Aerospace industry in Hungary Ready For Take-Off





History in a Nutshell



Hungary's aerospace industry can look back on rich traditions: several outstanding Hungarian aircraft designers and builders left their mark on the early history of aviation.

The peace treaty following World War II, in which Hungary fought on the losing side as an ally of Germany, specified that aerospace development in Hungary would be restricted to prototypes of powered trainer aeroplanes and gliders.

During the Communist era, little became public about the industry's new developments, although Hungarian engineers played a significant role in the research and development of Soviet-made aircraft and supplementary equipment. Hungarian instruments and communication equipment have always been used extensively in space research and space flights.

During the 1990's Hungarian engineers and mechanics became more and more familiar with advanced methods of aircraft operation, maintenance and overhaul, and, by the end of the decade, a new group of aerospace experts had emerged proficient in English and knowledgeable of the Western methods of aerospace business.

Starting with the year 2000, re-emergence of Hungarian aerospace began with the establishment of the first greenfield aerospace plant by GE Engine Services at Veresegyhaz, soon to be followed by Lufthansa Technik, ELDIM, ALCOA, Elektrometall GmbH and Flamespray. These companies have laid down the foundations for a new modern aerospace sector in Hungary. In the early 2000s, three new small aircraft design companies started operation. Using all-composite technologies, Corvus Aircraft Ltd., Composite One Ltd. and Waterfly Ltd. opened a new "composite era" in the history of the Hungarian aerospace industry.

The Hungarian Aerospace industry (including MRO organisations) currently has more than 120 registered organisations and employs some 2,100 people. The industry is 100% privately owned. The Hungarian Aviation Industry Foundation (HAIF - www.haif.org) was established in 2003 with the aim of accelerating the industry development process.

By organizing workshops, lobbying and bringing together aerospacerelated companies, HAIF initiated and organised the creation of the Hungarian Aerospace Cluster (HAC) in 2006, the first aerospace industrial group in Hungary focussing on development and manufacturing. HAC has 21 members at the time of writing, all of them in the private sector. The total number of employees of HAC members is more than 400.

In September 2006, HAIF organized a third key organization called the Hungarian Aerospace Research Platform (HARP) to help research and development organisations in participating in FP7 Framework programmes. HARP currently lists 18 organisations, including two major universities.

Established in 1993, the Defence Industry Association of Hungary (www.vedelmiipar.hu) also has several aerospace suppliers among its members.

Milestones of Hungarian Aeronautics and Space Research

Emil Némethy (1867-1943) was the first in the world to use steel tubes for aeroplanes and to apply aileron areas. The "Némethy-equation" was one of the first mathematical solutions to calculate with great precision the masslifting ability of early aeroplanes.



Sándor Svachulay (1875-1955) built an aeroplane with welded steel tubes in 1909, which was a forerunner of the modern skeleton structured aeroplanes. For the aeroplane Albatros, Svachulay designed a retractable landing gear, which was later

adapted by several international designers. His other inventions included the adjustable metal propeller and a device to control landing speed.

János Adorján (1882-1964) was the designer and builder of Hungary's first workable aeroplane. His two cylinder plane "Libelle" made several successful voyages in 1909-1910.



Aladár Zsélyi (1883-1914) was the first in Hungary to design and build an aeroplane entirely based on structural engineering fundamentals. It included several new concepts including a new control mechanism and a spring supported landing gear.

Tódor Kármán (1881-1949) is

considered a leading theoretician of aero-dynamics. Kármán analysed the flow of fluid past a cylindrical obstacle at right angles and determined that the wake separated into two rows that create vibrations, as in aircraft wing flutter and a bridge in high wind. The concept, presented by him in several papers in 1911 and 1912, came to be called the "Kármán vortex street" or "Kármán vortices". It led to the redesign of many structures to withstand oscillations and to modifications in the design of ships and aircraft to a streamlined shape. His theory on aerodynamic bumps served as a basis for the development of supersonic aircraft.

