Catalogue 2012

CREDIT: ESA ESA's Small GEO satelite

Czech Industry Successful in ESA

Ministerstvo dopravy

CZECH SPACE ALLIANCE

Ministerstvo dopravy

Introductory Word of the Minister of Transport

Pavel Dobeš
Minister
of Transport

As well as in 2011, the Ministry of Transport of the Czech Republic in cooperation with the Czech Space Alliance issues in 2012 a catalogue of Czech private companies with a proven track record in space activities through competitive contracts with ESA.

The Ministry of Transport as a coordinator of all space activities in the Czech Republic is also directly responsible for the Czech membership in the European Space Agency (ESA).

The Czech Republic acceded, as the first post communist state, to the ESA Convention in November 12, 2008. Just two weeks later it took part in the ESA Ministerial Council held in the Hague, subscribing to 13 ESA optional programmes amounting to more than 20 mil. Euros (in 2008 economic conditions).

Having approved its Policy Statement and the National Space Plan in 2010 the Government of the Czech Republic acknowledged the economic, political and security potential of the space activities and their importance for the national economy. Also the National Economic Council called the space activities as one of the pillars of the Czech competitiveness because their objective is to increase the international competitiveness of industry and an excellence in science, research and development.

The space exploration is no longer considered as an end in itself, but rather as an economic instrument for development and innovation. The Czech Republic therefore now aims to multiply economic effects of the space activities and to explore their potential for wide range of industrial sectors.

Space activities are generally characterised especially by their high technological content, multidisciplinarity and complexity, and the investments to space activities represent effective support of the national economy based on modern technologies. Since at this stage it is not conceivable for the Czech Republic to have an independent space programme with all its requirements, the Czech Republic invests especially in ESA optional programmes. The Czech participation in ESA optional programmes represents the main opportunity for strategic focus of industry, its internationalisation and meeting national priorities. ESA system is unique because of its geo-return principle, thanks to which the majority of the state contribution comes back in form of contracts for implementation of ESA programmes. However, the Czech industry has to win the contracts in competition with other European companies, which helps to increase their qualification and technological skills.

Together with other public authorities, the Czech Ministry of Transport stresses the necessity to create a suitable environment to increase the number of companies involved in ESA, and enhance their competitiveness and the competitiveness of the Czech economy as a whole.

I strongly believe that the number of Czech companies which take part in ESA projects will keep growing in the next years and that the Czech Republic will meet the goals defined in its National Space Plan. The excellent progress made by the Czech industry in the first three years of ESA membership, including successes in international competitive tenders, amply confirms this.

Ministerstvo dopravy

Activities of the Ministry of Transport of the Czech Republic concerning space technologies and applications

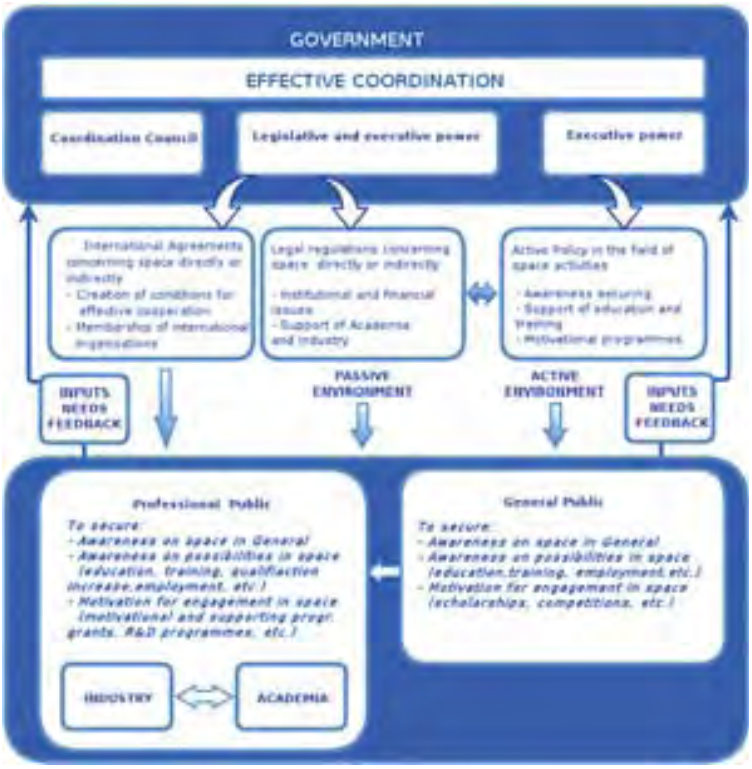
Following the decision of the Government of the Czech Republic from April 2011, the Ministry of Transport of the Czech Republic became the coordinator of all space activities in the Czech Republic. For this purpose, the Minister of Transport established a Coordination Council for Space Activities under its leadership. The Coordination Council consists of high level representatives of the Ministry of Transport, the Ministry of Industry and Trade, the Ministry of Education, Youth and Sport, the Ministry of the Environment, the Ministry of Foreign Affairs, the Ministry of Defence, the Office of the Czech Government and Government Commissioner for cooperation with European GNSS Agency (GSA). The Coordination Council has established three cross-sectional expert working groups - "Industry and Applications", "Science Activities" and "Security and International Relations" involving both industry and academia.

