FLYING CHINA

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自由飞翔与通航

Special Edition: 专刊：2019 国际（长沙）电动航空论坛
eFlight Forum Shijiazhuang

eCommuter
The next step after e-trainer
电动教练机之后是什么

eFlight in Scandinavia
Nordic cooperation ramping up
北欧电动航空合作联盟成立

eVTOL
Volocopter
在赫尔辛基、斯图加特和新加坡飞行

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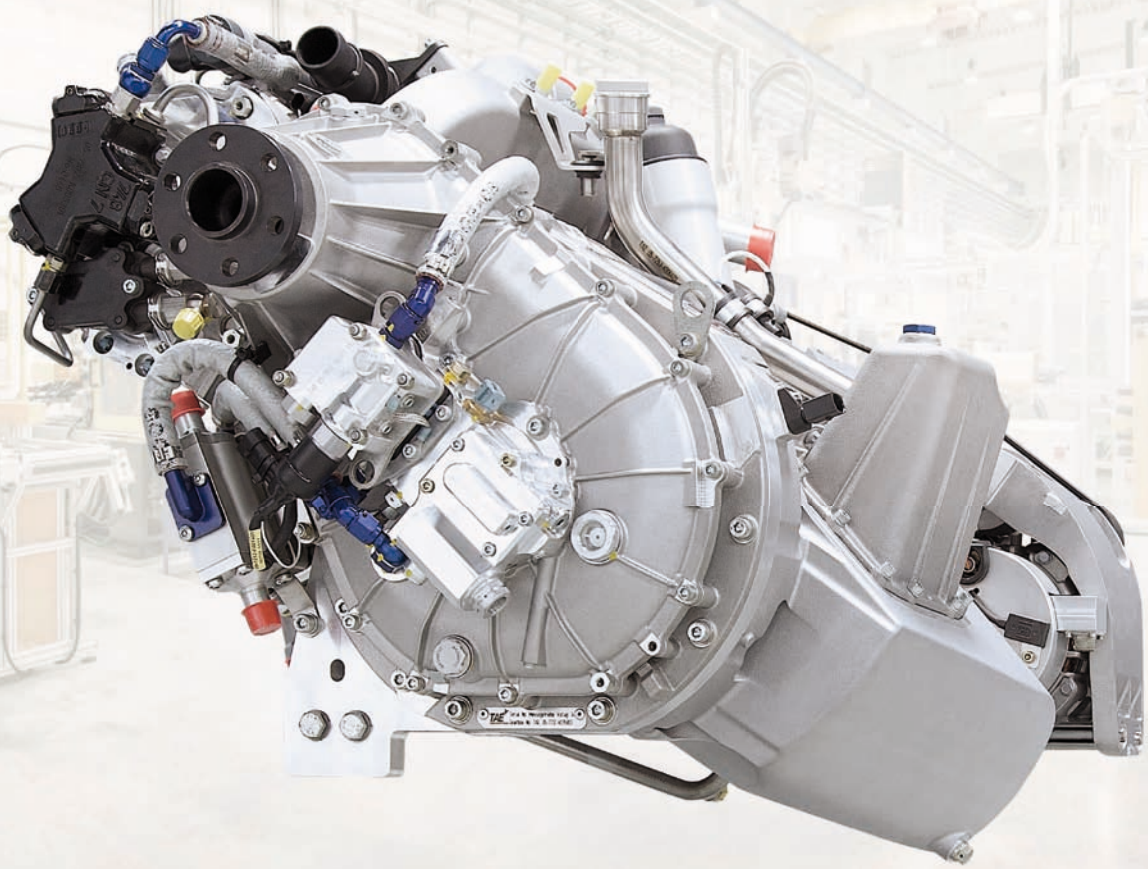
大陆Jet-A活塞发动机：创新、强劲、安心



大陆Jet-A航煤发动机是航空动力系统大量技术创新的结晶，具备良好的操纵性、高可靠性、易维护等特色，平和操作更是其一大亮点。我们的Jet-A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FAA和EASA（及其他78个国家）的认证。与此同时，我们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、强劲动力及平和运行等特点，难怪很多飞行员愿意每天驾驶搭载了大陆Jet-A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，您将得到大陆公司专业团队的帮助。 www.continental.aero

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适航审定是重点，短途通勤是亮点

Certification the key step, short-haul commuter the highlight

电动航空经过近几年的发展，已经逐渐形成了四个明确的发展领域：双座的飞行培训和休闲娱乐固定翼机型，六座及以上的短途通勤固定翼机型，电动垂直起降机型（eVTOL）和多电大飞机（MEA）。这几个机型的技术基础和用户群体都各有不同，但都面临一个同样的考验：适航审定。随着电动航空的发展趋势愈加明显，现在产业界和航管机构已经不再争论电动飞机是否可行，而是埋头推动适航工作。

适航审定作为电动航空领域近期的工作重点，对上述各个机型而言的难度是不同的。相对而言，双座固定翼机型设计较为传统，往往只需更换动力部分，适航审定的难度也相对较低，因此，目前已经有多款电动轻型运动机型（LSA）和欧洲标准超轻机（UL）获得了包括我国民航局和欧洲多国航管机构的适航证。eVTOL 作为资本市场的宠儿，技术突破很大，前景可观，但同时结构、技术乃至运营方式上也与传统航空器差异较大，因此适航审定的难度较大。当然，目前各国航管部门对 eVTOL 的适航管理创新的工作力度也都很大，EASA 在全球率先发布了针对 eVTOL 的新型垂直起降类航空器的适航审定大纲，我国民航局自去年以来，已接连发布了多个涉及大型无人机试运营和适航的相关文件。

嘈杂之中，短途通勤类电动固定翼机型的发展显得不那么引人注目，但从技术、适航、市场等多个角度来看，却可能成为异军突起的成功案例。市场来说，全球短途通勤支线市场很大，据多方统计，全球 50% 的航线距离在 800 公里公里以内，还有大量只需飞行一两百公里的跳岛航线，电动飞机已经可以满足这种市场应用；技术来说，相对 eVTOL 和 MEA，仍较传统；适航方面，可以大部分采用现有的 23 部适航规则。有鉴于此，过去一年来，全球已经出现多个亮相和试飞的多座电动固定翼机型，例如 Eviation、Ampaire（安飞）、Voltaero、Zeroavia、APUS、Scylax、Heart 等等。

北欧各国是电动短途通勤飞行最积极的力量。瑞典和挪威都已公布了雄心勃勃的电动航空计划，瑞典的计划是到 2030 年，所有国内航班不再采用化石燃料，挪威的目标是到 2040 年，所有国内航班采用电动飞机，电动航空成为挪威的电动大交通战略的组成部分，届时挪威国内全部交通方式实现零排放，今年 9 月北欧电动航空协会成立（NEAN），北欧航空公司、瑞典航空公司等 11 家单位成为发起成员。挪威具备非常好的短途电动飞行发展基础，挪威新车销量的 58% 都是电动车，为世界最高，挪威已成为特斯拉电动车的全球第三大单一市场，更重要的是，挪威 98% 的发电量都是可再生能源，同时，挪威经济富裕，具备强大的财政补贴实力，运输航空在挪威是公共基础设施的一部分，因此大多数短途航线都是 PSO（公共服务义务），因此电动飞机项目的商业运营将直接获得挪威政府补贴。

中文版主编

为配合在长沙举行的 2019 国际电动航空论坛，本期专刊同期推出《电动航空》中英双语专刊，敬请翻至本刊另一面阅读

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 of the magazine to read.

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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蓝创通用航空产业联盟
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一个联盟就是一个产业集群

高规格的中国首次电动航空论坛的主办方

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

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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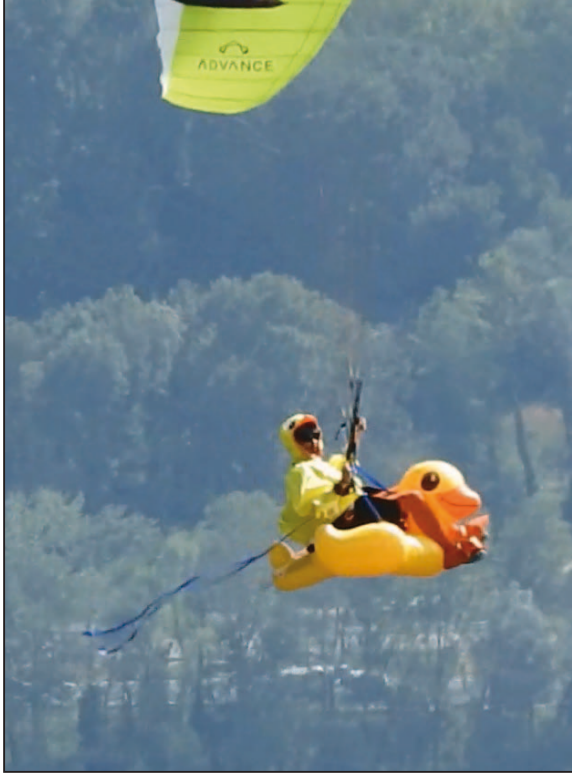
The most romantic flying festival: the 46th Coupe Icare

最浪漫的飞行，回归飞行的初心 --- 第 46 届法国伊卡洛斯飞行节



飞行节最大的亮点是世界规模最大的化妆滑翔伞飞行表演，各种造型，您最喜欢哪个？

English short version: The “Coupe Icare” in the little french mountain village of St. Hilaire is not only the largest paragliding meeting in the world but became over the years also a festival for all airsports. The more than 50 000 visitors see in the air over the Rhone valley next to paragliders also hanggliders, gliders, skydivers, aerobatics planes and ultralights. In the last two years the organizers also engage with the youngest aviation enthusiasts. They not only can take rides in different air vehicles but also try out special small paragliders on a training hill (photo bottom). But the core of the whole festival is the “Coupe déguisement”, where over 200 paraglider pilots, dressed in the most creative clothes, take off. These four days - from Thursday to Sunday - is the world largest expo for paragliders and paramotors, and a Free-Flying-Film-Festival with participants from all over the world. The secret of the success: Nearly all people in the region profit from the festival, so the regional Government supports the activity as well as over 1200 volunteers.