Pál Vágó (1889-?) invented and developed the gyroscopic stabiliser, a fore-



runner of modern gyroscopic artificial horizons. In the first decades of modern aviation history, aeroplane designers seeking new flying techniques probed many different solutions; along with the rigidwing "dragon" or the ornithopter, they also experimented with

propellers rotating around a vertical shaft. During World War I, Lieutenant-colonel István Petróczy, professor Tódor Kármán and Vilmos Zurovetz jointly made hovering experiments with a windmill plane, the PKZ.



Why Hungary?



Oszkár Asbóth (1891-1960) did military service at an aircraft factory near Vienna after the outbreak of World War I, where he was in charge of propeller manufacturing. He constructed and tested some 1,500 propellers in the factory's wind tunnel. Ten years later, Asbóth built his

first helicopter. Powered by a 120 HP nine-cylinder engine and propelled by two 4.35 meter propellers placed parallel above each other and rotating in opposite directions, the model "AH 1" took off vertically on September 9, 1928.

Dávid Schwartz (1845-1897), the Hungarian inventor of dirigible airship, used very thin aluminium to insulate the balloon, the aluminium skeleton and the propellers at the sides of the basket. Commissioned by the German army, he constructed the first dirigible



airship in 1896, which was tested with partial success at Tempelhof near Berlin, Germany, on November 3, 1897. The propeller belts broke, causing the pilot to lose control and crash the airship. Schwarz died shortly afterwards. His widow sold all patent rights to Graf Zeppelin in 1898. Zeppelin went on to develop a successful line of dirigible airships which bore his name, while that of Schwartz's sank into oblivion.

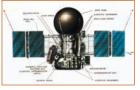


Erno Rubik (1910-1997) was a member of a group of aircraft designers who were instrumental in rebuilding the Hungarian aircraft industry after World War I and II. In 1956 as head of the Central Experimental Plant, he started to develop all-metal gliders

with simple structures suitable for mass production. A family of all-metal gliders emerged, the most successful of which was the R-26 Góbé two-seater glider still in use for training purposes. In 1963, 'Kossuth-Díj', the highest Hungarian state award for science, was awarded to Erno Rubik for his lifetime achievement.

The Space Technology Department of the Central Research Institute of Physics (KFKI RMKI) took an active part in the Soviet-lead Intercosmos international research programme. Vega 1 and 2 spacecrafts launched from

Baikonur in December 1984 carried KFKI's tracking and imaging systems and plasma particle detector and approached Halley's Comet in March 1986 from which it sent the first ever close-up pictures of a comet's nucleus. KFKI's instruments were also used at several other Russian



and NASA and ESA co-ordinated projects. Recent Hungarian involvement in space research includes Rosetta, the MarsExpress and the VenusExpress. KFKI RMKI will supply a data ac-quisition and control system to the ISS Plasma Wave Complex due to be launched at the end of 2008, while another Hungarian supplier, SGF Kft., is involved in developing the project's electronic ground support equipment.

Whether you are a producer looking for a new, cost-effective manufacturing base and new components or parts suppliers or a distributor of small aeroplanes – Hungary has much to offer.