The Ministry of Transport has been responsible for elaborating and delivering the National Space Plan to the Czech Government. The document was prepared in cooperation with other Czech ministries and approved by the Czech Government in May 2010. The National Space Plan represents a basis for decision-making of further Czech involvement in space, support of industry and academia, and participation in European and international projects and programmes. As a continuation of the National Space Plan, the Ministry of Transport prepared the National Space Implementation Plan. The Czech Government approved the document in August 2011.

The Czech Republic acceded to the Convention for the establishment of a European Space Agency (ESA) in November 2008 and became as the first post communist country the 18th ESA Member State. The Ministry of Transport is responsible for the Czech membership in ESA.

The Ministry of Transport is also responsible for the most of space issues of the European Union, in particular the European space policy and the administration related to Galileo and EGNOS programmes - including the Public Regulated Service. The successful candidature for the European GNSS Agency (GSA) seat has also been coordinated by the Ministry of Transport. GSA started its work in Prague in September 2012.

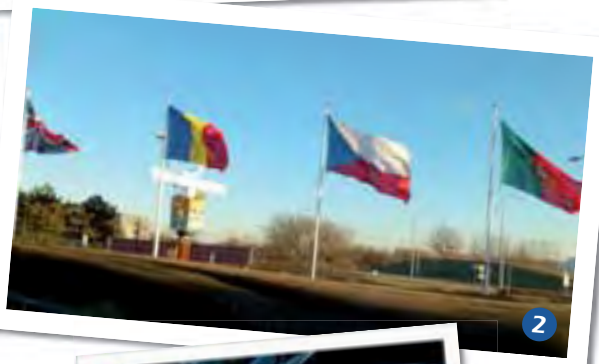
The scope of responsibility of the Ministry of Transport covers all key aspects of the national space agenda, not solely those related to transport. Among others, it protects and promotes public interests concerning space activities, ensures contacts with relevant international bodies or states, covers the participation of the Czech Republic in relevant space programmes, creates suitable environment for the Czech space industry and academia to facilitate their involvement in space activities and to develop their mutual cooperation and promotes co-operation especially with leading space nations.

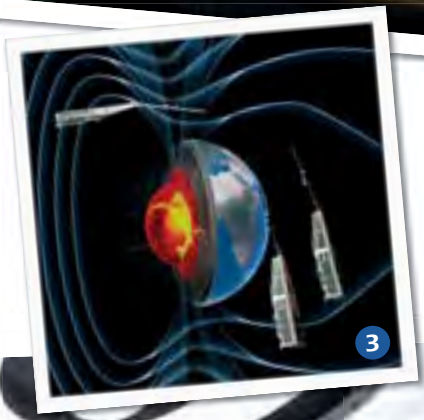


Scheme of National space Implementation Plan

As part of its efforts to ensure greater involvement of relevant sectors of industry and academia, the Ministry of Transport regularly organizes Galileo User Forum (GUF), Space Seminars, Space Industry Days and Space Information Events.