青少年航空科普是伊卡洛斯飞行节很重要的内容，滑翔伞是很适合小朋友接触尝试的飞行活动，厂家也专门推出了适合孩子的小型滑翔伞


AVIATION

飞行节所在的圣伊莱尔勒小镇有一条 160 年历史的山地铁路，曾是欧洲垂直爬升最陡的山地铁路，乘坐山地列车观赏飞行是极其独特的体验

老式飞机常见，但山谷里的老式飞机特技飞行表演就很难得了

一点儿历史
A little history

伊卡洛斯飞行节每年9月第三周最后四天（星期四到星期日），都会在法国格勒诺布尔（Grenoble）北部的美丽山地小镇圣伊莱尔勒图韦（Saint-Hilaire du Touvet）小镇如期举行。今年的伊卡洛斯飞行节于9月19-22日举行。伊卡洛斯这个名字来源于古老的希腊神话，一位名叫伊卡洛斯的小男孩怀揣着飞翔的梦想和父亲一起用蜡和羽毛制作了一双的翅膀，飞上了天空，这是人类最早的飞行梦想之一，也体现了飞行节延续至今的宗旨：飞行的乐趣和推广航空文化。圣伊莱尔勒图韦有“三山夹两谷”的优越地理条件，最大垂直高差超过1000米，这里是法国乃至世界最早的悬挂滑翔和滑翔伞场地之一，1974年5月，三位法国悬挂滑翔三角翼飞行员在这里第一次飞行，掀起了法国的滑翔热潮。今年的飞行节期间，共有5万多观众前来参观游玩，数千名飞行员到场飞行，是名副其实的飞行狂欢节，四天飞行节期间，周边20多个临时中大型生态停车场停满了大小房车及露营帐篷。

现在的飞行梦想，就会变成明天的现实

飞行节最大的亮点是世界规模最大的化妆滑翔伞飞行表演，各种造型，您最喜欢哪个？

并肩飞行，上是电动 Swift 超轻型滑翔飞翼

特技飞行表演在山谷中画出一个心形

小小星战黑武士也来凑热闹

夜幕降临，在飞行节看场电影是非常惬意的享受。白色大棚就是展会所在地

准备起飞的滑翔伞群

飞行节项目
Programs of Coupe Icare

飞行节发展30多年来，逐渐形成了多个富有特色的活动板块，主要有：户外电影、展会、飞行表演、热气球、轻型飞机、化妆滑翔伞、航空科普等。1983年，首届航空电影节上映，如今，伊卡洛斯飞行节期间的电影节吸引了近2万名观众，已成为电影和视频专业人士以及飞行爱好者的重要场所，并已逐渐扩展到户外山地电影。本届飞行电影节开幕式上丹尼尔主席宣布明年开始国际飞行节活动增加到4+4天时间，将安排更多时间让生产企业进行测试设备设施和试飞新产品及增加国际航空运动器材展览交流时间。飞行节期间评选出了2019世界航空运动特别贡献获奖及2019世界航空运动安全创新奖项并进行颁奖。

今年恰逢达芬奇逝世 500 周年，飞行节组织了儿童飞行物件制造活动，这是部分作品，最前方是达芬奇设计的滑翔翼的复制品

带着大雁飞行的动力三角翼，是的，就是电影《伴你高飞》一模一样的场景，非常难得一见

第46届伊卡洛斯国际飞行节上，全球200多家航空运动产业企业和机构齐聚参展，室内展场面积6000多平米，室外面积1万平米，是世界规模最大的滑翔伞、悬挂三角翼整机及周边产品的展会。

专业飞行表演安排在周六和周日这两天，它融入了各种飞行器比如老式飞机、风筝、滑翔机、滑翔伞、滑翔翼、热气球、回旋镖等，天气好的话，甚至可能看到翼装飞行。周末的清晨和傍晚以及周四和周五这两天留给了来自世界各地的飞行爱好者自由飞行，带着自己心爱的滑翔伞或三角翼来伊卡洛斯飞行节飞行已经成为全球许多滑翔爱好者的一大心愿。周四周五两天时间里，整个小镇上空都被各式各样的滑翔伞遮盖，如梦如幻，美丽异常。

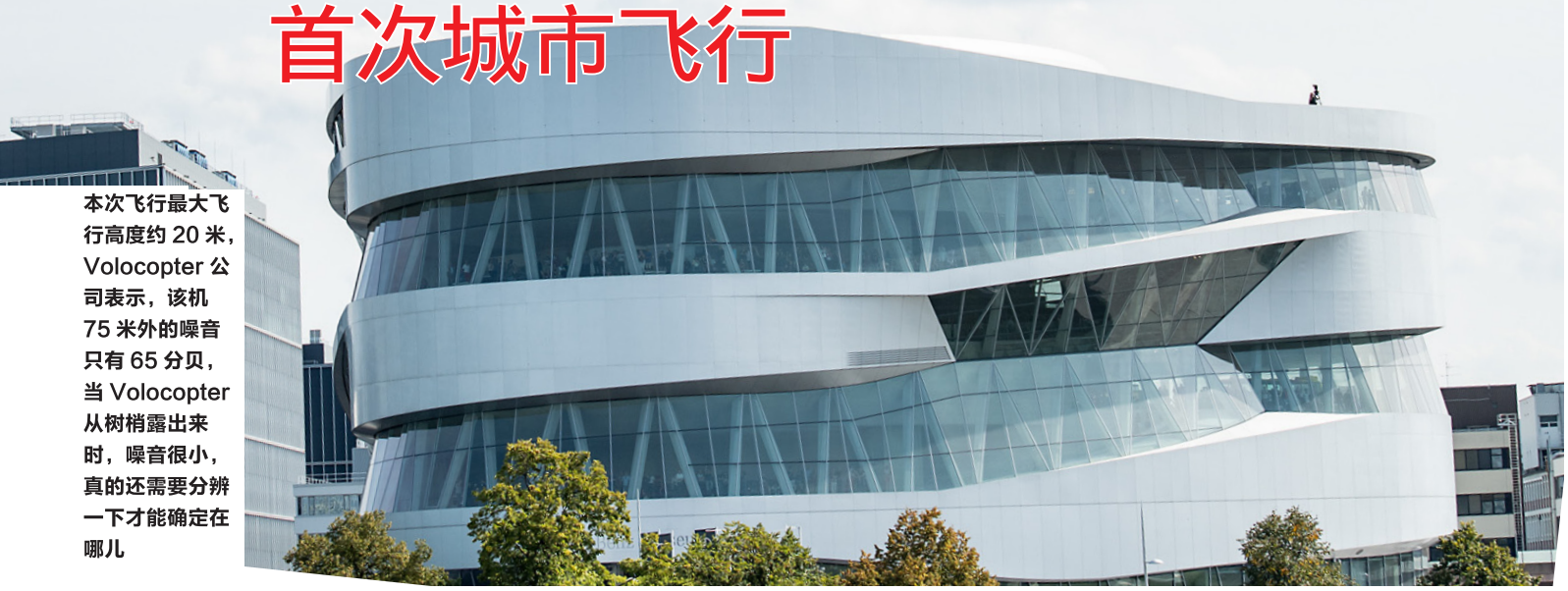
飞行节包括山上和山下两部分，山下的小镇有长设的航空运动营地，有轻型飞机跑道，每年飞行节期间，与法国航协和超轻机协会等组织共同在山下的场地举行轻型飞机展会和活动。

今年恰逢达芬奇逝世500周年，飞行节也举办了多项有关的纪念活动，包括在克洛斯卢斯城堡“达芬奇的飞行梦“主题展览，在附近学校举行的复制达芬奇飞行器的科普活动等，整个飞行节期间有大量各个年龄段的孩子们在老师的带领下来参观。为了表达对这位意大利天才的敬意，今年飞行节组委会举办了一场小学生和幼儿园参与的比赛，主题是“达芬奇的飞行器”，受列达芬奇作品的启发，孩子们不仅要想象一个飞行器，还要用他们选择的任何技术一起集体创造它，共有7所学校的19个班级的数百名孩子参与了这项挑战，创造了13个创意作品，将航空科普和飞行活动很好地结合了起来，真正做到了寓教于乐。

与EAA奥什科士飞行集会、德国腓得烈港AERO通航展等世界著名航展相比，伊卡洛斯飞行节更像是一个安静恬美的小清新，几乎没有发动机的噪音和过度的喧嚣，只有静静漂浮在空中的盛装滑翔伞、远方的山峦、青青的谷地和随风飞舞的飞行梦想，在这里，你可以坐着草地上，眯缝着眼睛，看着漫天的滑翔伞与时光慢慢流走，如果您自己飞滑翔伞，更是可以亲自与成百上千名飞行员一道融入这最美的时光之中，难怪来这里的人们要说，滑翔伞（paraglide）与天堂(paradise)有一样的字母真不是巧合。

飞行节分为山上和山下两个场地，山下是滑翔伞降落场和游乐园

Volocopter
在奔驰博物馆举行欧洲首次城市飞行



本次飞行最大飞行高度约 20 米，Volocopter 公司表示，该机 75 米外的噪音只有 65 分贝，当 Volocopter 从树梢露出来时，噪音很小，真的还需要分辨一下才能确定在哪儿

9 月 14 日周六，正是法兰克福车展期间，Volocopter 在其股东梅赛德斯总部所在的斯图加特举行了欧洲首次城市内飞行，地点当然得是奔驰博物馆啦，意义不言而明。这周 Volocopter 刚公布完成 C 轮 5 千万欧元融资，吉利领投，奔驰继 2017 年首次与英特尔投资 Volocopter 后，本次继续跟投，这次飞行展示就紧随本次融资之后。

English short version: After flying first time at the international airport in Helsinki (Finland) Volocopter achieved the next milestone: At the end of September they flew in the city center of Stuttgart (Germany) under the eyes of the regional Government. Co-organizer of the event was Volokopters shareholder Daimler. In the same month the manned multicopter company also announce that Geely, the largest single Daimler shareholder, also invested - together with other investors - more than 50 Million Euros into the German startup.
Next flight: end of October 2019 in Singapore where Volocopter will also introduce their vertiport.

Volocopter 无疑是这次综合性活动的最大亮点，参观 Volocopter 的人龙没有断过

这次展示飞行是奔驰大型主题活动“Vision: Smart City”（愿景-智慧城市：明日交通，今日体验）的一部分。该活动于周六周日两天举行，主题是奔驰的城市交通规划，城市空中交通（UAM）是其一部分，其他还包括电动车、智慧互联、自动驾驶、共享出行、轻小交通工具（micromobility）等。

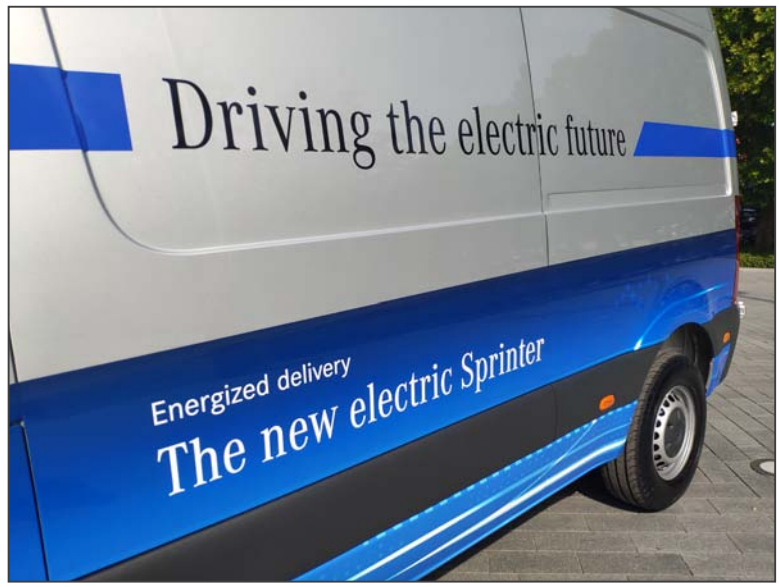
周六的重头戏当然是Volocopter飞行，此次活动全部公开免费，看稀奇的吃瓜群众非常众多，据奔驰事后公布的数字，当天共有1万2千多观众。政界人物当然也来捧场，包括奔驰和Volocopter所在的巴登符腾堡州州长、内政及数字化部部长等，戴姆勒公司董事长Ola Källenius当然也到场。