- Hungary is at the heart of Central and South-Eastern Europe, a region characterised by dynamic economic growth driven by high industrial output, excellent export potential and increasing domestic demand.
- Hungary lies along the Eastern border of the EU and is within the Schengen zone. The country's strategic position, highly developed logistics and ICT infrastructure and its traditional role as a trading post, makes it a natural service hub for the CEE region.
- Well-trained, creative and flexible human capital at competitive cost: 30-50% cost saving compared to Western Europe and the US. The average gross wage in Hungary is just €720 per month while labour productivity is one of the highest in the CEE region. The Hungarian labour force also rates highly in international comparisons for innovation and creativity, due to the country's renowned standards of schooling and tertiary education.
- Hungary, as a member of the European Union, fully harmonised its legal system with EU law including safety and quality regulations related to aerospace manufacturing, maintenance and aviation. The country also scores highly for data security and enforcement of intellectual property rights.
- Business processes have been simplified considerably in recent years. In addition, foreign companies willing to settle in Hungary are welcomed with comprehensive trade development services and supportive government policy.
- Globally recognised academic and university background. Increasingly, aerospace-related R&D activity is carried out in several universities and research institutions, making them potential partners for FP7 collaborative research.
- Leading multinationals in the high-tech sector, such as GE, Alcoa, Lufthansa Systems, Honeywell, Nokia, Ericsson, Bosch, Philips and IBM, are already present in Hungary. They have also surrounded themselves with clusters of home-grown small and medium sized manufacturers and service suppliers.
- A growing number of Hungarian companies designing and building small aeroplanes are looking for new sales opportunities and sources of high-tech materials and technologies.



Raw materials

Hungary's traditionally strong aluminium industry also supplies light-weight structures for vehicle manufacturing. Alcoa Hungary has recently launched a new airfoil casting plant, while US-based Zoltek makes Panex carbon fibre products in its plant at Nyergesújfalu.

Components

Hungarian automotive and electronic suppliers have been manufacturing high-quality products for international aerospace customers since the 1990s. Aerospace component manufacturing activity in Hungary was launched by foreign subsidiaries of Western aerospace companies including Hungaerotech, Elektrometall Paks, Alcoa-Köfém and Flamespray. Local companies soon joined them and, with the rapidly growing automotive industry in Hungary, there are more than 400 part suppliers covering a wide range of technologies and products (an increasing number also targeting the aerospace industry) throughout the country.

As for the avionics sector, currently four companies are active in this industry including Elektrometall Kft. (also supplying wire-harnesses for the Airbus A320/380 models), Aviatronics Kft. and Bonn-Hungary Kft. (involved in communication technologies) and SGF Kft. (design and manufacture of black boxes and instrumentation for space missions).

Composites

Due to the growing popularity of composite structures in the aerospace industry, several Hungarian private companies including Flytech Kft. High Tech Composite Kft. and Composite One Kft. have become suppliers of local Austrian, German and US small aircraft manufacturers.

Small aircraft development and manufacturing

At the end of the 1990s, Eger-based Halley Kft. was the first company to come out with a powered Trike and the Apollo series. Soon, three new private companies followed suit with new small aircraft designs using composite technology: Composite One Kft., Corvus Aircraft Kft. and Waterfly Kft. The four aircraft developers, with the support of HAIF, established the Hungarian Aerospace Cluster in 2006.

Design and engineering outsourcing

After 2000, several young engineers graduating from Hungarian universities and using the most advanced 3D softwares embarked on international ventures. In 2005, EDAG Hungary outplaced 15 young engineers to Hamburg to work on Airbus interior design. Today, dozens of EDAG engineers from Hungary work on the project. There are five engineering companies in the HAC cluster today.

Special-tool design and rapid prototyping

There are currently four or five companies with experience in the automotive industry and capable of designing and manufacturing special purpose machines, measuring devices, machine tools and assembling equipment and production lines for the aerospace sector. Rapid prototyping services are also available in Hungary, Varinex Ltd and Technoplast Ltd. provide various rapid prototyping services, finite element analysis, reverse engineering and 3D services.

Maintenance, Repair and Overhaul

The MRO sector employs the largest number of employees in the Hungarian aerospace sector. Authorised to service Airbus, Boeing and Fokker planes, both Aeroplex and Lufthansa-Technik provide line maintenance, repair and overhaul at Budapest Ferihegy Airport. GE Engine Service also repairs and maintains engines manufactured by parent company General Electric on a greenfield facility near the airport.

