

2015年9月24日分析《梦蓝科为直升机添加了瑞士的精准工业产品》

ANALYSIS: Marengo ADDS
SWISS PRECISION TO
HELICOPTER MARKET

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马丁·斯特奇, 梦蓝科瑞士直升机有限公司 (Marengo Swisshelicopter AG) 的创始和老板, 看上去并不像个常见的公司首席执行官, 而明显地他作为制造商也与大多数的行业中人很不同。

斯特奇是工程师、商业旋翼机飞行员和长期以来的直升机爱好者。来到我们的会上, 他穿戴随意, 牛仔裤和体恤衫, 一个直升机运动会的小耳钉在一个耳垂上。当然这也无可非议, 因为这是周五, 我们在他公司在普费菲孔的办公室, 设施原是一个当地的苹果酒工厂改建而成。但这些给出我们一个线索, 梦蓝科在瑞士这里做的是完全不同的事情。

他在 1997 年以来已经经营了一家成功的工程顾问公司 (梦蓝科工程公司), 他在 2009 年开始的使命是要为市场带来一个全新的, 高性能的单发旋翼机。

在其他情况下, 这或可说是一个发明家推动直趋破产的壮举。但由于一位不愿透露姓名、来自俄罗斯的投资者的支持 (传闻说是银行家亚历山大·曼莫特), 梦蓝科直升机已经从绘图板到了 KEYe SH09 机型的第一次飞行, 经历了一个在行业中相对较顺利、更快的设计历程。

在 2.5 吨 (5510 磅) 级直升机中, 梦蓝科的新机型面临着三大西方制造商的竞争: 空中客车直升机, 阿古斯塔·韦斯特兰公司和贝尔直升机公司。几家都在各自完备的设计平台上提供最新一轮的机型: H130, AW119Kx 和 407GXP。

但是, 这并没有阻止梦蓝科提供与它们竞争的新产品。新产品肯定不能直接雷同于其中的任何一个。

“2.5 吨级, 这其实是一个比较好的分类市场, 尤其是对我们在瑞士的公司,” 他说。他的意思是不是, 瑞士市场对于单发轻型直升机的特别热衷, 一方面众所周知此地对高功率高山多用途直升机的需求, 同时更多的是瑞士工业善于提供“相对低数量而高精度”的产品。因此, 这里反应了同一个手表制造业的“瑞士精确运转 (Swiss Movement)”的标语。

斯特奇认为, 通过采取这种方式梦蓝科实际上所能满足的是运营商的期望, 而不是通常制造商所想象的用户需求。

“如果你从一名工程师的角度看直升机, 那么你会看到一些细节, 你就可以有所提高,” 斯特奇说。他并不作任何的声称, 来表达他的直升机的革命性, 但他认为是若干设计特点导致了一个更好的整体产品。

举个例子来说，运送外挂载荷，传统的机型需要在右侧安装一个“气泡”状的特殊窗口结构，同时要求驾驶员/操作员扭曲身体才能看得到悬载的所在。梦蓝科直升机的解决方案很简单：安装两个驾驶舱座位之间的透明低窗，使飞行员可以垂直向下看。同时我们理解到不是每个人都能尽快适应新的优异工作环境，驾驶舱外缘直至底部到座位的边缘，都使用便于侧俯视的全长窗口。这样操作者就不至于扭断你的脖子啦。第二个好处是：除去右侧的“气泡”窗口，在机体的两侧的空气扰动被均衡，因此发动机的不必在尾桨上浪费功率去对付它。

在座舱上提供另一个简单的方便，是其装备了容易调整的脚踏板。施放一个简单的铝部件，就可调整它若干不同的设置。而且副驾驶的脚踏板和手控，在没有副驾驶的情况下可已容易第摘除，而无需惯常的得加装一个防护罩。

SKYe SH09 采用的是标准的六座位布局，容纳两名飞行员和四名乘客，全部配备了可独立调节的座椅，装有乘客座椅的滑轨。它也可以配置成高密度的八人布局，有 7 名乘客和单个驾驶员。

