efficiency solar cell technologies on the advanced graphite composite wing.



八月底,美国 Bye飞机公司的太阳能电动飞机“StratoAirNet”在科罗拉多州首次成功试飞。该机在试飞时为有人驾驶,但技术上也可以实现无人自主飞行。该机是该公司的 Solesa 系列中空长航时飞机的验证机,可以多种用途,分为有人驾驶和无人机两个系列,采用类型的动力和机体,StratoAirNet 是有人驾驶型号,Solesa 是无人机型号。该机翼面覆有高效太阳能电池板,用以补能,整机碳纤维制造。

## Japan launched an eVTOL program

日本政府发起 eVTOL 电动垂直起降飞机项目

Japan held its Public-Private Conference for Future Air Mobility on August 29th to jumpstart the eVTOL industry. The meeting was hosted by the Ministry of Trade, Economy, and Industry and was attended by over 20 companies including Toyota, Subaru, Boeing, Uber, Airbus, Japan Airlines, ANA Holdings, and Yamato. Japan plans to have flying cars in the air in a decade. With the initiative, Japan hopes to solve its plethora of ground transportation problems, which include heavy traffic, difficult-to-navigate mountainous regions, and remote islands.

从八月以来,日本政府牵头组织了多次会议,讨论制定日本的电动垂直起降飞机和城市空中交通项目规划和工作方案。8月29日,政府通产省与美国优步公司和日本多家相关企业的共计20多家单位,召开首次工作会,参会企业包括丰田、斯巴鲁、波音、空客、日航、全日空、大和运输等。日本政府计划在日本多地开展城市空中交通试点,并针对日本国情,将此类垂直起降机型应用到离岛和山区交通,丰田已经开展 eVTOL 机型投资和研制,计划2020年东京奥运会上亮相。

## Uber Elevate announced global trial city candidates

优步宣布其电动城市空中交通项目全球试点城市候选名单

Uber Elevate, the eVTOL urban mobility program, finalized the list of potential international locations for its third city of operations of UberAIR. It includes Tokyo and Osaka in Japan, São Paulo in Brazil, Paris in France, Melbourne in Australia, or Mumbai, Delhi and Bangalore in India. Uber Elevate confirmed last year that its first two cities would be Los Angeles, California, and Houston, Texas. It also announced that it would enter in one international city. Uber said that it would announce the final decision of the trial city next year.

优步的 Elevate 城市电动空中交通项目公布了全球第三个试点城市的候选名单。目前该项目已与美国洛杉矶和休斯顿合作开展试点。本次候选城市包括日本的东京和大阪、巴西圣保罗、法国巴黎、澳大利亚墨尔本、印度孟买、德里和班加罗尔。目前优步已在巴黎设立了 Elevate 技术研发中心,并与日本通产省共同主办了城市空中交通工作会。优步将在明年公布第三个全球试点城市。





# 航空的未来——电动飞机

## The Future of Aviation

April 10- 13, 2019

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**e-flight-expo** 是一年一度的德国AERO国际通用航空展的重要版块，汇聚先进的电动、混动、太阳能飞机、燃料电池及推进系统等。

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In early August at Helsinki's Malmi Airport a Pipistrel Alpha Electro took off as Finland's first electric airplane. Helsinki Electric Aviation Association was formed around this airplane to promote electric aviation in Finland. Matti Vanhanen, an MP and former Prime Minister spoke at the maiden flight ceremony stating "Within a very short timeframe we may see an air taxi network developing that will serve all of Finland. There are already about 80 airports around the country and an existing network upon which this could be developed." The Electric Aviation Association is partnering with Finnish airport operator Finavia.

## GAMA added a new membership category for electric aviation companies

### GAMA 新增为电动飞机企业专设的成员类别

The General Aviation Manufacturers Association (GAMA) is continuing to evolve its membership with a handful of former associate members coming on board in a new "associate member full" category from its Electric Propulsion and Innovation Committee (EPIC), along with a number of other new "full" and "associate" members that are joining the association for the first time. In all, the 14 companies represent the largest ever cache of new membership at GAMA at one time and further extend the breadth and scope of its membership activities. The companies represent a variety of businesses, from aircraft manufacturers and services providers to a host of companies involved in electric, hybrid, and eVTOL activities. Due to the additions, GAMA's membership has grown to encompass 126 companies located in 15 countries and five continents.

The associate membership category is designed for companies that have not yet achieved a TC, and largely is made up of members of GAMA's Electric Propulsion and Innovation Committee (EPIC). With the addition of the associate member full category, GAMA will be able to facilitate larger players in the simplified vehicle operation and electric and hybrid arenas.

The new "associate members full" members include Eviation, an Israeli startup developing an electric-powered aircraft; Icon Aircraft, a light-sport aircraft producer; Joby Aviation, which is developing electric aircraft, including electric vertical takeoff and landing (eVTOL) designs; Kitty Hawk, which recently merged with Zee.Aero and created the Kitty Hawk Flyer all-electric aircraft designed to operate over water; Terrafugia, developer of the flying car; and Uber, which aims to develop a network of urban electric aircraft transportation.

The newest associate members, meanwhile, include Alakai Technologies, which is planning to build air mobility vehicles for zero-emission eVTOLs; Faraday Aerospace, a new company that is designing electric propulsion systems; Karem Aircraft, which produces manned and unmanned advanced fixed-wing and rotary-wing aircraft; MagniX, which also is designing electric propulsion units; and, Xwing, which is developing technologies for autonomous aircraft.

## First electric plane in Finland took off

### 芬兰电动飞机项目起航

八月初，随着一架蝙蝠飞机公司的阿尔法电动轻型飞机在赫尔辛基的 Malmi 机场起飞，开启了芬兰的电动飞机时代。为促进电动航空发展，芬兰政府牵头成立了芬兰电动航空协会，采购了这架阿尔法电动飞机，用作测试和展示飞行。试飞当天，芬兰前总理 Matti Vanhanen 表示，计划不久的将来，在芬兰全境实现电动短途通勤飞行，充分利用该国 80 多个小机场，建立电动短途通勤航路网络。芬兰电动航空协会的合作单位包括芬兰机场管理单位 Finavia，两者将共同推动该计划的实施。

通航制造商协会 (GAMA) 为电动航空类企业专门设立新的 "associate member full" 成员类别。GAMA 成立于 1970 年，总部位于美国华盛顿，是世界上规模和影响力最大的通航行业组织。2015 年为推动电动航空发展，成立了电动及创新委员会 (EPIC)，参加该委员会的单位为 "associate" 成员，因为 GAMA 的正式成员单位必须是有适航审定产品的企业。本次新设立该成员类别后，将更有利于吸收电动航空企业，促进该领域发展。本次新加入的共有 14 家各类成员单位，截至目前，GAMA 共有来自 5 大洲 15 个国家的 126 家成员单位。本次设立的新类别专门针对尚未取得适航证，但已经开始适航审定，具有良好发展前景的成员单位，包括以色列的 Eviation 电动通勤飞机公司、美国 Icon 轻型运动飞机公司、美国 Joby 电动垂直起降固定翼飞机公司、谷歌创始人拉瑞佩奇投资成立的小鹰电动飞机公司、吉利集团收购的美国太力飞车飞行汽车公司、美国优步公司。EPIC 委员会新吸收的成员单位包括 Alakai 电动垂直起降飞机公司、法拉第航空技术公司、Karem 电动飞机公司、MagniX 电机公司和 Xwing 飞控技术公司。



## Astro eVTOL began test flight in Canada

### Astro 电动垂直起降飞机在加拿大开始试飞

The Texas based eVTOL developer Astro Aerospace obtained from the Canadian authority the Special Flight Operations Certificate (SFOC), a permit for the operation of an unmanned air vehicle (UAV) system, for its passenger drone project Elroy. It will be flight tested at the Toronto Markham Airport and will perform multiple flight maneuvers, take offs and landings, exercising it's newly developed Avionics software and flight control systems. Elroy is Astro's two passenger eVTOL, short haul aerial vehicle with the ability to travel up to 70km/hr for 25 minutes completely emission free. Ideal for urban commutes, turning 2 hour trips into 20 minutes. In May, Astro Aerospace acquired Passenger Drone, In June, it also partnered with American company Patterson Composites, which will be manufacturing the parts for the aircraft. Astro has also established a partnership with German company Kasaero, which specializes in lightweight design, composites, and certifications.



位于美国得州的电动垂直起降飞机公司 Astro 近期从加拿大交通部获得了特许飞行证 (SFOC)，可以在加拿大试飞其 eVTOL 机型 Elroy，试飞将在多伦多附近的 Markham 机场机型，初期将为无人驾驶试飞，主要测试起降性能和飞控。Elroy 是双座机型，多旋翼电动垂直起降，设计飞行时速 70 公里每小时，续航 25 分钟，计划用于城市空中交通短途飞行，可以将 2 小时的城市通勤缩短为 20 分钟飞行时间。该公司是诺斯罗普的子公司，将与美国 Patterson 复材公司合作制造该机机体，并与德国 Kasaero 公司合作研发。

## Bell Flight's patent hints at its air taxi design concept

### 贝尔的城市空中交通载具专利曝光

A US Patent filed recently by Bell Flight shows a three fanned air taxi that has tilting rotors – one on each wingtip and one at the tail of the aircraft – that would enable vertical takeoff and landing. Furthermore, the patent includes provisions for electric charging that begins automatically when weight from the landing gear of the air taxi is sensed on the landing pad, along with other energy storage provisions including battery technology. Bell Flight hasn't released the full version of their eVTOL yet; only teaser videos and a mock-up of what the cabin of such an aircraft could potentially look like. Additionally, there is no indication from Bell when the full design will be unveiled.

近日曝光的一份专利申请透露出贝尔公司正在研发的城市空中交通电动机型的一些设计细节。该专利中的机型采用倾转旋翼，每侧翼梢上有一个大直径旋翼，此外在机尾还有个小尺寸旋翼。该机型预计为电动型号，因为专利申请包括充电技术，起降坪感知到该机起落架压在上方的重量时，就可以自动开始充电。贝尔公司是优步的 Elevate 城市空中交通项目的五家飞机制造合作企业之一，但截至目前贝尔还没有正式公布其电动垂直起降机型的设计方案，仅公开展示了座舱体验全尺寸模型。

Bosch Aviation Technology



**BOSCH**  
Invented for life

## Elektra Solar made autonomous test flight

### Elektra Solar 太阳能电动飞机首次自主飞行试飞

Elektra Solar GmbH announced “The world’s strongest multifunctional solar-electric HALE aerial vehicle – the Elektra Two Solar with Take-off, flight and tough-down” successfully completed with autopilot system. Elektra Solar GmbH, a joint venture combining PC-Aero GmbH and Elektra UAS GmbH, uses aircraft designed by Calin Gologen, head of PC-Aero, and computer technology from Dr. Ing. Habil. Konstantin Kondak. The test flight was a demonstration of the new redundant autopilot system, which successfully completed several autonomous flights without human intervention, even though a safety pilot was aboard. Their collaboration led to two HALEs, the smaller Elektra One Solar (a veteran of a solar-powered Alpine crossing) and the larger Elektra Two Solar. This airplane is also the basis for Raphael Domjan’s SolarStratos, intended to take adventurous souls to 75,000 feet. Both “aircraft are characterized by long flight times and are able to carry payloads of up to 100 kilograms.” Motors are arranged on a single output shaft with one or both able to provide power at any time. Full power is 32 kilowatts. The craft are served by dual redundancy on the motors and triple redundancy on the control system.



德国 Elektra Solar 公司首次成功试飞太阳能电动飞机的自主飞行，整个飞行过程从起飞、巡航、到降落全部自动完成。Elektra Solar 公司是德国 PC Aero 公司和 Elektra UAS 公司的合资公司，该验证机由 PC Aero 公司的创始人和首席设计师 Calin Gologen 设计，飞控系统由 Habil. Konstantin Kondak 博士研发。本次试飞全程由自动飞控操纵，机上有一名安全飞行员，但没有介入操纵。瑞士冒险家 Raphael Domjan 创立的 SolarStratos 高空太阳能飞机项目也将在该机的基础上研制。SolarStratos 项目计划研发能够在 7 万 5 千英尺高度飞行的太阳能载人飞机，设计载荷 100 公斤，采用同轴双电机，最大功率 32 千瓦，采用三通道飞控。

## New Startup converting conventional light airplanes to fully autonomous

### 初创企业致力研制自主飞行轻型飞机

A San Francisco-based startup XWing claims to have created a “plug and play” software that can make most light aircraft fly autonomously. The technology will revolve around “sensing, reasoning and control”. It will also work on helicopters and multicopters but its designer sees its main benefit as making GA accessible to the masses. XWing hopes with the simpler cockpit operation to attract more people to aircraft ownership and that will increase demand for small planes. The higher volumes will reduce production costs and make GA aircraft more affordable. XWing has attracted \$4 million in the initial investment, including some from Microsoft.



位于旧金山的航空初创企业 XWing 正在研发适合现有轻型飞机使用的“即插即用”飞控软件，可以让轻型飞机具备自主飞行能力，减低飞行员操作负担。该飞控软件功能围绕“感知、决策、操纵”，将可以用在多种机型，包括直升机和多旋翼类电动飞机，不过该公司创始人表示，主要目标是大量的现有通航飞机，改装后，此类飞机可以用于多种用途，并使得私人飞行费用更低。该公司已获得 4 百万投资，包括部分来自微软的投资。



# SkyView™ SE

SIMPLIFIED EXPERIENCE | SPORT EFIS | STREAMLINED EDITION

简洁体验版、| 运动机型适用的综合数字航电、| 优化型

无论您如何认为，SE都是Dynamon公司价格最优、操作最直观的Skyview系列综合数字航电型号。



Dynon公司隆重推出该款SkyView综合数字航电系列的最新型号。SkyView SE专为目视飞行和想要体验最直观航电操作的飞行员而设计。该款产品的显示界面简洁明了，飞行中无需翻找多层菜单，而同样具备所有Dynon综合数字航电产品一贯的创新性先进功能，包括SkyView革新性的无线电操控面板以及一键操作的两轴自动驾驶仪。

SkyView SE无内置地图，因此即使是7寸屏型号也足以提供大尺寸、清晰易读的主要飞行仪表，包括可由飞行员自行设置的模拟显示的六个传统指针式仪表界面。凭借简化的功能操作和简单的安装方式，SkyView SE是Dynon公司经典的D100型综合数字航电的理想继任。

**DYNON**

Text & Photos: Marino Boric / XG

FARNBOROUGH 2018

# The e-flight accelerator!

The Farnborough Airshow (FAI) is a global aerospace exhibition with a strong military accent. This year was unexpectedly an impressive showcase for electrical innovations in aviation in almost all areas. On July 16-22nd, the FAI took place in Farnborough, a city about 60 kilometers southwest of London, known as the “cradle of English aviation”.

There I mainly expected “big aviation”. But what surprised me, was the crowd and the quality of e-Flight content from almost all areas of aviation were in attendance. That would be normal for events like Aero or AirVenture, though not for such a big, global and commercial aviation fair. I found innovations from the field of fixed-wing, VTOL and many electric applications, as well as in the commercial aviation.

Airbus presented the new stratosphere flyer Zephyr, but also non-aviation specialists, like the British automaker Aston Martin, surprised the crowds with an interesting eVTOL design together developed with Rolls Royce which have already had several of their own e-flight projects. Also many others - incumbents and start-ups - brought new projects to the FAI. Here we show only a selection, which also in our world of “small aviation” is of interest.