巴登符腾堡州州长Winfried Kretschmann 表示：“我绝对可以想象用Volocopter，我经常很有时间压力，对我来说，Volocopter是最佳解决方式。我们不仅正在创造未来的交通方式，也是在创造未来的工作岗位。”

戴姆勒董事长Ola表示：“我们的合作伙伴Volocopter展示了空中出租车如何将驾驶梦想变成飞行的梦想，通往交通领域的排放中和之路是公司和政治家的共同努力目标。巴登符腾堡州是第二次发明汽车的绝佳之地。继汽车之后，Volocopter开启了交通史新的篇章。任何有能力推动创新以实现更大可持续性的人都有责任这样做。”他指出，戴姆勒的目标是2022年实现梅赛德斯奔驰全部车型电动化，2030年实现电动车销量占总销量一半。现场展示也的确如此：展示车型全部是电动车，包括锂电池和氢燃料电池，车型从滑板车、商务车、SUV到巴士。

巴登福腾堡州内政及数字化部部长 Thomas Strobl 表示：“未来交通必须是智能化、数字化和清洁能源，同时大家负担得起。主要城市、中等城镇和农村地区的交通概念肯定会有不同的形式，对此没有一概而论的蓝图，但我们已经积极地、创新性和创造性地致力于未来的交通概念。”他表示，在该届州政府任期内，内政及数字化部将在车联网领域投资10亿欧元。

Volocopter CEO Florian Reuter表示，Volocopter的目标是成为世界上首个通过适航审定的eVTOL机型，已经与EASA开始审定工作，公司致力于解决城



活动现场展示了奔驰全系电动车型，从 Smart 到电动大巴。戴姆勒董事长在本次活动上也宣布，戴姆勒全面转型电动化，目标是 2022 年实现梅赛德斯奔驰全部车型电动化，2030 年实现电动车销量占总销量一半

现场展出的奔驰1886 年制造的世界首辆内燃汽车，这辆车是奔驰的开始，电动、智能、空地一体化将是奔驰的未来

市空中交通拥堵的瓶颈问题，将服务广大城市居民，而不会成为少数富人的专属。他表示，从奔驰博物馆到斯图加特机场12公里直线距离，使用Volocopter的话只需要不到12分钟。需要说明的是，Volocopter验证机目前持有的是德国航空局的特许飞行证（special permit to fly），本次飞行也是特许飞行，对飞行的范围和时间都有严格限制。

Volocopter的飞行下午2点开始，整个活动是从上午就开始，包括论坛、展示、亲子互动等等。现场有两架Volocopter，一架用于展示飞行的停放在远处的足球场，另一架则是现场的明星展品，长长的参观队伍自始至终就没断过，一点儿都不夸张。必须点赞的是，虽然人群密集，活动众多，队伍很长，VIP也很多，还有餐饮，但现场秩序井然，人群导流和各项服务工作做得非常好，不愧百年老店。

下午2点，Volocopter飞行准时开始，飞行持续了近4分钟，最大飞行高度目测约20米，Volocopter在方圆约200米范围内进行了机动飞行。最值得一提的是它的噪音：Volocopter声称，采用新型螺旋桨后，该机75米外的噪音只有65分贝，这个水平大致是小型涡轴直升机在500米处的噪音，也差不多是大城市街道白天的噪音水平，也就是说，如果你能接受城市道路的噪音，也就应该能接受Volocopter的起降噪音。抛开数值来说，现场肉测的感觉，我距离飞机大约距离100米左右，感觉不比普通轿车驶过的声音更大。一个有趣的证据是：Volocopter的飞行场地与观众聚集的广场之间隔着一排树，Volocopter刚从树梢后飞起来时，很多观众都在四处张望寻找飞机，说明该机的噪音不明显，我自己也是仔细分辨后才明确该机的位置。飞行场地就在城市道路旁边，并没有封路，说明该机的噪音也较好地融入了道路背景噪音。

本次活动和飞行充分体现了奔驰对未来城市交通的设想：电动、共享、智能、空地一体化，这些特点其实也已是许多汽车厂商的共识。就在距离斯图加特不远的法兰克福，正在举行的车展同样彰显了这些因素。

从左至右：巴登符腾堡州内政及数字化部部长、巴登符腾堡州州长、戴姆勒董事长、Volocopter公司 CEO

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《自由飞翔与通航》杂志是目前国内唯一一本专注于超轻机、轻型运动飞机、轻型直升机、自转旋翼机等运动航空器以及单发和双发轻型飞机的专业出版物，内容涵盖：

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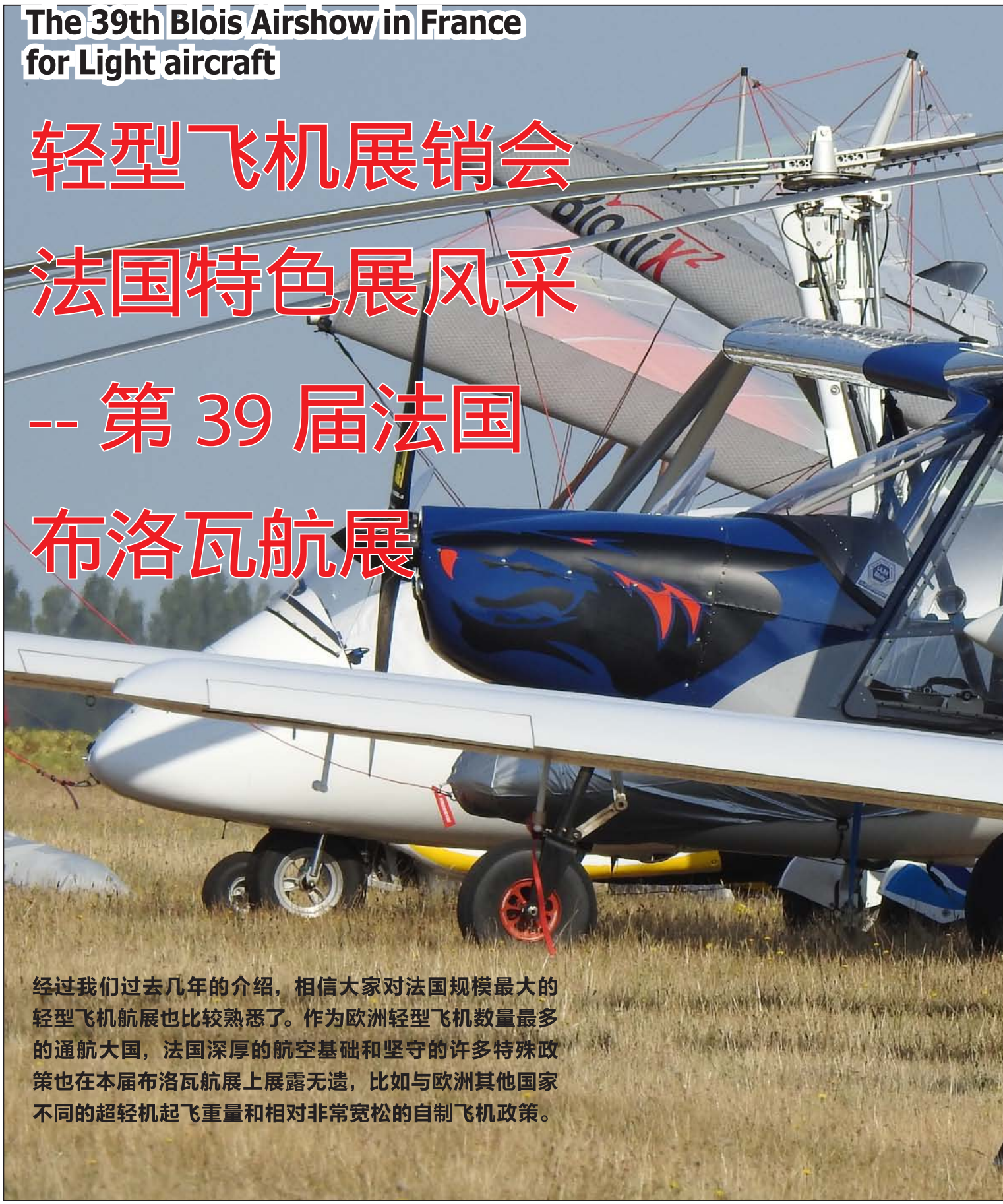
The 39th Blois Airshow in France for Light aircraft

轻型飞机展销会
法国特色展风采
-- 第 39 届法国
布洛瓦航展



经过我们过去几年的介绍，相信大家对法国规模最大的轻型飞机航展也比较熟悉了。作为欧洲轻型飞机数量最多的通航大国，法国深厚的航空基础和坚守的许多特殊政策也在本届布洛瓦航展上展露无遗，比如与欧洲其他国家不同的超轻机起飞重量和相对非常宽松的自制飞机政策。

English short version: Blois is a nice city on the french Loire river. At the end of the french summer school holiday, ultralight pilots from all Europe unite here for the largest Fly-In of ultralight aircraft in Europe, maybe even the world. Due to their very light regulations (declarative certification, no annuals and no medical for the pilots licence) the ultralights in France have grown rapidly in the past 20 years and new classes and trends like ultralight helicopters and ultralight hot air balloons have been created here.

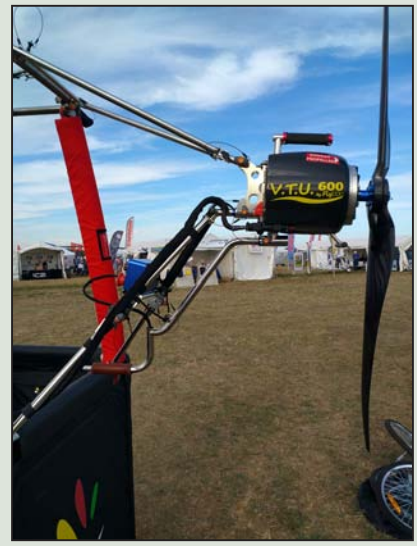
布洛瓦航展是各类运动航空器的大集会，您能看清这里有多少架多少种航空器吗？

强强相遇：同样都是优秀的畅销机型，斯洛文尼亚蝙蝠飞机公司的“病毒”超轻机（左）和德国 Flight Design 飞机公司的 CTSL 超轻机（右）

法国的航空运动和超轻机发展一直非常有自己的特色，不管是机型设计还是航规制定。布洛瓦航展作为法国规模最大的轻型飞机展会，也是颇具特色。跟欧洲规模最大的通航展—德国AERO腓得烈港通航展不同，布洛瓦航展聚焦超轻机和运动航空器，因此是以户外为主，直接针对机主和飞行员，兼具展销会和飞行聚会两大特色，非常适合有购机意向的观众现场观看厂商的展示飞行表演，并直接体验试飞，各个厂商也乐于安排客户现场体验飞行。同时，每届航展还有上百架轻型飞机自驾而来，露营集会，相见老朋友，认识新朋友，所以布洛瓦航展可谓展销会和飞行聚会的大融合，不过航展还是以法国厂商和观众为主，德国AERO腓得烈港通航展相比而言就更加国际化。