In addition, one of the Ministry key missions is to create suitable environment and conditions for development of applications based on space technologies in the field of transport. As such, it is directly responsible for integrated applications (especially when Intelligent Transport Systems are concerned), where all pillars of space come together.





1 Meteosat 3rd generation Credit: ESA

2 Czech national flag in ESTEC

3 ESA's magnetic field mission SWARM, Credit ESA

4 Opening ceremony at the Headquarters of GSA in Prague

5 Conference room at the Headquarters of the GSA in Prague

The Czech Space Alliance (CSA) and the European Space Agency

CSA is an association of 16 companies, established in 2006. Its members are vying for space business, especially through ESA. It is an SME association, with larger companies being associate members and sharing all the benefits and duties except for voting rights.

CSA members are winning the great majority of ESA's industrial contracts in the Czech Republic and all the contracts that had been won in international tenders. Our member Frentech has recently scored the 1st Czech win in a large commercial space tender for 1.8 M € - to design and develop 84 solar deployment mechanisms for Iridium NEXT.

CSA commercial space experience goes back to the 1990's
The founding members of CSA, namely BBT, CSRC, and Iguassu Software Systems have been participating in ESA and other space projects since the early 1990's. Hence when ESA carried out the 1st survey of the industrial capabilities in 2002, it was surprised to find companies which had already successfully implemented important international space projects, such as space qualified electronics for the Demetrius project or the MSG CF checkout software tools for Eumetsat.

Programme for European Cooperating States, PECS, 2005-2008 CSA members won 9 out of 12 industrial contracts
Broader scope of opportunities for industry arose, when the Czech Republic entered the ESA Programme for European Co-operating States (PECS) in 2005. However, the programme was administered by the Czech side in such a way, that it discouraged participation of industry. This is clear from the fact, that practically only those with previous space experience and existing ESA contacts were able to negotiate contracts. The initial group of experienced enthusiasts which existed before PECS barely increased by the end of the PECS period, while PECS was intended to prepare an industry base for full Czech membership. Thus it was no surprise that out of the 12 industry contracts during the PECS period, 11 went to companies with previous space experience - 9 to the CSA members.
Notwithstanding the unfavourable circumstances for commercial space activity at that time, the good results of the determined industry and the interest of the government in bringing the GSA HQ to Prague, combined to shorten the initially envisaged 5 year PECS period to less than 4 years.

The Czech Republic's accession to the ESA Convention in 2008 CSA won 16 out of 23 industry contracts in the Czech Industry Incentive Scheme tenders, and 10 out of 10 contracts in ESA's international tenders
Realistic opportunities for new companies to join in the ESA programmes only opened with the full membership and, more importantly, enforcement of standard ESA rules and procedures. Clear conditions and selection rules were what industry needed, as again shown by the results. Whereas the 4 years of PECS attracted one or two new companies, 3 years of ESA membership attracted ten. The limiting factor was the budget rather than the existing capabilities and industrial interest.
This so far brief period with immediate project results, as well as the psychologically highly important win in the protracted EU negotiations to place the GSA HQ in Prague, meant that the important political decision makers started to take greater interest in space technologies, the opportunities they bring to the economy and the way they advance the prestige of the country. Not least since ESA successes very aptly support one of the key governmental objectives, namely to demonstrate that the Czech Republic is not a place for assembly lines, but rather a technologically highly developed country.
What better way to prove it, than by giving industry the opportunity to shine in the field of space technologies. We hope that this realisation will be further reflected in the budget allocation to the new ESA contribution period, to be presented in the ESA Ministerial Council in 2012.

The European GNSS Agency seat awarded to Prague in December 2010
This excellent result of our politicians and of the government commissioner for Galileo, Karel Dobeš, created another boost to the interest of the stakeholders and industry in space technologies. Czech industry has been contributing to the Galileo development through the participation in international consortia since 2005, and developing EGNOS/GNSS technologies since 2005. The first CEE EGNOS monitoring station was established in Prague in April 2005. For instance most of the EGNOS learning tools on **www.egnos-pro.esa.int** have been developed or upgraded by Czech industry. Czech industry also designed and developed software for the GNSS interference monitoring system, recently put in live operation in ESTEC and two other RIMS stations.
The growing interest of the stakeholders in space has also led to broader realisation that space work is not just about studying the universe but rather, in ESA projects, it is predominantly industrial R&D. This realisation lead the government to tasking the Ministry of Transport with the elaboration of the National Space Plan.