ASTON MARTIN VOLANTE

## 2018 年范保罗 航展电动航空集萃 电动航空 孵化器!

英国范保罗航展 (FAI) 作为举世瞩目的世界级航展之一，具有很强的民航和军航展历史，因此，当观众们看到本届范保罗航展上那么多的电动航空相关内容时，不由得都吃了一惊。本届航展照例在距离伦敦西南 60 公里处的范保罗举行，7 月 16 到 22 日举行，范保罗被誉为“英国航空工业发源地”。

作为长期报道该航展的记者，本次航展我本来也照期待很多大飞机相关的内容，但我吃惊地发现，最吸引观众的却是电动航空展区，而且不仅观众多，参展

商也很多，而且大牌厂商悉数到场。这种场面也许在德国 AERO 通航展或美国 EAA 奥什科特航展很正常，但对于范保罗这样传统上的民航大飞机和军航为主的航展来说，就显得有些不寻常了。本届范保罗航展上的电动航空包括固定翼、垂直起降机型，也有大飞机的电动化项目。空客展出了刚创造滞空世界纪录的清风太阳能无人机。不仅是传统的飞机厂商，还有跨界厂商也展出了电动飞机项目，比如超跑公司阿斯顿马丁本次展出了其

eVTOL 电动垂直起降飞机设计，该机与罗罗公司共同设计，罗罗公司本身已经深入参与电动航空，已有多项电动飞机项目在研，包括与空客和西门子正在联合研制的混动支线客机。在此我们挑选了本次范保罗航展上一些对于“小飞机”爱好者们可能最感兴趣的电动飞机项目。





## 空客清风太阳能无人机

空客首次允许记者参观他们在范保罗的设施，110年前英国航空先驱Sam Cody就在此实现了英国的首次动力飞行，在这个地方，一座巨大的机库几乎是一夜之间就建立起来，这就是清风无人机的研制场所。该项目由空客防务与空间技术子公司负责，是一架巨大的平流层太阳能动力滑翔无人机，目标是所谓的高空类卫星（HAPS）机型，就是可以在临近空间长时间飞行，起到卫星的部分功效。清风无人机空重仅有70公斤，采用太阳能做动力，驱动两个电机，可以在7万英尺甚至更高高度持续飞行数周甚至几个月。按照空客的说法，“清风无人机翼展相当于A320，但空重只相当于A320的一个座椅。”

清风无人机由超轻的复材制造，表面覆满太阳能电池板，翼面处于半透明。该机目前仍处于保密状态，这次参观中空客只允许我们在远处拍摄整机和机翼部分。清风无人机是从QinetiQ发展而来，该机从2003年开始研发，本次航展前，QinetiQ无人机还保持着滞空的世界纪录，该机持续飞行了两周。不过就在空客在本次航展召开发布会的时候，清风无人机创造了30天持续飞行世界纪录。空客计划将滞空时间提到100天，并最终实现：在7万至8万英尺高空可以持续飞行一年。

高空长航时无人机的长航时和可以飞越恶劣天气和民航航班的特性，使得它具有广阔的应用前景，比如在卫星难以及时到达和覆盖的区域长时间监控，因为该机可以随时调整航线。清风无人机已经制造了多架。创造世界纪录的是S型，我这次参观中在这个机库里看到至少六架，该型号可以搭载半公斤的载荷，还只是验证型号，空客正在研制的T型将是应用型号，翼展33米，据称可以搭载140公斤的载荷。清风无人机项目主管Sophie Thomas说，“清风T型无人机将功率更大，性能更好，可以搭载更大载荷。”

## AIRBUS ZEPHYR

For the first time, Airbus allowed us journalists to visit their new factory on the airport grounds. At the place where 110 years ago Sam Cody first became motorized flight in Great Britain, a high-tech factory was built almost overnight to accommodate the Zephyr project. There, Airbus Defense & Space represents the gigantic Stratosphere motor glider called Zephyr S, actually a HAPS (High Altitude Pseudo Satellite). The unmanned, two-motor solar-powered Motorglider weighs only 70 kilograms and can fly for weeks, possibly even for months at a height of 70,000 feet and above. Airbus illustrated these numbers: “The Zephyr possesses the span of one A320, but weighs only as much as one of its aircraft seats”.

The Zephyr S is made from ultralight composites. At the top of the wings are high efficient solar cells attached. The aircraft structure consists of CFRP parts covered with transparent skin. Almost all parts used, as well as the Electric drive, are subject to a strict secrecy, so we can only photograph the wings. The electric motors were not allowed at all to be photographed up close. The predecessor Zephyr developed in 2003 by QinetiQ still held the flight record during the FAI for two weeks. That should be up to the printing to be outdated in our magazine edition. While the FAI gave Airbus a press conference, the first Zephyr S produced on July 11th already stayed in the air for 30 days, thus doubling the existing world record. Airbus then plans to extend the flight duration to 100 days before the ultimate goal is reached: one year at an altitude between 70,000 and 80,000 feet to stay in the air.

The long flight duration and the ability to sustain above the weather and commercial aviation, open up unimagined applications, including areas where satellites cannot cover, as these are not arbitrary directionally controllable. The Zephyr S, currently is produced in series (I saw during the visit about six copies in the production hall.), weighs less than 75 pounds at 25 meters span and can carry payloads of about half a kilo. The larger model, the Zephyr T is currently in the development. It is ten times larger at a span of 33 meters and can carry up to 140 kilos payloads. Sophie Thomas, director of the Zephyr program, showed itself to us very optimistic: “The Zephyr T is even more powerful, as we had hoped, and can carry significantly heavier payload”.



## RR& FAI

## 罗罗与范保罗航展

Lately, I've often wondered why Rolls-Royce does not participate in the e-flight movement, however now they do! RR presented itself here impressively for the first time with three different e-projects. This advancement is based on that of the British government sponsored initiative "Champion Electrification". RR builds on the experience gained in hybrid electric driving on trains and boats and combined these with their know-how of their own gas turbines and VTOL products. The company has about 31,000 units from the gas turbine RR M250 so far produced and can thus on a wealth of experience of over 250 million flight hours access.

The renowned British manufacturer now finally presented something advanced in their EVTOL project. According to the company, the aircraft with tilting wings will be able to go about 400 km/h to fly fast and 800 kilometers far. Rolls Royce assumes that the prototype will fly by 2020, but on the condition that it finds project partners and corresponding funds that are available. It was clear at the beginning that it is a design concept. RR does not intend to design, build and market the plane, the airframe and other components by itself. It will be the job of an aircraft manufacturer. The base concept of the concept is the gas turbine M250, which drives the electric generator.

This serves as an energy source for the power supply of the six electric motors used and loads in certain phases of flight. Also the on-board batteries, in turn and also the energy for the vertical and transition flight phases. Michael Cervenka, Head of the Business Unit of Future Business Project, said in an interview, "Our goal is to be a supplier for the propulsion system of a future becoming EVTOL aircraft design." He added, "We looking for partners in the electric drive system Support." The turbine M250 is able to produce about 500 kilowatts, but the hybrid electric concept needs about 700 kilowatts for

最近我常想为啥罗罗公司还没推出电动机型。说曹操，曹操到！这次航展上罗罗一口气推出了三个电动飞机项目。罗罗的这次集中推出是受益于英国政府资助的“电动化冠军”计划。罗罗充分发挥其在火车和轮船上的混动动力积累的经验，应用在其电动垂直起降机型上，采用自有燃气轮机作为发电机。罗罗已经生产销售了31000台M250涡轴发动机，累计工时超过2.5亿飞行小时。

现在罗罗终于推出了自己的eVTOL机型设计，虽然比其他厂商稍晚了点儿。根据罗罗公司的解释，该机采用倾转机翼，巡航时速可达400公里，航程800公里。罗罗计划2020年能够首飞原型机，不过也解释得很清楚，罗罗并不准备全部自行研制该机的全部部件并制造整机，而是希望能有专业的飞机企业合作生产整机，并且能获得足够的资金支持。该机采用混动系统，一台M250燃气轮机驱动发电机，使用六台电机提供升力和前进动力，在起飞阶段采用电池补能。

罗罗的未来项目发展部门负责人Michael Cervenka表示，“我们的目标是为今后的eVTOL机型提供成熟配套的动力系统，”他解释到，“我们与合作伙伴共同研制为机型配套的动力系统。”M250燃气轮机的发电功率是500千瓦，由于罗罗的混动eVTOL机型垂直起飞需要700千瓦功率，因此不足部分由电池补足。该机共有六个螺旋桨，其中四个在主翼上，两个在尾翼上，起飞时机翼向上倾转九十度，转为水平飞行



后，主翼的四个螺旋桨折叠收起，由尾翼上的两个螺旋桨提供前进动力。该机设计载员四至五名。Michael Cervenka还告诉我们，罗罗认为目前而言，纯电动eVTOL机型还不现实，因为此类机型续航时间只有20分钟左右，而且必要的基础设施也还不普及。

## Accel

这款固定翼电动飞机机身长度为3.7米，看上去像是一架普通的超轻机，这就是ACCEL项目（全称为快速电动化），该项目由英国航空研究所发起，目的是短时间实现电动飞行进行各项测试。该所的目标“清洁增长战略”旨在减少英国航空业的碳排放。ACCEL飞机名字虽然不酷炫，但技术含量可不低，全机采用碳纤维制造，在本次范保罗航展的3号创新馆中展出，该机目前尚未取得适航证，在位于伦敦两小时车程的Gloucestershire机场制造。

罗罗公司采取与第三方合作的方式以加快该项目进度，使得该机能够在24个月内制造完毕进行试飞。据罗罗公司介绍，该机只是作为技术验证，不会商业量产。该机的性能出众，甚至超过了其他的类似机型，比如空客的验证机和西门子的Extra电动特技机。罗罗的本项目合作方是英国的YASA公司，该公司负责研制大功率航空电机和电调，也为汽车和工业领域客户生产相关电动产品。Elektroflight公司也是该项目合作方之一，该公司擅长集成度高的高性能电机、电池，可以加快该项目电机部分的研制进度。目前还没有公开的该机性能数据，不过据说该机已经具备打破多项该级别飞机的速度和爬升记录的能力。罗罗将用该机测试和展现电动飞机的性能。



the vertical takeoff, so the missing energy is supplied by the on-board batteries. On the tilted wings up to 90 degrees total, they are arranged with six electric motors/propeller combinations, four on the main wing and two on the main wing rear wing. In horizontal flight, the four engines will be switched off on the main wing, where then folds the propellers streamlined. For propulsion only two arranged at the rear engines are responsible. With this hybrid EVTOL combination there should be four to five passengers with about 400 Kilometers per hour for about 800 kilometers. Cervenka also told us that Rolls Royce considers one purely electric, battery-powered (VTOL) to be currently unrealistic, since the flight duration of such eVTOL can last only 20 minutes and the necessary infrastructure does not exist yet.

## Accel

This fixed-wing aircraft with a 3.70-meter-long fuselage looks like a conventional low-wing UL with high speed performance. It is a product of the ACCEL program (Accelerating the Electrification of Flight) the British Institute of Aerospace for a Program accelerating the electrification of aircraft supported. The goal of the “Clean Growth Strategy” by the Institute is to reduce the aviation emissions in Great Britain. Rolls Royce presented under the bulky name ACCEL with a carbon fiber CFRP aircraft, which was exhibited in the FAI Innovation zone in hall 3. The not yet airworthy device was built at the Gloucestershire Airport, which itself is two hours west of London.

In a certain way, RR shows its new way of working on this project: the company develops a product with partner companies which should fly relatively quickly in just 24 months. In a conversation with the people in charge, I learned that RR intends this project to be the basics of e-flight in fixed-wing aircraft research and not a commercial product. Thanks to partnerships with specialists from different areas is this aircraft, currently a single-seater, much more powerful than that of competitors (here RR probably means the aerobatic E-Flyer from Airbus and Extra). In this project RR works with YASA (UK), a manufacturer from powerful electric motors and controls, in the automotive, aerospace and industrial sectors where applications are used.

Also the company Elektroflight Ltd. UK is involved in the ACCEL project.

They specialize in integrated high-performance electrical drives, including innovative energy storage solutions, and is considered an accelerator of development, integration and testing of electric drives. Unfortunately, there was almost no technical data for this airplane. But it was the comments that were made that this plane has set several speed and climb records and RR will try to demonstrate the possibilities and limits of electrification with this project.



### ASTON MARTIN VOLANTE

The high-priced automaker drives with its Volante Project towards aviation, where they made a new line to create urban luxury mobility. Aston Martin is an absolute newcomer in the world of VTOL and aviation, but as we convince ourselves at the booth in Farnborough, the company says this project really serious. The issued, about one and a half meters long model looked to me as a pilot and aviation engineer as very promising. The applied aerodynamic solutions, the chosen propulsion system and the sophisticated overall design of the high-end three-seater seemed much more mature than merely a bold attempt at a public relations stunt.

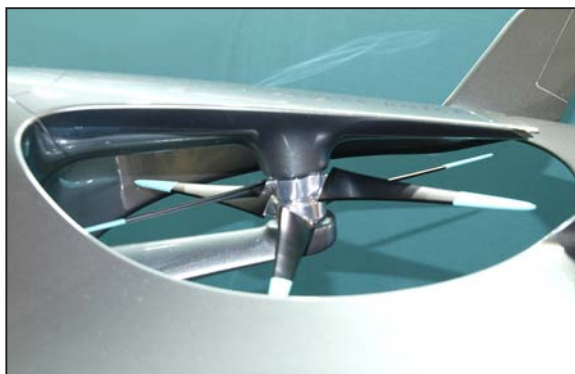
The Volante-vision is a collaborative project that Aston Martin joined 18 months ago with Cranfield University, Cranfield Aerospace Solutions and Rolls Royce. The hybrid electric plane is powered by three propellers, two front side of the fuselage and one behind the passenger cell. For vertical flight, the front motors swung in the horizontal and the rear, large channeled, rigid propeller is added. The engines are powered by a generator powered, flanged to the gas turbine RR250. The preliminary performance data give a top speed of 320 km/h and a range of 400 kilometers, enough to around Paris and connect to London. At the upcoming event international demo tour Aston Martin wants to show the willingness of their well-heeled customers to purchase of such an aircraft and then possibly start to building.



### ASTON MARTIN VOLANTE

超跑厂商阿斯顿马丁突如其来地进入了电动飞机领域，意在城市空地一体化高端出行。作为航空界的新军，阿斯顿马丁试图在范保罗航展上向我们表面他们对该项目的严肃性和重视程度。作为一名具有航空工程背景的专业航空记者，虽然这次展示的只是一米五大小的模型，不过在我看来，该机的设计概念具有可行性，无论气动外观、所选用的动力系统、还是精致的三座座舱，都显得较为成熟，绝不仅仅是一个宣传噱头。

Volante项目是阿斯顿马丁与英国Cranfield大学、Cranfield航空技术公司和罗罗的合作项目，已经进行了18个月。该机采用混动动力，采用罗罗公司的RR250燃气轮机发电，三个螺旋桨，其中两个位于前部，一个位于座舱后面。公布的设计指标是最大时速320公里，航程400公里，足够从巴黎前往伦敦。阿斯顿马丁接下来将进行环球巡回展示，向高端用户推广这种空地一体化出行方式和这款机型，如果有足够的用户需求，接下来就将正式启动该项目。

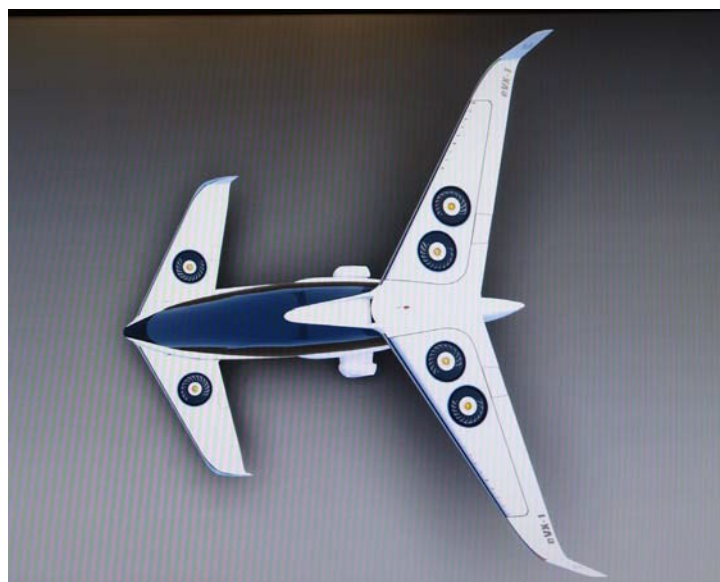






EVX-1

这个气动外观比较复杂的VTOL机型是Coventry大学的37岁研究生Dean Mangurenje的毕业论文设计。该机采用鸭翼设计，鸭翼上装有两个螺旋桨，主翼上四个。Dean的这个机型设计是Coventry大学的eVTOL机型设计课题的一部分。该机为2至4座，采用电动涵道风扇，模块化风冷电池组。Coventry大学在本届范保罗航展的创新展馆的展位上有该机的模拟器展示，可以体验该机的操控



EVX-1

This study of an aerodynamically sophisticated VTOL is the final thesis of the 37-year-old Student Dean Mangurenje from Coventry University. The plane in canard design uses two to drive engines in the front wing and four on the rear main wing. Dean's work was part of a larger research project conducted by Coventry University electric VTOL aircraft. The eVX-1 could be a two or four-seater, serve as a drive that will be very capable with electric turbines. On board is also an air-cooled, modular designed battery system. There was flight simulation of this plane during the fair at the booth of Coventry University in the innovation zone to experience at the fairgrounds.

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## SAMAD AEROSPACE

The largest interest of was shown for the British start-up Samad Aerospace during their Press conference on the eve of the beginning of the fair. The entrepreneur Seyed Mohseni explained on the FAI that he already has received 103 prospect orders for his e-Starling. He presented a whole build series of similar aircraft: the full elec-

tric UAV Starling, the e-Starling and - if all works - also a Starling Jet. The all-electric UAV should be able to carry ten kilograms of payload at 250 km/h from 170 to 500 km. The fully electric e-Starling is said to accommodate up to seven passengers with a 500 kilometers per hour speed and 650 kilometers range.