KEY INDUSTRY PLAYERS

Research & Development

- · Admatis Kft. www.admatis.com
- · Bay Zoltán Foundation for Applied Research www.bayati.hu
- · Budapest University of Technology and Economics
 - Dept. of Aircraft and Ships www.rht.bme.hu/
 - Dept. of Control Engineering and Information Technology
 - Department of Fluid Mechanics
 - Dept. of Mechatronics, Optics and Instrumentation Technology
 - Department of Control and Transport Automation
 - Department of Energy Engineering
- Comergen Inc. www.comergen.net
- Miskolc University Department of Chemistry www.uni-miskolc.hu
- · ODIN Budapest Kft. www.odinbudapest.hu
- Research Institute for Technical Physics and Materials Science (MTA-MFA) www.mfa.kfki.hu
- · SGF Kft. (Space & Ground Facilities Kft.)
- · Slot Consulting Kft. www.slotconsulting.hu

Small Aircraft Manufacturing / Composite parts

- · Composite One Kft. www.compositeone.hu
- Corvus Aircraft Kft. www.corvus-aircraft.com
 Flytech Kft.
- · Halley Kft. www.halley.hu
- HTC High Tech Composites Kft. www.htc.info.hu
- Hungarian Academy of Science, Research Inst. Physics and Material Science - http://www.mfa.kfki.hu/eng/
- · Idea Aircraft www.ideaaircraft.com

Aerospace-Related Design and Engineering

- · CAD-Terv Engineering Kft. www.cadterv.hu
- · CFD Engineering Kft. www.cfdengineering.hu
- Delta-Tech Engineering Kft. www.deltatech.hu
- eCon Engineering Kft. www.econengineering.com
 H4 Aerospace Kft. www.h4aerospace.com
- · Hilase Kft. www.hilase.eu
- · Naturen Kft. www.naturen.hu
- · Rea-Tech Kft.

Parts Manufacturing and Rapid Prototyping

- · ABF Bowdentechnika Kft
- · Alcoa Fastening Systems Kft. -

http://www.alcoa.com/hungary/hu/home.asp

- · Allied Visions Kft. www.allied-visions.com
- Anton Kft. http://www.anton.zalaszam.hu/
 Aviatronic Kft. www.avia.kfkipark.hu
- Aviatronic Krt. www.avia.krkipari
 Bálind Kft. www.balindceg.hu
- · BHE Bonn Hungary Kft. www.bhe-mw.eu
- · BL-Electronics Kft. www.bl-electronics.hu
- · Bódis Edelstahl-technik Kft www.bodis-exhaust.hu
- · Borsodi Muhely Kft. www borsodimuhely.hu
- · Calaluna United Technologies Zrt. www.calaluna.hu
- · Cooptim Kft. www.cooptim.hu
- · Dendrit Kft. www.dendrit.hu
- · EDAG Kft.- www.edag.hu
- · Elektrometall Kft www.eme-in.de
- · Eltec Holding www.eltec.net
- · Flame Spray Kft. www.flamespray.it-

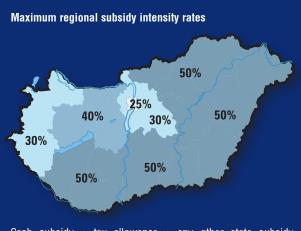


Investment Incentives

- · Gravitas 2000 Kft. www.gravitas.hu
- · IT Ware Kft www.itware.hu
- · K&K 95 Kft. www.brakehose.hu
- · Magyarmet Precision Foundry http://magyarmet.t-online.hu/mm
- · MTA-SZTAKI Distributed Systems http://dsd.sztaki.hu
- · Niké-Mátra Kft.
- · Orion Electronics Kft. www.orionelec.com
- · Ostorházi Kft. www.ostorhazi.hu
- · SGF Kft. www.sgf.hu
- · Simplesoft Kft. www.simplesoft.hu
- · Sky Soft Kft. www.sky-soft.hu
- · Hungarian Space Cluster www.hunspace.org
- · Sotex Kft. -www.sotex.hu
- Sulzer Hungaerotech Kft. www.epicos.com/epicos/extended/ hungary/hungaerotech/hungaerotech_home.html
- · Szimfék Zrt. www.szimfek.hu
- · Technoplast Kft. www.technoplast.hu
- · Varinex Informatics Zrt. www.varinex.hu
- · Zoltek Zrt. www.zoltek.com