National Space Plan, approved by the Czech government in May 2010, and the Space Coordination Board, approved in April 2011
Already the process of preparation of the Plan had created a breakthrough on several fronts. Hitherto competing ministries sat down to discuss and agree a common plan and ways to divide responsibilities according to relevant competences. The result was the creation of Coordination council for Space Activities of the Minister of Transport, with Ministries of Education Youth and Sports, Industry and Trade, and Foreign Affairs taking the lead of the coordination subgroups for scientific, industrial, and international affairs respectively. The Czech Space Alliance was invited to contribute its practical experience in ESA work and its expectations and needs to increase its participation and generate good results for the Czech Republic.
The National Space Plan sets itself mid-term objectives and measurable goals for the year 2016. The Czech Space Alliance welcomes the plan, not least because it took on board most of the industry suggestions.

And the bad news?
The main weakness of the Czech space industry is currently that it does not have the same network of partners in other ESA member states as our counterparts in the "old member states". This is where the CSA has to focus its work, now that the most difficult part of the other (internal) goal, namely removing obstacles to the industrial activities (e.g. undue preference to pure research), has been largely achieved. However, we not only aim to broaden our working relationship with ESA member states industry and organisations, but also with our universities, which also have excellent know-how. This remains a major challenge.

ESA-Czech Task Force and ESA's Czech Industry Incentive Scheme system for New Member States (2008-2014)
Whereas in PECS, projects were identified and awarded in a hazy ad-hoc process of direct negotiations, the full membership brought in clear written rules and practical procedures established and honed by ESA over decades. The feared challenge of the bidding process was in fact the opposite of what some feared - the easing of barriers. The strict rules in fact did away with the uncertainties of the local interference in the PECS procedures, administered by the Czech Space Office (a private non-profit company, with own business interests). Further counterweight to

the challenges of international bidding is the Czech Industry Incentive Scheme, which allocates 45 % of the mandatory contributions to the Task Force, to develop the competitiveness of Czech Industry.
The tenders of the Czech Industry Incentive Scheme were

- AO6052 in 2009, available budget of 2.4 M €, 10 out of 15 contracts to industry
- AO6647 in 2010, increased budget of over 4 M € 12 out of 16 contracts to industry

These basic figures also indicate that we are moving towards the goal of having the same industry/science balance as other established ESA states. We are keenly awaiting the next open Czech call this year.
This "fiesta" is going to end in 2016, and so we must work hard on developing the partnership with other countries' industry, since the most resource effective way to gain experience in standard ESA international tenders is to participate in them with more experienced partners. Many CSA members already have such partners, and eight ESA contracts have been awarded as a result of international tenders led by these partners.

This is an opportunity for you, dear reader, to take advantage of the enthusiastic, technically very capable and innovative Czech companies, gain a long term partner and, last but not least, improve the geographical distribution of your bids.

The international promotion activities of CSA
The alliance is very active in informing foreign partners of the know-how and growing space experience of its members, be at international conferences, ESA and Galileo industry days or in bi-lateral meetings with companies and space agencies or associations. In Prague we organise events either under the auspices of the Ministry of Transport. Examples of such events are - 2011 May, CSA presentations to the Japanese associations JASPA, SJAC and SPAC - 2011 Feb., Solar Orbiter workshop with EADS Astrium UK at the Ministry of Transport, Prague - 2010 Nov., Czech-Brazilian Space Technology Days, Brasilia, Sao Jose dos Campos, Alcantara launch base, supported by Czechinvest - 2010 Oct., Czech-Japan Space Seminar, Jaxa president and chairman of the Space Activities Commission, Prague - 2010 Oct., Czech-Dutch Bilateral Space Industry Roundtable, Netherland Embassy and Ministry of Transport, Prague
We already have joint projects with companies in Germany, Italy, Spain, Austria and France and we are founding members of the pan-European association of national space SME association Space4SME. We prepared and negotiated cooperation LOI with the Brazilian Space Agency AEB (signed by the Czech Minister of Transport) and an MOU with the Japanese aerospace SME association JASPA (signed by our alliance). Negotiations of a higher lever agreement with Japan are in progress.