关于时尚和适用性，全复合材料机身的外侧也有进一步的设计革新，以提高直升机的性能和能力。有充裕的尾段结构安装高度，允许访问舱后的侧开门，而不必像以往蹲下身体。这在紧急医疗使命中装卸担架的时候就变得非常重要。进一步，尾桨是涵道式的：梦蓝科调用了其设计大师，具有 120 厘米（47in）直径的尾桨，比空客车 H145 的 115 厘米版，后者要沉重许多。另外，斯特奇解释了，涵道尾桨的护罩宽度已被压缩到最窄，使其在向前飞行的空气动力实效足以类比一对常规的垂直稳定舵。风洞试验的结果证明，允许梦蓝科直升机省去了原本在 SH09 早期设计的一对小型垂直稳定结构。

直升机的动力：来自霍尼韦尔公司的 HTS-900-2 涡轮轴发动机。最初设计用于命运多舛的贝尔公司阿拉帕霍（Arapaho）美国陆军取消的武装侦察直升机的要求。这个设计紧凑的发动机可产生 1,020shp（760kW）的最大起飞功率。适用性，燃油经济性等关键标准都促成了这个选择。斯特奇指出，尽管它的动力输出算不上是与竞争对手很大的差异，但就是“这个一点点优势”对于“将来的性能发挥所构成的潜力是最大的”。

然而，值得注意的是，SKYe SH09 比它的竞争对手们拥有明显更多的起飞功率。事实上，只有加拿大普惠公司的 PT6B 在 AW119Kx 接近了 1,002shpd 的功率，但它是被用在最大起飞重量更重了 200 公斤的直升机上的。

充裕的功率驱动了一个五桨复合材料主旋翼，提供了优于其他 11 米直径选译的竞争对手们，而尤其是梦蓝科的叶尖速度降低了。斯特奇满意地指出，除了 L 形的旋翼，具有一定的满意度，最近推出的空客直升机 Bluecopter 生态示范配置也没有什么更好。

但关键的 SH09 成功希望，斯特奇说，在于它的多功能性。客户在 2.5 吨级取得梦蓝科所提供的 2650 公斤最大起飞重量，少有地承诺了其赢得所追求使命合同的保障。运营商“购买直升机，然后根据飞机的能力追逐合同项目”，他们不得不“有什么才能做什么”。

首飞成功是在 2014 年 10 月，测试的第一阶段按计划将在 2015 年暂停，以便同时完成第二个原型机，2015 年底到 2016 年初试飞。他说。2015 年将把一些变动集成进入原型机，包括修改无轴承桨鼓，并调整驾驶舱开关布局。然后是计划在 2016 年中的第三架试飞原型机，按计划将接近最终的生产标准，斯特奇说。

第二架试飞原型机的部件已经在它的各个分包商处制造，未来几个月交付给梦蓝科的 Mollis 总装厂完成整机。

Mollis 总装厂，从普费菲孔（Pfäffikon）驱车 45 分钟进山，是前瑞士空军基地，现在在一个沉睡的机场由当地社区经营。到目前为止，梦蓝科只有一个孤零零的建筑在哪里，生产开始后该设施将可能增多达五个这样的建筑。

迄今为止，梦蓝科已经取得了 70 多份采购意向书，在头三年的生产过程中，会增加更多的订单。在这个设施，计划在初始两年提供 40 架飞机，然后在 5 年内增加到每年 100 架的产能。

认证的完成有可能在 2016 年后期，“如果一切顺利的话”。但更可能是得进入 2017 年，斯特奇说。对于进度只要到第二原型机试飞时，就能有进一步清晰的时间线。这里，“第二原型机是深入测试的飞行试验”。

对比项目启动早在 2012 年，所需要做的事越来越多。或许是经验不足的梦蓝科吞噬太多太快？也许，斯特奇承认道。但他指出，这不是直升机本身的开发进展缓慢，而是一切围绕它的相关事宜。“在某些方面，我们不得不思考上千个细节。我们懂得直升机设计和制造的复杂性，这并不是个难题。但我们也不得不随之开发相关新机型的飞行测试仪表系统和变速箱等的基础测试设施、试验台、旋翼测试塔，还得发展供应链。“这也许比我们所预计的要更多。我对发生在每一天或每一周的任何拖延都不会高兴，但如今回头看看我们已经做成的，它可绝不是一个糟糕的纪录，”他说。

梦蓝科的所在：

梦蓝科瑞士直升机或可代表一个瑞士事件，但除了三个在阿尔卑斯山地区的设施，它还有两个设施分别在德国和南非。梦蓝科的经营总部和设计室所在，是改建了斯特奇家庭拥有的一个苹果酒厂，共用该设施的还有其姐妹公司梦蓝科工程公司。