去年欧盟通过了欧洲超轻机最大起飞重量修订规则后，采取的实施方式是由各国自行审批是否相应修订以及修订的范围。需要指出的是，欧洲各国的航空器之前只要起飞重量不超过450公斤（含整机降落伞为472.5公斤），都由各国自行管理适航，只有超过该重量的航空器才由欧洲航空安全局（EASA）进行统一的适航审定，因此600公斤起飞重量的轻型运动飞机（LSA）在欧洲就不幸属于EASA管理的范畴，需要进行适航审定才能销售，因此十多年来只有非常少的市售机型。欧洲独特的超轻机管理办法虽然给了各国很大的空间，使得450公斤级超轻机发展非常活跃，但过小的重量也同样限制了机型的发展空间，因此几年前各国超轻机行业组织纷纷要求提高起飞重量，几近周折，终于在无须修改LSA机型起飞重量的前提下，欧盟允许各国自行修订超轻机航规，只要起飞重量不超过LSA的600公斤，以避免EASA适航审定。自去年以来，已经先后有捷克、德国、意大利等国通过了各自的超轻机修订，将超轻机的最大起飞重量提高到了600公斤。

然而，有性格的法国人再次特立独行，只将超轻机起飞重量提高到550公斤，这就可能导致一个很尴尬的局面：法国的超轻机可以飞到欧洲其他国家，但其他国家的超轻机可能就没法飞到法国，同样，法国的机型可以在其他欧洲国家销售，但反过来就不行。这在一体化的欧盟境内无疑是个很尴尬的事儿。对法国的这一举措，欧洲多国都表示了意见，但现在看来，法国不大可能提高起飞重量标准，因此欧洲各国之间如何顺利让超轻机飞行，还需要商议解决。不过，法国这



法国 Flydoo 公司研制的超轻型单人电动推进热气球，在单人热气球基础上加装了电机螺旋桨，有利于控制方向

捷克企业研制的“Legend”（传奇）飞机并不在意表明跟塞斯纳 172 飞机的外观关联，但两者的相似性也就仅限于外观，前者的发动机和内饰都较后者有很大的改善，符合欧洲超轻机和轻型运动飞机航规，该机现由比利时 JMB 飞机公司销售

与经典的塞斯纳 172 相比，在各个方面都有很大改进，该机装有整机降落伞

整机质感较 172 飞机有很大提升

机门做工体现了现代设计和工艺水平

极具个性的机身涂绘是参观航展的一大乐趣

美国著名套材飞机设计师 Dean W. Wilson 设计的“迷你探索者”飞机是本届航展的一大亮点，该机满足法国超轻机航规，是一架飞行的房车。之所以叫迷你型号，是因为设计师九十年代已经研制过更大号的该类型飞机，用于环球航空旅行。

“迷你探索者”飞机内设有简易厨房和洗漱台

这架“迷你探索者”飞机的法国飞行员 Jerome Varet 展示飞机后部空间

法国飞行员 Arnaud 用 5 年时间在家里自行设计制造了这架名为 EXIA 的单座实验类飞机，目标是高效巡航，该机为碳纤维，使用 35 马力转子发动机，空重 133 公斤，失速速度 64 公里每小时，最大速度 210 公里每小时

科隆坂先生（左）与 EXIA 自制飞机的研制者和飞行员 Arnaud（右）在谈论该机设计

种独特的政策没有妨碍这届布洛瓦航展的举办，展销依旧很热闹，观众照样很多，欧洲其他国家的厂商参展的还是很多，毕竟谁都不想放弃法国这一欧洲数量最大的超轻机市场。

本届布洛瓦航展上，谈论最多的当然是超轻机新规，多个厂商也打出了“旗下机型为新规准备就绪”的销售口号，其实欧洲超轻机即便之前的起飞重量在欧洲只允许450公斤，但为了进入美国、中国、澳洲等国的轻型运动飞机市场，许多欧洲厂商的超轻机其实都是按照轻型运动飞机的600公斤起飞重量设计的，只是在欧洲降格销售而已。因此现在欧洲多国将超轻机起飞重量提高到600公斤，对厂商而言，无非就是办理下手续的简单事儿，飞机是早就准备好了。

与前几届相比，本届布洛瓦航展上，自转旋翼机参展厂商数量有所下降，超轻机新规出台后，固定翼超轻机商载大幅提升，相比较而言，自转旋翼机的载荷提升空间较小，因此受到固定翼机型的竞争挤压。不过相比较而言，动力三角翼厂商的日子更难过一些，他们同时受到自转旋翼机和固定翼的挤压，市场份额呈下降趋势，不过在强烈的市场竞争压力之下，也激发了厂商的创造力，动力三角翼厂商不断推出新技术和改型，比如可变翼型的翼面控制技术，可以有效改善高低速的矛盾性，多个厂商推出了可快速折叠或放倒的三角翼面和主桅设计，与自转旋翼机的便利性进行竞争，动力小车也及时换发，使用最新型的罗泰克斯915iS涡轮增压发动机，座舱的舒适性和功效性也在不断提高，比如更豪华的内饰，更宽大的座舱，更多的储物空间等等。极具特色的法国超轻机市场正如布洛瓦航展一样，在纷繁的环境中始终坚持自己，并乐在其中。

米歇尔·科隆坂先生设计的笑脸常开的 MCR-01 飞机，仿佛在欢迎来到布洛瓦航展

米歇尔·科隆坂先生设计的“蟋蟀”自制飞机为我国广大飞行爱好者所熟知，八十多岁的老先生谈论起飞机来精神矍铄，这是他在其设计的最后一个自制机型“萤火虫”单座飞机前

今年法国 Socata 飞机公司直接把一架飞机放在了前往航展的路口处

航展不仅是飞行员的乐园，狗狗也很舒适

自转旋翼机经过前几年的快速发展，现在面临提升起飞重量后的超轻型固定翼飞机的有力竞争，旋翼机厂商在各个方面大力提升产品竞争力，包括颜色

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EDITORIAL
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Step by step
逐步

Electrification is changing the world of transportation in all fields: e-Scooter, fuel cell cars, electric ferries. In Aviation a number of e-aircraft are flying even there are not only the technical challenges but also the certification of the products. Here the requirements are probably much higher than in other fields. When some eVTOL manufacturers state that they want to start operations with transportation in the next two years – this will be difficult. Sine the certification for all the new machines will be done in General Aviation, and this, in my opinion, will take time. At the moment there is no GA aircraft certified with a fly by wire system, neither in the fixed wing nor in the rotorcraft field (except some high end Biz-Jets). At the same time there is not one certified aircraft with an electric motor except two motor gliders and one LSA motor gliders (which you can not use for passenger transport). Without these two components certified, no eVTOL can take off for commercial use.

Apart from this there is another factor which is more in favor to electric fixed wing aircraft than eVTOL. For the new eVTOL business a complete new infrastructure inside the cities has to be installed and a new way of air traffic control has to be developed and put into operations. It's clear, the eVTOLs will not need large airfields like fixed wing aircraft. But for them the basic infrastructure with thousands of airports near cities in Europe and US already exists - with all needed authorization. So just the additional electric infrastructure has to be installed. There are also countries, like Norway in which the government has stated: Yes we want to operate STOL (Short Take off and Landing) electric planes for commercial people transport as fast as possible. And we will make sure that when the first aircraft is ready for operation this infrastructure will be there.

To be clear: I do not say eVTOLs are not coming or are technically impossible. I just saying they are not in competition with the new kind of electric STOL transport aircraft which, at the beginning, will have 5 to 10 , then 20 seats and then perhaps more. They are much more the logical first steps from the existing conventional aircraft and operations towards a new eAviation eco system with STOL and eVTOL aircraft. They are the logical steps in which the manufactures of the e-motors and the control system (which also includes later the development from existing manual aircraft over – assisted operation aircraft towards more or less autonomous aircraft) will have to learn to develop their products to aviation standards. The certification authorities create the certification and operation rules for e-aircraft with fly by wire and simplified operations.

What is the consequence?

The result will be, that we will see most likely first a fixed wing aircraft with e-Motor and conventional steering certified in part 23 than fixed wing aircraft certified part 23 with fixed wing and fly by wire and than perhaps the first eVTOL with full certification. And like I said it's logical to accelerate step by step because there is a high danger to fall if you start running and do step 4 before the first three steps.

Willi Tacke

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Uber to develop UAM site in Frisco area in Dallas

优步在达拉斯 Frisco 区开建起降坪

Uber will work with developer Hillwood to develop a test site for urban air mobility at Frisco Station in Dallas. The site will likely be the first test site for Uber Elevate project. The site will be larger and more complex than most helipads because it will be designed to handle more traffic and passengers than a regular helipad. Dallas is one of the three trial cities of Uber Elevate along with Los Angels and Melbourne Australia. Uber plans to start Elevate test flights in 2020.

优步与地产及基础设施开发商 Hillwood 公司合作，开始在达拉斯大区北部的 Frisco 市建设城市交通枢纽，该枢纽包括电动垂直起降（eVTOL）飞机起降坪，优步计划将此处作为优步“Elevate”城市空中交通（UAM）项目的首个试点场地，计划 2020 年底前进行首次试飞，达拉斯是优步全球 3 个 UAM 试点城市之一。该起降坪与正在建设的交通枢纽统一规划建设，该枢纽将整合城市空地一体化交通系统，包括城市间轻轨、UAM、高速路、公交车、共享汽车、共享电动滑板等各个空地交通方式。该 UAM 起降坪比普通的直升机停机坪更大，其设计考虑了比现有直升机运营更大的客流量、起降频率、与其他交通方式的衔接等因素，还考虑了 eVTOL 飞机的充电设施。

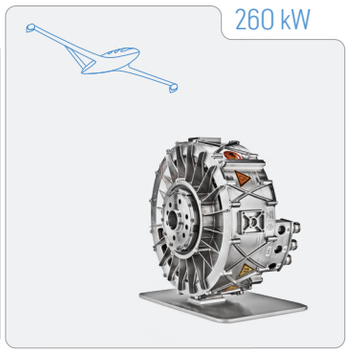
BAE entered electric aviation market

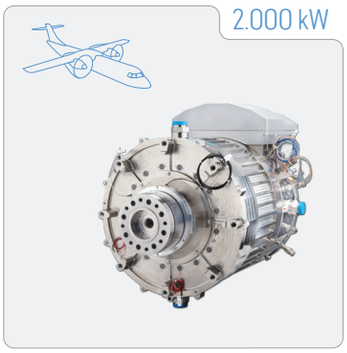
BAE 进军电动航空市场

BAE Systems entered electric aviation market by offering a wide range of different products to be used on platforms ranging from regional commuter to eVTOL. BAE plans to offer energy management, flight control and power conversion systems that are scalable and adaptable. The company plans to develop its products to be used by either hybrid or fully-electric systems. BAE is working with several eVTOL companies already including Uber Elevate partners. BAE plans to have operational prototypes of its products ready by early 2021.