Next steps
Should your organisation like to learn more about what we can offer, please do not hesitate to contact us. We can arrange a meeting or seminar in Prague or at your location. If the company that you are looking for is not our member, we will help you to establish the contact.
We are actively seeking partners to participate with them in coming bids. Among other things considering us for your consortia can give you the advantage of our still relatively cost effective skills and a chance to improve the geographical distribution of your bid. Once you have worked with us and tested our abilities, we are sure that you will come back for more even without the above bonuses.
Czech us out!

Petr Bares,
President of the Czech Space Alliance
September 2012

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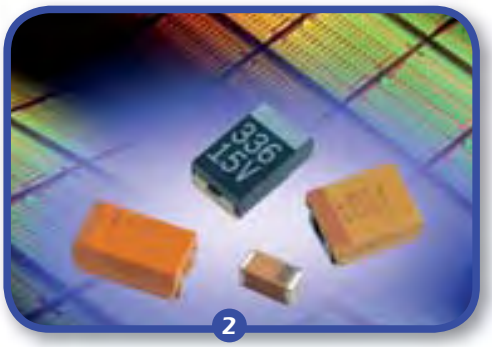
Czech Industry Incentive Scheme AO6052 (2009)

Project Title	Prime contractor
Hermetically Sealed Low ESR Tantalum Capacitor	AVX Czech Republic
Calomel for hyper-spectral imaging in space applications NAOMI	BBT-Materials processing
Parallel Data Mining Components (EO)	Iguassu software
Preparatory Activities for MTG	CSRC
Real-time Extrapolation Methods for Thermal Testing	L.K. Engineering
Real-time Performance Monitoring Tool (GNSS)	Iguassu Software
Solar panel deployment	Frentech
Study of SCOS-2000 deployment over WAN for a concept of CMCP	ANF Data

Czech Industry Incentive Scheme AO6647 (2011)

Project Title	Prime contractor
Transient Objects for M&C in GSSC/GMMI	ANF Data
SMT Assembly Verification according to ECSS-Q-ST-38	CSRC
Space Application of Timepix-based Universal Radiation Monitor (SATURM)	CSRC
Development of Test Facility dedicated to Passive Components	EGGO Space
Multimedia Antenna Deployment & pointing Mechanism	Frentech
Distributed Raster Processing Framework (EO)	Iguassu Software
Multi-Constellation Long-term GNSS assessment	Iguassu Software
EPOXY Core Development	SYNPO

Examples of project won in international competitive tenders	Tender reference	Prime	Subcontr.
Low ESR Tantalum Capacitor Evaluation and Qualification	ESA Direct negotiations	AVX	
Quality Evaluation Methods for Calomel Optical Elements	ESA Direct negotiations	BBT	CTU
Image Information Mining in Time Series	ESA AO5119	Astrium	Iguassu Software Systems
Interference Monitoring for the GNSS Reference Stations	ESA AO6149	ACS	Iguassu Software Systems
IRIS/ANTARES - Artes B1, BP, B2	ESA AO6050 - Direct negotiations	TAS	evolving systems consulting s.r.o.
IRIS/ANTARES - Artes B2	ESA Direct negotiations	TAS	Iguassu Software Systems
IRIS/ANTARES - Artes B2	ESA Direct negotiations	INDRA	Iguassu Software Systems
GISAR Galileo Search and Rescue	GJU	INDRA	Iguassu Software Systems
O3S - Open-standard Online Observation Service	ESA AO6143	EOX	Iguassu Software Systems
O3S - Open-standard Online Observation Service	ESA AO6143	EOX	Siemens Convergence Creators, s.r.o.
On-Board Software Reference Architecture Consolidation	ESA AO6452	SSF	evolving systems consulting s.r.o.
Requirements and I/F Definition for future OBCP Building Block	ESA AO6488	GMV	evolving systems consulting s.r.o.
Solar Orbiter STIX B	ESA Direct negotiations	evolving systems consulting s.r.o.	
MTG DCS & GEOSAR	AO10125	TAS	evolving systems consulting s.r.o.
Advanced Integration and Test Services (AITS)	ESA Direct negotiations	Astrium GmbH	Siemens Convergence Creators, s.r.o.
Decision Support and Real Time EO Data Management (DREAM)	ESA AO6809	Spacebel SA/NV	Siemens Convergence Creators, s.r.o.
Operational Data Off-Line Analysis, Correlation and Reporting	ESA AO6287	Siemens AG Österreich	Siemens Convergence Creators, s.r.o.
Solar Orbiter Power Spacecraft Check Out Equipment	ESA AO70154	Astrium LTD	Siemens Convergence Creators, s.r.o.