到今年底，梦蓝科瑞士直升机在靠近苏黎世的普费菲孔设施将满员 100 个雇员，但还得加上来自它的姐妹公司源源不断的资源。然后是在 Mollis 机场组装线，再加上其本地的工程检测中心。

境外，它在慕尼黑有一个专门管理认证的办事处，由 14 名空客直升机公司的前雇员组成，聚集了总计 240 人年的资深直升机设计经验。或说，与空客直升机的维系还不止于此，梦蓝科最近招聘了菲利普·哈尔契 (Harache) 任董事长，他是当初欧直公司之父、创始人之一。

最后有一个相关的小型工程咨询公司在南非，它进行风洞测试和相关设计评估。

原文（英文） **Original Article in English:**

Martin Stucki, the boss of start-up Marenco Swisshelicopter, is not like other chief executives, but then the manufacturer is also markedly different than most others in the sector.

Stucki, an engineer, commercial rotorcraft pilot, and long-time helicopter enthusiast, arrives at our meeting in jeans, polo shirt and trainers, and sports a small earring in the lobe of one ear. There is nothing wrong with that, of course – and it is Friday when we meet in the company’s Pfäffikon office, a converted cider factory – but his appearance gives a clue that things are done differently in this part of Switzerland.

Having been running a successful engineering consultancy since 2007 – Marenco Engineering – in 2009 he embarked on a mission to bring to market an all-new, high-performance single-engined rotorcraft.

In other circumstances this might have been a great way to rapidly achieve bankruptcy, but thanks to the backing of an unnamed Russian investor – widely reported to be banker Alexander Mamut – Marenco has moved relatively rapidly from drawing board to first flight of its SKYe SH09.

Sitting in the 2.5t (5,510lb) class, it faces competition from the three big Western manufacturers – Airbus Helicopters, AgustaWestland, and Bell Helicopter – who all offer the latest iterations of well-established platforms in the weight category: the H130, AW119Kx and 407GXP, respectively.

But that has not stopped Marenco taking on the establishment to offer a product that competes with, but in not directly equivalent to, any of them.

“It is a relatively nice part of the market, especially for a Swiss-based company,” he says. What he means by that is not that the Swiss market is especially keen on light singles – although there is a clearly defined national market for high-powered Alpine utility helicopters – more that Swiss industry is adept at delivering “high precision in relatively low volumes”, hence the nod to the watch-making industry with its tagline of “Swiss Movement”.

Stucki believes that through taking this approach Marengo can actually deliver what operators want, rather than perhaps what the industry thinks they need.

“If you look at helicopter as an engineer then you see some details that you might improve,” says Stucki. He makes no claims that his helicopter is revolutionary, but believes that some of its design features have led to a better overall product.

Take, for example, transporting a sling load. Conventionally, this has required a bubble cockpit window on the right-side of the aircraft and/or considerable contortion on the part of the pilot to peer out of that window to see the load’s position.

Marengo’s solution is simple: install a transparent panel between the two cockpit seats so the pilot can see straight down. And, conscious that not everyone will want to adapt to a new way of working, the cockpit floor now ends at the seat edge, which, coupled with a full-length window, allows a side view without needing to dislocate your neck.

There is a secondary benefit too: by removing the bubble window, the drag on both sides of the airframe is equalised, therefore there is no engine power wasted in countering it with the tail rotor.

Another cockpit tweak is the easily adjusted foot pedals – release a simple aluminium catch to allow a number of different settings. And, the co-pilot’s pedals and controls can be quickly removed, should the need arise, without having to subsequently fit a protective cover.

The SH09 comes in a standard six-seat layout – two pilots and four passengers – featuring adjustable seating front and rear, with rails installed for an additional passenger seat. A high-density, eight-person configuration is also possible, with seven passengers and a single pilot.

On the outside of the sleek, fully composite airframe there are further design tweaks to aid performance and capability. The low-profile tail boom is mounted high on the fuselage allowing access to the rear clamshell doors without having to crouch – helpful when loading a stretcher for emergency medical missions. Further aft is a shrouded tail rotor – Marengo calls its design the Maestro – which, with a 120cm (47in) diameter is larger than the 115cm version on the much heavier Airbus Helicopters H145. In addition, explains Stucki, the width of the shroud has been kept to a minimum, allowing an effect from the Maestro in forward flight akin to that of a pair of vertical fins; wind-tunnel tests allowed Marengo to ditch the small stabilisers seen on early designs of the SH09.