英国航空航天企业集团 BAE 公司宣布，他们将为电动飞机提供电能管理、航空电子设备和电力转换系统，这些系统将具备可扩展性，适用于从支线电动飞机到适用于小型城市空中交通（UAM）的电动垂直起降机型（eVTOL）。BAE 计划提供全电动和混合动力电动系统。BAE 已经与多家 eVTOL 企业合作，其中包括优步“Elevate”电动垂直起降项目的六家整机厂商，具体细节尚未公布。BAE 打算在 2021 年初之前推出原型产品用于飞行测试，2025 年交付适航产品。BAE 在原型产品使用的控制系统类似于传统的电传操纵系统，从飞机传感器向飞行控制器提供信息，飞行控制器向地面和发动机或发动机控制器发送命令，但针对电动飞机的产品将更紧凑和集成。

Powering the Future





With air traffic continuously rising, new solutions are needed to increase efficiency and limit environmental effects.

Rolls-Royce is developing electric propulsion systems to power a more sustainable future of aviation and new mobility concepts, with power classes ranging from less than one hundred to several thousand kilowatts.

rolls-royce.com

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Spanish Carrier Volotea jointed Dante to develop hybrid commuter airplane

西班牙航空公司与初创企业联合研制混动支线客机

Spanish carrier Volotea jointed Madrid-based startup Dante Aeronautical in the development of a hybrid electric aircraft for regional transport. Volotea will assist with refining the concept by providing market and technical data. Dante Aeronautical is developing a 19-seat regional aircraft, DAX-19, with a range of 400nm. Dante indicates that its design could ultimately accommodate 35 passengers, with thrust generated by batteries for energy storage and an internal combustion "turbo generator" to extend range. Dante is working with Altran and universities in Sydney and Adelaide on this project as well.

西班牙航空公司 Volotea 宣布与位于马德里的电动飞机初创公司 Dante Aeronautical 达成协议，联合研制混动客机。该机设计为 19 至 35 座，目标是与同级的喷气和涡桨机型相比，减少 50%的排放。第一个机型 DAX-19 将为 19 座，航程为 400 海里（700 公里）。DAX-19 飞机采用分布式电机（DEP）混动形式，每侧机翼上装有 5 台电机，机尾另有一个推进式螺旋桨，总共有 11 个电机加螺旋桨。Dante 公司目标是利用航空电气化创新技术研制支线客机，用于连接中小型居民点，在目前航班稀少的路线上提供点到点的通勤服务。该飞机将采用分布式电机（DEP），配合储能的电池和涡轮发电机提供动力，并为今后全电动改型预留基础。该项目的其他参与者还包括全球创新和工程咨询公司 ALTRAN，以及澳大利亚的悉尼大学和阿德莱德大学。

SkyDrive closed new round financing of 14 million USD

日本 SkyDrive eVTOL 完成新一轮融资 1400 万美元

The Japanese eVTOL company SkyDrive announced that it has secured another $14 million USD in financing. SkyDrive was established by the members of Cartivator project which was founded in 2012 by a group of eVTOL enthusiastic engineers of Toyota. SkyDrive was incorporated last year for commercial operation and certification of eVTOL. So far SkyDrive has raised a total of $18.5 million USD in capital. Investors include Drone Fund, Z Corporation, STRIVE III Limited Liability Partnership, ITOCHU Technology Ventures, Inc. and Energy & Environment Investment, Inc. The company made the first unmanned flight test of its prototype in December 2018.

本轮投资人包括日本 Drone Fund（无人机基金）、Z Corporation、STRIVE III 公司、伊藤忠商事科技风险投资公司和能源及环境投资公司。本次融资完成后，SkyDrive 已总共融资 1850 万美元。SkyDrive 公司是去年由日本 CARTIVATOR 项目成员成立的企业，CARTIVATOR 最初是 2012 年由丰田公司的几位工程师成立的一个垂直起降和飞行汽车业余兴趣研究组织，后获得丰田的 260 万美元种子投资，成立了 SkyDrive 公司。SkyDrive 公司 CEO 福泽知浩表示，公司现在最重要的目标是年内的首次载人试飞，以及随后的适航审定工作。原型机已于 2018 年 12 月首次非载人试飞，SkyDrive 公司在今年 6 月与丰田市和爱知县合作，在丰田市设立了试飞场和试飞空域。

Hyundai formed urban air mobility division and recruited former NASA executive

现代汽车成立城市空中交通部门，前 NASA 副局长出任负责人

Hyundai appointed Dr. Jaiwon Shin as head of its new UAM division. Before joining Hyundai, Dr. Shin was NASA's Aeronautics Research Mission Directorate. At Hyundai, Shin and his team will be tasked with developing the core technologies behind the company's flying vehicles. During his time at NASA, Dr.Shin oversaw a $725 million program to develop new aviation projects, including NASA's X-57 electric aircraft program, UAS traffic management and urban air mobility projects.

韩国现代汽车集团宣布，成立城市空中交通部门（UAM），由前任美国航空航天局（NASA）副局长申在元博士（Jaiwon Shin）出任负责人。截至目前，汽车厂商中，已有奔驰、宝马、奥迪、保时捷、阿斯顿马丁、吉利、丰田、斯巴鲁通过直接股权投资或参与设计的方式参与 eVTOL 项目。申在元博士是第一代韩国移民，离任前是 NASA 负责航空业务的副局长，在任期间主持发起了预算达 7.25 亿美元的“航空新地平线”航空创新计划，包含低音爆超音速验证机、分布式电动飞机验证机、飞机电气化系统开发、城市空中交通管理系统、集群无人机空管等等具体项目，是航空创新、电动航空、城市空中交通的积极推动者，曾出席美国国会关于城市空中交通的听证会。

Embraer unveiled the electric airplane demonstrator

巴西航空工业电动验证机亮相

On the date of the 50th anniversary Embraer unveiled its electric airplane demonstrator to the public. The demonstrator is based on Embraer's single-engine EMB-203 Ipanema ag plane. Embraer is developing the demonstrator with Brazilian electrical machine manufacturer WEG to jointly develop new products and solutions to enable electric propulsion in aircraft. The Ipanema technology demonstrator's first flight is scheduled for early 2020. The team will not only replace the Ipanema's engine with an electric motor, but will also replace the powertrain and power controls, which will all be provided by WEG. The team chose the Ipanema because it would be less capital intensive and is already designed to carry significant weight.

巴西航空工业在成立 50 周年纪念日暨巴西的“农用航空日”当天公开了首个电动飞机验证机，该机基于巴西航空工业的 EMB-203“伊帕内玛”农用飞机改装。

该项目由巴西航空工业与巴西电气企业 WEG 合作研制，WEG 负责电机和电气系统，巴西航空工业负责系统集成和试飞，美国知名航空供应商 Park Aerospace 也参与其中，负责冷却系统设计。巴西航空工业表示，在接下来的几个月里，参与该项目的三家公司“将继续进行系统测试，以准备在验证机进行集成，随后将进行试飞测试。”

Volocopter closed a new round of investment worth 50 million euros

Volocopter 完成新一轮融资 5 千万欧元

The German eVTOL company Volocopter completed C-round financing with 50 million euros. The Chinese automobile manufacturer Geely and existing investor Daimler led this round of investment. Volocopter said it plans to form a partnership with Geely to bring air taxis to China. This investment increases the total capital of Volocopter to 85 million euros.

德国 Volocopter 公司宣布 C 轮 5000 万欧元融资关闭，吉利控股领投，现有股东戴姆勒继续跟投，本轮投资后，吉利、戴姆勒和英特尔各持股 Volocopter 约 10%。此外，吉利和 Volocopter 将在中国成立合资公司，致力于将该公司的城市空中交通解决方案引入中国，吉利将负责 Volocopter 产品在中国的生产和市场推广。本轮融资完成后，Volocopter 融资总额将达 8500 万欧元，据悉 Volocopter 年内还有新的融资关闭。法兰克福车展期间，Volocopter 在奔驰总部所在的斯图加特市奔驰博物馆进行在欧洲的首次离地飞行公开演示。

Zeroavia's fuel cell modified Piper M500 made first flight

起飞重量最大的氢燃料电池飞机试飞

Californian-based startup ZeroAvia is developing a fuel cell propulsion system for airplanes. The prototype is based on a Piper M500 whose turbine engine is replaced with two 130kw electric motor. The company plans to have the engine ready for production by 2022. ZeroAvia plans to offer its fuel cell propulsion as a retrofit package to aircraft manufacturers and commercial operators. As a first step, ZeroAvia is targeting regional flights of up to 500 miles (800 km) in 10- to 20-seater aircraft.

美国电动飞机初创企业 ZeroAvia 研制的氢燃料电池电动飞机成功首飞。该机基于派柏 M500 单发涡桨飞机改装，将原装的 500 轴马力的普惠 PT6A-42A 涡桨发动机更换为一台大功率电机，采用氢燃料电池供电，M500 飞机最大起飞重量为 2.3 吨，ZeroAvia 宣称这是目前试飞的最重的氢燃料电池飞机，该公司目标是大幅降低短途通勤的运营成本，将为该电动系统申请 FAA 适航审定，计划 2022 年开始为运营商提供一站式动力更换服务。M500 飞机的最大航程为 1800 公里，巡航时速 480 公里每小时，ZeroAvia 公司计划改装的氢燃料电池电动型号在保持巡航速度不变的同时，航程为 800 公里左右，能有效满足短途通勤的市场需求，据市场调研，全球 50% 的商业航班的飞行距离在 800 公里以内。ZeroAvia 公司表示，该电动改型 M500 的每座 / 每公里运营成本将较适用涡桨的原装 M500 降低一半，达到大型民航客机的成本水平，能大幅提供短途通勤运营的盈利水平，推动分布式航空运输业态的发展。

a WOLONG company

About ATB

The history of ATB Austria Antriebstechnik AG dates back more than 90 years. Today, the Group ranks among the leading global suppliers of electric drive systems for industrial applications and home appliances.

The Company, which includes famous brands such as Schorch, Morley, Laurence Scott and Brook Crompton, currently has twelve manufacturing bases – in Spielberg, Welzheim, Moenchengladbach, Nordenham, Leeds, Norwich, Cradley Heath, Tarnow, Subotica and Bor – and employs more than 3,500 people.

ATB is committed to providing green electric driving solutions

GE Aviation

ATB a WOLONG company

GE Aviation Czech and ATB to explore turboprop solutions for urban mobility market

PRAGUE – GE Aviation Czech and ATB Antriebstechnik AG have agreed to jointly explore turboprop propulsion solutions for the general aviation and urban mobility market in the power range between 500 and 1000 SHP, leveraging GE's H Series turboprop aircraft engine technology and ATB electrical machines. Different configurations will be investigated and a first proof of concept test is aimed to take place later this year.

"We're excited to contribute into the development of more sustainable transportation systems and greener flight", said Michele D'Ercole, President and managing executive of GE Aviation Czech, Business and General Aviation Turboprops.
GE Aviation Czech will also provide system integration supported by leading European research centers for electric propulsion and other key partners for battery systems.

"We are extremely proud to join our efforts with GE to investigate new turboprop solutions combined with our system electrical technology", said George Gao, ATB Chief Executive Officer.
"The solution aims to combine simplicity and power density for a unit tailored for the turboprop general aviation market," said Francesco Falco, ATB-WOLONG VP Global Sales & Marketing.

