

INVESTMENT OPPORTUNITIES

# Aerospace Industry in the Czech Republic



## Contents:

|            |   |                                       |
|------------|---|---------------------------------------|
| 1          | ■ | The Czech School of Structural Design |
| 2          | ■ | Czech Designers on Czech Aircraft     |
| 6          | ■ | Partners for Czech Designers          |
| 7          | ■ | Aircraft Manufacturers                |
| 14         | ■ | Aircraft Engines Manufacturers        |
| 16         | ■ | Aircraft Instruments (Avionics)       |
| 20         | ■ | Aircraft System Manufacturers         |
| 22         | ■ | Precision Machining, Composite        |
| Production |   |                                       |
| 24         | ■ | Aerospace Design Engineering          |
| 26         | ■ | Aerospace Research and Development    |
| 36         | ■ | Aerospace Schools                     |
| 37         | ■ | Aircraft Maintenance Centres          |
| 39         | ■ | Airport Infrastructure                |
| 40         | ■ | Space Industry                        |
| 42         | ■ | Light Aircraft Industry               |
| 46         | ■ | Map of the Czech Aerospace Industry   |
| 48         | ■ | CzechInvest Support                   |



Last update: July 2008

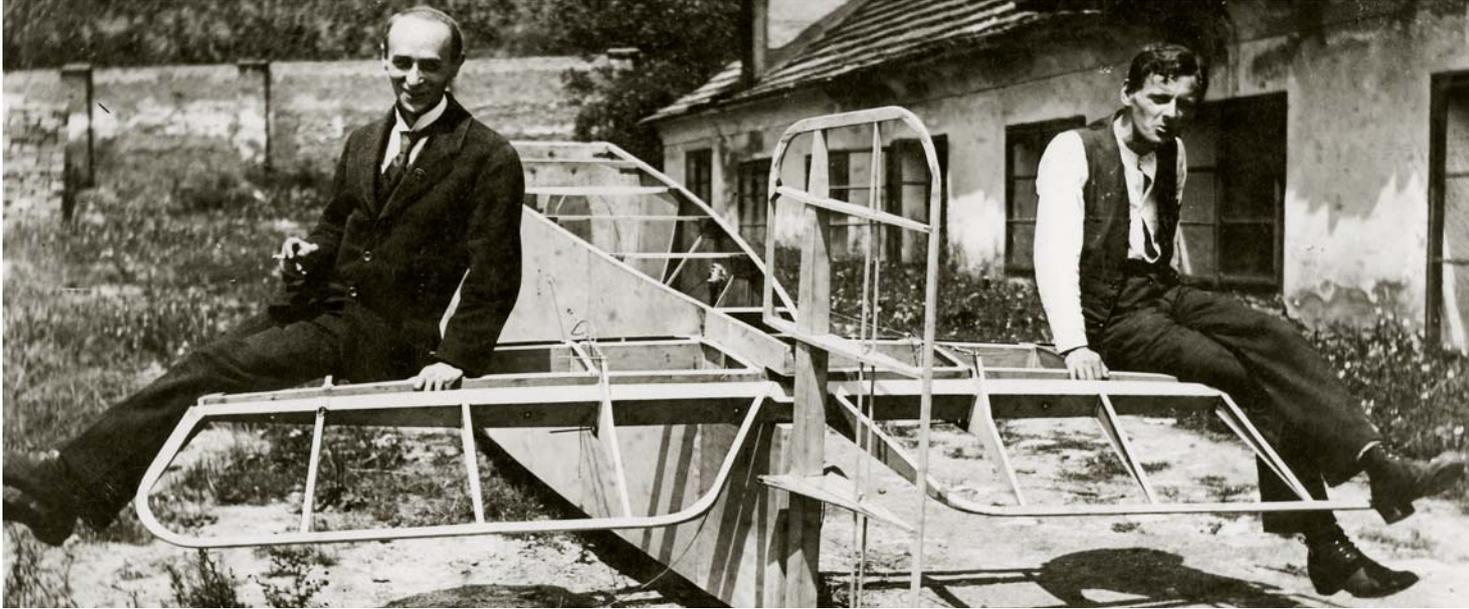
The Czech people were bothered by the fact that they didn't have a sea coast. So they began to look to the sky. In the 1930s, the number of aviation firms and people employed by them in the former Czechoslovakia reached the level of that found in the most advanced countries of that time, such as Germany, France, Great Britain and the United States. Later, in the 1950s and '60s, Russia's influence spurred the implementation of new aviation projects and motivated Czech aerospace companies to establish their own development projects.

## The Present:

1. Tens of small, flexible, self-starting aviation firms.
2. System of quality given by the culture created by generations of aviation specialists.
3. Renewal of production in aircraft factories and improvement of their infrastructure.
4. People working in aviation function as a society dedicated to a common purpose.
5. New aviation applications developed at Czech universities.

# The Czech School of Structural Design

Czech aircraft offer high-quality construction and outstanding flight characteristics resulting in better safety, low operating and maintenance costs and long service life.



## The unique approach of Czech designers

### 1. “A feel for structural design”

Designers carefully recorded their findings from every strength analysis and thus acquired a feel for structural design. In other words, they knew the structural properties and the exact places where cracks could occur. This was complemented with inventiveness, creativity and the ability to find new solutions.

### 2. “Aircraft design from scratch”

The technical skill and practical experience of Czech aviation designers enabled them to foresee the structure and characteristics of the aircraft, and subsequently to draft its final form before any calculations or construction activities were performed. Visualisation resulting from technical knowledge enabled designers to predict the characteristics of individual model variants, material requirements and advantages of the utilised materials.

### 3. “Chief of the structural design team”

Every issue can have dozens of solutions. Czech chief-design engineers showed their teams how to apply one solution derived from the general essence of a designed aircraft to all development stages. They were able to see relationships, such when and how a specific aircraft configuration and subassembly would be manufactured and which of these would come first and which would follow.

### 4. “Aircraft design from the ground up”

Any project that has been reworked several times becomes a lost project. Airframes and wing profiles were designed from the ground up and the concept did not change in the course of development. The solidity of the structural design and ergonomics of the cockpit are examples of elements that were taken into consideration from the beginning and observed by the design chiefs throughout the entire project.

### 5. “A passion for airplanes”

In most cases, the “pragmatic” approach of only making money by selling aircraft did not apply in the Czech aviation industry. Rather, designers tried to eliminate faults in the aircraft throughout their entire service life with emphasis on regular maintenance and post-warranty repairs. Each manufactured aircraft was a labour of love for the employees, who approached their work with a certain humility that resulted in the twenty- or thirty-year service life of individual types.

## A feel for structural design

Leading designers in the Czech aviation industry (particularly in small aviation) know the technical dimensions in which their structural solutions will be applied. Their work begins with rough outlines and sketches of two or three variants, which allows them to overcome problems much faster and more effectively. This mostly concerns manual work, when designers have a feel for transferring to paper rough ideas derived from their extensive technical knowledge.

## Czech Designers on Czech Aircraft



### Jan Kašpar

- 16 April 1910 – First Czech to fly, in a Blériot XI airplane
- 30 May 1911 – Completed the first long-distance flight from Pardubice to Prague



### Alois Šmolík

- Main designer and driving force of the Letov design department.
- Letov – from the Czech words letadlo (airplane) and továrna (factory). The company was established in 1918.
- 1921 – Start of series production of the Letov Š-1 airplane.
- Successful types included the Letov Š-28 (412 units produced) and the Š-328 (440 units produced).



### Pavel Beneš and Miroslav Hajn

- Founders and chief designers at Avia
- 1923-1925 – BH-7, BH-9 and BH-11 monoplanes. The BH-11 won the Coppa d' Italia prize
- 1929 – BH-21 fighter considered one of the world's best at the time.
- 1923 – Avia begins close cooperation with Walter, which launches series production of the five-cylinder Walter NZ-60 aircraft engine.





### František Novotný

- Chief designer, Letov and Avia
- Series production of the pre-war Avia B-534 fighter plane
- Development of the modern Avia B-35 fighter, which had the misfortune of arriving too late to enter service in the Czechoslovak Air Force. The first prototype with a thin elliptical wing and retractable landing gear was first flown at the time of mobilisation on 28 September 1938. Only three prototypes were flown before the 2nd World War.
- Aero was established in 1919 and its complex of assembly hangars was among the most significant in the 1920s and '30s.
- Aero retained tested concepts and unceasingly improved them. As a result, the technical level of its aircraft increased continually.
- By 1939 the company's airplanes had set eight international and 25 Czechoslovak records, winning the Challenge International des Avions de Tourisme in 1934.



### Jaroslav Šlechta

- Chief designer at Praga factory
- 1930 – aircraft development and construction department established in the Praga factory. The factory was of substantial importance to the Czechoslovak aviation industry, particularly in the area of sport and training aircraft
- 1933 – introduction of very progressive sport and civil-transport aircraft; successful participation in military development programmes
- Praga E-51 – prototype of a modern reconnaissance/light bomber aircraft
- After the second world war Jaroslav Šlechta dedicated himself to the development of Czechoslovak helicopters, e.g. the HC-2 and HC-3



### Antonín Husník

- Chief designer at Aero
- 1934 – The Aero A-200, a four-seat, low-wing monoplane, designed and constructed in a very short time specifically for the Challenge International des Avions de Tourisme in 1934. Two prototypes were built and were distinguished by a particularly ingenious wing design with flaps and slots.
- 1937 – Aero A-300, the most advanced pre-war twin-engine bomber produced in Czechoslovakia.



## Czech Designers on Czech Aircraft



### Karel Tomáš

- Chief designer, Ringhoffer-Tatra a.s.
- 1935 – Development and production of the Tatra T-131 airplane
- 1937 – Development and production of the Tatra T-201 airplane for sport use. The T-201 had outstanding flight characteristics and set an altitude record of 7,740 m and flew from Prague to Khartoum.
- 1947 – Chief designer of the world's well known Zlin Z-26 Trener at Moravan Otrokovice

### Ondřej Němec (Miroslav Baitler, Jiří Bouzek and František Vlk)

- 1948 - Development and production of the Aero Ae-45, a light, twin-engine, all-metal air-taxi for unscheduled service, tourism and business travel.
- The Ae-45 had exceptional flight characteristics placing it well above the world standard at that time.
- Reliable and easy to maintain, the Ae-45 was operated on six continents and found many satisfied customers.
- Series production ran from 1948 to 1961.
- The Ae-45 won the English Norton Griffith Challenge Trophy, and was flown non-stop across the Sahara and from Prague to Sri Lanka, Hong Kong, Buenos Aires and other distant destinations.
- With its modern lines the Aero Ae-45 is still considered a classic today.



### Ladislav Smrček

- One of the chief designers at LET Kunovice
- Development and production of the LET L-200 Morava, a five-seat, twin-engine, all-metal, low-wing monoplane with tricycle landing gear and dual vertical stabilisers.
- 367 L-200s were produced between 1957 and 1964.
- The planes served as air-taxis and were also used in harsh climates in Africa and Australia.
- 1966-1967 Chief designer of study and project of Let L-410.





### Jan Mikula

- One of the chief designers at Moravan Otrokovice.
- Production of the aerobatic Zlín Z-42, Z-43 planes and Zlín 50 all-metal, low-wing monoplane.
- Series production began in 1976 and Textron Lycoming engines were adopted in 1981.
- Numerous successes in national and international competitions
- 1983 – gold medal in the European Aerobatics Championship
- 1984 – gold medal in the 12th World Aerobatics Championship
- 1999 – world champion in its category
- Jan Mikula also participated in the development of Ae-270 IBIS.

---

### Jan Viček, Zdeněk Rublič and Karel Tomáš

- Chief designers at Aero Vodochody
- Development and production of the Aero L-29 Delfín, a single-engine, mid-wing jet trainer.
- A competition was held in 1961 for a new jet trainer for the entire Warsaw Pact. The L-29 emerged victorious over Polish and Soviet machines.
- A total of 3,665 L-29s were produced (1,943 at Aero Vodochody and 1,722 at Let Kunovice).
- L-29s were also exported to Syria, Indonesia, Nigeria, Vietnam and Uganda.



### Jan Viček (shown in photo) and Karel Dlouhý

- Chief designers at Aero Vodochody
- Development and production of the Aero L-39 Albatros, a single-engine advanced jet trainer.
- The L-39 is one of the world's most successful training planes.



## Partners for Czech Designers

### The Ten Commandments of Czech Structural Design

- 1) Live and breath airplanes – 24 hours a day, seven days a week.
- 2) Maintain contacts with a broad range of designers.
- 3) Use common sense and pay constant attention to planning human and material resources.
- 4) Trust your own strengths and abilities.
- 5) Practice effective leadership of employees, set construction-design goals and strictly adhere to them.
- 6) In drafting and testing, the following applies: “Even a bad experience is a good experience.”
- 7) Be aware that you can never stop learning.
- 8) Correct planning is the most important phase.
- 9) Quality work depends on 100% commitment and passion for the project.
- 10) It is absolutely necessary to share knowledge and experience.

### Example of a Czech design chief's process

A six-week business trip to the United States, bringing relief from all everyday design concerns. Determination of what the customer and the market expect from the aircraft and subsequent elaboration of the new project from A to Z.



The Czech school of design has always focused on the critical elements of the aircraft, which are:

- 1) its shape
- 2) wing profile
- 3) size of control surfaces
- 4) layout of the interior and control system

In the United States a mock-up is produced, design limits are set and two or three variants are sketched in detail. Enough time is dedicated to choosing the wing profile and, among other things, it is determined that the laminar wing profile needn't limit the profile character in the case of an all-metal airplane and that an LSA aircraft with winglets or without winglets will behave identically and have the same flight characteristics. At the same time, the aircraft's handling at stall speed is improved.

### The work of Czech designers abroad

Czech designers have played a significant role in the success of foreign firms. An example of this is the work of Jiří Sviňka, chief designer for the Swiss firm Pilatus. Formerly a designer at Let Kunovice, Sviňka applied his skills to the creation of the Pilatus PC-12, a successful turboprop corporate transport aircraft.

### Supply

The Czech aviation industry's potential lies in its extensive capacity to support design and development activities.

### Demand

Graduates of Czech aviation schools need to acquire a feel for structural design and need to observe, evaluate and analyse strength and other types of tests while putting their own designs and ideas into practice.



## Aircraft Manufacturers



### The Kunovice-Uherské Hradiště-Otrokovice Triangle:

More than 10,000 people were employed in aviation-related fields in this region of the Czech Republic at the beginning of the 1990s. Almost every family here had at least one member who worked in the aviation industry, though in many cases whole families worked in the local aircraft factories.

“Our era has two broad, unresolved problems: lack of skills among young people and difficulties encountered by older people. These problems call for a single solution. It is necessary to find a way for older people who have worked thirty or forty years in industry to transfer their know knowledge to young people aged 14 to 21.” Dr.h.c. Jan Antonín Baťa, 1938, To Build a Nation

### RoKo Aero

[www.rokoaero.com](http://www.rokoaero.com)

The company produces and develops inexpensive, high-quality aircraft in the UL and LSA categories. The planes' all-metal construction is based on deep knowledge of the materials used. Laminates are used particularly in aircraft interiors. The company is considering entering the 3- to 4-seat all-metal aircraft category. At the same time, production of hydroplanes with all-composite fuselages is also beginning. Current production capacity is roughly 50 aircraft per year.