AVX CZECH REPUBLIC SRO

A KYOCERA GROUP COMPANY

AVX is a multinational company based in the U.S.A. and a part of the Japanese industrial group KYOCERA, a leading global manufacturer of passive electronic components. The company offers a wide range of products for various electronic applications from mobile phones, laptops and MP3 players, through the automotive industry to high-reliability aerospace and medical devices.

AVX is the world's number one tantalum and niobium capacitor manufacturer with a market share of over 20%.

History

AVX has operated in the Czech Republic since 1992.Growing global market opportunities combined with AVX's high volume manufacturing experience and its established technology leadership led to the successful opening of a new plant in Lanskroun in 1994 for the assembly of tantalum SMD chip capacitors. Production grew significantly and a second plant for anode manufacturing was opened in 1998, realising a total start-to-finish solid electrolytic capacitor production facility.

Currently employing 1700 staff, the Lanskroun plant now provides technical, customer and logistic support services to AVX customers worldwide. The first co-operation on development projects at Lanskroun was begun in 1998 covering high-temperature (150degC) tantalum capacitors for automotive electronics, and further development activities at the plant have grown significantly since that time. In 2002, AVX introduced a new, revolutionary, solid electrolytic capacitor based on a niobium oxide anode, initiating a new era in the history of the capacitor.

AVX is an established supplier of tantalum capacitors for the European Space Agency (ESCC – 3012), and further aerospace capacitor development projects have been introduced in 2009.

Business activities

AVX, a recognized leader in the global passive electronic component and interconnect products industry, is at the forefront of technology, design, manufacturing and supply.

AVX enjoys significant competitive advantages including the benefit of global manufacturing and distribution provided by 20 manufacturing facilities in 11 countries. This assures customers of the most efficient balance of demand and production capability in response to their just-in-time inventory requirements. With research and development centres in five locations around the world - United States, Northern Ireland, England,

France and Israel - AVX has fostered customer relationships involving the design of new and advanced products to fulfil their specific product requirements.

AVX continues to invest heavily in R&D. The company is set apart from the competition by its broad array of specialty product offerings including ceramic and tantalum capacitors, connectors, thick and thin film capacitors, resistors and integrated passive components. AVX also benefits

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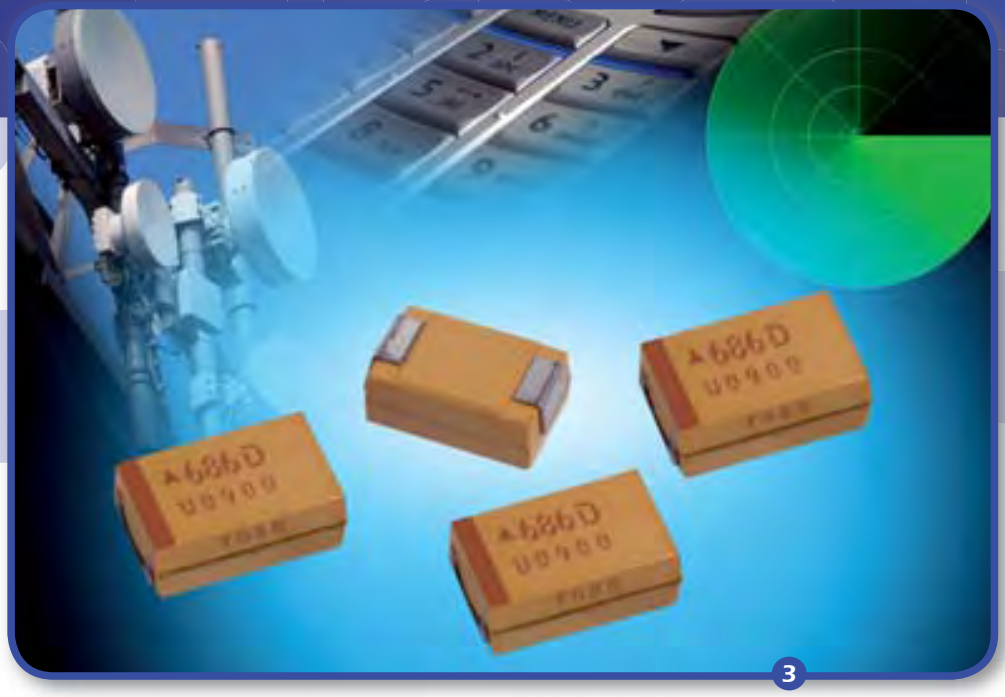