The Starling Jet is probably a distant future, because he should be able to carry ten passengers at 750 km/h transport more than twice as far as the e-Starling will be able. The jet Mohseni presented was surprising to prospective buyers. Samad explained at the press conference that the original concept with a V-tail was changed in favor of a traditional looking tail. The fair was brought a model 10% completed that was comprised of four channeled propellers; two are fixed built into the wing and two are rotatable on pylons. The electric motors are a manufacture product from a gas turbine generator power supply (the manufacturing is not yet selected). According to Samad there is be a model that is half complete currently being built, which should fly in 2020. The construction of first five prototypes in full size are scheduled for early 2019 and planned their maiden flight for 2021. The e-Starling will have a price of 6.4 million US dollars, then they should have a range of 650 kilometers and a maximum speed of 480 km/h. The Starling Jet is said to be \$12 million and should be available in 2024.



英国初创企业Samad公司推出的该机型在发布会上引起了不小的轰动。公司创始人Seyed Mohseni宣称该机已有103架预订。该机型是一个系列，有多个改型，包括无人机和载人型号，其中无人机型号可以载重10公斤，巡航时速250公里，航程170至500公里。全电动载人型号载客七人，最大时速500公里，航程650公里。

最终设计目标是载客10人，巡航时速750公里。Seyed Mohseni宣称最高端型号已经获得不少预订。发布会上Seyed Mohseni表示该机之前采用的V型尾翼将改为常规尾翼布局。该机在本届范保罗航展上展出了10%缩比模型，采用四个涵道风扇，其中两个是规定在机翼上，另两个是可倾转。该机为混动，采用燃气轮机发电（合作厂商尚未公布）。该公司表示正在制造一个50%的缩比样机，计划2020年试飞该缩比样机。第一架5座全尺寸验证机计划2019年开始制造，2021年首飞。e-Starling机型报价640万美元，最大时速480公里，航程650公里，最高端的Starling Jet型号预售价1200万美元，计划2024年交付。





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Text & Photos: Willi Tacke

**KittyHawk Flyer**

# OFF IN THE DESERT



KittyHawk is a Larry Page (Google) company. When Kitty Hawk presented the Flyer at Oshkosh last time, it was welcome with some smiles, especially from other eVTOL manufacturers. Flyer was a type of manned drone for the low flight at three meters high. In the past year the pre-production has started and the flight operations of the registration-free eVTOL was added. Now the new Flyer Mark 2 at Lake Las Vegas was presented. Your editor was there - as the only aviation media invited.



KittyHawk Flyer 电动垂直起降超轻机

# 从沙漠里起飞

KittyHawk (小鹰) 是谷歌创始人拉瑞佩奇创立的电动飞机公司, 当去年该公司在美国奥什科士航展上首次展示 Flyer (飞行者) 电动垂直起降超轻机时, 许多人只是报以微笑, 特别是许多 eVTOL 同行。过去一年来, 该公司推出了新型号并开始接受预定。在拉斯维加斯湖举行的新型号 Flyer Mark 2 的发布会上, 本刊作为唯一的受邀航空媒体参会并体验了该机的飞行培训过程。

The invitation came at short notice and, above all, surprisingly. One week before Oshkosh, I receive an email from a friend at Kitty Hawk: "Invitation Flyer by Kitty Hawk Open House ". I'm supposed to be there in the morning of July 18th to arrive at Lake Las Vegas at 7:30 pm to get to know the previously closely guarded Flyer Mark 2.

### SURPRISING INVITATION

The appointment is important, but does not fit, because on 17th of July we get the announcement at the Bavarian State Government to set up a test zone for autonomous flying eVTOLs and on Thursday evening I have to go to Oshkosh. But I definitely didn't want to miss the flyer, so the flights were quickly rebooked. Shortly before midnight I arrive at the hotel on Lake Las Vegas in Nevada. Despite the full-bodied announcement, I am among the few first which the "Flyer, Kitty Hawk's first staff flying vehicle" would see. I was among a large group of representatives of the American Aviation media that has been in Oshkosh for years. The Sun'n Fun and the AERO come across each other this year, but far from it! At breakfast at seven o'clock I meet folks from the BBC team, Fox News, CNN, two Las Vegas reporters and a science journalist from Japan, like me on the detour to Oshkosh. This is

这次发布会的邀请来得很晚，也很突然。就在奥什科士航展开始前一周，我收到了一个KittyHawk公司的朋友发的电邮：“特邀您参加KittyHawk Flyer发布会”。发布会定于7月18号晚上7点30分在拉斯维加斯湖举行，将首次公开之前一直保密的最新型Flyer Mark 2机型。

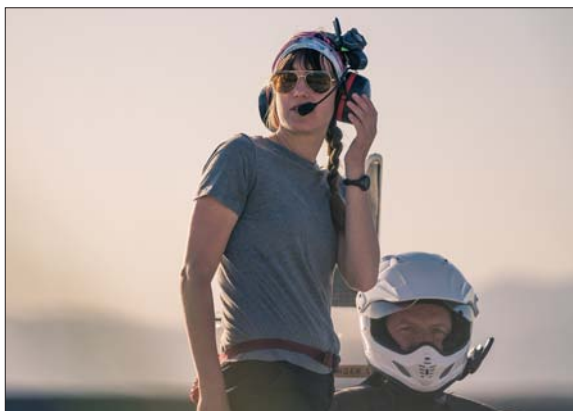
### 突然的邀请函

这个邀请当然很重要，但时间并不合适，因为7月17日我还受邀参加德国巴伐利亚州政府设立自主飞控飞机试点空域项目发布会，周四晚上我原计划才能前往奥什科士。不过对于Flyer新款发布会这样的活动，当然容不得错过，于是我立马改签了机票，发布会当天凌晨我赶到了拉斯维加斯湖的酒店。

尽管这次发布会很匆忙，但还是有很多媒体赶到，包括很多美国的航空媒体，虽然今年美国的Sun 'n Fun航展和德国AERO航展的日期刚好重叠，但还是有很多媒体赶来参加。当天早上7点，在早餐时，我就已经遇到了来自BBC、福克斯、CNN、两名拉斯维加斯当地记者和一名来自日本的科技记者，很多人都跟我一样，从奥什科士航展改道而来。很快我就明白了为啥我们这么早集合，因为我们早上7点15分站在酒店外面时，太阳刚出来不久，但气温已经30度了。我们乘车穿过干裂的土地和尘土飞扬的土路，来到了发布会







Britney Miculka is the director of Las Vegas Flight operations. Kitty Hawk boss Sebastian Thrun is under the helmet

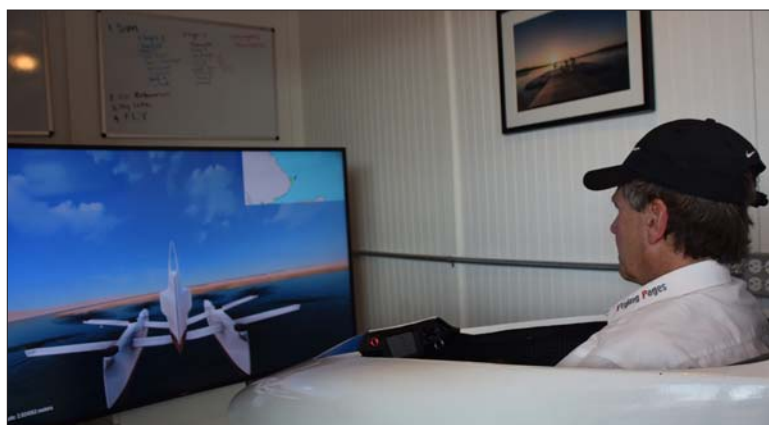
前面是拉斯维加斯飞行基地主管 Britney Miculka，后面戴头盔的是小鹰项目负责人 Sebastian Thrun。



Large overlapping propellers for low Noise levels.

大尺寸螺旋桨的桨盘范围有所重叠，尽量减小噪音

现场，那儿有一个机库、一个船屋、一个平台，Flyer Mark 2超轻机就静静地停放在起降平台上。该项目总工Todd Reichert首先向大家做了详细的安全防范讲解，随后首席试飞员Britney Miculka进入座舱。启动口令发出后，只见中间靠里的两个螺旋桨先转了起来，电门大开后，紧接着全部十个螺旋桨都转了起来。接着机身朝起飞方向稍微倾斜了一点儿，就飞起来了，朝湖面飞去，试飞最大飞行高度只有3米，可以朝任意方向加速、停止，还可以侧着飞。让人最吃惊的是该机的噪音非常小，只听得到很小的蜂鸣声。而去年在奥什科士航展上做展示飞行的那架Flyer原型机的声音都还不小。对此公司人员解释说，这得益于新采用的直径更大、转速更慢的新螺旋桨。飞行了大约20分钟后，飞机轻轻地降落在平台上。接下来就是首批用户之一的Carter Reum进行他的首飞。Carter是洛杉矶的畅销书作者，也是Flyer飞机的首批订户，Carter不是飞行员，在他首飞之前，他已经在模拟器上进行了充分的训练。不过当他刚坐入Flyer，就开始吹风了。



In the flight simulator the flyer flies easily. Joystick controls left and right, lever left = forwards and backwards; lever right = up and down  
小鹰模拟器很容易操纵。用手柄控制飞行，左侧手柄控制前进后退，右侧手柄控制上升下降



Kitty Hawk and not McDonald's: the pilots practice the emergency procedure in the ball pit to get out if the machine capsizes.

这个塑料球泳池可不是在麦当劳：这是让飞行员练习紧急逃生用的，以防小鹰飞机在水面迫降

why we met so early, I realized, as we to step outside the hotel lobby at 7:15 am: Shortly after sunrise, it is already 30 degree Celsius out. Through parched land and over a dusty dirt road we arrived in the place of the presentation. There was a hangar, a houseboat, a platform where the flyer Mark 2 sat. After a comprehensive safety briefing by Todd Reichert, the Chief Engineer of the Flyer, chief pilot Britney Miculka climbs the Flyer. After the start command, only the two middle, inner propellers first turned. After a beep accelerate all ten propellers at full throttle. Then the Flyer takes off. Slightly tilted in the direction of flight, it flies out to the lake. At maximum altitude, that is Britney flies three meters above the surface of the water slalom, turns on its own axis, accelerates, stops, and flies sideways.

The amazing thing is the low noise. Only a snores hum can be heard. The first prototype in Oshkosh had still hailed like a hornet. The explanation this is the new,



**Ultralight:** A person can easily move the Flyer alone. In the background is the control center on Lake Las Vegas. 真正的超轻机：一个人就可以轻松拖动。后面的房子就是拉斯维加斯湖飞行基地的塔台

much larger and slower rotating propeller. After about 20 minutes flying, Britney sets the flyer gently on the platform. Next up is Carter Reum to complete his first flight. Carter is a bestselling author from LA and one of the first customers at Kitty Hawk. In preparation for his first solo, the non-pilot Carter had a workout on a Flyer simulator. But no sooner did Carter take a seat on the Mark 2, the wind refreshes.

We wait, because “at the moment we do not leave in any wind over ten miles per hour in which flight students can fly,” explains Todd Reichert. The flyer automatically goes into position hold as soon as the hands are taken off the hook. This position (Altitude and location) is not yet linked to the GPS. That is, the flyer persists only in the given altitude, but not at the exact location. The wind can be the flyer easily displace if the student does not respond or react incorrectly. Bad luck for Carter, the wind does not set, not the whole day. This is bad luck for me, because now I can only fly the flyer probably only in the fall. Pity, but I understand that you do not take any risks, especially in front of cameras. No practice, but theory. We learn many new details about the Flyer project. Also about the training: After only 90 minutes basic course with theory and simulator practice the aviation novices make their own first flights - first over the water. The answers to questions about production numbers, delivery dates and costs are rather vague. “Although we produce a small pre-series and those people like Carter who buy a Flyer, get their training here at Lake Las Vegas. They cannot take a Flyer for the time being”.



**Todd Reichert, the Chief Technician of the Kitty Hawk Flyer Program, explains FLÜGEL publisher Willi Tacke the simplicity of the device.**

小鹰项目的总工 Todd Reichert 在向本文作者 Willi Tacke 介绍飞机操纵。

我们只得等待，因为Todd解释说，“目前学员可以飞行的最大允许风速是每小时10英里。”因为Flyer只要飞行员一松手，就会自动保持姿态和高度，稳在那儿不动，这种自稳定姿态不是跟GPS位置联动的，也就是说，Flyer此时的位置并不是完全保持不变，如果风速过大，而飞行员又没有介入的话，Flyer就有可能偏离位置。Carter的运气可真不好，看来这一整天的风都不会停，我也飞不成了，看来我的Flyer首飞得推迟到今年秋天了。不过我很理解这种谨慎的做法，都是为了安全着想，特别是更不想在那么多摄影摄像机和媒体面前出洋相。既然没法体验飞行，那就地面教学吧。我们回去了解Flyer的详细介绍，并体验地面模拟飞行。根据该公司介绍，该机的基础飞行培训只需要90分钟，包括理论和模拟机练习，然后学员就可以自行驾驶了，首飞只能在水面进行。当有媒体问到该机产量、交付时间和价格时，公司人员并没有给出明确的答复，只是说“我们已经生产了一小批，像Carter这样的订户已经购买了该机，会在这里受训，但目前还不能把飞机拿走。”“每天我们都在积累量产经验，第一批飞机可能在今年年底前交付。第一批用户的价格挺高的，跟电动车的价格差不多。”Reichert补充道，“我们还在新型休闲机型的开始阶段，初始用户的使用体验会有助我们今后向交通工具的方向进一步发展，但道路还很漫长。”

## 103 部超轻机规定

为什么拉瑞佩奇把 Flyer 飞机按照美国的 103 部超轻机标准来设计呢？103 部超





**Bestseller author Carter Reum waits for his first flight, because the wind is too strong.**  
畅销书作者 Carter Reum 在等着起飞，但最终没飞成，因为风太大了。

轻机航规跟正常的载人飞行器管理规定相比，宽松许多，不需要进行美国联邦航空局 FAA 适航审定，飞行员也不需要任何飞行执照。103 部超轻机航规从 1982 年开始实施，当时是超轻机的发展初期，103 部规定：超轻机最大空重 254 磅（115.2 公斤），无须适航审定，飞行员无需飞行执照。此外还有其他一些限制规定，比如最大载油量不能超过 5 加仑（19 升），最大时速不超过 55 英里（每小时 88.5 公里），不得在人口稠密区飞行。基本上，任何人都可以在美国造一架 103 部超轻机然后随意飞行。Flyer 超轻机的设计指标符合 103 部超轻机规定，而且重量上还有富余，因为 103 部规定如果超轻机安装浮筒的话，还可以增加每个浮筒 30 磅的重量，也就是说，Flyer 实际上的最大空重可以做到 314 磅（142.5 公斤）。Flyer 目前在试飞中的速度被飞控软件限制不超过每小时 10 公里，最大离地高度 3 米，最大允许风速每小时 16 公里。如其他的很多 eVTOL 厂商一样，Kitty Hawk 的技术非常先进，作为电动载人无人机可以实现垂直起降。拉瑞佩奇采用的超轻机策略目前看来是很对的，因为没有适航审定的费用和时间，可以很快推出产品，测试



**Youtube star Casey Neistat has already been there. He also showed that Flyer was evidently really fun.**  
网红明星 Casey Neistat 已经飞过老鹰，他也说驾驶老鹰飞行是非常有趣的体验。

“Every day we have new experiences that we have in to incorporate the production. It could be the end of the year come to the first deliveries. The price, the first customers have paid, is relatively high. After all but the price should be that of an electric car.” Reichert adds: “We are at the beginning of a process of recreational aircraft. Their exploration will show us the possibilities right through to the transport of people. But until then it is still a long way.”

### THE PART 103 APPROACH

Why is Larry Page positioning his Flyer in the US Category Ultralight Part 103? Part 103 stands for one exception from the rules of manned aircraft which the American aviation authority FAA oversees and will need a pilot's license.

The exception rule Part 103 comes from 1982, the childhood days of ultralight Aviation and states that aircraft with a curb weight up to 254 pounds (115.2 kg) approval-free are to be flown and without a pilot's license. There are a number of other limitations, for example, the amount of fuel (maximum 5 gallons = 19 liters) and top speed (55 miles = 88.5 km / h) and the ban on flying over a densely built up area. In principle, everyone can build such a Part 103 aircraft and in fly the US. The Flyer fits According to Reichert by weight good in this category. There is also a weight reserve, because the Part 103 rules state that a UL equipped with floats up to 30 pounds may be added to the balance per floater. That means the flyer should weigh 314 pounds (142.5 kg) empty. Kitty Hawk electronically limits the flyer's maximum speed - at least



for now, during testing – at 10 km / h and three meters at altitude. In addition, the operation is allowed in only up to 16 km / h wind. Like all eVTOL manufacturers Kitty Hawk is ahead of the task with new manned passenger transport aircraft which are powered electrically and can take off and land vertically. The approach of Larry Page seems to be that, the cheaper way to go and with uncertified devices want to gain experience in relation on development, production and technology. While other manufacturers need to invest a lot of money just to get the certification - so much that it even can hurt a billionaire -, Kitty Hawk will make money pretty fast, because the leisure flying market is booming in the US.