#### Background

Special nanofibre coatings for protecting the surfaces of aircraft produced by the family-run firm RoKo represented the beginning of cooperation with designers of top Czech aircraft who had worked for firms such as Let Kunovice and Czech Aircraft Works. Mutual understanding led to the establishment of a joint enterprise to design and manufacture airplanes.

#### NG4 aircraft

This firm's designers managed to develop low-cost aircraft NG4 (LSA) with far higher safety standards. A good example of this is the broad deformation zone between the engine and the cockpit. One of the key elements is the aircraft's ergonomic interior, which RoKo Aero has developed by engineers at Tomáš Baťa University in Zlín.

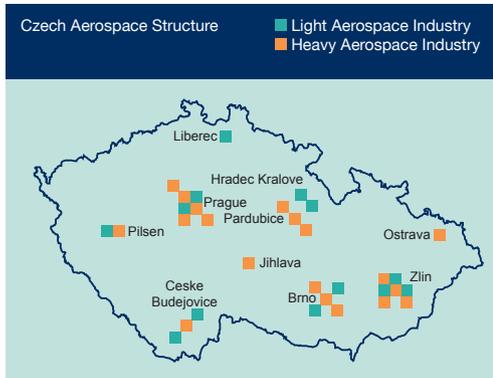
That less than a year passed between the first rough sketch and the launch of NG4 series production is evidence of the staff's goal-oriented approach to their work and their passion for airplanes and feel for design.

The company's young employees are gaining practical design and construction knowledge and can recognise structural stress. The chief-designer learned from generations of engineers at Let Kunovice and imparts his knowledge and years of experience to the company's young engineers. The staff's relative youth is tempered by employees with up to 25 years of experience in the field.



# Aircraft Manufacturers

“Landlocked nations have always been poorer than those lying on the shores of the world’s seas. The sea itself gave many possibilities of nourishment. In our country, we do not have this option. For the first time in human history we have a substitute for the sea which is the biggest and widest and accessible from every place on earth. It is the air.”  
Dr.h.c. Jan Antonín Baťa, 1938, To Build a Nation



## Jan Antonín Baťa

Jan Antonín Baťa was a founder of the Baťa shoe company, whose products could be found around the world by the 1930s. Baťa applied modern marketing principles and considered his employees to be the firm’s most valuable asset. He built a colony of homes for his employees and their families in Zlín and instituted a system of training and transferring experience into production. At that time, a vocational certificate at Baťa guaranteed employment, housing and a career path. Aircraft produced by Moravan carried the name of Baťa’s headquarters city, Zlín.



## Moravan Aviation

[www.moravan.cz](http://www.moravan.cz)

This traditional Czech aircraft manufacturer was established in 1934 by Jan Antonín Baťa, whose nephew, Tomáš Baťa, works for the firm as an external consultant. The factory complex contains the original hangar bearing the sign Aerodrome Baťa, where from 1937 to 1939 three Lockheed Electra airliners and several Fokker models owned by the Baťa factories were parked.

### The prestige of the Zlín badge

For decades, unique aircraft bearing the Zlín name have proven that strength lies in simplicity. An example of this is the Zlín 50 aerobatics plane, which remained in production until 1994 and was notable for its simplicity (rod-and-cable controls).

### Current product range

The Zlín 143 basic trainer and Zlín 242, whose flight characteristics make it a winning aerobatics plane, are among the world’s best aircraft of their type in the all-metal category. At first glance, the philosophy that has traditionally been associated with the Zlín brand is apparent: strength in simplicity and safety is paramount. The main girder (the most critical stress-bearing part of the aircraft) consists of a simple system of tubing filled with an inert gas with an indicator connected to the instrument panel, by which the most stressed components can be continually monitored. Every pressure deviation means a crack in the girder and the pilot thus receives a warning of potential danger. Another preventive safety feature is the system for monitoring stress on the aircraft’s structure. Operators are required to send data from the system to the producer for evaluation, which can result in the producer’s grounding the plane. The system was certified in 1999 and since 2000 it has been installed in all manufactured aircraft. Thanks to this equipment, service life can be substantially extended, as in the case of nine Z-143s that have been in service with a Canadian flight school for 13 years (see references). Another safety feature consists in large deformation zones.

## Advantages of Zlín aircraft

The extraordinary advantages of these aircraft consist in their high-quality metal construction, enormous fuel-reserve capacity and many other preventive safety features that warn the pilot if something goes wrong or could go wrong. Military and civilian flight schools appreciate these qualities, which increase survivability in extraordinary situations, while at the same time the planes are simply fun to fly.





## References

“After approximately 13 years of maintaining and observing flight operations of this aircraft I cannot say that it is a perfect aircraft but when put in comparison to other similar flight training aircraft manufactured in North America, i.e. Cessna and Katana, I have no doubt that the Z242L is a far better aircraft. The ZLIN is not what I call a „plastic“ aircraft such as the Cessna which looks good for a short period of time but quickly deteriorates in appearance when operated by a flight training unit. I have many years of experience around flight -training aircraft and can tell you that a Cessna or Piper aircraft would not be in the same excellent condition that our ZLINs are in after operating 13 years in flight training. I have found that the Zlin is a very rugged built aircraft which is outstanding for a flight training operation and easily withstands the punishment of inexperienced pilots.”

Rick Legros  
Maintenance / Quality Manager  
Sault College Aviation Technology

Moravan Aviation is 100% owned by the Irish investment company QucomHaps Holding, which acquired Moravan last year with the aim of producing components for aircraft operating at high altitudes. Other plans include revival of the successful Zlín Trenér aircraft and development of LSA-category aircraft. At its peak, the company employed 5,000 people. Today it employs 168 employees and maintains its own development department.

### Aircraft production

In the 1970s the company produced 80 planes a year. By the beginning of the 1990s this number had fallen to 3-4 planes per month. Moravan produced 11 Zlín 143/242 planes in 2007. Current production capacity is 15 planes total per year. Zlín aircraft are backed with complete service, replacement parts and full support from the manufacturer.

### Other aviation-related production

Aircraft production has never been the company's main source of income. Moravan has manufactured, for example, ejection seats and ejection-seat rocket motors, parachute components, undercarriages, brakes, wheels and parts for the Czech L-410 transport aircraft and Polish M28 aircraft manufactured by PZL Mielec. Production for the military aviation industry also plays a significant role.

### Production capabilities

Production capabilities include manufacturing of sheet-metal components, shaping of parts and sets, machining, structural welding, and construction of wings, large fuselage components, and control surfaces.



# Aircraft Manufacturers



## Evezktor – Design and Engineering

### Design and development

- Complete design of airframe and its optimization
- Design processing of individual groups
  - e.g. fuselage, wing, tail units
- Power unit and fuel system installation
- Design of aircraft electric system
- Project and installation of avionics and communication equipment
- Certification plan, approval of avionic installations

### Structural analyses

- Stress analyses
- FEM models for parts and assemblies
- Linear and non-linear analyses
- Solution of optimization tasks in HyperWorks/Optistruct
- Evaluation of fatigue strength and service life
- Mass analyses and optimization

### Dynamic analyses

- Modal analyses of design, including optimization
- Sensitivity analyses for noise and vibration elimination
- Non-linear dynamic simulations of structures
- System simulations of many bodies with kinematic and dynamic dependence
- Dynamic and mechatronic systems for excitation in time and spectral area
- Analysis of structural vibration propagation
- Simulations of crash tests
- CDF analyses
- External and internal aerodynamics
- Hydrodynamics

## Evezktor – design and development activities

### Evezktor-Aerotechnik – Aircraft production

#### www.evezktor.cz

Evezktor is among the most significant domestic providers of design work operating primarily in the aviation and automotive industries. Both Evezktor and Evezktor-Aerotechnik are engaged in a broad range of activities in the aviation sector: from design and development of new aircraft, including calculations and 3D modelling, to series production of ultralights and light sport aircraft. The company is number-one in the United States in terms of the number of LSAs delivered to flight schools there, and its SportStar is the bestselling low-wing plane in its category on the American market. Aircraft sales in the United States are handled by the company's Evezktor Aircraft sales branch. Evezktor employs 195 designers and Evezktor-Aerotechnik has 250 employees. Production capacity is 200 aircraft per year.

#### Evezktor's capabilities:

- Aircraft development and production – Evezktor is certified to design aircraft (DOA) according to EASA Part 21 and to produce aircraft (POA) according to EASA Part 21.
- Aircraft design and development, all types of FEM computations, including dynamic process and flow computations, including crash analyses and computational fluid dynamics.
- Production of aircraft, aircraft assemblies and subassemblies, preparation and production of composite components.

#### Product portfolio:

EuroStar – 100 aircraft per year

SportStar – 50 aircraft per year

VUT100 Cobra – certification testing of prototypes, preparations for the series production

EV-55 Outback – production of prototypes and preparations for the first flight

#### Partnership between Evezktor and the Brno University of Technology

New possibilities result from the cooperation between the Brno University of Technology (BTU) and Evezktor on the development and production of the 200 hp VUT100 Cobra and the 315hp SuperCobra. The Technical University conducted the initial study, performed aerodynamic computations and preliminary designs of technical nodes. Evezktor undertook the complete aircraft development, production and testing of two prototypes. The planes are currently undergoing certification testing and production is expected in the range of 100 to 250 units per year, for which the company is seeking a strategic partner. The advantage of the VUT100 Cobra and SuperCobra lies primarily in the planes' outstanding flight characteristics, payload, wide and comfortable cabin, unmatched styling and modern interior including a glass cockpit.



#### EV-55

The EV-55 Outback is a multipurpose aircraft transport plane with capacity for 9-14 passengers or 1,800 kilograms of cargo. Powered by two reliable Pratt & Whitney PT6A-21 turboprop engines, the Outback is intended for small operators, unscheduled transport of persons or cargo to remote destinations or for ferry service between islands and mainland locations. The plane will be a useful workhorse able to take off and land on short and mid-length runways, which will help operators to increase their flexibility and profitability. A floatplane version is also being planned. In short, the Outback is not just another corporate aircraft. **Development is expected to be completed in 2011 and the company is looking for a partner to produce the Outback.**



### Training of qualified mechanics

Let Aircraft Industries has its own aviation secondary school located within the factory complex. This four-year school trains aircraft mechanics in accordance with the EASA Part 147 standard. Students can test their newly acquired skills on decommissioned L-410 aircraft directly in the production hall. 110 students are currently involved in this study programme.



## LET Aircraft Industries

### www.let.cz

With a history dating back over 70 years, LET Aircraft Industries has produced over 8,000 aircraft, including the famous L-13 Blanik glider, L-410/L-420 commuter aircraft, L-29 Delfin jet trainer, Z-37 Bumble Bee crop-spraying aircraft, L-200 air-taxi, and many other types. The company is certified according to EASA Part 21 and ISO 9001 standards.

### L410 UVP-E / L-420

More than one thousand L-410 aircraft are operated in fifty countries on five continents. With capacity for up to 19 passengers, these twin-turboprop planes workhorses on short and medium-length routes and feature outstanding flight characteristics and operational reliability, easy handling and simple maintenance.

Their remarkable hot-and-high performance, excellent STOL capabilities, durable structure and ability to operate under extreme climatic conditions make them excellent transportation tools appreciated by operators around the world.

The L-410 UVP-E20 is certified on the basis of FAR 23, Amendment 34 and is accepted by EASA. The L-420 is certified by the FAA according to FAR 23, Amendment 41 regulation.



### Glanders

LET Aircraft Industries' other products are the L-13 AC, L-23 Super Blanik and L-33 Solo gliders, which have been chosen as training equipment by the US Air Force and the US Civil Air Patrol.

### Production of large components, assemblies and subassemblies

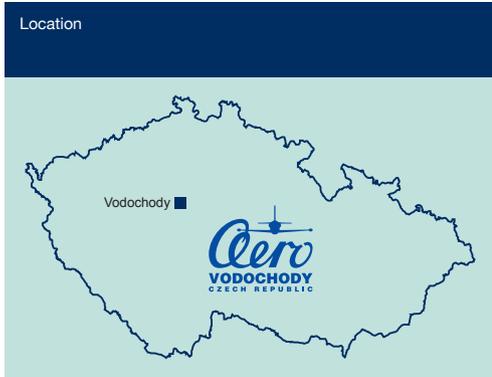
Thanks to the company's 6,090 m<sup>2</sup> assembly hall and three other halls for shaping and machining large metal components, welding and riveting, and chemical and heat surface treatment, and a 2,470 m<sup>2</sup> hall for final painting, Let Aircraft Industries is prepared for expansion of its production programme for other finalists as well as Tier 1 and Tier 2 suppliers.

### Kunovice's factory airfield and giant manufacturing complex

Ideal infrastructure for manufacturing general-aviation and business aircraft is provided in the form of an airport featuring a VPD 03/21 concrete runway measuring 2,000 x 30 m with PCN 33/R/B/X/T load-bearing capacity enabling instrument approach, and a manufacturing complex covering 1,268,000 m<sup>2</sup> with production halls covering a total of 68,000 m<sup>2</sup>. Due to the presence of the training centre, it is possible to train the required personal in a short time.



# Aircraft Manufacturers



## Aero Vodochody

[www.aero.cz](http://www.aero.cz)

AERO Vodochody focuses mainly on development, production, sales and support of aerostructures and final aircraft in the areas of both civil and military aviation technology. The Company follows the tradition of Aero – továrna letadel (Aero – Aircraft Factory) established in 1919, and thus ranks among the oldest aviation technology producers in the world. AERO is currently the largest aviation technology producer in the Czech Republic and historically the largest jet training aircraft producer in the world. Aero has a certified quality management system according to AS 9100 / ISO 9001 and is a holder of all relevant certificates of the company as a whole as well as all partial processes according to national and international standards. 100 % of the shares of Aero are owned by the private equity group Penta.

### Aerostructures program

Aero participates in the entire life cycle of civil and military projects, from development to industrialization and validation of products, combining experience in aerospace production dating back to 1919 with every-day practice within running serial production, utilizing the latest technology and test methods. Aero has the competence to design and produce complex aerostructures with a high degree of product finalization. This includes systems integration and testing, full control of quality, full supply chain management and complex customer support starting from the production transfer phase, through implementation of customer's requirements during the production phase to after-sales support. Currently is Aero focusing on cooperation with leading aerospace manufacturers – Sikorsky Aircraft Corporation (S-76C helicopter), Alenia Aeronautica (C-27J Spartan center wing box), Latecoere (Embraer 170/190 subassemblies), Saab (JAS-39 Gripen pylons), Spirit Aerosystems (B767 fixed leading edge kits), EADS (A320/340 subassemblies), etc.

### Military program

The Military Program of AERO Vodochody focuses on development, production, sales and support of final products of the Aero brand – advanced training and light combat aircraft. The single-seat advanced light combat and two-seat advanced training L-159 aircraft represent the key elements of the complex L-159 Combat & Training System, which moreover includes integrated logistic support, ground based training system, mission planning and debriefing equipment and other support aids. The system was developed in cooperation with leading aviation technology manufacturers abroad as well as in the Czech Republic. The L-159 system is well established in service with the Czech Air Force and in 2009 it becomes a part of the Spanish Air Force as well. For the L-39 / L-59 customers, the program offers a complex portfolio of services starting from their service-life extension, overhauls to upgrades of all the systems of the aircraft.