ATB Aviation drivetrain products portfolios:

Pmax ≦ 1000 kW Nmax ≦ 40000 RPM SiC-inverter

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White House policy indicates eVTOL for the first time

美国白宫指导性文件首次专门提到电动垂直起降飞机

On Aug. 30, 2019, the White House released Policy Memorandum memo "Fiscal Year 2021 Administration Research and Development Budget Priorities" which indicates the need to support the development of eVTOL. The document says that "to prioritize R&D [research and development] to lower the barriers to the deployment of surface, air, and marine autonomous vehicles with a focus on developing operating standards, integration approaches, traffic management systems, and defense/security operations."

8 月 30 日，白宫的管理及预算办公室和科技政策办公室两个部门联合签发了"2021 财年度研发预算优先事项"文件，发往各联邦行政机构。该文件是白宫根据各项工作进展情况不定期发布的指导性文件。这份文件列举了需要特别重视推进的科研及应用领域，其中在"未来工业"部分的"先进通讯网络及自主技术"项中，专门提到要加强电动垂直起降航空器和民用超音速飞机的适航审定工作，要求"各部门和机构应优先考虑能够实现电动垂直起降和民用超音速飞机的研发，包括适航审定、陆地上空超音速飞行噪声标准的制定以及低音爆超音速飞机研究。"

UK earmarked 300 million pounds for low-emission aviation development

英国计划投资 3 亿英镑用于电动飞机研发

The British government unveiled a more than £300 million ($368 million) government-industry joint investment to develop "cleaner, greener" forms of air transport, including electric and autonomous aircraft and sustainable alternative fuels. The government will provide £125 million in the Future of Flight Challenge, supported by an industry co-investment of £175 million, to fund development of technologies including cargo drones, urban air taxis and larger electric passenger aircraft. An additional £5 million has been awarded by the UK's Engineering and Physical Sciences Research Council to five new transport research networks led by the Universities of Birmingham, Durham and Leeds, Cardiff University and University College London. The funds will support work to develop cleaner fuels and other technologies to reduce emissions. The document describes four main areas of work under the challenge: new models of airspace management and "anticipatory regulation," novel air vehicle demonstrators, ground infrastructure demonstrators for cities and "sub-regional airports," and new operating models for users and commercial operators of air services.

英国首相鲍里斯 • 约翰逊宣布设立 3 亿英镑的专项扶持资金及一揽子推动政策，作为英国环保减排政策的一部分，其中英国政府投资 1.25 亿英镑，英国产业界投资 1.75 亿英镑，目标是推动低排放、智能新型航空器的研制和产业化，重点是电动垂直起降机型（eVTOL）、城市空中交通应用和物流无人机。配套政策包括：

1、形成院校协同研究机制：在伯明翰、利兹、达勒姆、加的夫和伦敦大学学院分别设立新型交通研究项目，每所院校先期将获得 500 万英镑用于清洁燃料和其他创新以减少排放和改善空气质量的研究项目。

2、设立"未来飞行挑战"（Future Flight Challenge）项目，细则将于 9 月 30 日公布，预计该项目将就实现特定目标进行招标，主要面向产业界。

3、先期将重点扶持小型电动飞机和电动垂直起降机型的研制，逐步向大型载客飞机发展。

航空的未来——电动飞机

The Future of Aviation

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Scandinavia under e-Power

北欧全面推动电动航空

The Swedish infrastructure Minister, Tomas Eneroth launching ELISE.
瑞典基础设施部长 Tomas Eneroth 主持发起成立 Elise 瑞典电动航空联盟

Not only Norway, also its Scandinavian neighbors Denmark, Sweden and Finland are ramping up to get electricity going. When Norway announced they want all inner Norwegian flights being fully electric until 2040, now Sweden topped this with 2035. They started the "ELISE" initiative for electric flying in Sweden and in mid September eleven Nordic companies founded an Electric Aviation Alliance to combine this efforts. The first international Nordic e-Aviation summit is planned for Spring 2020.

不仅挪威，斯堪的纳维亚地区的丹麦、瑞典和芬兰也正在加紧电动化航空。挪威政府计划到 2040 年，挪威全部国内航空全部转为纯电力，瑞典则更为激进，计划 2035 年执行电动飞机航班，为此瑞典政府成立了“ ELISE”电动航空计划，9 月中旬十一家北欧地区单位和企业在北欧六国政府的协调下成立了北欧电动航空联盟，并计划 2020 年春季举行首届北欧电动航空峰会。

挪威于2018年3月在机场管理集团公司Avinor的主持下开始电动航空规划和实施，此后，瑞典以其诗意的名字“ Elise”设立了电动航空协调机构，即瑞典语“ Elektrisk Lufttransport i Sverige”（瑞典电动航空）的意思。 该项目由瑞典创新机构Vinnova资助。埃莉斯（Elise）的目标是在瑞典推动电动飞机研制和

After Norway started his e-Aviation in March 2018 under the lead of the state owned Avinor the neighbor Sweden countered with their initiative with the poetic name “ELISE”, which stands for “Elektrisk Lufttransport i Sverige” (Electric Aviation in Sweden). The project is funded by the Swedish innovation agency Vinnova.

ELISE wants to build an electric aircraft in Sweden. It is a collaboration between Chalmers University of Technology, KTH – Royal Institute of Technology, Linköping University, Luleå University of Technology, Uppsala University, the Civil Aviation Administration and RISE Viktoria research institute with the aerospace industry and other actors. The first result is the company Heart-Aerospace and its 19 seater e-aircraft (see following page).

Half a year later, in September 2019, a Nordic initiative is combining the Norwegian and Swedish efforts to drive the development of electric aircraft in whole Scandinavia. The initiative is funded by Nordic Innovation (an organization under the Nordic Council of Ministers), a platform is created where Nordic players gather together.

“We will be a Nordic network that works with both infrastructure, industry issues and new business models,” said Maria Fiskerud, project manager for The Nordic Network for Electric Aviation (NEA), at the founding meeting middle of September.

The NEA network will organize workshops and other events to build knowledge and cooperation in the Nordic countries. At present, the network has eleven members: Air Greenland, Avinor, Braathens Regional Airlines, El-fly AS, Finnair, Heart Aerospace, Iceland Air, NISA (Nordic Innovation Sustainable Aviation), RISE, SAS and Swedavia. There are four focus areas with clear objectives for driving the growth of electric aircraft:

1. Standardize electric air infrastructure in the Nordic countries
2. Develop business models for regional point-to-point connectivity between Nordic countries. (Although the Nordic countries have a substantial airport infrastructure that could connect regions).
3. Develop aircraft technology for Nordic weather conditions (These aircraft are highly susceptible to wing icing).
4. Create a platform for European and global collaborations

Next to the amelioration of the quality of life the government see as well a huge potential for Nordic businesses to get on board with this innovations.

运营，目前成员包括Chalmers科技大学、KTH （瑞典皇家理工学院）、林雪平大学、吕勒奥工业大学、乌普萨拉大学、瑞典民航局和RISE Viktoria研究院，以及航空航天领域其他参与者。 Elise联盟的第一个项目是Heart-Aerospace电动飞机公司及其19座电动飞机（请参阅下一页）。

半年后，2019年9月，北欧各国倡议将挪威和瑞典的努力结合起来，以推动整个斯堪的纳维亚地区的电动飞机发展。这项创新由北欧创新组织（北欧部长理事会下属机构）提供资金，聚集北欧地区的电动航空参与者。 “我们将成为一个能够同时处理基础设施、行业问题和新业务模型的合作平台，”北欧电动航空联盟（NEA）项目经理Maria Fiskerud表示。NEA联盟将组织研讨会和其他活动，以在北欧国家建形成共识合作。目前，该联盟有11个成员单位（格陵兰航空、Avinor、Brathens支线航空公司、El-fly AS公司、芬兰航空、Heart Aerospace、冰岛航空、NISA（北欧创新可持续航空协会）、RISE）。联盟确定了四个重点工作领域来推动电动飞机的发展：

1.北欧国家的电动航空基础设施标准化；
2.为北欧国家之间的短途通勤航空开发业务模型；
3.开发适应北欧天气条件的电动飞机技术，特别是在北欧地区飞机容易出现机翼结冰。
4.与欧洲和全球合作创建平台，除了改善生活质量，各国政府还认为北欧企业具有巨大的潜力参与这项创新。

Swedish have Heart for e-aircraft

瑞典的电动飞机“之心”

According to the ELISE initiative of the Swedish Government, to build an electric aircraft made in Sweden – the first company Heart Aerospace was founded by Anders Forslund who was also the initiator of ELISE when he worked as a researcher at the company Chalmers. The goal of the Startup - which already raised about 2 million Euros - is to build an electric 19 seat aircraft, the ES-19.

根据瑞典政府的 Elise 电动飞机联盟的倡议，瑞典正在研制一架电动飞机，名为 Heart Aerospace 公司（意为“心脏飞机公司”），由 Anders Forslund 创立，而 Anders Forslund 还是 ELISE 联盟的发起人，当时他是 Chalmers 公司的研究员。该初创公司已筹集了 200 万欧元，正在研制 19 座电动飞机

令人”心动”的首架ES-19飞机将搭载19名乘客，电池续航里程为250英里，足以覆盖瑞典国内交通的三分之一，这个续航里程涵盖了全球航线量的14%。公司CEO Fforslund表示，“我们的目标是到2025年完成适航审定，我们的使命是为短途支线建立最快、最便宜和最环保的运输方式，并将其应用到世界的各个角落。”如果您仅消除二氧化碳的排放，飞机是一种极

The ES-19, Hearts first aircraft, will accommodate 19 passengers and have an operating range of 250 miles on batteries, enough to cover a third of domestic traffic in Sweden, and 14 percent of departures worldwide. The goal is, to certify the aircraft for passenger traffic in 2025.
"Our mission is to build the fastest, cheapest and most environmentally friendly means of transport for regional travel, and export it to all corners of the world" announced Fforslund. "If you only get rid of CO2 emissions, aircraft are an extremely resource-efficient way of transporting people. Our aircraft carries the equivalent of four Tesla batteries, and with those batteries, one plane can transport a hundred people across the country every day. By electrifying the aircraft, we can completely remove the emissions, and thereby create a new type of sustainable travel ".
The next step is to build a 48-seat aircraft on the same platform.
"Just look what Norway did with electric cars. They put heavy incentives in place, and now, 50% of all new cars in Norway are electric, compared to less than 1% in the US. For aviation, subsidies will play an even larger role, since air travel is part of the Norwegian public infrastructure, and most routes are PSO (public service obligation)."
Sweden has a long tradition in aerospace. Anders Forslund: "We are one of a handful of countries in the world who independently developed both civil and combat aircraft flying today, in a country of ten million inhabitants".
Recently Heart was accepted for the Silicon Valley institution Y Combinator to its prestigious accelerator program. "The collaboration with Y Combinator means that we can accelerate the work of developing electric aircraft in Sweden," says Anders Forslund, founder and CEO of Heart.
The first prototype should fly in 2020 and the certification should be finished in 2025 in EASA CS 23 Level 4. The aircraft will have a MTOW of 8600 Kilograms, 4 Motors with 400 kW, a length of 17 and a wingspan of 22 meters. At the moment the company has 10 employees and three locations.