技术、量产工艺和市场反响。而许多其他 eVTOL 机型项目，面临适航的问题，费时费钱。目前看来，Kitty Hawk 有望很快实现盈利，因为美国的娱乐休闲飞行市场正在快速增长。



## KITTY HAWK

Company Name:	Kitty Hawk Corporation
Headquarters:	Mountain View, California
Kitty Hawk CEO:	Sebastian Thrun
Product Name:	Flyer
Type of Machine:	Personal aircraft
Power:	All-electric
Capacity:	Designed for one participant
Height Limit:	Operates between 3-10 ft off the surface of water
Wingspan:	8' x 13'
Vertical take-off and landing:	Powered by 10 independent lift fans
Battery Life:	Battery life will depend on participant weight, environmental factors, and forward speed.
Flight time:	12-20 minutes (at 20 mph)
Regulation:	Part 103 Ultralight
Web:	Kitty Hawk <a href="http://www.kittyhawk.aero">www.kittyhawk.aero</a>





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Text & Photos: Willi Tacke

**Test area for autonomous flying  
in Bavaria / Germany**

**德国巴伐利亚将设立自主飞行测试空域**

# Laptop, leather pants and eVTOL

## 笔记本电脑、皮裤与 eVTOL



Prime Minister Markus Söder in the simulator which TU Munich developed for the company AutoFlightX.

巴伐利亚州州长 Markus Soeder 在体验飞行模拟器，该模拟器是慕尼黑科技大学与 AutoFlightX 公司合作研制的

The Bavarian State Government has decided to launch a test program for the testing the operation of manned and unmanned autonomous eVTOLs set up (electrically powered, vertical-launch aircraft). The prelude was an informational event at the Hofgarten in Munich.

德国巴伐利亚州政府决定设立测试空域和试点项目，用以试验具备自主飞行能力的电动垂直起降无人机和载人无人机 (eVTOL)，该项目在慕尼黑举行了发布仪式。

The demonstration in the Hofgarten behind the Bavarian State Chancellery was a complete success. Companies like Lilium and Siemens presented Bavarian e-Flight and eVTOL, even Prime Minister Markus Söder took a flight in

发布仪式在巴伐利亚州政府官邸后面的花园举行，州长Markus Soeder亲自到场参加，多家位于该州的此类产品企业携多款机型到场现场展示，包括Lilium和西门子，充分展示了巴伐利亚在航空创新领域的重







Felix Oerley of Lilium explains to Prime Minister Söder and Minister of Economic Affairs Franz Josef Pschierer about the eVTOL from Oberpfaffenhofen in the Hofgarten in Munich.

Lilium 公司的 Felix Oerley 向 Soeder 州长和州经济部部长 Franz Josef Pschierer 该公司在 Oberpfaffenhofen 研制的电动垂直起降机型

大力量，州长Markus Soeder还饶有兴趣地亲自操作AutoFlightX公司的电动垂直起降载人飞机的模拟器和Quantum无人机模拟器。仪式上，州议会宣布巴伐利亚州进入交通技术创新新时代。该测试空域将位于慕尼黑西南部，使用Oberpfaffenhofen机场作为主要试点机场，该机场曾是道尼尔飞机公司所在地，垂直起降类飞机在该机场有着悠久的历史，道尼尔公司早在50年前就在这里试飞Do-31倾转喷气式垂直起降验证机，是垂直起降喷气式飞机先驱之一。测试空域以该机场为中心，向西南方向延伸。为保障飞机和地面人员设施安全，测试空域区域和试点项目将采取多重安全保障措施，包括地面冗余飞控设施和操作手，可以随时接管飞行，并且所有测试飞行将被全程监控。

## 巴伐利亚的自主飞行和自动驾驶试点

巴伐利亚州已经批准在经过该州的A9号高速公路划出专门路段用于自动驾驶车辆测试，现在随着测试空域的设立和自主飞行项目的开展，空地一体化将实现融合，两种自动驾驶技术将可以互相借鉴，共同发展。汽车公司与电动飞机公司也可以在许多其他领域进行合作，比如更换下来的电动车电池，仍然有足够的使用寿命，就可以用于eVTOL电动飞机地面充电，并配合太阳能充电站，实现电动飞机的清洁能源自持使用。Oberpfaffenhofen是巴伐利亚州重要的航空试验机场，驻场单位不仅有欧洲宇航局和德国航空航天研究中心这样的国家级科研机构，还有很多eVTOL和无人机初创企业，比如Lilium、Quantum，以及新进驻的AutoFlightX电动飞机公司，该公司是电动航空重要领军人物之一田瑜创立的。这么重要的试点项目和机场，当然少不了西门子。西门子的研发中心就位于

the simulator of the company AutoFlightX and a drone of the company Quantum to have a taste of the control. Afterwards, the cabinet announced the entry into the new transport technology. The area should be located in the southwest of Munich. Central area becomes the test airport Oberpfaffenhofen - the former Airfield of the company Dornier. Start vertically has a tradition here: Dorniers started there 50 years ago Whiz kid Do-31. The test area will extend from Oberpfaffenhofen to the west and south. For the safety reason, there will be redundant flight control system with which the autonomous flights can be consistently monitored.

## AUTONOMOUS FLYING AND DRIVING IN BAVARIA

Since there is a program in Bavaria on the highway A9 at the same time for testing autonomous driving, there is a possibility to a later connection for synergies and the know-how transfer between the two transportation methods. Further cooperation, for example, with the automobile companies could the "Second Life" use of disused car batteries combined with solar-powered ground charging stations for the eVTOLs. Today Oberpfaffenhofen is a research aerodrome of the Bavarian state government. In addition to research institutes such as ESA and DLR, there are also several eVTOL and drone companies including Lilium, Quantum and AutoFlightX the newly founded company of one of the e-flight pioneers Mr. Tian Yu. Besides these companies Volocopter (located in Baden-Wuerttemberg) has also obliged to set up a branch in Oberpfaffenhofen. Of course, Siemens is also on board. Siemens, as a global corporation based

Prime Minister Söder in conversation with Mathias Bittner (AutoFlightX), Professor Florian Holzapfel (TU Munich), David Löbel (AutoFlightX) and Willi Tacke (Flying Pages).

Soeder 州长与 AutoFlightX 公司的 Mathias Bittner 和 David Loebel、慕尼黑工业大学的 Florian Holzapfel 教授和 Flying Pages 公司的 Willi Tacke 交谈



in Bavaria, is working on the development of electrical and hybrid electrical aircraft propulsion systems for conventional and eVTOL aircraft. Because Siemens provides motor for Airbus' CityAirbus eVTOL, Airbus has certainly a presence there.

Siemens not only exhibited its all-electric version of the Extra 300 airplane at the Hofgarten event, but also presented a new project with the company RUAG, also in Oberpfaffenhofen has its seat and where the Dornier 228 has been manufactured. This model is initially to receive an electric motor and then fully electrified. The program is to be managed by BavAIRia, a State-owned GmbH, to coordinate the Bavarian aviation activities. The Technical University of Munich (TUM), which has been working on autonomously flying aircraft for years, brought different players together for the joint program. With this program, the Bavarian government is planning in Germany an eVTOL test area, in which smaller drones and larger eVTOLs beyond the line of sight can fly. So not only tradition with laptop and lederhosen, but also into the future with eVTOL.

巴伐利亚州，研发电动航空专用电机。作为西门子电动航空合作伙伴，空客也将在该机场设立机构，西门子为空客在研的 CityAirbus 电动垂直起降飞机提供电机。

本次发布会上，西门子带来了多款机型，不仅有安装了目前世界上最大功重比电机的全电动改装 Extra 300 电动飞机，还有一个新机型项目的模型，该项目名为 RUAG，将改装一架道尼尔 228 双发飞机，先期将改装一台发动机安装电机，最终将把两台发动机就更换为大功率电机。为此，巴伐利亚州政府已经成立了一家名为 BavAIRia 的企业协调该州的航空创新项目。此外，慕尼黑技术大学（TUM）也积极牵头参与，该校研究自主飞行技术已经多年，本次活动召集了多家企业，是重要的学术牵头单位。巴伐利亚州不仅有传统的皮裤和慕尼黑啤酒节，还有高科技软件企业，而这次实施的试点项目还将使该州拥有 eVTOL 电动飞机。

fc

**VTOL tradition in Oberpfaffenhofen:  
50 years ago the Do 31 took off here.**

该州的 Oberpfaffenhofen 机场与垂直起降飞机有着不解之缘：50 年前道尼尔 31 倾转垂直起降验证机就从这里起飞





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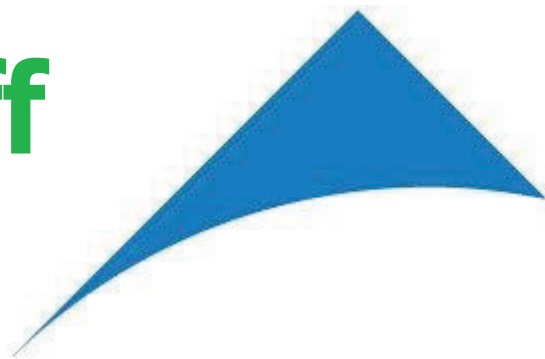
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# BEAM takes off 项目启动



# bavAIRia

B

Bavaria has a long tradition in Aviation, with companies like Airbus, Eurocopter, Grob etc. Which means also Aviation oriented Universities like the TUM ( Technical University Munich and large number of mid size supplier companies. The Bavarian

Government supported this by the state owned Company BavAIRia which manages the AEROSpace cluster. As Many eVTOL companies ramping up around Munich - BavAIRia now has the task to create the right environment to let them grow and keep their leading role in this booming part of the aviation Market. On the following pages we introduce BavAIRia and some Bavarian aviation players



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## 情况简介

据预测，全球零排放客机市场规模到2035年将达到750亿美元。与此同时，快速增长的无人机市场特别是视距外操纵（BVLOS）在许多领域的应用正带来大量的新增工作岗位。为此，德国巴伐利亚州政府正努力促进这个面向未来的新兴领域的发展壮大。位于巴伐利亚州的企业和研究机构已研发出一些世界水平的先进机型，接下来需要测试这些电动飞机，为此，目前德国全国范围内都急需此类飞机专门的试飞空域。

巴伐利亚州政府成立的该州航空企业联盟 BavAIRia e.V. 在过去五年里已经主办了多次无人机论坛，除了会议和行业交流活动以外，该联盟也负责管理在多处设立的德国首

## SITUATION

By 2035, the world-wide market volume is expected to grow to 75 billion for emission free passenger transport. Meanwhile, the fast-growing market for UAS is creating new jobs especially in "beyond visual line of sight" (BVLOS) operations in various fields of new services. The Bavarian Government is supporting new developments in this future oriented domain.

Bavarian Companies and research centers have developed world class solutions.

**Under the Name BEAM (Bavarian e-tonomous Air Mobility) A complete overview on the autonomous eVTOL scene will be published at the beginning of 2019**

一个名为BEAM（巴伐利亚电动自动飞行的简称）的统筹项目已经设立，将对自主飞行电动垂直起降飞机的总体发展情况进行全面分析，计划于2019年初发布该研究报告



Consequently, these advantages must further be developed, therefore test areas for practical operational testing are needed all over Germany. The Bavarian Aerospace Cluster bavAIRia e.V. has been working for over five years in organizing the UAS Forum in this field. Beside conferences, workshops and networking events, they also managed the first German UAS Test Range at different locations. It's now time for shifting into second gear. The experimental Airport Oberpfaffenhofen near Munich, Germany Bavaria is a great asset, as it has testing experience with the National Research Agency DLR including UAS applications from bavAIRia members.

#### OBJECTIVES FOR THE EXTENDED TEST RANGE FOR UNMANNED, ELECTRICAL FLYING (TUEF) IN BAVARIA

Building the pilot region for Air Taxis and UAS, a dedicated test range for developing hardware, software and adequate procedures within a realistic operations environment is fundamental. The following objectives are essential:

- Development, testing and operation of UAS, Air Taxis and electrical powered Aircrafts
- Components and procedures for safe integration into airspace
- Testing of new applications under realistic operational/ environmental conditions
- Extending step by step existing VLOS test area to BVLOS area
- Use of existing infrastructure and expansion with new features for automatic landing / charging facilities

#### BENEFITS OF NEW TEST AREA

Bavaria and Germany, both benefit from this new facility the vast opportunities to improve existing and new business ideas. New ways of co-operation between research, universities and industry, including start-up companies, can flourish even more with the close vicinity of practical test facilities supported by the local government. A strong interest for partnership between industry, university and start-up companies exists. Investment partners for infrastructure are also available.

#### NEXT STEPS

Currently, the analysis of requirements of future users is taking place followed by the finalization of financial planning and funding. Furthermore, discussions about installing a safe airspace of 60 km length is being conducted as well as measurements for a safe integration and cooperation within the existing airspace. New technologies using mobile networks including 5G will be introduced.

bavAIRia as project coordinator invites all interested members of the community to join forces for the sake of developing a market for safe, unmanned electrical air traffic world.

**bavAIRia**, the Bavarian Aerospace Cluster is representing, since 2006, over 300 members (75% are SME) in the field of Aerospace in Bavaria. It is located at the Special Airport Oberpfaffenhofen, near Munich, Germany.  
info@bavAIRia.net  
www.bavAIRia.net

批无人机试飞场。现在该联盟将加大工作力度, 加快推动步伐, 为此牵头组织设立了位于慕尼黑附近的奥博哈芬霍芬机场的专用测试场所, 该机场作为此类新型航空器的试飞机场再合适不过, 因为该机场本来就有多家科研机构驻场, 包括德国宇航中心 (DLR) 和多家巴伐利亚州航空产业联盟的无人机会员单位。

为培养城市空中交通载具 (Air Taxi) 和无人机飞行员, 必须设立一个专门空域, 以开展软硬件研发和最贴近实际的测试环境。该试飞空域的主要目标是:

- 无人机、城市空中交通载具 (Air Taxi) 和电动飞机的研制、测试及运营
- 上述航空器进入融合空域所需设备的测试及实际运营
- 贴近实际的新应用测试
- 从现有的视距内操纵试点区域逐渐扩大至视距外操纵
- 在现有设施基础上改造新增自动起降和充电设施

#### 新试飞空域的优势

巴伐利亚州及德国其他各州都能利用该试飞空域对各类新项目进行测试, 还可以增进各研究机构、院校和产业界的交流合作, 由州政府提供支持的该测试场地和各类设施也有利于包括初创企业在内的周边各类企业单位的发展。产业界、院校和初创企业对建立合作关系已有浓厚兴趣, 该试飞空域项目也已经吸引了许多投资机构的关注。

#### 下一步工作计划

目前, 该试飞空域的预计用户分析已经在进行之中, 随后将完成财务预算, 同时还同步开展设立60公里长度的安全缓冲空域的讨论, 并计划在该试飞区内测试5G移动网络控制技术。

bavAIRia作为上述项目的执行单位, 诚邀广大相关企业单位共同携手建设一个安全的无人驾驶电动飞行环境和开拓这一广阔市场。

bavAIRia作为德国巴伐利亚州航空企业产业联盟, 成立于2006年, 已聚集了该州超过300家各类航空相关企业, 其中75%是中小企业。该联盟位于慕尼黑附近的奥博哈芬霍芬机场。

联盟的宗旨是促进产业界、中小企业、院校、科研机构以及相关政府部门之间的合作交流, 推动该州在该领域的国际竞争力。

联系地址:

info@bavAIRia.net  
www.bavAIRia.net

## TU Munich



**The Technical University of Munich (TUM) is in the center of the eflight activities in Bavaria.**

**Professor Florian Holzapfel, head of the Institute of Flight System Dynamics describes what is so interesting in the new technic developments :**

Disruptive progress in various technological domains like compact high-performance computing power for safety critical applications, rugged high quality sensors – inertial, GNSS and air data, extremely low weight carbon-fiber structures along with synergies with other domains like autonomous driving or e-mobility with ever growing efficiencies, performance and energy densities of motors, components and batteries suddenly enable new types of aviation just unimaginable a decade ago. Electric planes, unmanned aviation and urban aerial mobility have a bright future and a tremendous market potential – this is not only acknowledged by technologists but also realized by investors and increasingly also governments and regulators.

Besides the new technical possibilities per se, but this is a tremendous chance also for small and medium size enterprises, new start-ups, research institutions and universities – it offers the chance of a re-vitalization of the overly consolidated aerospace landscape and a multitude of high profile jobs in exciting high tech areas.