### Portfolio of companies

AERO Vodochody is a 100% holder of the shares of Technometra Radotín, a traditional producer of landing gears and other assemblies, and Letiště Vodochody (Vodochody Airport), a private international airport, utilized for both company as well as commercial flights. Within the companies portfolio of private equity group Penta, Rotortech AERO Composites Ltd., a producer of composites, significantly increases the potential of AERO Vodochody. The acquisition of Rotortech was carried out in the year 2007.





### Company prospects and objectives

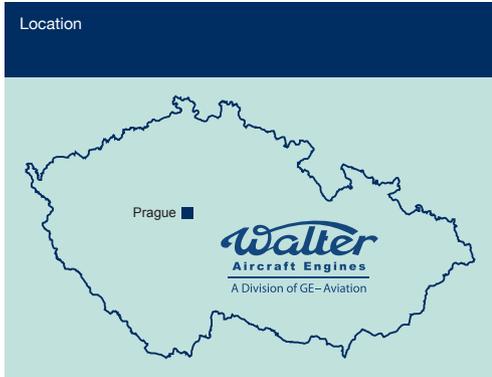
AERO Vodochody entered the year 2009 as a stable and profitable company capable of developing long-term partnerships with its customers. Especially its complex capability of final production of aviation technology, experience with aerostructures projects with high level of product finalization and highly qualified staff enable the company to compete with high quality of production, reliability of deliveries and short introduction of new production. AERO Vodochody will continue in developing its current production programs, increasing its potential through extensive investments into machinery and advanced technologies, and systematically seeking for new orders within both military and civil aviation technology. In the year 2007, works on investment projects were launched, especially on the project of an in-house composite plant construction. Till 2012, AERO Vodochody plans to invest almost CZK 1.5 billion and hire 700 employees. Today, Aero is fully focusing on its strategic aim: to build a new international aerospace holding in the CEE region.

The main part of the strategy of the company is represented by aerostructures, a dynamically growing segment, which brings the company an extraordinary growth potential. The main objective of the company is to access long-term partnerships with leading entities in aerostructures, with concurrent diversification of risk in terms of customers' portfolio, trade currency and advanced state of the project. The company will focus on deliveries with high value added at the first-tier supplier position. The Aerostructures Program thus continues in negotiations with its current customers mainly on quality extension of cooperation and at the same time intensively negotiates with further leading aviation manufacturers on new orders.

In the military sphere, AERO Vodochody represents the key partner to the Czech Air Force in support and further development of the L-159 fleet, on the basis of the long-term general agreement signed with the Ministry of Defense of the Czech Republic, valid till 2029.

AERO Vodochody will systematically seek for opportunities of involving its research and development into all its projects up to the level of direct involvement in risk-sharing projects.

# Aircraft Engines Manufactures



## Walter Engines

[www.walterengines.com](http://www.walterengines.com)

Walter Engines has been a traditional aircraft engine manufacturer since 1920s, established in 1911 in Prague. Walter has produced more than 37,000 engines. The M601 turboprop engine family has more than 1,500 engines in service on more than 30 aircraft types, 15 million flight hours accumulated. In addition to manufacturing and overhauling turboprop engines, Walter Engines also manufactures high precision machined parts for the aviation industry with customers worldwide. The company and its sister company Prague Casting Services employ together about 520 employees. In 2007, General Electric Company, acting through its GE Aviation business division entered into an agreement to acquire certain assets of Walter Engines and Prague Casting Services in order to grow GE Aviation's capabilities and presence in the turboprop segment.

### Two main production programs:

**Walter M601** program: Range of turboprop engines available in 18 different versions, EASA and FAA certifications. M601 engines are used in 30 different aircraft types.

**Subcontract production** program: Walter Engines manufactures various parts and subassemblies of turbine aircraft engines and other high technology engineering products for external customers.



### Quality system:

AS/EN/JISQ 9100, MOA, DOA, POA, 18 versions of the M601 engine certified by EASA, five versions certified the by FAA, NADCAP certificates of special processes, etc.





#### Location



#### Quality system:

Certificates ISO 9001:2000, EN 9100:2004, EN 9110:2004, ISO 14001:2004 (Lloyd's Register), AS 9100, BOEING, RW TÜV (Bureau Veritas), JAR 21, etc.



## PBS Velká Bíteš

[www.pbsvb.cz](http://www.pbsvb.cz)

První brněnská strojírna (PBS) Velká Bíteš is a modern and prosperous mechanical engineering company founded in 1950. The system of dividing the company into divisions with respect to individual products and their technical development capability makes the company very dynamic. PBS's production plant covers an area of 183,996 m<sup>2</sup>. The company has 800 employees and turnover of more than 30 million EUR.

#### Aircraft Technology Division:

- Small gas turbines (APU) working as air, electricity and hydraulic source for aircraft systems and as emergency power source for aircraft and helicopters
- Air-conditioning systems (ECS)
- Turbojet engines for UAV, UCAV, experimental airplanes and target drones
- Turboprop engine for UAV, UCAV and small airplanes
- Air starting systems for aircraft engines
- Components for aircraft and helicopter systems such as turbo-cooling units, heat exchangers, water separators, special fittings and parts for pneumatic regulation, actuators, shut-off valves
- High-speed gearboxes
- Helium expansion turbines used in the gas-liquefaction process
- Cold compressor unit for aspiration of helium vapours in superconductive arrangements
- Ground power units (GPU) using electrical power and compressed air
- Cogeneration units (combined heads and power – CHP – based on the turbine engine)
- Turbine engines for driving permanent-magnet high-speed generators

#### Metallurgy division:

- Precision investment castings of carbon steel, high-alloy steel and superalloys on a nickel and cobalt base in the weight range of 0.1 to 48 kg
- Over 340 types of castings, air and vacuum casting
- Casting certification in the company testing laboratory

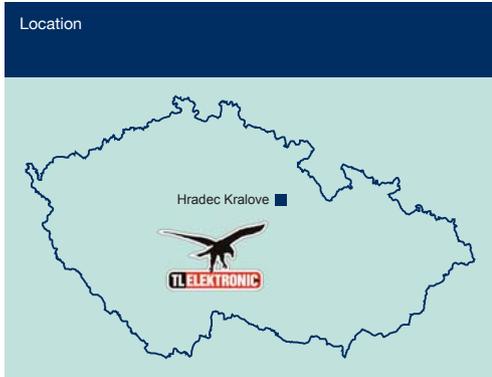
#### Machine Shop and Tools Division:

- Production of moulds for precise casting and plastic pressing of plastics
- Production of jigs and special tools
- Production of complex parts and assemblies
- Production of decanting centrifuges for continuous separation
- CNC tool grinding
- Electrospark machining

#### Capabilities

- Aircraft starting and air-conditioning systems (APU, ECS ,GPU)
- Aircraft-engine components, high-speed gearboxes
- Small turbojet / turboprop engines
- Cryogenic engineering, helium and nitrogen expansion turbines
- Investment castings of carbon steel, high-alloy steel and superalloys
- Production of moulds for precise casting and plastic pressing
- Design/Production of complex parts, jigs and special tools, electroplating of parts, heat treatment, laboratory testing

# Aircraft Instruments (Avionics)



As an original equipment manufacturer TL elektronik prides itself on the relationship it has built directly with aircraft manufacturers around the globe, they view the design, flexibility, reliability, and quality, linked with value for money and on time delivery as a major reason to choose TLE when purchasing avionic solutions. Between the major customers of TLE are Extra Aircraft Industries, BRP Rotax Bombardier, BAE Systems, Red Bull Air Race Team, and many others.

TL elektronik also sells its products through distributors in more than 30 countries worldwide and export sales accounts for 98% of its overall production. It is a very flexible and reliable company focused on utilization of the latest manufacturing technologies in highly sophisticated products.

TL elektronik is also engaged in the development of very sophisticated instruments. In 2004 the TL-5824 an Aircraft Structural Monitoring Unit designed and produced by the company was nominated for the most prestigious national award "Czech Head" in the category "The most significant new technology or product developed in the Czech Republic".



## TL elektronik

[www.tl-elektronic.com](http://www.tl-elektronic.com)

Established more than a decade ago, TL elektronik is one of the world leaders in design and development of aircraft instruments and onboard aircraft systems, having developed more than 40 aircraft instruments. Certificates: ISO 9001:2001, EASA Part 21, etc.

### Avionics

TL elektronik produce wide spectrum of avionics instruments and systems

#### -- General products

Fuel management, thermometers, RPM and engine hours meters, air speed and vertical speed indicators, accelerometers, altimeters, engine monitoring system etc.

#### -- Sophisticated products

Fatiguemeters and methodology; Structural life monitoring system and methodology; Flutter test equipment and methodology

#### -- Other products

Intercoms, Voice warning systems; Autopilot systems; Wireless data communicator; Flight position logger

### Onboard Aircraft Systems (Glass Cockpit)

Multifunctional flight monitoring system integrating all primary flight instruments  
Multifunctional engine monitoring system integrating all primary engine instruments

### Structural Life Monitoring Unit

Enable monitoring and evaluating residual life of several critical places of aircraft structure.

It is based on in-time measurement of vertical "g", which is recalculated on the stress spectra or direct stress measurement using by strain gauges. Evaluation of measured stress spectra provides information about the residual life-time of the plane structure.

### UAV systems (UAS)

Systems DSA (Detect, Sense and Avoid) and C3 (Command, Control and Communication), Engine monitoring systems, Radio altimeter, engine monitoring system etc.

### Autonomous parachute supply system

Autonomously guided precision airdrop system enabling soft landing with flare maneuver (accuracy is less than 50 m, drop altitude 10 km and payload weight up to 1000 kg).





# Aircraft Instruments (Avionics)



MESIT Instruments is a leading Czech aerospace company with extensive experience in development and production of electronics, instruments and precision mechanics. MESIT Instruments is one of 16 companies belonging to **MESIT Holding**, which represents a group of capital and technologically related firms concentrated in a single, expansive manufacturing complex. The MESIT group also includes, among other firms, DICOM (military radio equipment), FIMES (precision castings) and MESIT Ronex (machining of complicated parts and sets). The group's philosophy can be expressed in only three words: **tradition, quality, reliability.**

Since 1992, companies in the MESIT group have continued the long tradition of producing aircraft instruments and communications technologies that began in 1952 and has continued through production of avionics developed in their own research and development facilities for the L-410, L-420, L-39, L-59, L-159 and L-610 aircraft with the aim of building a lasting tradition of the MESIT protected trademark and applying these technologies in other industrial sectors.

## MESIT Instruments

[www.holding.mesit.cz](http://www.holding.mesit.cz)

MESIT Instruments was established in 1994 and took over the technical equipment and main production programme of the original MESIT, which until 1989 had employed more than 3,000 people and whose customers included Let Kunovice, Moravan Otrokovice and Aero Vodochody. The production programme is still based on communication, indication and processor systems used in aviation and special technologies.

### This specifically concerns

- Aircraft instruments for measuring physical variables
- Radio-communication systems intended for civilian and military aviation applications
- Intercom equipments
- Control and regulation microprocessor systems
- Aircraft static single-phase and three-phase converters 400 Hz
- Data-transfer systems

Today the company's production portfolio includes more than 800 types of products, most of which are intended for use in aviation. MESIT Instruments employs 170 people, including 25 university graduates in the development department.

### Current aviation production

Small series of instruments such as trim indicators, transmitters, indicator and fuel-gauge sets, wing-flap controls, landing-gear controls, fuel-flow and consumption indicators, engine gas-temperature indicators, thermoelectric temperature and resistance temperature sensors, three-phase converters, airborne communication transceivers, resistant antennas, etc. The company supplies 20 components for the M601 aircraft engine produced by the Czech company Walter Engines and replacement avionics for Czech L-39 and L-410 aircraft operating in Russia and Asia. For the EV-55 Outback project (see the Evektor section) the company will deliver fuel-gauge, pneumatic de-icing and cabin-temperature-regulation systems, among other components.

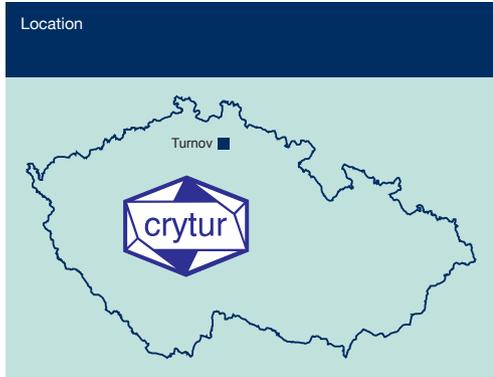
### General overhaul of aircraft instruments

Besides the standard certificates of quality – ISO 9001, ISO 14001, EASA Part 21 – for production of aircraft instruments, the company is also certified according to EASA Part 145 to perform repairs of most similar aircraft instruments. If the company obtains documentation from the producer, it has the capacity to perform not only the prescribed repair work and inspection, but also general overhauls of such instruments. At the same time, the company is able to produce special tools and equipment to ensure repairs on such a scale.

### ELMS601 system for the Walter M601 aircraft engine

The ELMS601 system monitors and continually assesses 20 engine parameters, making it possible to warn the operator that the engine's limits are being exceeded, which could shorten its service life. This system can be used in any aircraft engine as long as the degrading parameters are known.





## Aeronautical Laser Applications

### Crytur

[www.crytur.cz](http://www.crytur.cz)  
[www.crytur.com](http://www.crytur.com)

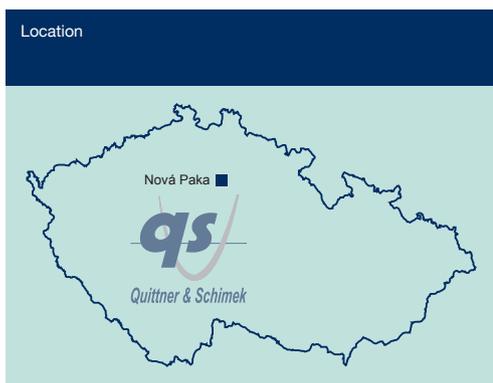
Production of Crytur based on 65 years long tradition consists of crystal growth, polishing and coating of single crystals. The Laser Division of Crytur produces laser rods, mirrors and other optics namely for medical and military applications. Broad portfolio of available materials consists of, among others, Tm:YAP and Tm:YAG laser rods suited for radar and atmospheric sensing, microchip laser working on 1,3 microns, variable reflectivity mirrors



## Wire Harnesses

### Ray Service

[www.rayservice.cz](http://www.rayservice.cz)  
 Ray Service provides complete solutions in the area of wire harnesses and cable components. The company handles all aspects in this area, from design (CAD) and production of wire harnesses to their electromechanical assembly (complete delivery of panels and boxes, AC/DC distributors, relay boxes and control panels). The company is certified according to the ISO 9001:2000, AQAP 2120 and EASA POA Part 21 standards.