为宝贵的资源。我们的飞机上装有相当于四台特斯拉电动车电池的电量，有了这些电池，一架飞机每天就可以在全国运送一百人。通过电动飞机，我们可以完全消除碳排放，从而创造出新的可持续航空旅行"。

该公司的目标下一步是在同一平台上建造48座的飞机。"看看挪威的电动汽车发展吧，他们制定了很多鼓励措施，现在，挪威所有新车中有50%是电动车，而美国只有不到1%。对于航空而言，补贴将发挥更大的作用，因为航空旅行是挪威公共基础设施的一部分，而且大多数航线都是PSO（公共服务义务）。"
瑞典在航空航天领域具有悠久的传统，作为只有一千万人口的国家，我们是世界上少数几个自主研发过民用飞机和战斗机的国家之一"

最近，Heart公司被著名的高科技孵化器，硅谷机构"Y孵化器"选中培育。 Heart公司的创始人兼首席执行官Anders Forslund说："与Y Combinator的合作意味着我们可以加快在瑞典开发电动飞机的工作。"

首架原型机计划于2020年首飞，申请EASA CS 23部 Level 4的适航审定。目前，该公司拥有10名员工和3个办公地点。这架飞机的最大起飞重量为8600千克，采用四台电机螺旋桨，翼展为22米，功率为400千瓦。

The Electro Alpha with Norwegian registration over one of the many Nordic islands.

挪威购买的蝙蝠公司的阿尔法电话飞机飞翔在挪威若干群岛之一的上空

Norway & Avinor getting ready

Last year in March Norway surprised the world with its first conference where the Government of the Oil producing country announced that they will electrify all domestic flies by 2040. The state owned operator Avinor who had invited to the Meeting confirmed a supporting strategy. eFlight Journal spoke with Olav Mosvold, responsible manager at Avinor.

eFJ: What happened in the last 1,5 years since the meeting in Norway?

OM: After the conference we purchased a Pipistrel Alpha electro. Most of the summer 2018 we made mainly promotion flights with politicians and journalist to promote electric aviation. This was very successful, we had a lot of positive media resonance.

挪威及主管部门准备迎接电动航空

去年 3 月，挪威举行了第一次电动航空会议，这个世界最大的石油生产国之一宣布他们将在 2040 年之前实现国内所有交通方式电气化，这个决定让人惊讶。会议主办方挪威机场管理公司 Avinor 发布了一项协同战略。我们与 Avinor 的电动航空项目经理 Olav Mosvold 进行了交谈。

eFJ：一年半以前，挪威发生了什么事？

OM：会议结束后，我们买了蝙蝠飞机公司的阿尔法电动飞机做测试，在2018年夏季的大部分时间里，我们带许多相关方进行了电动飞机体验飞行，以推广电动航空。这种做法非常成功，在媒体上引起了很大的积极反响。

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EASA Patrick Ky and Norway CAA General Director Lars Kobberstad signed an agreement for accelerate the work on electrifying aviation.

eFJ: Any details on the incident?

OM: As known the pilot was our CEO Dag Falk-Petersen. Although the battery showed 80 % suddenly the power dropped, as he was flying over a large forest there was no other landing spot than the lake. As Dag is an experienced ex-fighter-pilot he managed to land on the lake near the shore, but the plane flipped due to the heavy nose. Luckily pilot and passenger got out without any problem, also the aircraft has almost no damage. Unluckily the passenger was Aase Marthe Horrigmo, a junior government minister.

eFJ: Was there any issue with the high voltage and the water ?

OM: No, not at all! The "switch off" in isolation worked. The accident is now under investigation of the Norwegian CAA. And the plane is expected to go back to Pipistrel for repair later this year.

eFJ: Dos this accident effect the Avinor strategy?

OM: Sure we will check the accident report but in another terrain it would probably been just an unspectacular emergency landing which also happens with conventional planes. It was a technical defect and the politicians confirmed that they keep the course.

Norway changed to electric cars over the last years. There has been accidents as well but this year more than 50 % of the new cars in Norway are fully electric.

EFJ: Was the aircraft also used for training?

OM: No, we had so many public events that there was no time for it. But the University of Tromsö in northern Norway bought two more planes to try it in the extreme weather up there.

eFJ: What are the next steps?

OM: We are right now working on a report for suggestions for action items for the politicians: What to-do for supporting our path, where and how to start the transformation... Next spring we will hold a conference with our Scandinavian partners. And we are preparing a closer collaboration between our CAA and the EASA. The goal is to make Norway a test arena for the development and certification of electric aircraft.

eFJ: Is this cooperation already happening?

OM: Yes in June EASAs Executive Director Patrick Ky and CAA Norway General Director Lars Kobberstad signed a binding agreement which will accelerate work on electrifying aviation.

EASA 局长 Patrick Ky 和挪威民航局局长 Lars Kobberstad 签署协议，以加快航空电气化的工作。

eFJ：但最近发生了一次事故?

OM：是的，当时的飞行员是我们的首席执行官达格•福克-彼得森（Dag Falk-Petersen），当时突然显示80%的电量下降了，当时他飞越一大片森林，除了湖泊外没有其他着陆点。由于达格是一位经验丰富的前战斗机飞行员，他设法安全迫降在湖岸边上，由于机头沉重，飞机发生了翻转，但人员无恙，甚至飞机也几乎没有损坏。当时机上的乘客是政府官员Aase Marthe Horrigmo。

eFJ：高压电池在水中有什么问题吗?

OM：幸运的是根本没有，很明显隔离措施起作用了。事故正由挪威民航局进行调查，计划于今年晚些时候将受损的飞机返厂维修。

eFJ：这次事故会影响Avinor的电动航空策略吗?

OM：目前还不确定我们是否要检查事故报告，但是这可能只是一次常规飞机也会发生的罕见的紧急降落。这是事故是技术上的缺陷，但挪威政府表示会坚持推动电动航空。过去几年，挪威改用电动汽车，期间也同样发生了事故，但今年挪威新车中有50%都是纯电动的。

eFJ：蝙蝠电动飞机也用于训练吗?

OM：不，我们有太多的展示飞行活动，没有时间用于飞行培训，但是挪威北部的特罗姆瑟大学（University ofTromsö）在那里的极端天气下又购买了2架，以进行测试。

eFJ：下一步计划是什么?

OM：我们现在正在编写一份规划报告，为挪威的电动航空项目提供建议，为支持我们在何处以及如何开始电动化转型的道路做些什么。 明年春季我们将与斯堪的纳维亚地区其他国家的合作伙伴举行会议。我们还推动了挪威民航局与EASA之间的紧密合作，目的是使挪威成为电动飞机开发和适航审定的试验场。

eFJ：这种合作已经开始了吗?

OM：是的，今年6月，EASA局长Patrick Ky和挪威民航局局长Lars Kobberstad签署了一项具有约束力的协议，以加快航空电气化的工作。

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Hydrogen production and storage solution for light aircraft

针对轻型飞机的氢燃料制取储存解决方案

Endurance is one of the technical difficulties of electric aircraft. Hydrogen fuel cells are a technically feasible solution. However, as of today it is complex and expensive to manufacture and store hydrogen, and there are few small-scale hydrogen industrial production solutions.

续航是电动飞机的技术难点之一，氢燃料电池是技术可行的解决方法，但目前还存在氢气的制造和储存需要专业昂贵的技术产品，而且小规模的工业化制氢方案很少。德国 PS-HyTech 推出了专门针对轻型飞机的小规模氢燃料制取储存解决方案，可在小机场相对容易地储氢并为氢燃料电池加注，满足轻型飞机长途转场飞行的需求

PS-HyTech 公司的解决方案的三个关键环节、产品及预计价格

Three key links, products and estimated prices for PS-HyTech's solutions

根据德国政府的规划，到2050年将总共有89吉瓦的氢能电解能力，德国的新能源发电装机容量也在稳定持续增加，但是制氢还存在技术专业、产品价格较高等缺点，因此目前的制氢主要还是集中式的大规模工业化。PS-HyTech公司的氢燃料技术是专门针对的通航小机场的解决方案，当然也可以应用于城市空中交通（UAM）起降场、电动汽车、工业等其他领域。该公司技术最大的特点是与分布式新能源小型发电装置形成一体化解决方案，因地制宜采用光伏或风力发电的电能制氢，然后现场压入高压瓶储存，并现场加注到氢燃料电池堆栈，适合独立运营的小型机场和工业场所，无须依赖外界运输氢气。针对新能源发电的输出特点，该制氢方案可适应10-100千瓦电力制氢，是目前少有的小规模工业化制氢解决方案。
该公司已与多家合作伙伴开始测试该系统，包括氢燃料电池供应商、储能锂电和BMS供应商和轻型飞机厂商。根据该公司提供的数据，可提供两种规格的碳纤维高压气瓶储氢，6500升容积的气瓶重量为150公斤，可储氢150公斤，175升容积的气瓶重量为70公斤，可储氢7公斤，采用的氢燃料电池为49千瓦一组，重量为21公斤。

该公司与多家特轻型飞机厂商正在研制的氢燃料电池双座轻型飞机的性能指标是：
起飞功率：40千瓦
巡航功率：20千瓦
巡航速度：200公里/小时
效率：60%
氢能：33千瓦时/千克
氢气消耗量：1公斤/小时
压力罐：700 bar，70公斤空重
氢气储量：7公斤
续航时间：7小时
航程：1,400公里

PS-HyTech GmbH from Germany has been developing hydrogen fuel production and storage solution specifically for 10-100kw small-scale renewable energy generation. This solution may be suitable for light aircraft. Small airports can produce and store hydrogen relatively easily and locally and fill up aircrafts at the airports.

The company has started testing the system with a number of partners, including hydrogen fuel cell suppliers, energy storage lithium and BMS suppliers and light aircraft manufacturers. According to the data provided by the company, two types of carbon fiber high pressure gas cylinders can be used for hydrogen storage. The 6500 liter capacity cylinder has a weight of 150 kg and can store 150 kg of hydrogen. The 175 liter cylinder has a weight of 70 kg and can be stored. The hydrogen is 7 kg, and the hydrogen fuel cell is a 49 kW group with a weight of 21 kg.

The performance of the hydrogen fuel cell-powered two-seat light aircraft being developed by the company and light aircraft partners are:
Takeoff power: 40 kW
Cruise power: 20 kW
Cruising speed: 200 km / h
Efficiency: 60%
Hydrogen energy: 33 kWh / kg
Hydrogen consumption: 1 kg / hour
Pressure tank: 700 bar, 70 kg empty weight
Hydrogen weight: 7 kg
Duration: 7 hours
Flight distance: 1,400 km

Pipistrel China

In 2017 Pipistrel announced a partnership with the newly founded Pipistrel China aircraft.

For starting the production and distribution of Pipistrels Electic Airctraft for the Asian market in China in the city of Jurong, e-flight-Journal met with Pipistrel China Chairman Danny Wu Hao who explains where the company stands now, two years later and what are the next steps.

eFJ: Danny, in the last two years we heard a lot from Pipistrel in Slovenia but not much from Pipistrel China. Is there any news specially on the development of the site in Jurong?