It is a great pleasure to see that especially in the State of Bavaria, many small companies and research groups were able to attract significant investment from all around the world. This is a proof of the capabilities and the know how in these new domains – apart from the classical players. However, to be internationally successful and have long-term perspectives, it is mandatory to have the possibility to test and demonstrate the own products and developments under realistic conditions right at the “home base”. With many new players on the field, it makes sense to have shared testing facilities and a joint legal and operational basis for testing. Beyond this, it is very important, that the test area is operated by an independent institution with no competing commercial interests. For this reason, we all emphatically support the planned test area around the Oberpfaffenhofen airport, spanning via Landsberg/Penzing to Mindelheim in the West and Kaufbeuren in the South, as a home for a multitude of small and medium sized enterprises, research institutions and university institutes. This allows us all to test and demonstrate our

## TU Munich

慕尼黑技术大学是巴伐利亚州电动航空发展的中心。

该大学飞行动态系统系主任Florian Holzapfel教授描述电动航空所带来的技术发展的动人之处：

多个关键技术领域的突破性发展辅之以相关领域的协同发展效益，使得十年前难以想象的新的飞行方式成为可能。这些关键的颠覆性技术包括高性能计算机的小型化，能够满足重要安全应用的大量快速计算要求，高性能传感器比如惯导、全球导航系统、大气数据、超轻碳纤维结构，与之发挥协同效应的相关技术包括汽车自动驾驶、越来越高效的电动交通技术、高性能和高功重比电机和电池等相关部件。电动飞机、无人机和城市空中交通的前景大好，具有巨大的市场空间，这种观点不仅仅是技术专家认可，投资者和越来越多的政府相关部门也已经充分认识到这种航空创新技术的市场机遇。

这场技术创新给整个航空业带来了巨大的发展机遇，特别是对高技术中小企业、初创企业、研究机构和高校，因为新技术开创了新市场，有助于打破长期固化的航空市场格局，非常有利于中小企业和初创企业的发展，而且还能创造大量的高技术工作岗位。

令人激动的是，德国巴伐利亚州政府正在积极推动这场航空技术创新，位于该州的相关中小企业和研究机构已经受益于该州的鼓励政策，已经吸引了全球投资者的青睐。这种良好的发展局面再次证明了在航空领域的这类技术创新的巨大影响力和快速发展，而不仅仅限于只是传统老牌航空企业受益。

不过，为了在世界范围内获得长期的成就，就必须在最贴近真实使用环境的“主场”条件下，对各项技术和产品进行测试。随着越来越多的企业和产品进入该领域，有必要共同建立共享的试飞场地并制定相应的法律和运营的行业规范。为此，必须由独立的第三方机构来管理和运营该试飞场地，以避免利益冲突。

为此，我们愿意积极支持在巴伐利亚州的奥本法芬霍芬（Oberpfaffenhofen）机场规划设立的电动飞机和无人机测试空域，该空域范围计划从西面的蓝茨伯格/彭兴到明德海姆，至南面的考夫堡恩，该空域将作为多家中小型企业、研究机构和院校的测试基地，用于上述企业和单位测试其各类无人机、电动飞机和城市空中交



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通载具。该空域所在范围内聚集了大批该类企业和院校，因此该区域十分适合设立此类测试空域，开展试飞活动。我们十分期待巴伐利亚州州长及其领导的州政府尽快实现这一规划目标，进一步促进该州航空技术创新的快速发展。



TU Munich competence: Prof Florian Holzapfel (left) and Prof Mirko Hornung (top)



Oberpfaffenhofen residents: eVTOL – Lilium (left) And drone manufacturer Quantum (top)



Bavarian primus Airbus (left) Siemens-RUAG electrified Dornier – 228 project (top)





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## Campus of Technology—the Future made in Oberpfaffenhofen

### asto Park –Part of the e-tonomous AIR Mobility in Bayern

#### 科技园—奥博法芬霍芬机场

#### 航空工业园—拜仁州的城市电动空中交通项目计划落地



Digitally connected, electric and autonomous flying: This is how many people in the aerospace industry imagine the future. With Autoflight X, Quantum system and Lilium, Oberpfaffenhofen is already the location for e-tonomous AIR Mobility. In detail, this means that the research and establishment of air taxis is already happening around the asto park. Above all, young innovative stationed companies as well as established technology companies, which want to use the dynamics of the location and to bundle their activities in the asto park, are addressed

The Asto Park and the research airport in the southwest of Munich are also officially the hotspot of the aerospace industry. In 2017, the Federal Ministry of Transport has named Oberpfaffenhofen as one of the twelve nationally important airports when presenting the air traffic concept. The internationally renowned location is considered the cradle of German aerospace.

In the meantime, around 8,000 sustainable jobs have been created across the site. Innovative technologies in aerospace, satellite navigation, IT, mechanical engineering, robotics and automotive are developed and produced here.

In the immediate vicinity of the international aviation group RUAG, the satellite manufacturer OHB and the DLR with its Galileo control and robotics center, more than 80 technology companies have settled in the Asto Park. The internationally operating companies in the Asto park are u. a. the ESA Incubator, the aircraft manufacturers Dornier-Seawings and Lilium, Telespazio, OHB as well as companies such as AOA (Diehl Group), Dassault Systèmes, Microchip, SII, Mynaric, Quantum Systems, Valeo, pro-beam and Coherent.

现在许多航空界人士眼中的行业未来将是：数字化互联、电动和自主飞控的飞行方式。随着许多创新性航空企业入驻，比如Autoflight X、Quantum、Lilium等，奥博法芬霍芬机场已然成为城市电动航空交通项目（e-tonomous AIR Mobility）的大本营。这意味着城市交通电动机型的研制和生产已经在该园区开展。各个入驻的创新性初创企业和已经在此的各类科技型企业将充分利用园区创造的有利环境，互相促进，共同发展。

奥博法芬霍芬机场及其航空工业园位于慕尼黑西南部，已经成为航空工业的重要所在地。2017年，德国交通部将奥博法芬霍芬机场定为全德国12个国家级空管创新重点机场之一，作为国际知名大都市，该地区将成为德国航空工业的发展源泉

与此同时，该园区范围内已经创造了8000多个长期工作岗位，来自航空、卫星导航、信息技术、机械制造、机器人、汽车等行业的大批创新性技术正在此蓬勃发展。

该园区范围内聚集了许多世界水平的航空航天企业集团，例如RUAG集团、卫星制造企业OHB、德国宇航中心（DLR）的伽利略卫星导航系统控制中心和机器人研发中心。共有80多家来自世界各地的科技型企业已经入驻该园区，例如欧洲航天局孵化中心、德国道尼尔Seawings水上飞机公司、Lilium电动飞机公司、Telespazio、OHB，还有AOA（德国代傲集团）、达索系统、Microchip、SII、Mynaric、Quantum系统、Valeo、pro-beam、Coherent等著名航空航天企业。





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Text & Photos: Willi Tacke, Xin Gou

An Icarus C42-e in final  
C42-e 电动飞机起飞



# A quiet electric gala on the ground and in the air

## 欢乐的空地一体电动交通



BMW i3 is the most popular  
electric car at the event.

宝马 i3 是这场活动中最多的电动车



今年，一场在德国已经举办多年的电动车巡游大会首度在三维空间同步进行。德国巴伐利亚州南部的eRUDA电动车巡游大会（意为绕阿莫湖电动车环湖巡游）在10月5日至7日举行，今年首次邀请多款电动飞机参与，将电动交通的舞台从地面扩展到天空。据我们所知，这场活动应该是首次同时有电动车和电动飞机参加的电动交通展示活动。

eRUDA电动车巡游活动从2013年开始每年举行，最初的路线是环绕该地区的美丽的阿莫湖，这也是该活动得名的原因。随着大众对电动车的兴趣越来越浓厚，以及电动车的性能特别是续航里程越来越高，该活动的行驶路线也越来越丰富，以提高参与者的驾驶乐趣、挑战性和对观众的吸引力。今年的三天活动期间，10月7日这天是整个活动的高潮，不仅行驶路线最多最长，而且首次与电动飞机飞行表演共同举行。

我们到达活动所在的Greiling机场时已经稍晚，但还是看到现场有40多辆各型电动车和十多架各类电动航空器。在场的电动车以宝马i3和尼桑Leaf为主，毕竟巴伐利亚州是宝马总部所在地，Leaf则是欧洲地区性价比最高的纯电动车型。特斯拉当然也是少不了了，特别是现场还有一辆第一代特斯拉路特斯敞篷跑车，这款跑车开创了特斯拉历史，同款的那辆马斯克自己的路斯特今年2月更是被装在试射的猎鹰重型火箭上被发射到太空，正向宇宙深处飘飞而去。此外，还有一辆非常罕见的大众XL1超高经济性油电混动车，该车从2013年开始仅限量生产250台，是集当年大众高效技术大成的高端车型。当天参加的电动飞机也是多种多样，包括固定翼、动力滑翔机、动力三角翼、悬挂三角翼、超轻机、超轻机、自制飞机等，基本展现了目前投入实用或已量产的电动航空器的类型。

参加电动车大会和电动飞机航展最需要适应的一点就是特别安静。对于习惯了赛车场和飞行表演的噪音的传统爱好者可能的确需要一些时间来适应，但一旦习惯后，就会发现电动交通活动的真正魅力。没有了震耳欲聋的噪音和让人喘不过气来的废气，观众就可以更好地静静欣赏参展车辆，更好地享受飞行表演。只是在现场走动时必须更加小心，因为电动车甚至电动飞机都太安静了，从后面驶来时稍不注意就容易忽略。

**A large electric car rally in Germany evolved to the 3rd dimension this year. The eRUDA (electric around the Ammersee Lake) electric car rally in southern Bavaria, Germany was held from Oct.5-7th. This year they were joined with a fleet of electric aircraft. To the best of our knowledge, it may very likely to be the first of this type of coordinated event to celebrate electric mobility both on the ground and in the air.**

The annual eRUDA started in 2013. The route initially was around the Ammersee Lake in the area. Over the years with the growing interests in electric mobility and the increasing performance of electric cars, the routes have become more diversified to make it more challenging to participating cars and to attract more attention. This year there are several rally routes over the three-day event including one stopover at Greiling airport on Oct.7th to join a group of the electric aircraft.

When we arrived relatively late at Greiling airport, we saw about 40 electric cars and a dozen electric aircraft. The electric car fleet was dominated by BMW i3 and Nissan Leaf, followed by Tesla, but there were some interesting ones. There was a first-generation Tesla Roadster convertible (the same model launched on a SpaceX rocket heading to deep space this February), even a very rare Volkswagen XL1 diesel hybrid super-efficient car (only 250 units produced). The electric aircraft fleet has a good mixture with a C42 fixed wing, motorgliders, trikes, hang gliders, experimental, and ultralight. The electric airplanes on the site mostly represented nowadays commercially available electric airplanes.

It is a little weird to be at a car rally and airshow which was very quiet. Old-timer car rally and airshow goes who go for the roaring sound of the high-power engines may take a while to get used to it, but once you sink in a little, you would find the beauty of such e-mobility gathering. Without the noise and exhaust gas smell, people can appreciate the cars better and enjoy the flying performance better. You just have to be more careful wandering around the apron and especially the flight line.



**This homebuilt airplane with single-disc electric motor from Geiger has good gliding characteristics.**

这架自制电动动力滑翔机采用 Geiger 电机，具有良好的滑翔性能



**The Geiger double motor is redundant throughout.**

All electric airplanes at Greiling made demo flights, showing the practical capability of electric aircraft. Among the electric airplanes on that day, many use Geiger motors which may be the most widely-used electric motor on electric airplanes as of today. Geiger Engineering's founder Joachim Geiger told us at Greiling that there are already over 60 electric aircraft projects flying with their motors and many more are under development including eVTOL model. The largest ultralight manufacturer in Germany Comco Ikarus brought their electric C42 to Greiling and made multiple demo flights. The electric C42 installs a 32-kilowatt (50 horsepower) electric motor from Geiger and has four battery packs 15 kilograms each. Production versions may have six battery packs, enabling flight times of up to 90 minutes. Even though having less power than the Rotax 912-powered version, the electric C42 did not appear to be lame in the demo flight at all. The electric C42 made several low passes each of which ended with steep climbs. The 32kw Geiger motor costs only several thousand Euros. The number of battery packs installed can be variable depending on the budget and application, so flying an electric C42 can be justified financially. There were also fun machines including EGO trike and several hang gliders with electric motor harness. Combining MGM Compro motor with high-performance ATO wing and light carbon fiber materials, EGO trike makes a high-end powered trike product. Miloslav Novotny of EGO trike flew in formation with electric-powered self-launch hang glider, which was a very elegant and enjoyable view with almost no sound.

本次在Greiling机场参展的多款电动飞机进行了飞行表演，充分展示了电动飞机已经具备的实用性和性能。本次参展的很多飞机使用的是德国Geiger公司的航空专用电机，该公司的电机及其配套的电调很可能是目前在电动飞机上使用最广泛的电机产品，包括动力伞、动力三角翼和超轻机。该公司创始人Joachim Geiger在现场向我们介绍说，全球已经有60多款电动机型采用了他们的电机，还有多款在研机型包括eVTOL电动垂直起降机型项目。德国销量最大的超轻机公司Comco Ikarus本次带来了使用Geiger电机的C42双座超轻机，进行了多次飞行展示。电动改型C42飞机安装了一台Geiger公司电机，持续功率32千瓦（50马力），采用四个电池组，每组15公斤，量产型将可以选装六组电池，最长续航时间可达90分钟。虽然从功率上看该电机小于该机本来安装的罗泰克斯912内燃发动机，但飞行表演过程中该机一点儿不显动力不足。该机做了多次低空通场飞行，每次通场最后都是快速拉起，急速爬升，爬升率显得很不错，然后收小功率后，整个飞机就非常安静地巡航，即使是本场飞行，现场也只能听到很小的声音，充分显示了电动飞机的低噪音优势。装在C42飞机上的Geiger电机售价几千欧元，电池组可以根据预算和用途需要灵活选择，更容易满足不同用户的需求。除了固定翼超轻机，参加这次活动最多的就是动力三角翼和悬挂三角翼。来自捷克的EGO单座动力小车采用捷克MGM Compro电机，配合德国ATO高性能硬式三角翼翼面，采用高质量碳纤维制造，是很实用的高性能电动三角翼。EGO公司的Miloslav Novotny驾驶动力三角翼与采用电动吊袋的自升空悬挂三角翼进行了编队飞行，非常赏心悦目，几乎没有任何声音，只有外观流线漂亮的三角翼静静地划过天空。





Geiger 同轴双电机具有很好的安全冗余性



An Ego electric trike from the Czech Republic with almost three hours of range.

捷克的 Ego 电动单人三角翼续航近三小时

在Greiling机场的这次电动空地一体展示活动，展现了各种电动交通技术和用户的相互支持配合，共同携手发展的热情和良好的协同效应。正如西门子执行副总裁、电动航空负责人弗兰克安东博士所说，“世界正在电动化，无论是空中、地面还是海洋。”我们期待明年的eRUDA电动车巡游有更多的电动飞机参加，更希望在不久的将来，会有水陆空三位一体的电动交通大会的出现。如果您作为本刊读者，对电动飞机更感兴趣的话，那您一定不能错过明年4月10-13日在德国腓得烈港市举行的e-flight-expo电动航空展暨电动飞行表演，这是世界上规模最大的电动航空展会，明年将迎来它的10周年庆典。

At Greiling it is really exciting to see that different kinds of e-mobility are helping each other and developing hand-in-hand. Just as Frank Anton, the head of eAircraft and the initiator of electric aircraft development at Siemens AG said, “the world is becoming electric, whether in the air, on land or at sea.” We are looking forward to the eR-UDA with electric aircraft again next year and perhaps even an e-mobility event with electric cars, electric aircrafts and electric boats altogether sometime in the future. But if you are a more avid electric aircraft follower, then you definitely should mark your calendar for e-flight-expo, the largest electric aviation tradeshow and the electric airshow which will have its 10th anniversary next year, on April 10-13, 2019 in Friedrichshafen.



The Tesla Roadster: Elon Musk caught the eye with this first-generation e-car.

第一代特斯拉路斯特跑车：这就是伊隆马斯克开启电动车时代的车型

# Chinese-Bavarian Joint Venture agreement signed:

## 10 Seat e-Aircraft Made in Bavaria

## 在巴伐利亚州研制的 的 10 座电动飞机

**Electric Aircraft Pioneer Calin Gologan will develop and build a 2 seat e-trainer and a 10 seat passenger e-aircraft in Bavaria in cooperation with EADCO and Chinese investment. A contract was signed in a meeting with the Bavarian Ministry of Economics at the ministry in Munich in September.**

At a meeting with the Bavarian Minister of Economic Affairs Franz Josef Pschierer, Gao Shengli, Chairman of Zhonglan Aviation, Rosario De Luca, Managing Director of SCYLAX GmbH and Calin Gologan, Managing Director of SCYLAX GmbH and Elektra Solar GmbH, signed an agreement worth 75 million Euros for a groundbreaking aviation joint venture on September 18th 2018 in Munich at the Bavarian Ministry of Economic Affairs. The three companies want to develop and produce several electric aircraft, including the world's first 10-seat electric aircraft E-10, a 6-seat Demonstrator E-6, a two-seat electric training aircraft, and a light unmanned solar powered glider that will operate autonomously at high altitude.