### Quittner & Schimek

[www.qscomp.cz](http://www.qscomp.cz)  
 Quittner & Schimek (QS) is an experienced supplier of interconnection solutions for the aerospace market. The company provides assembly of complete wire harnesses, cables, boxes and panels, assembly of circular MIL-Spec. connectors, and supplies electrical components. QS is certified under AS 9100, ISO 9001:2000 and QSF-A issued by EADS Military Aircraft. Seventy employees work in the company's 1,800 m<sup>2</sup> facility

# Aircraft System Manufactures



In the 1960s, a modern aviation development department was established using, among other things, mathematical modelling for designing new hydraulic and fuel circuits. The company's RPM and fuel regulation kits were used primarily in the Czech L-29, L-39 and L-410 aircraft.

## Successful cooperation with Parker Hannifin

Jihostroj has long cooperated with Parker Hannifin on development and production of complete hydraulic systems for end-producers of aircraft.

## Jawa a Jihostroj

Jihostroj owns the Jawa motorcycle brand, which was once a major player in the Asian market.

## Jihostroj

[www.jihostroj.com](http://www.jihostroj.com)

Aviation department founded in 1935 – deliveries for the Czech military. During the second world war, up to 1,500 people worked at Jihostroj manufacturing sophisticated components such as gearboxes and fuel and hydraulic systems for fighter planes. Aircraft-components manufacturing continued after the war with, for example, licensed production of fuel gauges for MiG-15s.

The main production focus in the aviation area currently consists in hydraulic and fuel systems, on which Jihostroj complements with other Czech manufacturer Jihlavan.

Basic products include propeller-regulation and fuel-regulation systems for aircraft engines and other fuel-system components such as regulators, pumps, valves, filters, etc. In the area of hydraulics, the company focuses on hydraulic elements for vehicles and machines, such as high-pressure pumps, aggregates, cylinders, power-steering units, rotational flow separators, valves, etc.

### Jihostroj's other capabilities:

- Components machining, final assembly and testing
- Surface preparation
- Heat treatment
- Material grinding

The company archives the results and data from all conducted trials and inspection tests of delivered products, and their technical findings in this area are top-notch. Today the company has 672 employees and is certified according to the ISO 9001 and EASA Part 21 and Part 145 standards. The aviation development department comprises a team of 27 developers.

### Goals

Development of fuel systems for end-producers of aircraft, expansion of the production portfolio to include other products with higher added value. Jihostroj is seeking a partner in the aviation sector that will use its innovation potential and above-average development capacities.



## Jihlavan

[www.jihlavan.cz](http://www.jihlavan.cz)

Jihlavan was established in 1952, when it began licensed production of hydraulic systems for Russian MiG and Yak aircraft. The company, which is a holder of the AS9100 certificate, develops and produces components for rudder and elevator hydraulic control mechanisms, hydraulic power control, hydraulic valves, hydraulic cylinders, brake-system components, landing-gear control, etc.

Jihlavan has its own development department that does design work not only in the area of aircraft hydraulics, but also for mobile applications (logistics, transportation, healthcare). The company is also a significant producer of small sport aircraft and is involved in production in the area unmanned aerial vehicles (launch ramps).



Jihlavan is continuing its long-term cooperation with Czech manufactures such as Aero Vodochody, for whose aircraft it supplies approximately 40 hydraulic devices, e.g. control and emergency valves, main and emergency accumulators, pressure indicators, landing-gear and flap cylinders, among other things. The company is involved in cooperative programmes with Letov/Latecoere (door components for Airbus aircraft) and has cooperated closely with GE since 2000.

### Capabilities

- Cutting, turning, milling, drilling, honing, grinding - CNC machining (40 machines), precision-machining components
- Heat treatment (annealing, hardening, tempering, carburizing, nitrohardening, carbonitriding) in inert atmosphere or vacuum
- Non destructive testing (FPI, MPI)
- Surface treatment (hard chromium plating, painting)
- Welding (TIG, MIG) using robots
- Assembly testing
- CAD/CAM - CATIA V5, Unigraphics NX3
- Vibrating and shatter testing
- MRO of complete hydraulic systems and devices



Jihlavan's expansive production complex, where up to 5,000 people worked at the peak of production, and significant investments in equipment including CNC milling machines has spurred the company's search for new production partners and end-producers.

### High-precision machining

- Hubs for two-, three- and five-blade propellers
- Components for fuel control systems, aircraft engines, door systems, etc.

### Business Scope

- Development and production of hydraulic systems and components - hydraulic actuators, valves and accumulators for actuating systems

# Precision Machining Composite Production



## Letov

[www.llv.cz](http://www.llv.cz)

Letov is the oldest aircraft manufacturer in the Czech Republic. The company was founded in 1918 by the Czechoslovak Defense Ministry. Letov has been a member of the Latecoere Group since 2000 (100% owned by Latecoere SA Toulouse) with 600 employees. The Quality System is certified according to EN9100 standard.

Letov is an aerostructures manufacturer focusing on assembly of passenger, service and cargo doors, door mechanism and composite parts for door structure for Airbus, Boeing, Dassault and Embraer aircraft. All the new future cooperation programs are fully governed by the owner – Latecoere Group.

### Capabilities

- Design of aircraft components including stress analyses
- Machining Al-alloys, Ti-alloys, high strength and corrosion resistant steel
- 3 and 4 axis CNC milling and drilling centers, CNC turning centre
- Surface treatments (galvanic and chemical processes) and painting
- Sheet metal forming
- Non destructive testing
- Assembly of riveted structures and mechanisms

### Composite components

Production of structural composite parts by using RTL technology

- Cutting by water jet cutter
- Forming on heated press



Production of structural composite parts from prepregs by using autoclave

- Cutting of prepregs
- Lay-up of parts by laser localizers
- Curing of parts in the autoclave
- Ultrasonic non-destructive testing
- Final machining of cured parts on the CNC 5 axis milling machine

## LA Composite

[www.lacomposite.com](http://www.lacomposite.com)

- Founded in 1997; 60 employees
- Production of composite and sandwich parts
- EN ISO 9001:2000
- AC 21-26 Quality Control for the Manufacture of Composite Structures
- AC 20-107 Composite Aircraft Structure

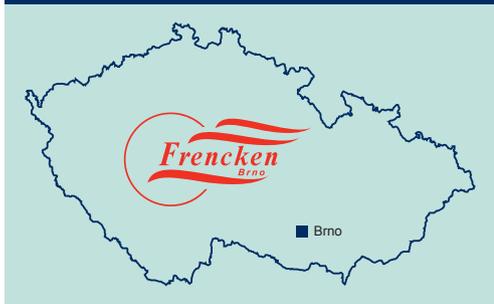
## CompoTech

[www.compotech.com](http://www.compotech.com)

- Founded in 1995; 50 employees
- Production of structural composite tubes
- Solution provider in designing, testing and manufacture of tubular, fibre reinforced and composite parts
- Products: Control rods, drive shafts, structure tubing, integrated joints



## Location



### System of cybernetic control

Frencken Brno was the first company in Europe which introduced the system of the cybernetic control of production process CPC and it has been continually applying the latest knowledge from the field of mechanical-engineering and communication technologies. Quality machinery and measuring equipment together with the cybernetic control of the production process guarantee the optimum performance of the company and the maximum possibility of production flow monitoring. Parts are manufactured on 3 to 5-axis CNC machines connected to the cybernetic planning, controlling and monitoring system.



## Frencken Brno

[www.frencken.cz](http://www.frencken.cz)

Frencken Brno presents itself as a supplier of precision mechanical parts and mechanical assemblies for the professional use in small up to medium series. The acquired know-how makes possible to supply the components for aircraft and space industry, for microelectronics, production of special machinery, vacuum technique, radar control and navigation technologies, medical instruments and optics.

Frencken Brno was established in 1994 and the same year a new production plant was built up in the Brno industrial zone. The production of precision mechanical parts has started since January 1995. The production has gradually expanded and the company has made massive investments, for the most into productive CNC technologies. Frencken Brno owns also adequate measuring instruments, including two 3D (CMM) measuring devices. All measuring instruments and devices are periodically calibrated and the inspection workplace is air-conditioned. Frencken Brno utilizes the state-of-the art CPC system, supplied by MAZAK for planning, production control and monitoring of the machine operations.

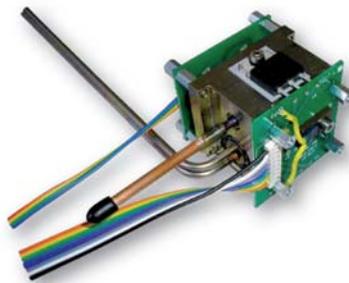
### Products

- Aerospace assemblies and parts
- Components of aircraft brake
- Components of hydraulic pump
- Assemblies mounted with high accuracy

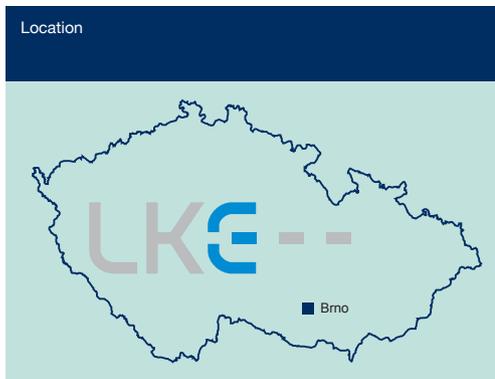
### Capabilities

- Programming
- Machining
- Welding
- Assembly
- Inspection

Products of Frencken Brno are exported for the most into the EU countries and the USA. Frencken Brno is certified in compliance with ISO 9001, AS 9100 and QSF-A as a supplier of the German Aerospace Industry. Frencken Brno has established management system in accordance to ISO 14001 and OHSAS 18001.



# Aerospace Design Engineering



## Engineering Projects

LKE provides services in area of technical calculations for mechanical engineering. Company activity is focused on structural analyses of mechanical components, consultations in problem solving and special calculation methodology development. Technical consultations provided by LKE will resolve problematic behavior of machine or component and help to identify root cause of failure and propose the best correction action.

High quality and effective service is guaranteed by LKE experts who have long term experience with international projects and continuously acquire the latest technologies in the area of CAE. The experts has successfully accomplished projects for various areas of industry such as nuclear components, electric generators, turbines, turbochargers, aerospace field, space field, transportation, architecture, etc.

## Benefits

- High quality product
- Time saving – less rework, less testing
- Cost saving – less prototypes, no warranty repairs
- Competitive advantage – time to market, product quality
- Code qualification - product meets the Code requirements (EN, ASME,...)

## LK Engineering

[www.lke.cz](http://www.lke.cz)

L.K. Engineering (LKE), founded in 1994, provides design and detailed engineering analysis using advanced computational technology. Except engineering projects, LKE has been involved in advanced research projects such as development of special FEM models in mechanics, development of computational software for specific problems in fluid dynamics, measurement of parameters of FEM models from hyperelastic materials, modelling of bone and vascular tissues with respect to mechanical stress and interaction of such tissues with the environment (biomechanics).

## Capabilities

### Structural Analyses

- Static analyses
- Lifetime calculation
- Structure optimization
- Combined loads

### Dynamic Analyses

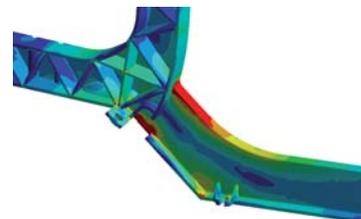
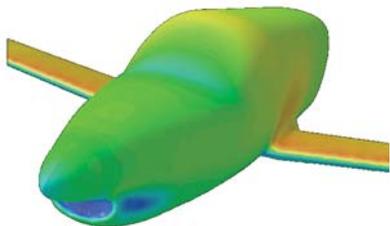
- Free vibration
- Forced vibration
- Operating machines repairs
- Failure cause identification
- Seismic analyses

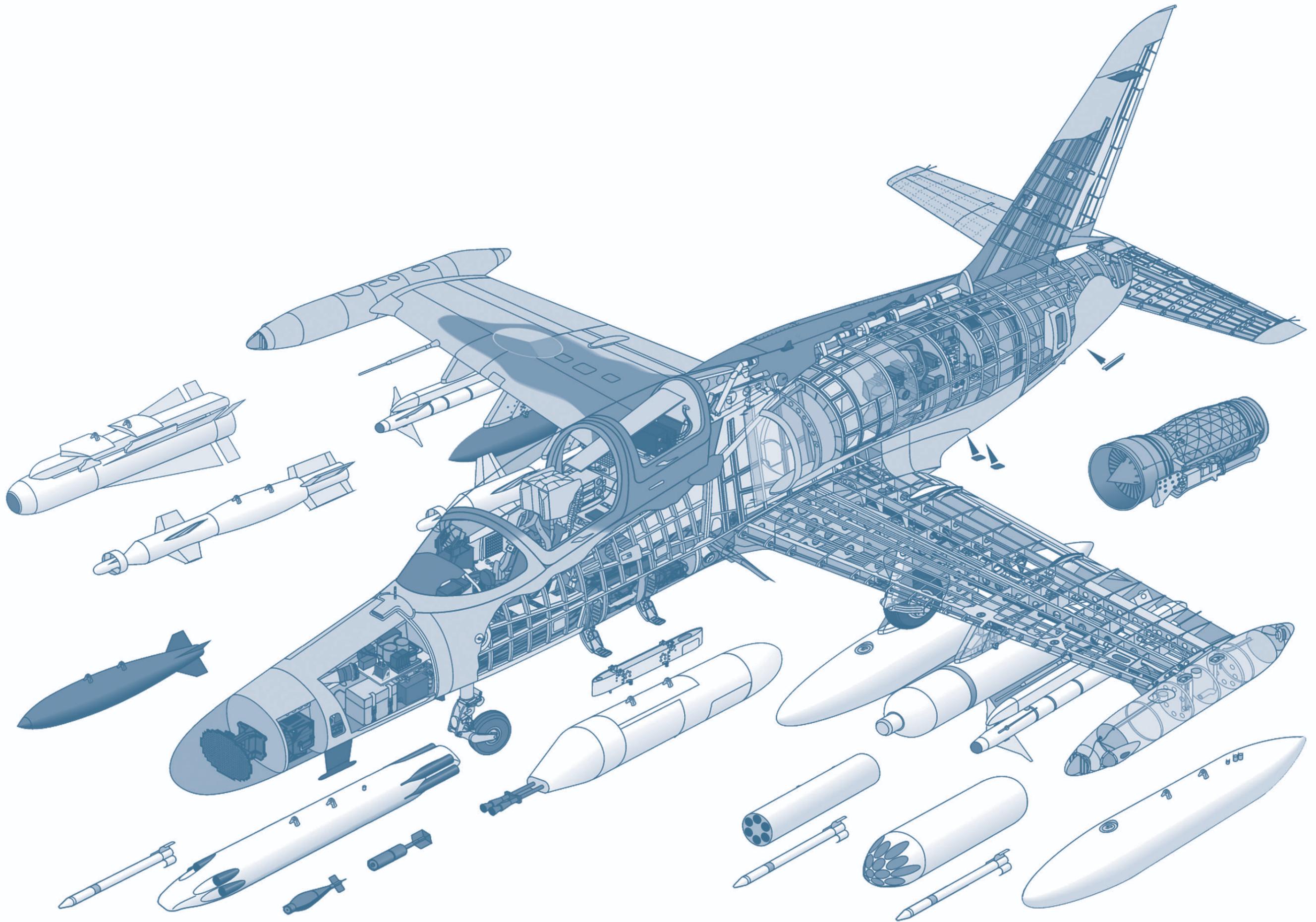
### Thermal Analyses

- Heat transfer
- Time effect history
- Combination with other analyses

### CFD Analyses

- External aerodynamics
- Internal aerodynamics
- Hydrodynamics
- Fluid/Structure Interaction





## Location



## Designers

Inter-Informatics has a highly skilled engineering staff that is flexible, experienced and cost-effective. The company has the ability to quickly reinforce its engineering personnel with up to 100 designers per year.