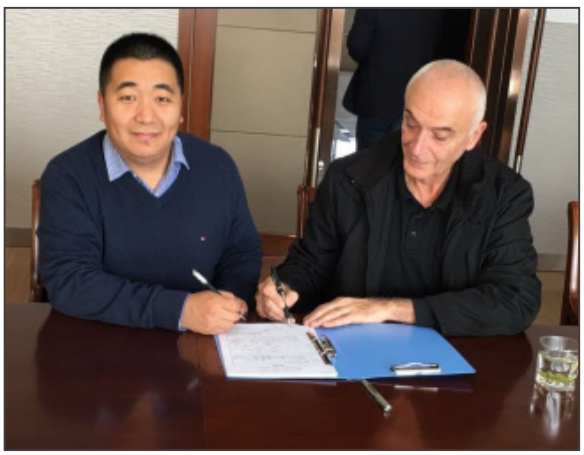
Danny Wu: A lot of things has happened. Not only the ground breaking here in Jurong. The government has cleared the area and removed old houses, we received government permissions as a private airport and now we are waiting for the last OK from the Military. You see, all the signals are positive. At the moment we are building the production halls for Electro Alpha and Panthera Hybrid.

Pipistrel China has begun flight operation at Miyun airport near Beijing.

亚澳通航科技已经在北京的密云机场开展飞行活动

蝙蝠飞机在中国的现状与未来 -- 与蝙蝠亚澳通航科技公司董事长的对话

2017 年，斯洛文尼亚的蝙蝠飞机公司（Pipistrel）与中方合作伙伴成立了合资企业蝙蝠亚澳通航科技（江苏）有限公司，在江苏省句容市建立工厂，为亚洲市场生产和销售蝙蝠飞机公司的多款机型，包括电动飞机。我们最近与亚澳通航科技的董事长吴昊进行了对话，他向我们介绍了蝙蝠飞机目前在中国的情况以及今后的发展规划，以下就是对话内容。



The two founders of PIPISTREL ASIA-PACIFIC, General Aviation Technology Co. Ltd: Danny Wu Hao (left) and Ivo Boscarol, founder Pipistrel.
将蝙蝠飞机引入中国的两位重要人物：亚澳通航科技董事长吴昊和蝙蝠飞机创始人 Ivo Boscarol

Besides electric models, Pipistrel China is the dealer of Pipistrel's conventional models including the Virus LSA in the photo.

亚澳通航科技已经将多款蝙蝠飞机引入国内并获得适航证，包括图中的病毒轻型运动飞机

eFJ: How long will be the Runway of the airport? Is it already under construction?

Danny: It will be an 800 Meters runway. At the moment we are delineating the Ground. We already signed an agreement on airspace coordination with the international Airport of NANJINK

eFJ: How will airport-control and airspace be handled?

Danny: We will operate the airport ourselves in coordination with the international Airport in Jurong. In the beginning we will have 2 airspace, one up to 600 meters above Ground with 20 Square Kilometers for flight training and first test flights and the second one larger and higher.

eFJ: What will be the facilities of the airport in the beginning - will you start with a full production?

Danny: In the first stage we will have an RND office and office space for the administration. The first aircraft will be demo aircraft which will be built from kits. At the same time our first workers will be send to Slovenia and learn to build the aircraft in the existing Pipistrel factory for one year. Then they will come back together with Pipistrel specialists who will build up the production here in China. At the same time, we will test and synchronize together with the Slovenian the first parts from local suppliers for the LSA Electro Alpha.

eFJ: You said you own RND office, I thought you would produce the Electro Alpha in Licence from Slovenia?

Danny: We will work for the Chinese facilities for a full DOA (Design Organization Approval) and POA (Production Organization Approval) from CAAC. Because the 600 Kg Electro Alpha is not certified as LSA in Slovenia, and even if the Virus Electro will receive the EASA CS LSA, at the moment there is no validation for this certificate. So we have to do our own certifications if we want to produce and fly here in China. The first aircraft will probably fly as Experimental as CAAC opened this way now as well.

eFJ: As specially for the flight training the schools will also need Alphas with combustion engines or for cross country flights? To give the students a full license with which they also can fly combustion engine aircraft?

Danny: We will only produce Electro Alpha and hybrid Panthera – as these are the only licenses we purchased - but we are also the importer of all other Pipistrel aircraft and sell these aircraft to the customers who want them. As you know most of them already have Chinese validated certifications.

eFJ: When will the airport here in Jurong be ready and when will the first aircraft take off?

Danny: The Runway will be ready by mid 2020 and the first take offs we expect by the end of next year. But at the same time we already started to operate and distribute aircraft from our Miyun airport near Beijing. Since august 2019 the first 10 students have signed up and started to fly. As you know the rules for LSA Training has been eased by CAAC this year and so we see a sharp increase of people who want to be trained and who want to be trainers. We also delivered already aircraft to various flight schools.

eFJ: What about eVTOL and other Pipistrel activities?

Danny: At the moment we at Pipistrel China concentrate on conventional aircraft and ramping up the facilities, but Pipistel is in contact with CAAC for testing and operating unmanned eVTOL aircraft in China in the future.

eFJ : Thank you for the interview.

Pipistrel China operates both Virus LSA (right) and Taurus motorglider (left) at Miyun airport.

亚澳通航科技在密云机场拥有病毒轻型运动飞机（右）和大金牛动力滑翔机（左）

eFJ：在过去两年中，蝙蝠飞机的新闻不少，但在国内的合资公司的消息不多，您能介绍下句容工厂的建设情况吗？

吴：项目进展很大。句容工厂已经破土动工，厂区内的房屋都已拆迁，我们已经获得了通航机场建设许可，各方面的状况都不错。目前，我们正在建立阿尔法电动飞机和黑豹混动飞机的生产车间。

eFJ：机场跑道建设需要多久？已经开始建设了吗？

吴：这将是一条800米的跑道，目前还在设计中，我们已经与南京机场签署了空域协调协议

eFJ：机场空域如何协调？

吴丹妮：我们将与句容机场共同运营通航机场。首先，我们将拥有2个空域，一个空域高度不超过600米，有20平方公里空域用于飞行训练和试飞，第二个空域将会更高更大。

eFJ：机场的设施将会怎样？你们准备一开始就全面铺开生产吗？

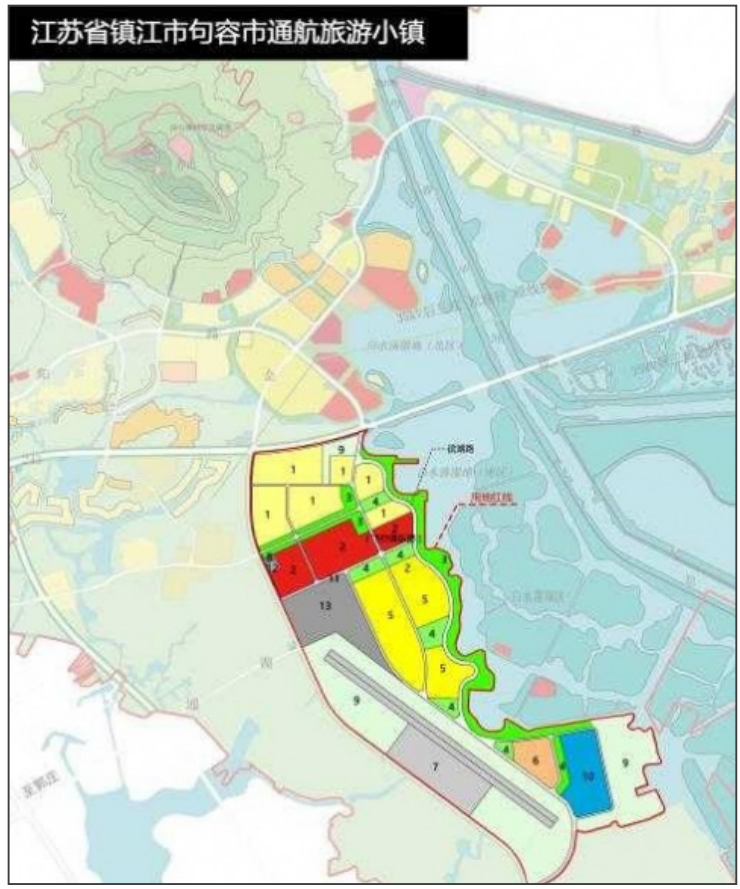
吴：在第一阶段，我们将有一个研发办公室和行政办公空间。第一架飞机将是展示用途，将使用现成的套件组装。同时，我们的第一批工人将被派往斯洛文尼亚，在蝙蝠飞机公司学习一年的飞机制造技术，然后他们将与蝙蝠飞机公司的技术专家回来，将在国内建设生产基地。同时，我们将与斯洛文尼亚工厂一起对阿尔法电动轻型运动飞机的本地供应商提供的第一批零件同步进行测试。

eFJ：电动阿尔法轻型运动飞机的适航工作进展如何？

吴：句容工厂将申请国民航总局的完整的DOA（设计机构批准）和POA（生产机构批准）。由于600公斤起飞重量的电动阿尔法飞机在斯洛文尼亚还没有获得轻型运动飞机适航认证，因此即使电动型号的“病毒”飞机获得了欧洲航空安全局（EASA）的轻型运动飞机适航审定，目前也还不能直接在国内对该机的EASA适航审定进行认证。因此，如果要在中国生产和飞行，我们必须自己在国内申请适航审定。原型机也可能申请实验类适航证进行试飞，民航局已经开放了此类适航证的申请。

eFJ：航校还需要另外配备使用内燃航发的阿尔法飞机吗？是否需要内燃航发机型用于转场训练？学员如果要申请飞行执照，是否还必须补充培训驾驶内燃航发的机型？

吴：我们将只生产电动阿尔法轻型运动飞机和大黑豹混动飞机，因为这两个机型是我们购买了生产授权的，但我们还是所有其他蝙蝠飞机的经销商，可以进口销售其他机型，大部分蝙蝠飞机型号都已经获得了中国民航局的适航认证。



The complex is located next to a highway which connects it to Jurong City (10 minutes car-drive) and international airport in Nanjing (30 minutes drive)

句容通航小镇位置优越，距离句容城区仅 10 分钟车程，距离南京机场仅 30 分钟车程

eFJ：句容机场何时准备就绪，何时首架飞机起飞？

吴：跑道将在2020年年中准备就绪，我们预计明年年底前将首飞。与此同时，我们已经开始在北京附近的密云机场开始经销和运营蝙蝠飞机。2019年8月以来，第一批十名飞行学员已经在密云机场注册并开始学习飞行。今年以来，中国民航局已经放宽了对轻型运动飞机培训的规定，因此，我们预计学飞的人数和想成为教练的人数会大幅增加，我们还已经向多家航校交付了蝙蝠飞机。

eFJ：电动垂直起降机型（eVTOL）的进展如何？

吴：目前，国内的合资公司专注于传统机型经销和工厂建设，不过我们也已与民航局积极联系，争取将来测试非载人eVTOL机型。

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