Maintenance

- · Aero-Kit Bt. www.aerokit.fw.hu
- · Aerometal Kft. www.aerometal.hu
- · Aeroplastic Kft.
- · Aeroplex Kft. www.aeroplex.com
- Agro-Aero 2000 Kft. www.agroaero.hu
- · Base Kft. www.baseairlines.hu
- · FARNAIR Hungary Kft. www.farnair.com
- · GE Engine Services, Aviation www.ge.com/hu/en
- · Hat&S Kft. Gyor www.hats.hu
- · Kossuth Lajos Maintenance Traingin School
- · Lufthansa Technik Budapest Kft. www.lht-budapest.com
- · Multiprojekt Kft. www.multiprojekt-kft.com
- Produktum Kft. www.produktum.hu



Cash subsidy + tax allowance + any other state subsidy (excluding training subsidy) combined cannot exceed the maximum regional subsidy intensity rate for the given location. Maximum intensity rates vary between 25% and 50% depending on the state of development of the region.

The Hungarian Government offers two types of subsidy package for hightech manufacturing projects:

I. Incentive package with EU co-financed cash grant - for investments up to EUR 25 million

1. EU co-financed cash grant

A non-refundable cash subsidy issued by the National Development Agency. The entire subsidy system is approved by the EU. ITD Hungary provides comprehensive and up-to-date information on open tenders on request.

2. Development tax allowance

- 80% of corporate income tax (currently at 16%, 19% from 2010) can be deducted for a period of up to 10 years
- Minimum EUR 10 million investment with at least 150 new jobs created in developed regions and EUR 3.3 million with at least 75 new jobs in less developed regions

3. Tender for job creation

- Non-refundable
- Amount of subsidy: HUF 0.8 million to HUF 1.5 million per created job (approx. EUR 2,700 – EUR 5,000)
- Application period: March to April every year

II. Incentive package granted on a case-by-case basis

In cases where no EU co-financed subsidy is available, the Hungarian Government offers tailor-made incentive packages for high value-added projects with eligible costs exceeding EUR 10 million and generating at least 25 new jobs in less developed regions and more than 50 in developed regions. These incentives are offered as follows:

1. Cash subsidies

- Non-refundable subsidy defined as a percentage of eligible costs and based on an individual Government decision
- Decision factors: investment volume, location of project, number of jobs created, ratio of graduates and wage-related costs
- On receipt of all necessary project data, ITD Hungary will send an official incentive offer within 30 days

2. Development tax allowance

- 80% of corporate income tax (currently at 16%, 19% from 2010) can be deducted for a period of up to 10 years
- Minimum EUR 10 million investment with at least 150 new jobs created in developed regions and EUR 3.3 million with at least 75 new jobs in less developed regions

3. Training subsidies

- From 25% to 90% of total training costs, depending on type of training and location of investment
- Up to EUR 2 million
- Granted above the maximum regional intensity rate

4. Other incentives depending on location and direct job creation

Please contact ITD Hungary for further information on available incentives and conditions.

Partnership Opportunities

Foreign companies are invited to be part of the revival of the Hungarian aerospace and aeronautics industry, in particular in the following areas:

Training and consultancy

- HAC members need regular updates and assistance for the implementation of the AS 9100 Quality Assurance Programme and the Design Organization Approval programme.
- New prototypes recently developed will need type certifications from around the globe. This procedure also needs advisory assistance from experienced international consultancies.
- Demand for small aeroplanes will generate a market for UL and LSA category aeroplanes. International co-operation will be needed for their maintenance and pilot training.