## Inter-Informatics

[www.inter-informatics.cz](http://www.inter-informatics.cz)

With more than 300 employees and a design centre located in Prague, Inter-Informatics Group focuses on providing state-of-the-art engineering and IT services in the aerospace industry. In 2005, the firm entered a 10-year partnership with Airbus as a first-level subcontractor (Airbus Deutschland Design Subcontractor Qualification).

## Capabilities

### Conceptual Design

- Product definition & Specifications
- Interface definitions
- Advanced Technologies
- Composite materials & other advanced technologies
- Definition of basic structural components and systems

### Pre Design

- System Integration
- Manufacturing & Assembly concept
- Virtual prototyping
- Cost reduction

### Detail Design

- Stress Reports
- Systems Design
- Interior Styling & Design
- 3D models & Drawing sets
- Composite materials & other advanced technologies
- Technical illustrations

### Project Support

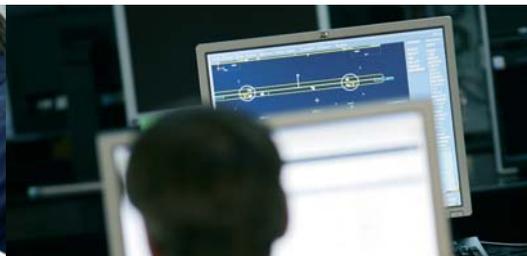
- Project & Product Management
- Data Management Tools
- Workflow design
- Methods & training
- Manufacturing support, NC programming

### Information Systems:

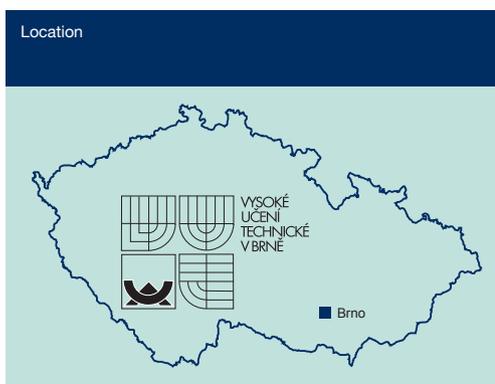
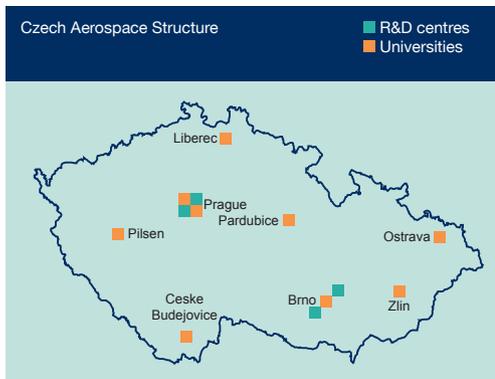
- Management Information systems
- Performance Monitoring
- Business Intelligence
- Data Management Solutions
- Product Lifecycle Management (PLM)
- Custom Software development

Quality Management Certificates includes: ISO 9001:2000, EN 9100:2003.

Engineering Services Certificates includes: EASA DOA Part 21- Design Organization Approval, DIN 6700-2 – class C5 and Airbus Deutschland Design Subcontractor Qualification.



# Aerospace Research and Development



“In all fields of human endeavour, research is analogous to the advanced guard of an army in the field. No general would leave his army in the field with an advanced guard.”  
Dr.h.c. Jan Antonín Baťa, 1938, To Build a Nation

## Brno University of Technology

[www.vutbr.cz](http://www.vutbr.cz)

### Institute of Aerospace Engineering

The research activities of the Institute of Aerospace Engineering (IAE) are focused on the area of using state-of-the-art computation methods (numeric methods in aerodynamics and strength of aircraft structures – CFD and FEM methods, broad application of CAD tools in parametric modelling of structures and parts thereof) as well as the area of practical tests (strength testing facility certified by the CAA for static and fatigue tests, in-flight measurement in flight-testing facility). Students, primarily postgraduates, are intensively involved in all research activities. The IAE cooperates with several industrial enterprises on new projects, research and development, and tests, which are performed in an aeronautical testing facility.

#### Research activities

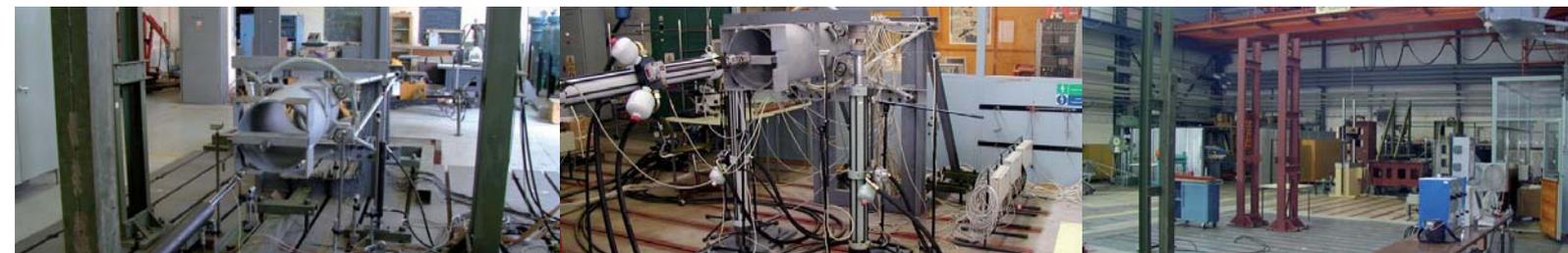
- Design of aircraft structures
- Static/fatigue tests of aircraft structures
- Complex aerodynamic analyses (using CFD methods)
- Stress analyses of structural components (using advanced FEM software)
- Testing of aerospace materials (involving metal and composite materials)
- Reliability analyses (analyses of aircraft systems and failure rate predictions)
- Design of hydraulic systems for general-aviation aircraft

### Faculty of Information Technology

Safety-enhanced flight-control architecture

#### Research profile

Flight-control design involves highly specific tasks with a multidisciplinary nature. Contemporary automatic flight-control systems represent the results of stepwise evolution characterized by the introduction of more advanced features with every new generation leading to highly complex and sophisticated applications installed onboard military and transport aircraft. Using existing technology, it is possible to incorporate an intelligent system effectively providing the pilot with an assisting or supervising “virtual co-pilot”. An aircraft with this capability represents another step in the evolution that might ultimately lead to an “autonomous” aircraft. A proposed digital flight-control system design is intended as an accessible flight-control system that would simplify piloting, reduce pilot workload, and allow low-end general-aviation aircraft to operate under adverse weather conditions.





The main advantage of a digital flight-control system is its ability to influence the flight characteristics at every point of the flight envelope using the appropriate flight-control laws. Utilisation of a digital flight control system allows implementation of complex algorithms which modify the inherited dynamic behaviour, thus suppressing turbulence effects and increasing passenger comfort during flight. Flight envelope protection is an important feature that allows full control inputs without the danger of leaving the safe flight limits or structural overload. An overall increase in safety resulting from reduced pilot workload during routine operations favours awareness distribution towards navigation tasks.

#### Research activities

- Design of digital flight-control systems – industrial partners Evекtor, Honeywell
- Active aeroelastic effect suppression through digital flight-control means (active in flight vibration damping)
- Flight envelope protection to increase pilots' safety
- 4D navigation (spatial coordinates reached at a predetermined time, improvement in air-traffic flow, security and safety implications)
- Avionics design based on a super-safe computational platform (meeting the regulation restrictions imposed on extremely reliable aviation products)
- Flight-software design (meeting the recommendations and requirements of certification authorities in terms of reliability)

#### Modelling and Simulation

##### Research profile

Estimation of dynamic response qualities is one of the crucial tasks in aerospace engineering. The aim of the faculty's research is to pursue the area of classic aeroelastic computation and further apply it to modelling the flight characteristics of aircraft, stability and control, i.e. mathematical modelling of elastic aircraft flight dynamics.

Compared to the analytical solution, which reduces the entire process to a straightforward manipulation with time-proven graphs and tables, the numerical simulation offers a more complex description of the dynamic processes investigated. A complex simulation allows monitoring of the selected quantities in a time domain, thus offering a tool for visual qualification of the investigated process.

The analytical solution and the 'competing' mathematical simulation are complementary tools in the case of a classic light aeronautical structure. Complex structural models could be further used for optimization purposes as well as for other static and dynamic analyses.

##### Research activities

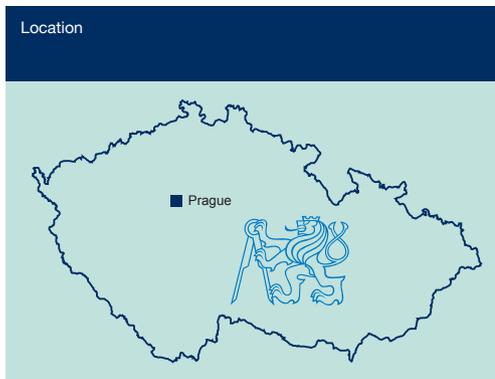
- Aircraft dynamics model reconstruction from in-flight measurements
- Modelling and simulation of complex flight-dynamics tasks considering the influences of the structural elasticity
- Computational fluid dynamics (CFD) and computational structural dynamics (CSD)

#### Research in other faculties/departments

- Control of fuel systems using devices with distributed intelligence
- Control of fuel systems with use of a joint microcontroller (Common Core Computer)
- Communication subsystems of various types of experimental satellites
- Vibrating micro-generators for powering sensors (performance 1-20 mW)
- Advanced composite materials for aerospace applications
- Nano-composite coatings



# Aerospace Research and Development



## Department of Cybernetics

### Research projects

**Agent Technology Distributed Artificial Intelligence**, agent architectures, multi-agent systems, communication and negotiation, coordination and cooperation, alliances and coalitions, collective behaviour, trust, agent platforms, production planning and scheduling  
(AGENTFLY – Autonomous Agents in Air-Traffic Control – open multi-agent test bed used for air traffic simulation)



## Czech Technical University in Prague

[www.cvut.cz](http://www.cvut.cz)

Czech Technical University in Prague was established in 1707 and belongs to the largest technical universities in Europe. Education of the Aviation Sciences has a long ongoing tradition. Aerospace research is conducted by 3 faculties: Faculty of Electrical Engineering, Faculty of Mechanical Engineering and Faculty of Transportation Sciences.

### Research and Development

#### Structural design

- Design of light sport aircraft and unmanned aerial vehicles
- Safety and operational reliability of aircraft structures and civil UAV applications
- New types of intelligent material (smart structures)
- Structural strength, load capacity and increased service life of aircraft
- FEM calculations (including complex, non-linear tasks, post-processing of limiting states of aircraft components)
- Design of systems for monitoring/evaluating the limiting states of rigidity, fatigue strength and service life and for evaluation of propagation of cracks and failure of structural integrity
- FEM calculations/optimization of composite components including evaluation of failure of their structural integrity
- Monitoring of flight spectra of stress and service life of aircraft in operation
- Design of experimental methods for monitoring, measuring and evaluating the state of stress and deformation of aircraft components during operation (health monitoring)
- Fractographic analysis of defective structural aircraft components
- Impact of structural, material and technological changes on the process of aircraft deterioration (modelling of stress and deformation in critical structural nodes)
- Frequency analysis and aeroelasticity
- Implementation of aeroelastic trials of light sport aircraft
- Experimental testing and verification of aircraft structures

#### Aerodynamics

- External and internal aerodynamics
- Design of aircraft profiles and profiles of propeller blades
- Low-Re aerodynamic applications in light aircraft, engine-less aircraft and UAVs
- Active and passive control of the boundary layer
- CFD modelling and software development for numerical simulations

#### Aircraft engines

- Flow solutions in 3D channels of aircraft turbine engines
- Centrifugal compressors of aircraft turbine engines
- Light fan propulsion for light aircraft
- Fractographic analysis of defective parts of aircraft engines

#### Avionics

- Avionics for sport aircraft using Kalman filtration
- Systems for measuring and evaluating aerometric values for sport aircraft
- Measuring the parameters of aircraft engines using intelligent sensors and busbars
- Precision of low-cost inertial aircraft measuring units with the use of GPS



## Model of cooperation with Industry

- Consultancy
- Standard short-term or long-term contracts
- Know-how transfer to spin-off companies with follow-up supervision
- Targeted education of future employees
- Mediation of cooperation in different fields through various channels
- Incubation of (even highly interdisciplinary) research teams
- Incubation of independent R&D bodies
- The latest model: research lab funded by strong industrial bodies

- Control algorithms of dynamic systems
- Reliable integrated receivers for the GPS, GLONASS and Galileo systems
- ACS components for unmanned aerial vehicles (instruments, autopilot, data collection, communications, identification, control algorithms)
- Stabilized camera platforms for unmanned aerial vehicles
- Low-cost autopilot
- Implementation of methods for testing decentralised systems
- Methods using accelerometers for measuring angular acceleration in aircraft applications
- Systems for measuring and evaluating aerometric values
- Digital filters in inertial aircraft computer units

### New technologies

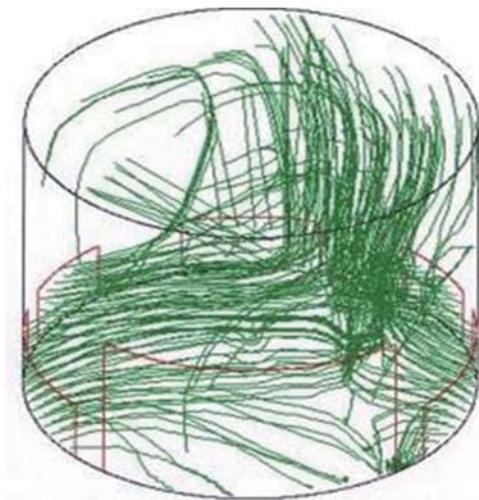
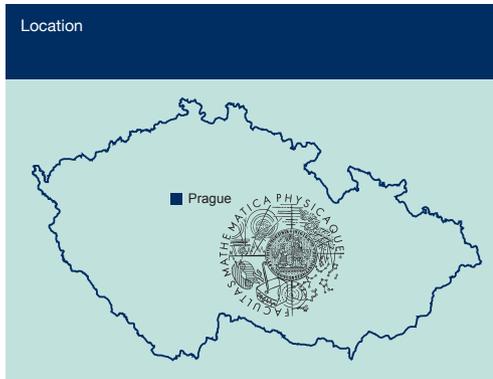
- Foundry technologies for casting aircraft components from Al, Mg alloys
- Technologies for volumetric and surface shaping of unconventional materials, high-rigidity steel and non-ferrous alloys
- Technologies for welding Al-alloy aircraft components concentrated on unconventional joining
- Technologies for composite components based on polymer matrices for extreme working conditions
- Technology for creation of coatings on functional parts of aircraft
- Machining technologies in the area of applying CAD/CAM systems for 5D/five-axis milling in the production of structural components of aircraft
- Alternative methods of assembling construction units in aircraft production
- Handling of automation processes in small-series aircraft production

### Materials research

- Structural analysis and diagnostics of Al-Li-X alloys
- Mechanical and physical properties of Al foams and creation of hybrid components from such foams
- Initiation and propagation phases of fissures in the case of the shock load of composites produced using various technological processes
- Analysis of the transition from reactoplastic materials to thermoplastic long-fibre composites (LFT)
- Impact of surface preparation on the fatigue life of aircraft
- Processes and micromechanisms of fatigue defects in structural alloys used in aircraft engines
- Fractographic analysis of aircraft components
- Comprehensive analysis of defects in aerospace technology



# Aerospace Research and Development



## Charles University in Prague

[www.cuni.cz](http://www.cuni.cz)

### Faculty of Mathematics and Physics

Charles University was founded in 1348 as the first Central European University. Faculty of Mathematics and Physics was established in 1952 by separation from Faculty of the Natural Sciences.