Power for the helicopter comes from Honeywell’s HTS-900-2 turboshaft. Originally designed for ill-fated Bell Arapaho for the US Army’s cancelled armed reconnaissance helicopter requirement, the compact engine produces 1,020shp (760kW) at maximum take-off power. Availability, fuel economy and performance were all key criteria for its selection, says Stucki, noting that although its power output it not that dissimilar from that of its rivals it “has a little bit of an advantage” with “some future potential, it is not already maxed out”.

It is worth noting, however, that the SH09 boasts more take-off power than all its most obvious rivals. In fact, only the Pratt & Whitney Canada PT6B on the AW119Kx comes close at 1,002shp, but that is fitted to a helicopter with maximum take-off weight some 200kg heavier.

That power is delivered via a five-blade composite main rotor, which at 11m diameter is larger than that of some rivals – with a lower tip speed, too. Stucki notes, with a certain satisfaction, that it is not vastly dissimilar, L-shaped blades aside, to the configuration recently unveiled on the Airbus Helicopters Bluecopter eco-demonstrator.

But the key to the SH09’s hoped-for success, says Stucki, will be its versatility. Customers in the 2.5t-class – and the Marengo tips the scales at 2,650kg MTOW – rarely have the security of much contracted work. Instead, operators “buy a helicopter and then look for work” and need to be willing to take on whatever comes their way.

First flight was achieved in October last year, with the first phase of testing coming to a planned halt in the first half of 2015. A second prototype is due to fly late this year or early next, he says. This will incorporate a number of changes including modifications to the bearingless rotor head and the layout of overhead switches in the cockpit. And a third flight-test article – planned to be closer to the eventual production standard – should follow in mid-2016, says Stucki.

Structures for the second flight-test prototype are already being built by its various subcontractors, and are due for delivery to its Mollis assembly facility in the coming months.

Its facility at Mollis, which sits in the mountains some 45min from Pfäffikon, is a former Swiss air force base and now a sleepy aerodrome run by the local commune. So far, Marengo has a solitary building on the site, although once production ramps up it could have as many as five.

To date, Marengo has taken in some 70 letters of intent for the helicopter – or around three years of production, with more still to be added. It plans to deliver 40 aircraft in the first two years, rising to a 100-per-year output within five.

Certification is possible in late 2016 “if it all goes well”, but is more likely in 2017, says Stucki, noting that it will have a clearer idea once prototype number two flies and “we go deeper into flight testing”.

However, when the programme was launched back in 2012, service entry was envisaged this year. Perhaps a sign of inexperienced Marengo biting off more than it could chew? Perhaps, admits Stucki, although he points out that it was not the development of the helicopter itself that slowed progress, but everything else around it.

“In some respects there were a thousand small items that we had to think about. We knew about the complexity of the helicopter – that’s not a problem – but we also had to develop the flight-test instrumentation and infrastructure like the gearbox test bench and the whirl tower, as well as the supply chain.

“It was perhaps more than we estimated. I’m extremely unhappy about every day or week of delay, but if you look back at what we have achieved then it’s not a bad track record,” he says.

MARENCO - LOCATIONS

Marengo Swisshelicopter may bill itself as very much as Swiss affair, but aside from three facilities in the Alpine country, it has sites in Germany and South Africa.

It shares its headquarters and design office – housed within a converted cider factory that belonged to the Stucki family - with sister company Marengo Engineering.

By the end of the year it will employ 100 people at the site in Pfäffikon, near Zurich, but with its sister firm next door, it has additional engineering resources on tap.

Then there’s the assembly line at Mollis airfield, plus an engineering test centre in the town itself.

In addition, it has an office dedicated to certification compliance in Munich, staffed by 14 former Airbus Helicopters’ employees, with a total of 240 years of helicopter design experience between them. The link with Airbus does not end there, either, with Marengo having recently recruited Philippe Harache – one of the founding fathers of what was then Eurocopter – as its chairman.

Lastly it has a relationship with a small engineering consultancy in South Africa, which has performed wind tunnel tests and other evaluations.