Research & Development

- With the establishment of the Hungarian Aerospace Research Platform, a new opportunity is offered for R&D co-operation with Hungarian institutions and enterprises in the FP7 Framework programme and the upcoming Clean Sky JTI programme.
- The Hungarian Government provides cash subsidies and other incentives for the establishment of research and development centres in Hungary.

Subcontracting

- Machining and composite manufacturing offer the best potential for outsourcing products from Hungary.
- Several aerospace engineering companies have launched initiatives in Hungary in recent years. These diversified companies are active in both the aerospace and automotive sectors. With Hungarian labour costs far below the EU average, these companies represent good opportunities for Western companies to outsource products and services in Hungary.

Small aircraft supply

• In the early 2000s, three new small aircraft design companies started operation. The production of Corvus Corone started in 2005 and the Composite One and the Waterfly amphibian prototypes are scheduled to start flight tests in 2008. Halley Kft. has produced more than a thousand "Apollo" UL-powered hang gliders and 50 Apollo Fox light aircraft since its foundation in 1980. To prove the reliability of the aircraft, Apollo Fox equipped with a Rotax 912ULS 100 Hp engine made a record-breaking 25,000 mile flight from Sármellék, Hungary to Sidney, Australia without any technical problem in 2003.





Bonn Hungary converters, transceivers, amplifiers













CDMS of Rosetta Lander supplied by SGF Kft.





Outsourced maintenance

- Aeroplex provides third party maintenance services for several charter airlines. It has B737, B767, and Fokker 70 'C' check capability. It also plans to build new hangar capacity to cope with the growing demand for low-cost MRO services.
- Dozens of small maintenance service providers throughout the country will need foreign capital and technological assistance to upgrade capacities and to improve service levels.

Outsourced services

- Hungarian engineering companies are rapidly expanding to the western market. EDAG Hungary outplaced 30 engineers to Hamburg to support Airbus projects in cabin interior work. The professional organisations of the Hungarian aerospace industry are seeking partnerships with western universities to establish joint ventures for postgraduate aerospace engineering training. Foreign universities are invited to establish a CEE affiliate in Hungary which can provide cost-effective training to the industry.
- Hundreds of highly skilled Hungarian companies in the ICT sector are available · for contract programming, software integration and other communications and information technology services.

Airport development

- There are more than 70 airports in Hungary, but only a few are currently suitable for international traffic. Foreign airport operators are invited to help develop secondary and regional airports for freight and civilian use.
- In the coming years, major investments will transform Budapest
 Airport into Central Europe's leading air transport hub. More that €250
 million has been earmarked to boost passenger and freight traffic
 and upgrade related airport services, logistics and tourist facilities
 by 2011. In terms of freight transport, the airports at Sármellék,
 Taszár, Debrecen and Mezőkövesd have been singled out for further
 expansion and development.





A ONE-STOP SHOP FOR INVESTORS

ITD Hungary (www.itd.hu) is the Hungarian government's Investment and Trade Development Agency, established by the Ministry of Economy and Transport, to promote inward investment and bilateral trade. With representative offices in eight regional centres of Hungary and a foreign network operating under Hungary's diplomatic services at 55 offices in 43 countries, ITD Hungary is a single point of contact to support decision-makers looking for investment and trade opportunities in Hungary. The Agency provides foreign investors with high-quality support for key decision-making processes and a wealth of supplementary services.

PROJECT PREPARATION

- In-depth, tailored information on the local economy and business climate, corporate taxation and the legal environment, as well as sector-specific overviews
- Site visits, meetings with local, regional and government bodies and introductions to local suppliers, service providers and experts
- Information on available incentives

IMPLEMENTATION

- Site selection assistance, coordination of licencing procedures
- Finalisation of incentives agreements
- Assistance with recruitment and visa application
- VIP treatment for expatriate employees

AFTER-CARE

- Intermediary role for future developments between government bodies and companies operating in Hungary
- Support and generation of reinvestments

For more information please contact:

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