### Research Activities

#### Materials Science

- Structural, mechanical and physical properties of light metals (Mg, Al, Mg and Al alloys)
- Superplastic properties of Al alloys
- Metal matrix composites with ceramic reinforcements
- Carbon composites
- Modelling of material properties
- Magnetic properties of materials, magnetic multilayers
- High real-space resolution structure of materials by high-energy X-Ray techniques
- Properties of semiconductors, semiconductor nanocrystals
- Surface properties and processes
- Nanostructured materials, super-thin films
- Optical fibres

#### Laser Physics

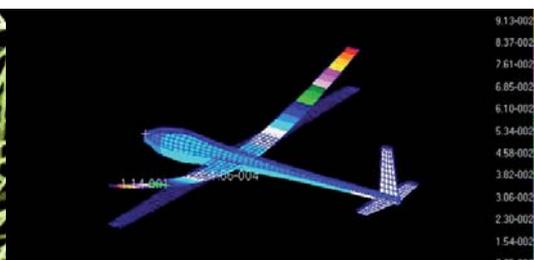
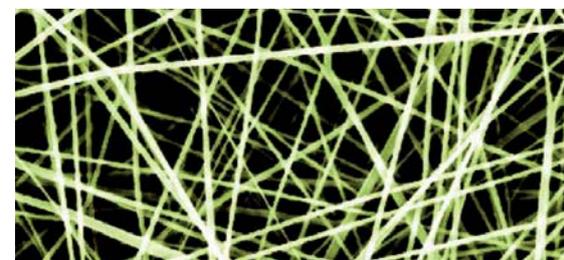
- Ultra speed laser spectroscopy

#### Space Science

- Space research in the Earth surrounding
- Development of new measuring methods and equipments
- Meteorology and Climatology

#### Mathematical Modelling

- Modelling and simulation of flow (viscous, high speed)
- Software Engineering





## University of West Bohemia

[www.zcu.cz](http://www.zcu.cz)

### Research Activities

#### Materials research

- Testing and prediction of material properties in the course of the material life-cycle
- Material structure and composition analyses
- Qualitative and quantitative phase analysis
- Residual stress analysis
- Texture analysis
- Analysis of changes in the crystal structure

#### New materials development

- Polymer composites
- Thin layer materials
  - Sensors and actuators application
  - Photovoltaic application
- Catalytic layers

#### Computational simulations

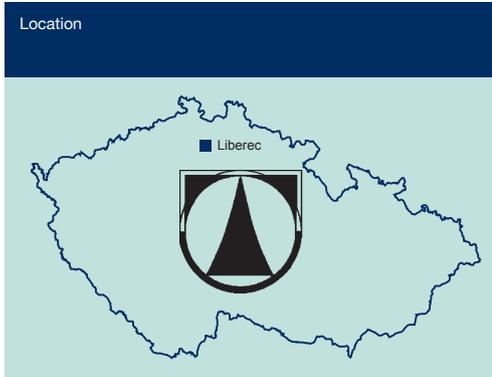
- Modelling of material behaviour including the inner material structure
- CAD modelling and construction
- CAE for partners
  - Structural simulations
  - Thermomechanical processes simulations
  - Computational fluid dynamics
  - Multi-physical simulations
- Experimental validation of results (wind tunnel, live brake-disc experiments, etc.)

#### Software development

- Duct and muffler acoustics
- Thermal processes and control
- Impact-echo method for material-rupture localization
- Brake-disc hot-spot modelling and prediction
- Shape optimization
- Complex material-structure homogenisation methods



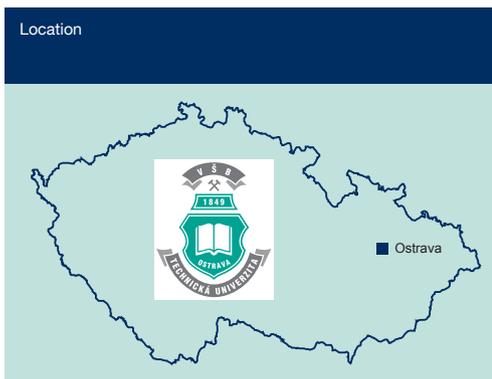
# Aerospace Research and Development



## Nanofibres in Liberec

At the Textile Faculty, a new method was developed for industrial production of nanofibres from organic polymers and/or inorganic substances. The method is protected by international patents and the Liberec-based firm Elmarco produces and sells the production machinery on the basis of an exclusive license. Intensive research of various nanofibre applications in a range of areas is currently being conducted at the Technical University and at Elmarco.

Nanofibres represent a completely new class of materials with enormous application potential. Some products are prepared for realisation. The Technical University of Liberec and Elmarco are seeking partners in the area of developing nanofibre applications.



## Technical University of Liberec

[www.vslib.cz](http://www.vslib.cz)

### Research profile

- Use and evaluation of new polymers and composites (nano-composites, micro-composites, biodegradable and long-fibre composites, etc.)
- Simulation of technological processes in plastics manufacturing
- Monitoring of technological processes in plastics manufacturing (pressure and thermal processes, dimensions, quality, structure)
- New technological process in the area of plastics manufacturing (support of gas and water, operation of counter pressure and vacuum, hybrid technological processes, etc.)

## VSB-Technical University of Ostrava

[www.vsb.cz](http://www.vsb.cz)

### Materials shape optimization

- Optimal design in mechanical engineering
- Optimal design in electro-magnetic devices
- Solution of complex industrial problems
- Metal-forming simulations
- Design of composite structures

### Graphics and vision

- Efficient algorithms for detecting the "feature points" (points needed for creating a 3D model)
- Efficient algorithms for computing the "motion field" (what and moves in an image and how much)
- Software for intelligent cameras for surveillance purposes (e.g., motion tracking, object counting, reading car licence numbers, etc.)
- Optical measurement of surface tension of molten metals

### Information retrieval and data mining

- Semantic web
- Multimedia and multidimensional databases, data indexing and storage
- Text retrieval
- New methods based on statistics, linear algebra, neural networks and other bio-inspired methods
- Geometrisation, a unifying theoretical basis, reduction of the space dimension





#### Location



### Historical milestones

**1922** – Military Aeronautical Study Institute

- Seven departments: Aerodynamics, Aircraft, Engines, Electrical and Radio Equipment, Photo-optics, Flight Medicine and Meteorology

**1928** – First successful full tests of aircraft engines

- Structural-integrity tests of Aero, Letov and Avia aircraft
- Onboard-instruments development

**1948** – Aeronautical Research and Test Institute (VZLU)

- Cooperation with the Aero Vodochody and Let Kunovice aircraft factories
- Testing of new L-40, L-60 utility and sport aircraft, HC-2 helicopters

**1959** – Testing of the L-29 Delfín, the first Czechoslovak jet trainer

- M-701 engines (9,250 units); L-13 Blaník gliders (2,649 units)

## Aeronautical Research and Test Institute (VZLU)

[www.vzlu.cz](http://www.vzlu.cz)

VZLU is an aerospace engineering and testing centre in the Czech Republic established in 1922.

### Profile

- Large R&D and testing infrastructure
- Located in Prague on a 23-hectare site
- Staff: 340 in total, 30 DSc, 115 university graduates, 50 technical specialists
- ISO 9001, EASA (CAA CR) approvals
- Extensive experience in international cooperation in RTD

### Aerospace research, development and testing

- Aerodynamics (low-speed high-speed wind tunnels)
- CFD – Computational fluid dynamics, flight mechanics
- Aeroelasticity, flutter and other dynamic responses
- Structure analyses, static and fatigue tests of airframes (full-scale) and components (MTS, Instron Schenck, Tira, etc.), residual strength
- Combined structural strength testing (temperature, humidity)
- Modal testing (ground resonance) and vibration
- Bird-strike testing – high-velocity impact
- Landing-gear testing
- FEM stress-strain analysis
- Composite structures development
- Environmental testing (mechanical, climatic)
- Design of propellers and fans
- Design of testing equipment, jigs and fixtures

### Main Activities in Detail

#### Wind-tunnel testing

- Measurement of aircraft aerodynamic characteristics
- Measurement of flow characteristics of parts of turbo-machines (blade cascades of turbines and compressors)
- Wind resistance testing (antenna systems)
- Calibration of aerodynamic probes, balances, anemometers and other instruments

# Aerospace Research and Development

## Computational fluid dynamics

- Complex flow solutions in 2D and 3D
- External and internal aerodynamics
- Steady and unsteady flow analyses
- Subsonic, transonic and supersonic flows
- Physics modelling capabilities of combustion, cavitation, multi-phase, compressibility, reacting flows, heat transfer, buoyancy and natural convection, distributed resistance
- Aerodynamic multidisciplinary optimization

## Strength analyses

- Stress and strain, FE analysis (linear and non-linear, K-factor, J-integral, plastic zone, contact analysis, isotropic and anisotropic materials)
- Modal analysis and dynamical response
- Buckling analysis
- Prediction of crack growth, prediction of durability for low- and high-cycle fatigue
- Optimization (weight, stiffness, topology, dynamical properties)

## Structural testing

- Static and fatigue tests of whole structures and subassemblies
- Strength tests of metal and composite structures with environmental influences (temperature and dampness)
- Residual static strength tests
- Stress, strain and deformation mapping; experimental stress analysis (strain gauges, laser interferometry, photogrammetry, thermoelasticimetry, photoelasticimetry, brittle coating)

## Modal analysis

- Operational modal analysis – modal parameters of structure determination under real operational conditions
- Modal characteristics of full-scale structures, dynamically similar models and mechanical structural articles

## Vibration tests

- Vibration and shock tests
- Complex combined climatic – vibration and shock – functional tests

## Environmental testing

- Climatic tests – RH 20-99%
- Temperature shock tests – 80/+200 °C

## Reliability analysis and lifecycle management

- Analyses of damage propagation
- Certification of structures according to relevant regulations





## Aerospace Research Centre in Brno

<http://clkv.fme.vutbr.cz>

The Aerospace Research Centre (ARC) was founded in 2000 with the primary goal of supporting the effective transfer of aerospace know-how.

### ARC council

Coordinator: Institute of Aerospace Engineering, Brno University of Technology  
Participants: Aeronautical Research and Test Institute (VZLU), Czech Technical University in Prague

### Research profile

#### Aerodynamics

- Flow fields in aviation applications
- Advanced methods in aerodynamics
- Flight-loads correlation with computations
- Fixed-wing aircraft aerodynamic envelope research
- Acoustic load in air traffic
- Prediction of the acoustic environment in airplane cabins

#### Technologies for aerospace applications

- Metallic fibre laminates and low-cost composite technologies
- Advanced technologies of structural jointing
- Impact of the environment on the lifecycle of materials and surface finishes

#### Propulsion systems

- Numerical modelling of the flow in rotating machines
- Increasing effectiveness and safety of the fan drive
- Flight-loads correlation with computations
- Advanced diagnostic methods

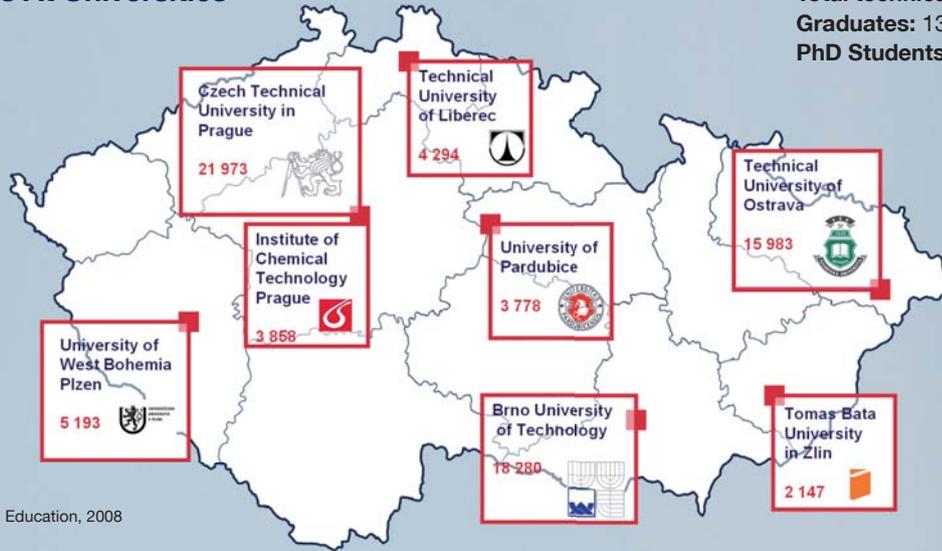
#### Structural design, strength and durability

- Research aimed improving the passive safety of aircrews and passengers
- Reliability of aircraft equipment and systems
- Aeroelasticity
- Strength of composite structures
- Structural optimisation
- Fatigue and durability of composite structures

# Aerospace Schools

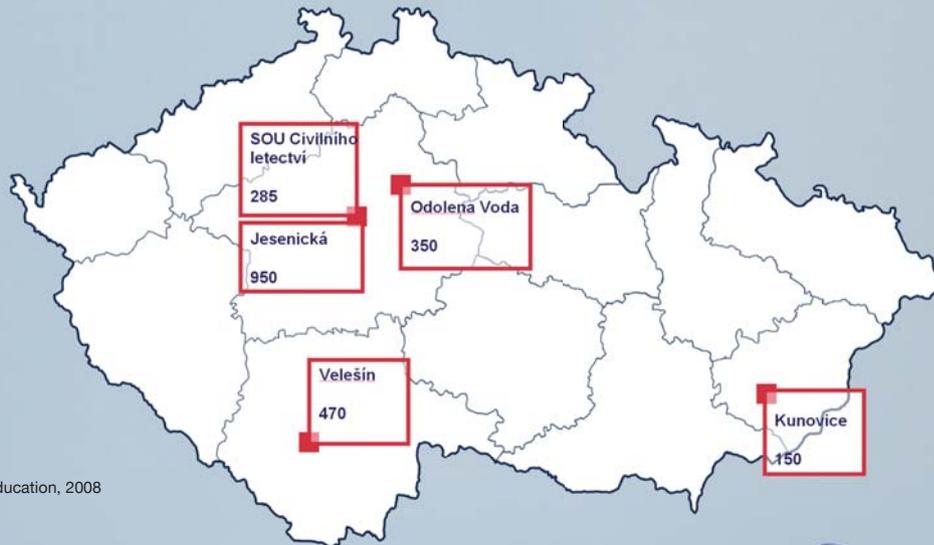
## Technical Faculties At Universities

**Total technical students:** 75 506  
**Graduates:** 13 923  
**PhD Students:** 7 652



Source: Institute for Information on Education, 2008

## Secondary Education Applicable to Aircraft Industry



Source: Institute for Information on Education, 2008



## Aircraft Maintenance Centres



“There is no reason that anyone should be more capable in aviation than we are. No one on the world needs aviation as urgently as we do. Not for war, but for peace. For service that leads to the prosperity of the whole world. Why not a Czechoslovak route to China or Japan? Why not a Czechoslovak route to Cape Town? Why not Czechoslovak routes to North and South America? Who wants to say that we cannot do it? What is stopping us? Our people? No. We have the best pilots that a nation could wish for.” Dr.h.c. Jan Antonín Baťa, 1938, To Build a Nation

### Aircraft Maintenance and Repairs in the Czech Republic

Aircraft maintenance, repairs and overhaul in the Czech Republic is based on the country's strong engineering background and specific approach. The lack of aircraft components in the 1970s due to the restrictions on foreign imports, taught Czech companies and their employees to develop and produce crucial aircraft parts using their own resources knowledge and skills. Actually, it seems that this gave us as a major competitive edge because of the resulting wealth of very skilled technicians who are able to cope with current manufacturing difficulties.