At a meeting with the Bavarian Minister of Economic Affairs Franz Josef Pschierer, Gao Shengli, Chairman of Zhonglan Aviation, and Rosario De Luca, Managing Director of SCYLAX GmbH and Calin Gologan, Managing Director of SCYLAX GmbH and Elektra Solar GmbH, signed the agreement

电动飞机设计先驱卡林格罗岗将在德国巴伐利亚州与德国EADCO公司和来自中国的投资者共同研发双座电动教练机以及10座电动通勤飞机。9月，本项目在慕尼黑的巴伐利亚州经济部签订合作协议

9月18日在德国巴伐利亚州经济部部长Franz Josef Pschierer见证下，中蓝航空董事长高胜利与德国SCYLAX公司两位执行董事Rosario De Luca和Calin Gologan在慕尼黑签订了合作协议，达成7500万欧元的合作框架，将共同推动多个电动飞机项目的研发生产，包括世界上首个10座电动及混动机型E10、6座的E6电动飞机、一个双座电动教练机及一个高空长航时太阳能无人机。

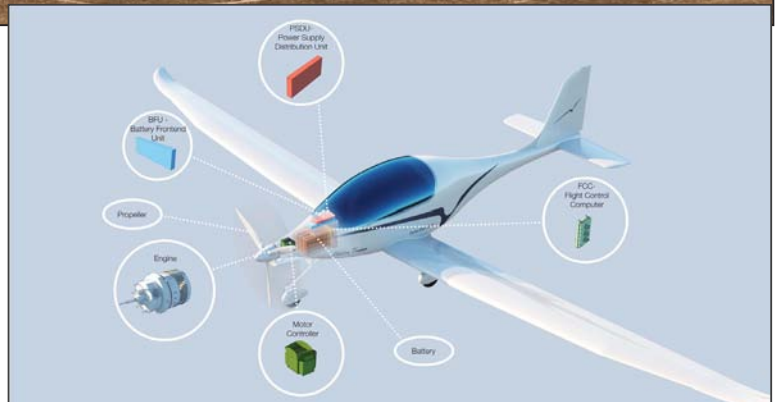
**在德国巴伐利亚州经济部部长 Franz Josef Pschierer 见证下，中蓝航空董事长高胜利与德国 SCYLAX 公司两位执行董事 Rosario De Luca 和 Calin Gologan 在慕尼黑签订了合作协议**







For the past 6 years Elektra Solar, in particular the predecessor PC Aero, has been designing and building a family of solar-electric aircraft, Elektra Solar 公司及其前身 PC Aero 公司在过去六年中已研发试飞了多款电动飞机



Scylax是电动航空初创企业, 其创始企业都具有深厚的技术和行业背景。Scylax

由德国Elektra Solar和EADCO公司合资成立。Elektra Solar公司创始人Calin Gologan是电动飞机领军人物之一, 长期致力于电动飞机研发, 已经研制了多款电动及太阳能飞机, 其研制的Elektra One单座电动超轻机从2011年开始已经持续飞行, 并在2013年德国e-flight-expo电动航空展上首次亮相, 该机的最新改型在翼面上增加了太阳能电池板进行补能。该机的兄弟企业Elektra UAS公司是德国航天技术中心 (DLR) 的孵化企业, 该机已由该公司进行了无人化改装, 具备了自主飞行能力, 可以实现有人机上操控或无人自动飞行。EADCO公司有丰富的航空项目管理经验、技术研发和结构分析能力, 该公司创始人Rosario De Luca参与过多个飞机项目管理, 包括空客A350、A400M、A330、A380、A320、欧洲战斗机、Seastar和利尔85喷气公务机等。

Scylax计划在2年内完成六座的E6验证机制造和完成10座的E10飞机的设计。两机都为双发, 采用两个大功率航空电机和配套螺旋桨, 都可以采用纯电或混合动力系统, 根据设计指标, 纯电时, 两机航程为400公里, 采用混动系统时, 两机航程为1800公里, 最大巡航时速360公里, 两机都具备短距起降能力 (STOL), 起飞距离为100米, 爬升率为每秒15米, 着陆距离200米。



Though a start-up itself, Scylax's founding companies have a vast experience in electric aircraft and aviation project. Scylax is founded by Elektra Solar GmbH and EADCO GmbH. Founded by Calin Gologan, for the past 6 years Elektra Solar, in particular the predecessor PC Aero, has been designing and building a family of solar-electric aircraft, including Elektra One, the single seat ultralight which has been flying since 2011 and first presented at e-flight-expo in Friedrichshafen in 2013. The latest version of Elektra One, named Elektra One Solar is equipped with solar cells on the wing surface as range extender. With the support of DLR's robotics and mechatronics institute (RMC), these aircraft are now prepared for test and demonstration of optionally piloted and/or unmanned operation, using advanced autopilot and remote ground control station technologies. Professor Gerd Hirzinger former Director of the RMC institute is a partner in Elektra Solar and will support the program with his decade long experience in automatization.

EADCO is specialized in project Management, R&D, structural and systems design. EADCO's founder Rosario De Luca has been involved in numerous projects in his aviation career such as A350, A400M, A330, A380, A320, NH90 Eurofighter, Seastar and LEARJET 85.

Scylax plans to build the E6 proof of concept (POC) and to complete the engineering of E10 in two years. Both designs will have two motors and propellers and can both be pure electric or hybrid. When being purely electric powered, both are designed with a range of 400 km with currently available battery technology. When using hybrid power, both E6 and E10 will have a range of 1800km and max cruising speed 360km/h. Both E6 and E10 will be STOL airplanes with a projected takeoff distance of 100m, climb rate of 15m/s, and landing distance of 200m.

e-flight-expo - 10th anniversary

# eVTOL Approaching

## 电动航空展 10 周年庆典：电动垂直起降机型来临

When the world's leading GA Fair "AERO Friedrichshafen" started the e-Flight-Expo in 2009 it was the world's first show for electrical Aircraft. Last year the e-Aircraft filled a full 6000 square meter Hall. Also the first e-Flight-Show took place - with electric Aerobatics. For the 10th anniversary in 2019, flying eVTOL are expected in the sky over lake Constance.

当世界最大规模的通航展——位于德国腓得烈港市的 AERO 通航展在 2009 年开始举办 e-Flight-Expo 电动航展时，这是世界首个电动航展。十年之后，去年的电动航展占据了 6000 平米的展馆，并首次举行了有电动特技机参展并做精彩的特技飞行表演的电动飞行表演 e-Flight-Show。至此电动航展 10 周年之际，将会有更多更精彩的内容，电动垂直起降飞机将出现在美丽的博登湖上空。



The report of first e-flight-expo in 2009

德国《飞行》杂志 2009 年对首届电动航展的报道



Volocopter's prototype made the first public appearance at e-flight-expo in 2012.

过去与现在：德国 Volocopter 电动多旋翼飞机在 2012 年的电动航展上首次公开亮相

People say time flies. With electric propulsion, time seems flying faster. Next year will be the 10th e-flight-expo. When e-flight-expo was founded in 2009 by AERO and Flying Pages GmbH, it was world's first and only trade show dedicated to electric aviation. It seemed quite futuristic to even think about electric airplane back then, if not too lunatic. In 2009 iPhone was just two-year old. Cell phones with keypad still dominated the market. Lithuania's LRTC rolled out the world's first operational 4G mobile network on March 2009, the same month that year when Uber was founded. Mark Moore designed the electric eVTOL called "Puffin" at NASA in 2009.

The Green Flight Challenge of NASA sponsored by Google was announced at AirVenture in 2009. Tesla just began delivering its first generation roadster electric car in 2009 and didn't release its first auto drive function on Model

俗话说光阴似箭，对于电动飞机来说，时光的速度仿佛更快。一转眼明年就将是电动航展 e-Flight-Expo 十周年了。当德国 AERO 通航展与德国 Flying Pages 公司共同在 2009 年举办首届电动航展时，是世界首个也是唯一的电动航空展会。当时电动航空仿佛还是很遥远的事，甚至是有点儿疯狂的想法。的确，2009 年时，iPhone 才刚出来 2 年，带键盘的手机还在一统天下。第一个商用 4G 网络才刚在 2009 年 3 月在立陶宛投入使用，当月优步公司才刚成立。NASA 的马克摩尔设计了一款轰动一时的“海鹦”单人电动垂直起降飞机。

那一年 7 月的美国奥什科士航展上，NASA 宣布设立绿



色飞行挑战赛，谷歌是赞助商。2009年，特斯拉公司开始交付第一代路斯特电动车，它的首个自动驾驶功能还要等5年之后才会在S车型上首次推出。那一年大疆才成立三年，距离树立市场标杆的精灵无人机推向市场还有足足四年。戈尔副总统的环保纪录片《难以忽视的真相》三年前发布后引起了巨大反响，戈尔在2007年凭借该片获得了诺贝尔和平奖。我国三年后开始发布PM2.5空气污染指数。2009年1月奥巴马宣誓就任美国总统。那一年，默克尔已经在任德国总理四年。

在那之后，智能手机、4G网络、消费类无人机、电动车、自动驾驶、共享出行、空气质量、极端天气等等已经成为席卷全球的产品和话题。伴随这些相关技术的快速发展，以及人们的思维方式的改变，电动航空从“不可能”变成了“势在必行”的事物。作为市场重要的风向标，e-Flight-Expo电动航展及附属的电动航空论坛也在这十年间不断发展壮大，从2017年开始占据了6千平米的展馆，并推出了世界首个电动飞行表演。截至目前，全球已经有多个短途通勤电动飞机、100多个电动垂直起降机型在研，一些市场观察者们甚至已经开始担心电动航空出现投资过热的局面。默克尔还仍然是德国总理。

第十届电动航空展将于2019年4月10日至13日在德国腓得烈港市举行的AERO通航展期间同期举行。这将是电动航空的重大庆典，回首往昔，展望未来，新老朋友齐聚。我们将全力组织一场内容丰富、形式多样的电动航展，将有更多的电动飞机和厂商参展，固定翼、电动垂直起降、飞行汽车，将应有尽有。同时将继续举行电动飞行表演，还将有电动垂直起降飞机进行飞行表演！明年的世界最大规模电动航展期待您的到来。



In 2017 e-flight-expo held the world's first e-flight-show.

**2017 年电动航展举办了世界首次电动飞行表演**



Planned for 2019 flying eVTOLs

**2019 年将计划电动垂直起降机型飞行**



S five years later. DJI was three-year old and didn't release the first drone model until four years later. In 2009 Al Gore's environmental documentary film "An Inconvenient Truth" was released three years ago which brought him the Nobel Peace Prize in 2007. Chinese people didn't hear of the PM2.5 air pollution concept until three years later when the first micron bit index was released. Barack Obama was sworn in as the US president in January 2009. Angela Merkel has been the German Chancellor for four years.

Since then, smart phones, 4G network, consumer drones, electric cars, auto drive, ride sharing, air quality, extreme weather have become prevailing commercial products and social subjects around the world. Propelled by these technologies and the associated changing mindset of the market and the society, electric aviation has been evolving from "impossible" into "inevitable". As a good indicator of the market trend, e-flight-expo has become larger and large in scale and finally took over the whole A7 hall with over 6000 square meters exhibition area at AERO in 2017 and introduced the world's first e-flight-show the same year. As there are publicly announced several electric commuter and regional aircraft projects and over 100 eVTOL projects, some industrial and market insiders have even began worrying about electric aviation overheat. Angela Merkel is still the German Chancellor.

The 10th e-flight-expo will be held from April 10 to 13 in 2019 at AERO in Friedrichshafen, Germany. It will be a good opportunity to celebrate what have been archived in electric aviation in the past decade and to look into the future. We are making great efforts to organize a historical event with the largest ever electric aviation expo in terms of show plane numbers and diversity. Fixed wing, eVTOL, flying car, and everything in between. We also expect more electric aircraft than even giving demo flights at e-flight-show, perhaps even including eVTOL! After ten years of hard work, now it is time for takeoff. Looking forward to seeing you at the world's largest e-flight-expo in April 2019.



EU Commissioner Violetta Bulc in the first eGyro 2015

**欧盟委员 Violetta 2015 年体验首架电动旋翼机**

# Long way... to electric Aviation eVTOL and autonomous flight

## 电动航空、电动垂直起 降和自主飞行之路



As the global general aviation industry has developed over the years, the General Aviation Manufacturers Association (GAMA) has been in the forefront of coordinating and providing leadership for new entrants, new technologies, and technology disruptions. Once GAMA was an organization representing only U.S. companies but today, GAMA represents companies around the world. GAMA expanded from several dozen members to currently over 110 full and associate members. We represent the global GA industry, with members in the Australia, Brazil, Canada, China, Europe, India, Israel, and the United States. In addition to aircraft manufacturers also represents engine, avionics and component manufacturers and certain maintenance, repair and overhaul companies and other service providers. Most recently, in 2015, GAMA established a new category of associate member and created a committee to address issues in the most innovative and cutting-edge trends and technologies in the growing field of electric and hybrid propulsion and innovation and simplified vehicle operations.

Today, many of GAMA's traditional member companies, along with new associate members, are charting a new path for the breakthrough technologies that will revolutionize aviation as we know it. The GAMA Electric Propulsion and Innovation Committee (EPIC) works to enable certified hybrid and electric propulsion and increased automation in general aviation design, production, maintenance, and operations across key global aviation regulators.

The Electric Propulsion & Innovation Committee considers likely developments and technologically mature innovations which can support the growing safety and utility of general aviation. The committee focuses efforts on creating an environment conducive to efficient design and production certification. Key technological considerations include:

- Hybrid/Electric Propulsion & Increased Electrification
- Simplified Vehicle Operation & Increased Automation
- Electric Vertical Takeoff and Landing (eVTOL)
- Electric Aircraft Infrastructure

总部位于美国华盛顿的通航制造商协会 (GAMA) 是世界上规模和影响力最大的通航行业协会, 自从 2015 年成立电动航空与创新委员会 (EPIC) 以来, 由于 GAMA 的巨大号召力和电动航空的迅速发展, EPIC 成立以来已经吸引了 50 多架各类企业, 几乎囊括了电动航空产业的全部企业, 其中既包括传统的通航龙头企业, 也有很多电动飞机初创企业, 还有许多跨界发展的其他领域领军企业。

许多 GAMA 的传统厂商单位和新加入的合作成员单位都已制定了旨在实现航空重大技术突破的发展规划。GAMA 的电动及创新委员会 (EPIC) 正积极与各国航管部门沟通协调, 大力促进混动和全电动动力产品、通航自动化飞控产品、新加工工艺及上述产品相应的使用维护等领域的适航审定工作。

EPIC 委员会支持的技术领域主要是具有良好发展前景和成熟度较高的技术创新, 这类技术有利于提高通航安全和用途。该委员会致力于创造一个有利于新技术设计应用和产品适航审定的良好环境, 目前该委员会主要关注的领域包括:

- 混动 / 全电动动力系统及多电系统
- 简化座舱操作及更加自动化的飞控
- 电动垂直起降机型 (eVTOL)
- 电动飞机基础设施





**GAMA president Pete Bunce spoke at EPIC meeting**  
GAMA 主席皮特邦斯在 EPIC 委员会会议上讲话

该委员会还与主要的研究机构建立了良好的工作关系，以助力相关技术的产业化。

自从 GAMA 积极推动电动航空以来，与多国航管部门关于混动和电动动力系统适航审定的沟通工作已经取得了重大成效，例如美国联邦航空局（FAA）的发动机和螺旋桨主管部门以及小飞机创新主管部门正在研究制定电动动力系统的适航审定政策。GAMA 已经建立了涉及电动航空的适航政策进展的进度跟踪机制，并于 2016 年发布了第 16 号文件作为电动飞机的一般性使用参考规范（下载地址：<https://gama.aero/wp-content/uploads/GAMA-Publication-No-16-Hybrid-and-Electric-Propulsion-Performance-Measurement-1.pdf>）。关于电动飞机适航的一个关键议题是讨论制定适合各类电动飞机的安全余电量，包括固定翼机型和 eVTOL 电动垂直起降机型。

鉴于我们已经积累了很多该领域的可行性研究的经验，对此已有深入理解，因此有必须对上述的一般性使用参考规范进行更新，以体现关于安全余电量的最新意见。例如，最新的要求之一是电动垂直起降阶段所需的最低余电量要求，该项要求对于该类机型的适航审定至关重要，这点跟目前的关于特定飞行阶段的最低飞行时间保障有所不同。同时，电池技术的最新发展也对有关技术规定提出了新的要求，包括航空用锂离子电池（Li ion）的化学特性使得对其的关注重点在于重量能量密度比、可燃防范、使用温度范围等，与地面交通涉及该类电池时所关注的价格、体积能量密度比、重量能量密度比等因素的先后顺序不同。



**GAMA event at EAA Airventure**  
GAMA 在 EAA 奥什科士航展上与各方交流

This committee also maintains relationships with key research entities to facilitate the rapid industrialization of enabling technologies.

Since GAMA began efforts to support the development of electric aircraft there has been significant movement in the regulatory environment to enable hybrid and electric propulsion and regulatory authorities such as the FAA's Engine and Propeller Branch and the Small Airplane Innovation Branch are studying the expected path for the certification of electric propulsion motors and installations. GAMA has maintained a summary of the regulatory design environment to date. In 2016 the electric propulsion community developed GAMA Publication 16 (<https://gama.aero/wp-content/uploads/GAMA-Publication-No-16-Hybrid-and-Electric-Propulsion-Performance-Measurement-1.pdf>) to provide a common operational context for aircraft that utilize electric propulsion. One of the key issues debated during these initial discussions was the development of appropriate operational reserves for electric aircraft including both fixed wing and eVTOL.