### History

The history of MRO services in the Czech Republic dates back to 1937, when the Czechoslovak Aviation Company (CLS) established its repair facilities with a new hangar dedicated to servicing Douglas DC2s. Consequently, the hangar and all the aprons were used by the German Luftwaffe for thorough inspections of its bombers. After World War II, the Czechoslovak Aviation Company merged with Czechoslovak Airlines and since that time the Czech flag carrier has represented a long, ongoing tradition of MRO at Prague-Ruzyně Airport.

### Czech Airlines – Technical Division

<http://www.csamaintenance.cz>

Czech Airlines – Technical Division is a branch of the Czech flag carrier with responsibility for line and heavy maintenance, heavy structural repairs and modifications of the classic and new Generation Boeing 737 and Airbus A320 supported with backshops (including B737 landing gear overhaul), laboratories, NDT etc., and working under the EASA/FAA certificates. Timely delivery, uncompromising quality and high safety standards across all services are highly rated by a growing number of customers such as Lufthansa Technik, AF-KLM, Air Berlin and Transavia.





## JOB AIR-CENTRAL EUROPE AIRCRAFT MAINTENANCE

[www.jobair.eu](http://www.jobair.eu)

JOB AIR-CEAM is driving an ambitious project targeted at the Airbus A380 and Boeing 747 MRO Centre of Excellence at Ostrava Airport. In order to fulfil this goal, the company has been progressing step by step since 1996, when Job Air established its maintenance facilities for turboprop aircraft under the JAR145 certificate. JOB AIR-CEAM is a joint-stock company offering integrated MRO solutions for mid-sized and large civilian aircraft and is situated at the Ostrava Airport, enabling the acceptance of all categories of aircraft due to the site's excellent parameters. The company has also set up a longstanding partnership with the Technical University in Ostrava in order to satisfy the company's labour needs.

JOB AIR-CEAM is building one of the biggest maintenance service centres in central and Eastern Europe. The project is absolutely unique, thanks to the huge size of the hangar, which covers an area of 11,680 m<sup>2</sup> and is 24 m in height. The size of the hangar, its configuration and dimensions of the garage gate are designed to accommodate two jumbo B747s and two mid-size B737s inside at the same time, which until now has been impossible in the CEE region.



## LOM PRAHA

[www.lompraha.cz](http://www.lompraha.cz)

A traditional Czech aerospace MRO service provider dealing with repairs and upgrading of military aircraft, helicopters and aircraft engines, development and application of information and communication systems and manufacture of simulation equipments (in co-operation with its subsidiaries). MRO service includes overhauls, repairs, modifications of aircraft and helicopters, jet and piston engines, disassembly, assembly and testing of aggregates, installation of aircraft instruments and avionics, interior and exterior rebuilding, surface treatment, balancing of rotary parts, non-destructive material testing etc. The company was established in 1915 as a manufacturer of piston engines and is fully authorised by the Ministry of Defence of the Czech Republic to perform on commercial basis full spectrum of activities in the field of aeronautical industry within both the Czech Republic and abroad. LOM PRAHA is certified upon ISO 9001/2000 standards; AQAP 2110; holds certificates and authorizations awarded by ministries of defense of several countries allowing performance of repair works and complete overhauls of engines, gearboxes and airframes of aircraft and helicopters.



# Airport Infrastructure

Czech International Airports with paved RWY



| Airport          | ICAO | IATA | Current Flight | Status        | Paved RWY |  |
|------------------|------|------|----------------|---------------|-----------|--|
| Ceske Budejovice | LKCS |      | VFR            | International | Charter   | RWY 27/09 (2,500 x 80)                           |
| Brno-Turany      | LKTB | BRQ  | VFR/IFR        | International | Regural   | RWY 10/28 (2,650 x 60)                           |
| Hradec Kralove   | LKHK |      | VFR            | International | Charter   | RWY 16/34 (2,400 x 60)                           |
| Karlovy Vary     | LKKV | KLV  | VFR/IFR        | International | Regural   | RWY 11/29 (2,150 x 30)                           |
| Kunovice         | LKKU | UHE  | VFR/IFR        | International | Charter   | RWY 03/21 (2,000 x 30)                           |
| Ostrava-Mosnov   | LKMT | OSR  | VFR/IFR        | International | Regural   | RWY 04/22 (3,500 x 63)                           |
| Pardubice        | LKPD | PED  | VFR/IFR        | International | Regural   | RWY 09/27 (2,500 x 75)                           |
| Praha-Ruzyně     | LKPR | PRG  | VFR/IFR        | International | Regural   | RWY 06/24 (3,250 x 65)<br>RWY 13/31 (3,250 x 60) |
| Praha-Vodochody  | LKVO |      | VFR/IFR        | International | Charter   | RWY 10/28 (2,500 x 45)                           |
| Prerov           | LKPO | PRV  | VFR/IFR        | International | Charter   | RWY 06/24 (2,476 x 60)                           |



# Space Industry



Czech lands have since middle ages been the cradle of genius that contributed new ideas in space exploration and astronomy, as well as provided fertile conditions for many foreign personalities to carry out their work (e.g. Kepler: Two of his laws invented in Prague). Even today the Czech Republic boasts highly qualified, experienced and enthusiastic scientific and engineering human resources stimulating the next development of space industry in our country.

## Czech Space Alliance

Czech Space Alliance is an association of Czech SMEs in space industry.  
[www.czechspace.eu](http://www.czechspace.eu)

|               |      |
|---------------|------|
| Foundation    | 2006 |
| Manufacturers | 14   |

### Czech SMEs on the road to ESA

|         |  |
|---------|--|
| 01/2007 | Application for full membership                    |
| 01/2008 | Process of accession started                       |
| 06/2008 | ESA council approved Czech membership              |
| 07/2008 | Accession to ESA convention to be signed in Prague |
| 01/2009 | Full Membership (Estimated date)                   |

### Summary of recent Czech Space Alliance Projects

Successfully completed

- 3 x ESA PECS projects
- 1 x substantial extensions
- 2 x non PECS space projects completed

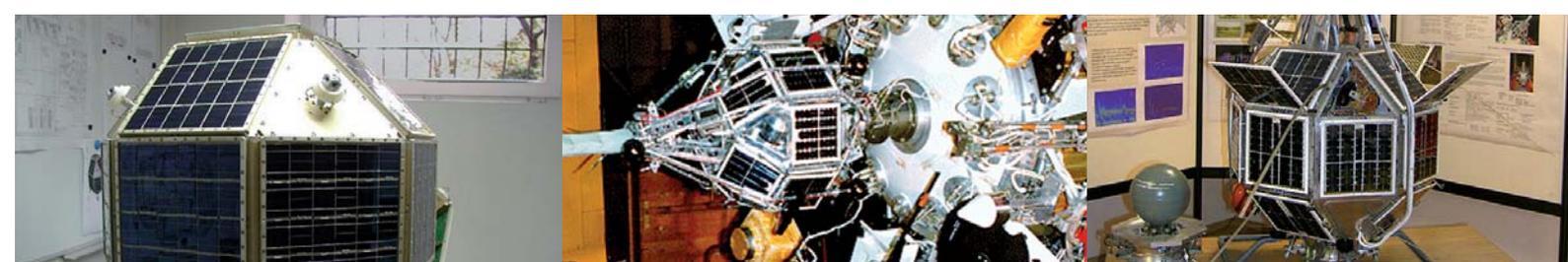
In progress

- 3 ESA PECS projects in progress
- 4 non PECS project in progress

Several other opportunities in discussion/negotiation

### Product Portfolio:

- Space material sciences and technology; Crystal sciences
- Precision mechanical components and space modules
- Software incl. ESA documentations, simulations, control systems, embedded software, satellite navigation
- Satellite on-board instruments, space qualified electronics
- Digital space instruments and equipments
- Precise X-Ray optics and cameras
- Instruments for space research
- Engineering services and information systems
- Investment casting, pressure, dia-casting
- Moulds; Injection moulds
- IC design, EDA and embedded systems
- Advanced computational methodologies and industrial engineering





## Czech Space Office

[www.czechspace.cz](http://www.czechspace.cz)

Czech Space Office is a private non-profit company and the government contact point for Czech space sciences.

### Selected current space projects

- Galileo Satellite Navigation System (GSNS)
- Experiments on the International Space Station (ISS)
- Solar weather; Planetary explorations

### Achievements

- 1897 First observatory in the Czech Republic (Ondřejov)
- 1930s Solid fuel rockets  
Anti-aircraft missile project to the air force
- 1950s Interplanetary mass movements (1st calculation of the interplanetary orbit of the meteorite)  
Predictions of solar proton eruptions  
2-stage sounding rockets at Military Academy Brno, stopped for political reasons
- 1960s 1st optical detection and radio acquisition outside the Soviet territory (orbit calculations)  
Czech instruments for measuring X-ray radiation from sun in Space
- 1970s 13 carried Czechoslovak payloads for recording of cosmic rays  
**1st Czechoslovak astronaut in Space**
- 1980s **Magion** (MAGnetospheric and IONospheric): Design, construction and scientific exploitation of a series of 5 sub-satellites  
**Vega** Spacecrafts (stabilised platform to photograph and study Halley comet)  
Shock waves in cosmic plasma (9 experiments)
- 1990s **Mimosa** (MicroMeasurements Of Satellite Acceleration): Study of non-gravitational forces  
Microaccelerometer, GPS tracking system; Satellite platform etc.
- 2005 First ESA projects started in the frame of the PECS agreement between ESA and the Czech Republic
- 2008 First win in international ESA tender with Czech Space Alliance member participation

Source: Czechs in Space; 2000; Published by the American Institute of Aeronautics and Astronautics, Inc.

# Light Aircraft Industry

## Atec

[www.atecaircraft.eu](http://www.atecaircraft.eu)

Atec initially focused on custom manufacturing of parts of ultralights and parts thereof, as well as marketing and procurement activities. In 1995 the company started production of its own two-seat airplane, the ZEPHYR. The latest result of the company's own development is the fast and manoeuvrable ATEC 212 SOLO, a single-seat aircraft with outstanding flight characteristics.

## Aveko

[www.aveko.com](http://www.aveko.com)

Aveko, founded in 1990, manufactures components for industrial automation. The company's other lines of business involve applications of new technologies and manufacturing of composite materials for industrial use with a focus on aviation. Aveko took over the manufacturing of the VL-3 SPRINT, an aerodynamically clean, fully composite low-wing ultralight aircraft with retractable landing gear. The airplane's construction makes extensive use of state-of-the-art highly uses carbon and hybrid materials.

## AirLony

[www.airlony.cz](http://www.airlony.cz)

Airlony produces two aircraft models: the Skylane and Highlander. The Skylane is a classic two-seat, high-wing airplane. Easy to fly and very reliable, it is ideally suited to holiday flying and air tourism. It can also be used for towing gliders and as a trainer at flight schools. The Highlander is a modern biplane designed with higher limit factors than most ultralights. The Highlander is sufficiently dimensioned for aerobatics.

## Dova Aircraft

[www.dovaircraft.cz](http://www.dovaircraft.cz)

Dova Aircraft's Skylark is a two-seat all-metal low-wing aircraft designed for to be assembled from a kit. Simple construction details make it easy to build with a minimum of jiggling. Its strong features are excellent handling and flight characteristics, as well as excellent visibility from the large bubble-type canopy. Its very mild stall characteristics result from its unique high-lift laminar wing section, together with the use of winglets. These characteristics and its rugged metal construction make it a very safe aircraft to fly.

## Czech Aircraft Works

[www.czaw.cz](http://www.czaw.cz)

CZAW manufactures its own line of aircraft including the amphibious Mermaid, the SportCruiser and the streamlined Parrot, and a line of straight and amphibious floats that fit many brands of aircraft. CZAW builds primarily American-designed aircraft, built with American materials and to American standards.

## Composit Airplanes

[www.compositairplanes.cz](http://www.compositairplanes.cz)

Since Composit Aircraft began producing aircraft in 1991, it has been engaged in the manufacturing of laminated plastic components which can be found in a wide range of airplanes of all kinds and categories. The company's new VIVA ultralight is a new-generation two-seat airplane with a front-mounted engine. All parts and components are built exclusively by Composit Airplanes, and the company also produces other components for wide range of ultralight airplanes.

## FMP

[www.fmp.cz](http://www.fmp.cz)

FMP was established in 1991. Its Qualt 201 is a light, two-seat, modern aircraft intended for pleasure flying due to its favourable flight characteristics. The Qualt 201 has a range 700 km (or 1,100 km with a larger fuel tank) at a high average cruising speed. Its consumption is between 5 and 6 l/100 km with endurance time of about 7 hours (11 hours with a larger fuel tank).

## Fantasy Air

[www.fantasyair.com](http://www.fantasyair.com)

Fantasy Air is one of the biggest manufacturers of light sport aircraft in the Czech Republic. The company's business office is located near a paved airfield close to Pisek, in the south of the Czech Republic Fantasy Air was established in 2000 by an experienced team of engineers and enthusiasts who started with production of the Cora, a light aircraft that was manufactured from 1995 until 2000 and sold over 100 units. Since the 2000, Fantasy Air has been manufacturing the model Allegro 2000 and its Allegro SW and F versions.



## Interplane

[www.interplaneaircraft.com](http://www.interplaneaircraft.com)

Interplane's primary mission is to build high-quality airplanes and aircraft components for other aircraft manufacturers and to design and build its own brand of exceptional aircraft.

Interplane's model line started with the single-seat Griffon, which was followed by the two-seat Skyboy, of which there are approximately 100 around the world. In 2008, the company is introducing a revolutionary single-seat aircraft, the ZJ Viera, which qualifies as a USA part 103 or LSA category craft.

## Jihlavan Airplanes

[www.ultralight.cz](http://www.ultralight.cz)

JIHLAVAN Airplanes was established in 2005. The company's main goal is to continue production of aircraft under the current name RAPID. Certified in the UL and LSA categories, the RAPID is an all-metal airplane with superior aerodynamic properties and flight characteristics.

## Tomáš Podešva

[www.podesva-air.com](http://www.podesva-air.com)

Tomáš Podešva deals in the production and distribution of certain types of airplanes. The company's activities consist in the production of specially designed planes, replicas, and aircraft made in accordance with plans provided by clients. Our current production programme covers two categories of sport planes – ultralight aircraft (450-472.5 kg MTOW) and experimentals (600 kg MTOW).

## ProFe

[www.profe.cz](http://www.profe.cz)

ProFe was established in 1992 and currently produces four aircraft models: the Banjo glider, Banjo-MH ultralight, DuoBanjo ultralights, and Tukan ultralight.

## Direct Fly

[www.ultralights.cz](http://www.ultralights.cz)

Established in 2006, Direct Fly's main business focus is on batch production of ALTO ultralight sport aircraft. The ALTO is a single-engine, two-seat, low-wing cantilever monoplane. The aircraft is of all-metal riveted construction and can be equipped with rescue parachute system.

## TeST

[www.testandfly.com](http://www.testandfly.com)

TeST was established in 1992 with the goal of designing and producing ultralight gliders, ultralight powered gliders and ultralight planes. The TST-10M Atlas is a single-seat self-launching glider with a retractable propulsion unit, and is suitable for thermal flights and wave or ridge flights. The aircraft also offers easy handling characteristics and the capability of independent take-off. The TST-13 Junior is a single-seat ultralight composite glider with an engine installed in the front of the fuselage. The aircraft is suitable for tourist flights and leisure thermal flying. The TST-14M Bonus is a two-seat motorised composite ultralight self-launcher with a retractable power unit, suitable for thermal flying, wave or ridge flights and for clubs and flight schools. The aircraft also offers easy handling and the capability of independent take-off.

## TL Ultralight

[www.tl-ultralight.cz](http://www.tl-ultralight.cz)

TL Ultralight's TL-2000 Sting is the fastest Czech ultralight. Its maximum speed in level flight is approximately 285 km/h. The planes broad air-speed range, from the minimum 63 km/h to maximum 305 km/h, gives pilots of all abilities the opportunity to operate within their skill level and to fly from grass strips or paved runways. The Sting is a dynamic machine with the characteristics and comfort of a much larger aircraft. The panoramic view from the cockpit and low noise levels give pilots a level of comfort and style as yet unattainable in this category.

## Urban Air

[www.urbanair.cz](http://www.urbanair.cz)

The prototype of Urban Air's LAMBADA airplane first flew in May 1996. Urban Air based the design and production of the aircraft on the structure of high-performance sail planes, which greatly affects the quality of the manufacturing process. The UFM 13 Lambada sport ultralight is an all composite, two-seat, single-engine, mid-wing aircraft. The Samba XXL ultralight is a two-seat, single-engine, all-composite low-wing airplane.

# Light Aircraft Industry

## UL Jih, s.r.o.

[www.uljih.cz](http://www.uljih.cz)

Established in 1991, UL Jih focuses on the manufacture, service and repair of ultralight aircraft made of standard materials and laminate composites. Initially production mostly involved the manufacture and repair of hang-gliders and motorised microlights. The firm is currently focusing on producing Fascination, Evolution and Fascination-VLA ultralights, all of which feature all-composite construction.

## S-WING

[www.s-wing-cz.com/letadla.php](http://www.s-wing-cz.com/letadla.php)

S-Wing two-seat ultralight features braced high-wing composite and fixed tricycle landing gear

## Jora

[www.jora.cz](http://www.jora.cz)

The JORA two-seat, high-wing ultralight features a front-mounted engine, T-configuration tail assembly and tricycle landing gear (braked main gear and steerable nose wheel). The airplane's construction uses a combination of laminate and wood, with polyester fabric skin.

## Evektor-Aerotechnik

[www.evektor.com](http://www.evektor.com)

Evektor was established in 1991 by three men with a vision of creating a strong and effective company focused on the aerospace and automotive industries. The company's EuroStar SL is an advanced ultralight airplane which set new benchmarks in quality, safety, reliability and comfort of ultralight airplanes, a category into which Evektor, as certified aircraft manufacturer, has transferred the highest standards of general aviation to recreational aviation market. The SportStar SL is a top-of-the-line S-SLA aircraft that features business-travel comfort for business travel and the easy handling of a great trainer. The airplane was the very first aircraft approved by the FAA in the U.S. S-LSA category and is a holder of the prestigious „S-LSA Aircraft of the Year“ title from AeroNews Network (ANN).

## Schempp-Hirth

[www.shvl.cz](http://www.shvl.cz)

Schempp-Hirth manufactures the Discus CS, a mid-wing, all-composite, high-performance gliders with a T-configuration tail assembly. The Duo Discus C is a two-seat version featuring the same construction characteristics.

## HPH

[www.hph.cz](http://www.hph.cz)

HPH was founded in 1989 under the name Modeler's Club H+H. The company name and trademark were changed to HPH in 1994. The firm's G-304C is a single-seat, mid-wing, all-composite, high-performance glider of the FAI Standard category and features a T-configuration tail assembly. To date, HPH has produced 45 of G-304CZ and 30 G-304C gliders. The G-304S is a single-seat, mid-wing, T-tailed, all-composite, high-performance glider in the FAI 18-metre class.

## High Performance Aircraft International

[www.hpa-international.com](http://www.hpa-international.com)

High Performance Aircraft International has produced various types of aircraft kits in recent years and currently produces high-performance experimental aircraft, for example the F1 and F1EVO kits for TeamRocket LP. HPA was founded in 1997 and its design team has more than ten years of experience in experimental-aircraft kit production.

## Vanessa Air

[www.vanessaair.cz](http://www.vanessaair.cz)

Vanessa Air was established in 1997 by spinning off the design department of Vanessa plus s.r.o., which had specialised aviation activities since 1990. The company's main activities are focused on design, drafting and analysis work in the field of ultralight (microlight) and sport aircraft, though it is also capable of solving interdisciplinary problems in the automotive and construction industries, among others. Vanessa Air has cooperated on the development of many projects, particularly those involving ultralight aircraft. The company's VL-3 is a two-seat, low-wing, all-composite airplane approved for both the ultralight (450kg) and up-to-560kg (LSA) MTOW categories.

## Moravan Aviation

[www.moravan.cz](http://www.moravan.cz)

Moravan Aviation is a Czech aircraft manufacturer with a long tradition in the production of training, sport, aerobatic, utility and touring aircraft bearing the name Zlín badge, which have been delivered to over 60 countries around the world. More than 5,600 aircraft have left the company's production facilities since 1934.

## Roko Aero

[www.rokoaero.com](http://www.rokoaero.com)

Roko Aero is a joint-stock company that was established to develop and manufacture light aircraft and to conduct research in the aviation sector. At the time of its establishment, the company's clear principal mission was to become the primary supplier of small sport aircraft in the LSA and UL categories for the world market. The company's potential lies in its top-flight construction department, carefully selected lead employees from the shop floor all the way up to the company's management. This focus on quality at all levels is abundantly apparent in its NG4 and NG4 UL aircraft models, which demonstrate the high quality and structural design that can be achieved in relatively short time. Thanks to their innovative features, quality and flight characteristics, aircraft from Roko Aero have been judged by experts to be among the best in their category. Roko Aero is the only company to offer a seven-year or 2,000-flight-hour warrantee.

# Map of the Czech Aerospace Industry





**Honeywell**



**RayService**

**Honeywell**



MORAVAN AVIATION



roko aero aircraft manufacturer



Aircraft Industries



LKE



UNIS

# Association for Foreign Investment



## Partnership to Support Foreign Direct Investment into the CR

"The Association for Foreign Investment (AFI) represents a group of renowned companies operating the Czech market that support the entry of foreign investors into the Czech Republic by providing them with a broad range of professional services. The AFI's primary purpose is to make the entry of new investors into the Czech Republic as fast and easy as possible. Consultants from the AFI's ranks are experts in the areas of legal and advisory services, consulting, engineering, project management and other services.

During its more than ten years in existence, the AFI has assisted its members in preparing a range of significant projects of foreign investors in the Czech Republic.

Thanks to their experience, the AFI's members are the ideal bridge between local conditions and the expectations of foreign investors."

Jan Bobek, Chairman of the Steering Committee, AFI

...is a joint project of the Association for Foreign Investment and CzechInvest - the Investment and Business Development Agency of the Czech Republic. The project is intended for stable companies that offer highly competitive services and products and that are interested in supporting the high-quality investment climate in the Czech Republic while promoting the country abroad. Programme activities support, to the maximum degree possible, communication between partners and foreign investors, Czech companies, representatives of the state administration and AFI members by means of e.g. organising prestigious award ceremonies, such as:



Investor roku  
Investor of the Year



Podnikatelský projekt roku  
Business Project of the Year



Podnikatelská nemovitost roku  
Business Property of the Year

### Contact us:

#### Association for Foreign Investment

Stepanska 11  
120 00 Prague 2  
Czech Republic

Phone: +420 224 911 750  
E-mail: martin.michalov@afi.cz

More information on Association for Foreign Investment is available at [www.afi.cz](http://www.afi.cz).





#### CZECHINVEST HEADQUARTERS

PHONE: +420 296 342 500  
FAX: +420 296 342 502  
E-MAIL: [fdi@czechinvest.org](mailto:fdi@czechinvest.org)  
WEB: [www.czechinvest.org](http://www.czechinvest.org)

Stepanska 15, 120 00 Prague 2  
Czech Republic

#### CZECHINVEST WORLDWIDE

**FRANCE**  
PHONE: +33 1 56 24 87 72  
E-MAIL: [paris@czechinvest.org](mailto:paris@czechinvest.org)

**UK & IRELAND**  
PHONE: +44 20 7291 4610  
E-MAIL: [london@czechinvest.org](mailto:london@czechinvest.org)

**GERMANY - MUNICH**  
PHONE: +49 899 9216 362  
E-MAIL: [munich@czechinvest.org](mailto:munich@czechinvest.org)

**JAPAN**  
PHONE: +81 45 222 2075  
E-MAIL: [yokohama@czechinvest.org](mailto:yokohama@czechinvest.org)

**SOUTHEAST ASIA**  
PHONE: +852 2530 8806  
E-MAIL: [southeast-asia@czechinvest.org](mailto:southeast-asia@czechinvest.org)

**USA - EAST**  
PHONE: +1 312 245 0180  
E-MAIL: [chicago@czechinvest.org](mailto:chicago@czechinvest.org)

**USA - WEST**  
PHONE: +1 408 524 1690  
E-MAIL: [california@czechinvest.org](mailto:california@czechinvest.org)

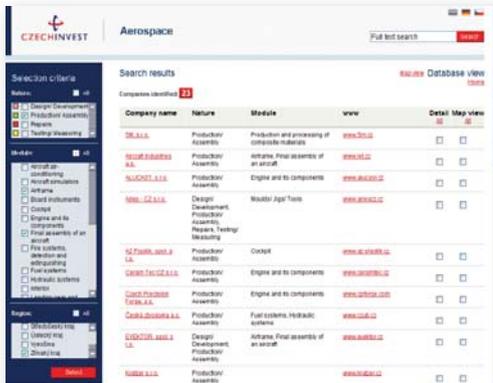
[www.czechinvest.org](http://www.czechinvest.org)

This material is distributed free of charge.



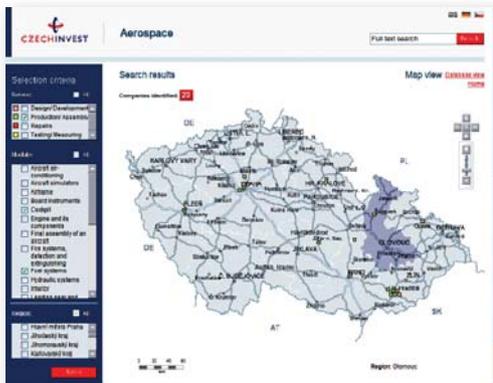
CzechInvest Investment and Business Development Agency is a government organization under the Czech Ministry of Industry and Trade.

## CzechInvest Support



CzechInvest is a non-profit government organisation of the Czech Republic which provides foreign investors and new partners with the information support, tailor-made visits, project management, and handling of financial supports, business property identification, supplier identification, aftercare services, and business infrastructure development. CzechInvest has the proven project management expertise to reduce the burden on clients' management resources in terms of site selection, matchmaking, sourcing and facilitation of the entire investment decision-making and implementation process.

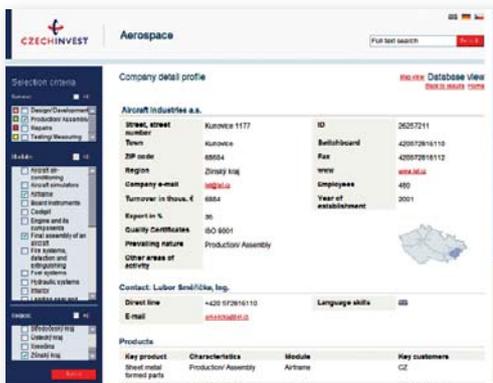
### Make a date with Czech firms Leave the legwork to us



Do you want to have a look at the production facilities of your potential suppliers or joint-venture partners? The Czech Republic is a small country, which gives it certain advantages: over the course of a few days, you can visit dozens of firms in every corner of the country and thus find out which companies will make the most suitable partners.

CzechInvest's project managers will organise visits exactly according to your requirements. Do you have a list of firms that you would like to check out at first hand? We will contact them for you and prepare the itinerary of your business trip. Are you not sure which firms in the Czech Republic could become your partners? That doesn't matter, as we will seek them out according to your specifications in our internal database of suppliers.

### Information can cost you a fortune Our Aerospace database offer it for free



CzechInvest's fundamental tool for seeking out suitable business partners is comprised of its sector databases of Czech companies. The Aerospace database contains nearly 120 high-quality records with a broad scope of information on Czech suppliers interested in long-term cooperation with foreign partners. The databases are regularly updated and supplemented according to the demands of foreign companies.

<http://aerospace.czechinvest.org>

On our website, you will find an on-line database that is a freely accessible simplified version of our own internal database. Through filtering by sector, technology, products, region, company name and by full text, the database enables fast and simple searching for suitable suppliers and partners from the Czech Republic.

The databases represent a complete summary of information on Czech firms in aerospace sectors in a user-friendly, graphically vivid environment enabling detailed searching. The sector database are also available on CD.