Since we now have more experience and understanding of what is possible and appropriate in the field, there is a need to revisit the common industry agreement on what is an appropriate reserve requirement for these aircraft. For example, one area where new requirements are called for is in the specific area of electric vertical take-off and landing minimum energy reserve for aircraft design certification (as opposed to an operational minimum on a particular flight). At the same time, there is ongoing research into battery technology, including addressing the specific needs of aviation such as lithium ion (Li ion) chemistries that prioritize weight-based energy density, flammability, and operational temperature, as opposed to the historical focus of the surface transportation industry which prioritizes cost, volumetric energy density, and weight energy density.



Workhorse eVTOL recently had a test flight  
Workhorse 电动垂直起降机型最近进行了首次试飞



Pipistrel Alpha Electro electric airplane has flown in many countries around the world.  
蝙蝠飞机公司的阿尔法电动飞机已经销往多国并投入使用

In addition to the significant research going on in the above areas, the industry is also examining related areas such as charging and storage for electric aircraft. There are broad efforts underway to address items such as charging systems, but broader issues like identifying power requirements within traditional airport locations have yet to be broached. GAMA's Electric and Hybrid Propulsion and Innovation Committee is discussing key charging, battery storage and equipment support issues which need to be addressed to ensure hybrid and electric aircraft can operate efficiently within airport, helipad and vertiport locations.

There is a consensus among key regulators that single engine electric airplanes can be flown by single engine rated pilots. However, issues related to specific training for electric propulsion and the appropriate rating and training for electric airplanes which may have distributed thrust are less certain. There are designs which utilize a single throttle control (or potentially speed control) for which multi-engine training wouldn't be applicable but may currently be required.

Operationally as well, electric aircraft may not perform in ways which air traffic control would expect as compared to traditional aircraft. For example, because energy onboard may be more limited, it may be necessary to slow to best efficiency or range speed more often during IFR procedures and electric aircraft might be less able to accept changes to IFR flight plans that would add significantly to flight time. It will be important to understand how electric aircraft will be able to perform traditional IFR terminal and approach procedures. It is important to identify any issues in following traditional operational requirements or expectations as soon as possible so we can begin working to mitigate these issues.

The electric and hybrid propulsion and innovation space has attracted huge interest and several non-traditional high-tech, well-financed entrants who are challenging our conception and definitions of aircraft, airspace, mobility and other areas. As On-Demand Mobility (ODM) and eVTOL markets have begun to mature, it is vital to understand these vehicles and future operations in more detail.

有大量的研究机构正投身于上述领域的研究工作，此外，航空业界也在积极研究相关领域比如电动飞机的充电和储能技术。关于充电的问题已经有较深入的讨论，但有些问题还没有得到足够的重视，比如机场的电力供应是否能够满足电动飞机的使用需求。GAMA的EPIC委员会正推动讨论许多涉及电动飞机应用的重要问题，包括充电、电池存放、相关配套设备等，以确保混动和电动飞机能够在机场、直升机起降坪和专用垂直起降坪高效运营。

各国航管机构就单发机型飞行员驾驶单发电动飞机的问题已经基本达成了一致，但关于电动飞机飞行培训和相应的执照类别，以及分布式动力电动飞机飞行培训的政策制定还存在较多问题。有的多发电动飞机只有单一的动力控制杆，对于这种机型目前的多发机型培训要求就显得不适合，但目前来看，驾驶此类电动飞机的话，多发执照还是必须的。

电动飞机的运营上也存在许多政策问题，电动飞机的空管可能跟传统机型不一样，比如由于电量有限，电动飞机按照仪表规则飞行时，可能就必须以较低的最经济速度飞行以延长航程，或者由于电量无法满足要求而不能按照空管要求变更飞行计划。为此，必须充分理解电动飞机的仪表进近进场程序跟传统要求的差异，尽早确定这些不同之处并与航管部门进行充分沟通，以便我们能尽早开始解决这些问题。

混动和电动动力系统及相应的技术创新已经吸引了各方极大关注，一些传统业务并非在高科技领域但资金非常雄厚的企业也已经投身其中，这些参与者正在挑战我们关于飞机设计、空域管理、交通方式等领域的传统观念和定义。随着按需交通方式（ODM）和eVTOL电动垂直起降市场逐渐起步和成熟，深入理解这些新机型及其运营方式就显得尤为重要。



**Pipistrel flight simulator uses VR to provide a realistic training environment on the ground at low cost.**  
**蝙蝠飞机公司的地面模拟机采用 VR 技术提供低成本高仿真的飞行培训**



像优步和亚马逊这样的非航空类的非传统企业，正在与诸如空客、波音这样的老牌航空企业同步致力于电动航空领域，它们已经投入了大量的资源，并且这些非传统企业不仅是要研发新的机型和动力系统，而且要发展新的运营和使用模式。例如，随着电动系统的逐渐成熟，许多 EPIC 成员单位正在研发短途支线电动机型，以满足短途支线的市场需求，如果这类采用电动飞机的短途飞行的市场如预期那样大量增加，空管的负担将会大大增加，将对传统的空管模式提出严峻的挑战，并且即使采用星基空管系统可能也无法全部满足需求。虽然 eVTOL 机型和电动支线飞机一开始只会在非管制空域进行试点，但随着数量的增加，仅采用目视识别避让将无法持续增长的飞行架次需要。

面对这种新形势，FAA 有可能不愿意建设新的空管基础设施，因为毕竟花费十年之久建设推广的 ADS-B Out 空管监控系统即将于 2020 年强制实施。

不过，有些参与者有不一样的想法，比如 4G 和 5G 移动通讯有可能成为非强制性的空中交通通讯体系，一开始可能只是作为目视识别避让的补充，然后逐渐发展，一旦其技术能在实际应用中证实其效果，将有望在此基础上支持保障更复杂的飞行活动。

电动飞机的最大优势之一是环保因素，因此也很有必要开展关于电动飞机全使用寿命的电力成本的研究。此类全寿命（LCA）研究对于扩大电动飞机在全球许多国家的应用将非常有帮助，并且将有助于让通航经营者从财务角度理解和采用电动飞机，并让公众更好地理解并支持可持续航空。这是全球通航业最激动人心的时代，GAMA 对于能够引领该领域的发展感到由衷骄傲和自豪。



Non-aviation, non-traditional companies like Uber and Amazon, along with industry giants like Airbus, Boeing and others are devoting much effort and resources into developing not only new vehicles and propulsion systems, but new business models as well for aviation. For example, many members of GAMA's EPIC are developing electric aircraft which may enable new regional markets because of the efficient nature of electric operations. The potential growth and higher airspace density of the electric aircraft sector threaten to upend the traditional model for air traffic control, even after moving to a satellite-based system. While low density operations of eVTOL and regional aircraft can initially increase in uncontrolled airspace, over time these aircraft might reach a level which no longer allows for visual separation.

Further, it is likely that key regulators such as the FAA will be hesitant to take on new air traffic control infrastructure just as the decade long ADS-B out mandate is nearly completed (2020).

There are those who are thinking outside this box, however. For example, 4G & 5G mobile network services might provide a backbone for voluntary aviation networks which could supplement visual operations initially and which could enable more complex operations once the benefits of such a voluntary network were proven out.

Given that one of the key benefits of electric propulsion in aircraft is its environmental sustainability, it is also important to undertake research related to the life-cycle cost of the electrical energy which will power electric aircraft of the future. These life-cycle analysis (LCA) studies could be very useful to enable the expanded operation of electric aircraft in many markets around the world and potentially in justifying fiscal incentives and improving public understanding of, and support for, sustainable aviation.

It is an exciting time in the general aviation industry globally and GAMA is proud to be leading the way.

## 河北 - 秦皇岛

### 河北致远通用航空有限责任公司



固定翼。私照。商照

培训基地：河北邯郸机场  
河北致远通用航空是经中国民航华北地区管理局批准的，可从事固定翼私用和商用飞行驾驶执照培训的甲类通用航空公司，是华北地区唯一一家 141 部航校。公司已购进钻石 DA40 单发教练机 8 架，钻石 DA42 双发教练机 2 架，钻石 DA20 螺旋桨教练机 1 架，奖状 CJ1+ 双发喷气高性能教练机 1 架，用于飞行培训。公司坚持“高标准，严要求”的训练，致力于培养出“安全意识强，责任心强，飞行技术过硬”的优秀飞行员。

## 湖北 - 宜昌

### 海南航空学校



固定翼。私照。商照 直升机。私照。商照

培训基地：湖北宜昌三峡机场 宁夏中卫  
海航航校是中国民航 CCAR-141 部运行航校，以航空器驾驶员培训为主营业务，开设固定翼私用驾驶员执照、商用驾驶员执照、仪表等级和飞行教员执照、直升机私用驾驶员执照、商用驾驶员执照课程。公司总部设在湖北宜昌，拥有湖北宜昌、随州、宁夏中卫和甘肃庆阳四个训练基地。海航航校选用先进的钻石系列单发 DA40D、双发 DA42、单发 DA20-C1 飞机、西科斯基 269C-1 直升机和豪客 800XP 高性能飞机组成训练机队，机队规模达到 43 架，飞行教员 60 余名。目前，海航航校同时具备固定翼、直升机和高性能飞机培训资质，成为全国培训资质最全的航校之一，在规模上仅次于中国民航飞行学院的飞行训练机构。

## 江苏 - 南京

### 南航艾维国际飞行学院



固定翼。私照。商照 直升机。私照。商照

南航艾维国际飞行学院（南京）是由南京航空航天大学、中航国际航空发展有限公司和南非试飞学院国际集团三方共同投资兴建的以培养高素质、国际化、全才型的民航航线飞行员为本的合资公司。注册地为江苏省省会南京。培训涉及私用飞行员执照、商用飞行员执照、航线飞行员执照培训和直升机私照、商照培训。培训以国内为本兼顾拓展国际业务，集合三方优势，以“践行航空战略、依托民航平台、融入外力外资、三方优势互补”为原则，实现“高素质的人才培养-高水平的商业运作-高水平的飞行实训”三联联合。

## 山东 - 莱芜

### 山东齐翔通航自转类旋翼机培训中心



旋翼机。轻功类执照

培训基地：山东莱芜雪野通用机场  
山东齐翔通用航空有限公司成立于 2010 年，是国家航空产业协会重点扶持单位。2014 年 4 月 15 日，国家体育总局经过严格筛选和评估，正式确定了山东齐翔通航公司作为国内首批自转旋翼机驾驶员执照培训的主办方，截至目前山东齐翔是国内唯一一家具备自转类旋翼机培训资质的企业。目前公司拥有多名资深教官，8 驾 MTO sport，已于 2014 年 12 月份成功培训第一批驾驶员共计 10 名。

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## 山东 - 青岛

### 猎鹰滑翔俱乐部



三角翼

青岛猎鹰滑翔俱乐部是国内首家经国家体育总局航空运动协会和济南空军司令部及青岛北航空军备案的专业滑翔翼运动俱乐部，专业从事滑翔翼培训和销售。2013 年第 5 期至第 11 期培训已于 2013 年 4 月陆续开班，欢迎您的加入！代理以下飞行器品牌：Wills Wing, North Wing, Aeros, Mosquito, Icaro, Woody Valley, Ace。

## 山东 - 青岛

### 青岛九天国际飞行学院



固定翼。私照。商照

培训基地：山东临沂机场、大滨洲大高机场、东营胜利机场  
青岛九天国际飞行学院有限公司（以下简称“九天飞院”）是经中国民航局批准成立的国内首批通过 CCAR-141 部审定的飞行学院。学院总部位于青岛，以山东临沂机场为主运行基地，辅助运行基地两处，滨州大高机场和东营胜利机场。我院现有持照飞行教员 31 人，地面理论教员 8 人。目前拥有教学飞机 30 架，教学模拟机 5 台。2014 年成立了专业的维修工程公司，获得 145 维修许可证。2014 年 10 月，九天飞院与美国 IASCO (IASCO Flight Training) 航校签署协议，正式成为美国 IASCO 航校投资方。可将国内航空公司的委培学员直接送往美国接受飞行培训。IASCO 航校共有资深教员 54 人，教学飞机 36 架，FTD 模拟教学机 5 台。IASCO 不仅为各国航空公司培养飞行员，还与美国中央华盛顿大学 (CWU) 合作，联合培养高等学历的职业飞行员。

## 陕西 - 西安

### 精功（北京）飞行俱乐部



固定翼。私照

运营基地：公务机机场：杭州萧山机场  
通航机场：绍兴滨海机场、北京八达岭机场、陕西蒲城、浙江舟山机场  
精功（西安）飞行俱乐部一直致力于为社会提供最专业的航空服务，俱乐部拥有 17 架西锐 SR-20 飞机及多名飞行教员开展 CAAC 私人飞行器执照培训。私照培训包括 95 小时理论学时，46 小时飞行课时，4 小时模拟机课时，52 小时飞行课时。主营业务：公务飞行、私人飞机托管、飞机销售、通航产业投资咨询服务、飞行执照培训、空中游览、私人旅行定制、CLUB 服务等。机队规模：公务机：达索猎鹰 200LX (2 架)；作业飞机：运五 (2 架)、赛斯纳 208B (3 架)；教练机：西锐 SR-20 (17 架)；高教机：空中国王 350I (2 架)。

## 陕西 - 西安

### 陕西天颖航空俱乐部有限公司



固定翼。私照

培训基地：陕西蒲城内府机场  
陕西天颖航空俱乐部有限公司于 2010 年 11 月注册于陕西渭南富平通用航空产业园，2011 年 11 月取得中国民航局颁发的经营资质。公司已取得德国 Flight Design 公司的 CTL5 飞机中国代理权，具有精良的航空专业团队，主要开展航空器销售及代管服务、私用飞行执照培训、休闲娱乐飞行和会员制飞行，以及青少年早期航空教育等业务；我们的目标是为中国热爱飞行的人士提供一个安全、自由的私人飞行平台。公司主运营基地设在陕西蒲城内府机场。公司一期建设的 2000 m² 机库已建成并投入使用，包括 3 个 300 m² 小机库和 1 个 1100 m² 大机库；同时已完成二期建设会所及其他配套服务设施的规划。公司计划在未来 5-10 年内在全国范围内建立多个连锁飞行俱乐部，建成辐射全国各主要城市，布局合理的全国运营服务网络和飞行网络。

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## 陕西 - 西安

### 西安中飞航空俱乐部有限公司



固定翼。私照。商用。航校

培训基地：西安阎良

中航工业中国试飞院航空俱乐部（简称中飞航空俱乐部）座落在中国航空城西安阎良，控股方为中国试飞院，2006年12月取得通用航空经营许可证，2007年12月通过民航适航局的91部运行合格审定，2008年开始正式运营，拥有直升机和固定翼照培训资质，被业界誉为中国首席航空俱乐部。公司依托中国试飞院飞行资源优势，飞行、机务团队隶属试飞院，飞行基地位于蒲城内府机场。拥有美国赛斯纳-172R轻型飞机，罗宾逊R44直升机和专业模拟器。中国试飞院拥有近60年试飞经验，是亚洲最大、中国唯一的军用飞机、民用飞机、无人机的专业鉴定试飞机构。

## 新疆 - 石河子

### 新疆天翔航空学院



固定翼。私照。商照

培训基地：石河子山丹湖机场、克拉玛依机场、博乐机场

新疆天翔航空学院成立于2010年6月，由中国民航大学和新疆通用航空有限责任公司共同出资组建，是一所专门培养运输航空、通用航空飞行技术专业人才的高等院校。学院位于新疆维吾尔自治区石河子市，在石河子山丹湖机场、克拉玛依机场和博乐机场设三个训练飞行基地。学院拥有雄厚的师资力量和先进的培训设施，航院现执管飞机22架，其中目前世界上最先进的奥地利钻石系列DA40飞机14架、DA42双发飞机2架、DA20特技飞机2架、美国空中国王C90飞机2架；DA42模拟机1台、DA40模拟机1台，成为国内仅有的三家拥有高性能飞机的院校之一。获得批准训练大纲21个，可以满足学员对私照、商照、仪表、单发（包括螺旋桨科目）、多发、高性能飞机等各项训练的需要。新疆天翔航空学院拥有优质高效的培训能力，已经成为汇聚业内精英，培养人才的摇篮。

## 广东 - 珠海

### 珠海龙翔航空俱乐部



固定翼。私照

培训基地：罗定机场

珠海龙翔航空俱乐部有限公司成立于2011年，为华南区首家经中国民航CCAR-61/91部认证、并经国家体育总局航空管制中心认证持有初级类飞机（运动驾驶员执照）训练资质的通航公司，是德国CTLS飞机在中国的授权经销商。公司主要提供飞机私用驾驶员执照培训、会员飞行、体验飞行、跨区转场飞行、空中观光飞行、飞机出租、托管维护等服务。主运营基地位于广东西部的罗定机场，交通便利，环境优美，净空条件好。机场等级为3-B，跑道长度1400米，宽度30米。俱乐部配套设施完善，有专用的贵宾休息室、会议室、教室、机库和维修设施。使用的德国CTLS飞机配备先进电子仪表设备和整机弹射救生系统，豪华、舒适、安全，适合驾照培训和通航作业飞行。目前俱乐部已开通珠海三灶-珠海九洲-广东阳江-广东罗定-广西梧州之间的低空飞行航线。龙翔航空俱乐部集航空运动、航空娱乐、航空教学于一体，拥有经验丰富的空地勤专业团队，引进国际畅销机型，为珠三角和港澳地区的飞行爱好者提供自由飞行的服务。

## 广西 - 梧州

### 珠海中航飞行学校



固定翼。私照。商照

培训基地：广西梧州长洲岛机场

珠海中航飞行学校有限公司是中航工业通飞的全资子公司，注册地为广东省珠海市。学校以收购国航旗下的深航直属单位——深圳鲲鹏国际飞行学校为基础组建而成，拥有中国民航局按CCAR-91部和CCAR-141部审定批准的飞行运行和培训资质，主运营基地为广西梧州长洲岛机场。学校的主营业务是面向国内外通用航空企业和运输航空公司开展飞行员私用驾照培训和商用驾照执照培训。学校是国内飞行培训门类最全的机构之一，同时也是中航工业通飞飞机研制、生产、营销和用户飞行培训及运营支援的重要平台。学校拥有一支由前空军优秀飞行员和民航飞行学校毕业的飞行员组成的优秀飞行教员队伍，理论教员、维修、指挥、签派等工作团队中持有中国民航有效执照的人员占学校员工总数的70%以上。学校的训练机队由赛斯纳172、钻石DA42和豪客比奇空中国王C90GTI高性能飞机组成，同时拥有与训练飞机相应的训练器。学校的训练大纲、教材、检查单等严格按照中国民航局方规范编制并经大型运输航空公司评估，追求最安全和高质量的飞行培训是学校的宗旨。

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## World Directory of Light Aviation 2018/19

\* The **World Directory of Light Aviation 2018/19** lists with images, descriptions and technical data over 1000 aircraft: ultralights, microlights, LSA, gyrocopter, ul-helicopters, certified aircraft, kitplanes, trikes, ultralight and certified gliders & motor-gliders, VTOLs and multicopters, instruments, engines, propellers and accessories.

\* The **World Directory of Light Aviation 2018/19** is available in four languages: English, French, German and Chinese.

\* The **World Directory of Light Aviation 2018/19** is also available online [www.flying-pages.com](http://www.flying-pages.com).







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## 一个联盟就是一个产业集群



中关村蓝创通航联盟驻美办事处负责人、美国资深通航专家TIM ARCHER 在联盟大会上发言



高规格的中国首次电动航空论坛的主办方



联盟已连续两年参展美国EAA航展



联盟在北京航展设立的展位



联盟理事长金乾生在联盟大会上发言

中关村蓝创通用航空产业联盟 成立于2016年，总部位于中关村国家自主创新示范区的核心中关村软件园，是国内首个通航领域产业联盟，是由来自通航各领域多家单位组成的非营利性行业组织，联盟成员涵盖国内领先的通用航空运营服务、保障维修、研发制造、科研院所、投资机构及各延伸产业领域企业。联盟致力于充分发挥行业平台作用，为联盟会员及行业企业提供产业资讯、政策研究、金融服务、国际交流和产业培训等多项专业化服务，促进通航企业业内及跨界合作，推动产业政策及标准的优化实施，推进通航产业国际合作与有序发展。

自成立以来，联盟积极开展了在会员服务、政企协同、军民融合及国际交流等方面的多项工作，包括连续两年在美国飞来者大会设立独立展位和展馆；主办首届“中国通航问道北京”中国国际通用航空产业论；承办2017中国国际通用航空大会创新创业大赛；与清华大学通用航空技术研究中心共同策划筹备“全国飞行汽车设计大赛”等多项活动。

联盟将持续着力整合国内及全球通航资源，加强通用航空研发制造、运营管理、飞行培训等领域的多元合作，建设面向国际的，集创新设计、展示体验、渠道发展、品牌孵化、技术支持及应用系统服务配套于一体的国际国内交流与开放服务平台，积极开拓通航国际市场合作渠道。联盟还将大力支持北京市的科技创新和跨界融合发展，为通用航空在北京市及中关村园区的发展深度服务，并通过中关村在全国的200多个园区，将可操作的通航产业合作模式推广至全国各地。

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Text & Photos: Michel Ferrer, Xin Gou

## The first Icare Cup in China

# Electric Flight on the Way

The Icare Cup, the largest free flight event on the planet and one of the largest aviation event altogether, has just been held for the first time in China. The cooperation between Icare Cup and the Chinese market may very well help promote free flight sports. China is already one of the big world markets for paragliding sports with more than 8000 pilots or the 6th in the world after the alpine countries (Germany, France, Switzerland, Austria) and Japan.



# 首届伊卡洛斯国际飞行节 在青海成功举办，将更多 引入电动飞机

世界上规模最大的滑翔伞及三角翼飞行节，同时也是规模最大的航空活动之一的法国的伊卡洛斯国际飞行节于 7 月 12 日 -15 日在青海省祁连县成功首次举行。我国已经是世界上最大的滑翔伞运动市场之一，全国滑翔类飞行员超过 8 千人，位列世界第六位，仅次于老牌欧洲滑翔国家，在亚洲仅次于日本。本次伊卡洛斯国际飞行节的成功举办将带动我国滑翔活动开展，促进我国航空运动的整体发展，并将引领我国一举跨入国际一流航空文化活动前列。



Festive reception for guests from abroad.

现场热情的欢迎牌



**Alexander Voronin from Ukraine's AEROS has been successful with his trikes on the Chinese market for several years. 乌克兰 AEROS 动力三角翼的 Alexander Voronin 在给观众讲解, 该公司三角翼在中国市场已经畅销多年。**

The Chinese Icare Cup contract was signed in September 2017 between the French organizer and the Chinese partner. Initially Tsingtao, a large coastal city of 9 millions inhabitants located halfway Beijing and Shanghai, was selected as the host city. But everything changed and finally, we find ourselves in the mountains, in a small town called Qilian, a very different place.

It was a long trip to Qilian. We took the flight from Paris to Beijing, then an inland route to Xining, the capital city of Qinghai province, located in the very center of China. Then another 6 to 7 hours by bus to Qilian, which hosted the first Chinese Icare Cup. Just above Qilian, there is a real "arena", natural and perfect. A circus of alpine

伊卡洛斯国际飞行节于1974年创立于法国, 每年9月在法国Saint-Hilaire 和Lumbin 的山区举行, 吸引全球的滑翔飞行员、爱好者和观众参加。发展30多年以来, 伊卡洛斯国际飞行节已经发展为涵盖多个航空领域并包括丰富文化娱乐项目的航空类节庆和最大规模的自由飞滑翔类展会, 飞行活动也包括滑翔伞、悬挂三角翼比赛、轻型飞机、热气球、翼装飞行表演等多种航空器, 以及丰富多彩的各类文化娱乐节目。伊卡洛斯国际飞行节最著名的节目当属“鸟人”比赛, 这项创立于飞行节的比赛活动中, 滑翔伞和三角翼飞行员们充分发挥创造力和想象力, 将飞行器和自己打扮成各式各样的造型, 为观众带来极大的视觉享受。

2017年9月, 青岛猎鹰通航集团与法国伊卡洛斯国际飞行节组委会签订合作协议, 共同将飞行节引入我国。经过反复选择, 飞行节最终落户美丽的青海祁连山, 美丽的自然景观与优雅的滑翔飞行融为一体。当然, 祁连山的高海拔也给飞行员们带来了挑战, 这反而提升了飞飞行节的观赏性, 激发了飞行员们的斗志和参与性。飞行节滑翔场地起飞海拔4100米, 降落场地海拔3000米。这里有天然的起飞和降落场地, 虽然不担心海拔问题, 但稀薄的空气带给飞行员不少的难度, 在这里需要更长的起飞助跑时间并且要及时调整更快的降落速度, 更能体现飞行员的经验和技术。







Well traveled: the Silent Dragon Trike from Germany with the AIR wing. With the small wheels, there were problems on the rough track.

来自德国的 Silent 动力三角翼，采用 ATO 公司的翼面。由于机轮尺寸太小，不能在粗糙场地起降



Thanks to its large wing area, the Dragonfly had also no problems with the climb at the high altitude of the mountains.

得益于其较大的翼面积，来自澳洲的蜻蜓飞机在高海拔山区爬升性能良好



Motor glider at 4000 meters. Pipistrel China showed its motor glider Taurus 4000 米海拔的动力滑翔机。蝙蝠中国公司的大金牛动力滑翔机表示毫无压力



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After a kite tow, a tow UL from the Dragonfly brand from Australia is landing.

澳洲的蜻蜓超轻机拖拽滑翔机起飞后降落



pastures, surrounded by pretty rounded grassy mounds. We were at 2800m high in altitude which will pose a lot of problems of adjustments to paramotor engines! The planned takeoff of the paragliders is 1200 meters higher ... So at 4000 meters one can only imagine! Curiously, no one will feel bad, we will need to be careful not to get too agitated.

At Qilian this year there were wingsuit jumpers, paragliding acrobats, motorized balloon, all Parabatix staff of Pascal Campbell-Jones and his team and 5 competitors in paramotor slalom. And also 5 paragliders of Grenoble University Club (the GUC), who will build their disguises on the spot. In all, about sixty European representatives including exhibiting professionals, a hundred Chinese pilots, paragliding, paramotor, which should be considered to be success for the first year.

Among many other things, the first Chinese Icare Cup surprised visitors with the presence of an eVTOL, the e-Hang 184, which is a manned full electric vertical takeoff and landing aircraft. It will be beginning of the integration of electric aviation into the Icare cup in China. The organizers mentioned that there will be more electric aircraft next year. Free flight together with emission-free electric aircraft will certainly bring more fun in a quiet and environmentally-friendly way to Icare Cup.

2018 伊卡洛斯·中国祁连国际飞行节继承了法国伊卡洛斯国际飞行节自由快乐的精神内涵，保留了飞行表演、飞行器展览展示、飞行互动体验、伊卡洛斯电影节及音乐表演五个板块，来自10多个国家和地区的200多名飞行爱好者在祁连山进行了飞行烟幕、化妆飞行、特技飞行、热气球飞行表演等多种项目的飞行竞技。本次飞行节创新融合独特的中国元素，极大地推动低空旅游产业的健康发展，填补中国低空旅游领域的空白，对低空旅游产业在中国的稳步发展具有重要的战略意义。

相比法国本土的伊卡洛斯飞行节，在我国举办的本次国际飞行节还增加了高科技航空内容，亿航184载人电动多旋翼航空器出场，为飞行节带来了电动航空的科技元素。据悉，今后的伊卡洛斯国际飞行节会将电动飞机作为一项专门展示内容，与世界电动航空同步展示航空创新技术的最新产品和最高水平。电动航空作为航空业继喷气时代以来最重要的技术革新和发展机遇，其无排放、低噪音的优势与伊卡洛斯飞行节的核心宗旨和自由飞滑翔活动的特点完美结合，目前已经量产的电动飞机中有许多电动三角翼和动力伞机型，参加飞行节展会的许多厂商已经推出电动型号，电动航空将是伊卡洛斯国际飞行节的重要方向和展示内容之一，期待明年的伊卡洛斯国际飞行节上有更多的电动飞机出场，让历史悠久的飞行节与不断创新的航空技术共同发展壮大。





The heart of the Coupe Icare, the fairing flying, came in China not too short -despite 4000 meters altitude: a panda at the start.

伊卡洛斯飞行节最经典的项目就是化妆飞行，即使是 4000 米的海拔也挡不住化妆飞行的热情，这个熊猫装扮的滑翔伞正准备起飞

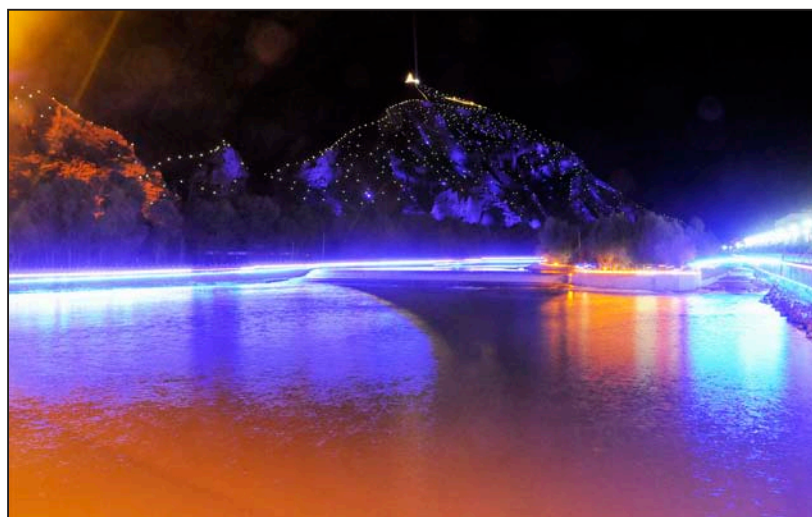


the Chinese eVTOL ehang 184 also showed up  
亿航的 184 载人电动多旋翼飞机是飞行节的一大亮点



... and a cock at the landing. Some pilots came with disguise from France.

这个装扮成公鸡的滑翔伞正在着陆，飞行员来自法国



There was magnificent firework display at night.  
壮观的夜间烟花表演



# Global effort

## 全球协力 合作共赢

具备自主飞行能力的电动垂直起降飞机 (eVTOL) 是 21 世纪以来第一个也是截至目前最具颠覆性的航空技术创新。为此，众多相关领域的优秀工程师们正与全球各国的航管部门共同致力于推动该技术的成熟和应用。而且，自动化和电动化是席卷整个交通领域的发展目标，因此，电动航空的成功也取决于与大交通领域和其他相关行业的合作。电子化和智能化是实现上述目标的关键性技术领域，特别是自动驾驶技术，是促成航空电动化新技术产业化规模应用成功的关键。如果您留意电动航空最具成功潜质的项目团队，您就会发现，他们的团队成员都很国际化，因为如果一个项目要想获得成功，就必须招募最优秀的成员，而非在意他们来自哪儿，只需要寻找最优秀的人才。随着涉及电动航空的各个相关领域跨界融合越来越多，人才和技术的交流融合也势在必行。这正是我们举办或支持多个国际性电动航空活动的原因，包括位于欧洲的德国 AERO 通航展及 e-Flight-Expo 电动航展、位于美国的奥什科什 CAFE 基金会电动航空论坛，以及我们与中关村蓝创通航产业联盟共同在中国举办的国际电动航空论坛。我们的国际化团队还创办了 e-Flight-Journal (《电动航空》) 杂志这一行业交流平台，通过网上和纸质媒体在上述相关展会上宣传交流。我们坚信中国拥有新能源产业的巨大市场，并且为协同配合蓝创通航联盟的相关宣传，因此本期电动航空杂志首次推出中英双语内容。

世界形势变幻莫测，民族主义有抬头的趋势，而新型自动驾驶电动垂直起降飞机的发展正是证明了国际合作才是发展之道，才是解决各国交通瓶颈和生态保护的必由之路，在这个全球化的时代，任何单个国家都难以独自实现上述所有发展目标，合作才会共赢。

The development of autonomous flying eVTOLs aircraft is the first disruptive moment of aviation in the 21st century. Expertise of the top engineers in many fields are needed as a collaboration with the authorities around the world. As automation and electrification are main targets in all other fields of transportation - the way to the success is also marked by cooperation with these other fields. Electrification and computerization are the keys and automation helps to implement this new technology in potential business cases with an economy of scale.

If you watch the teams of the most promising projects, they are all very international, because if you want the best in your team - you do not look for the nationality, you just look who is the best. As new developments in the connected field are happening around the world, networking between the best heads and projects is more necessary than ever. That's why we organize or support international Meetings like AERO / e-Flight-Expo in Europe, Oshkosh-Cafe-EAS in US and why we founded the eFlight-Forum in China. That's why the international Team of eFlight Journal (eFJ) is providing this communication platform. On the internet and printed for special occasions like the events above. As we think China is one of the largest markets for these rising Green Technologies- and as a courtesy to our hosts from Z-park Alliance, this issue of eFJ is for the first time is bilingual English/Chinese and published in a cooperation with Flying China, Chinas first independent GA Magazine.

In times where not only politicians praise nationalism, the development of the new autonomous eVTOL, proves that international cooperation can solve the international problems of transportation and ecology much better than any nation alone.

Willi Tacke  
Xin Gou

为配合在长沙举行的 2018 国际电动航空论坛，  
敬请翻至另一面阅读

Together with 2019 e-Flight-Forum, there is also a special edition of "e-Flight-Journal" in this edition. Please flip over to another side to read.





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