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1 AVX High Reliability MIL PRF 55365 Qualified Tantalum Capacitors

2 AVX offers the widest range of tantalum and NbO capacitors

3 Low ESR, High Power AVX Tantalum Multianode Capacitors

4 AVX Tantalum Aerospace Capacitors ESCC 3012 Qualified

from its partnership with Kyocera Corporation and the wide breadth of products and technologies that its Japanese parent company offers. AVX enjoys a balance between high volume commodity products and its increasingly-innovative Advanced and Hi-Rel Products offerings.

Acquired Certifications:

CECC-ECQAC – granting the right to use the mark or certificate of conformity

IECQ-CECC – incorporating the requirements of ISO 9001:2000

ISO 9001:2000 – Quality Management System

ISO / TS 16949 – Quality Management System (meeting the requirements of the automotive industry)

ISO 14001:2004 – Environmental Management System environment

SONY GREEN PARTNER AWARD – granted to companies meeting the requirements of SONY environmental protection.

ISO 9001 – Quality Management System

AS 9100 – Quality Management System

ESCC 3012/001 – SMD Solid Tantalum Capacitors for Space Applications

ESCC 3012/004 – SMD low ESR Solid Tantalum Capacitors for Space Applications

4

BBT MATERIALS PROCESSING, SRO.

PRAGUE, BBT

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Main Fields of Activities

- Crystal chemistry, study of crystal growth and solidification processes, growth of crystals for technical applications (optics, acousto-optics, laser applications, etc.).
- Material sciences and technology in Space (Salyut 6-Sojuz, MIR, ISS) and on Earth.
- Development and manufacturing of apparatuses, devices and software according to customer's requirements for Space and on-ground applications, incl. mechanics and electronics.
- Digital Image Analysis (sample microstructures, etc.).

The BBT team is proud to be associated with many scientific and technological programmes and projects. Our products (scientific facilities and devices) were operational on board Salyut 6 - Sojuz and MIR orbital laboratories for 17 years ! - non-stop from 1984 up to 2001 (to 1990 within the Czech. Acad. Sci., from 1991 within BBT).

Some of our selected products and achievements:

CSK-1A, -1B and 1C: The programmable space furnaces and crystallizers for MIR-type and FOTON-type orbital laboratories for material research in microgravity (1991–2001).

TITUS/CSK-4: The 2nd generation programmable space furnace for the Euromir´95 (ESA) and MIR´99 - PERSEUS (CNES) missions (BBT in co-operation with ESA, DLR-MUSC, DARA, Humboldt Univ., Kayser-Threde, RKK Energija) (1992–2000).

Fast optical processors for Space applications (ESA) - BBT in co-operation with STIL, Ireland (1991–1993).

Mercurous halides, sapphire and ruby crystals and their applications (acousto-optics, polarizers, IR-optics, microwaves, laser technologies, electronics etc.) (since 1970).

Non-equilibrium multi-component alloys: Realisation and scientific evaluation of the ground-based, space and post-flight experiments. R&D and manufacturing of the related apparatuses, devices, software, etc. (since 1980)

Assistance in the training of astronauts to operate the research apparatuses made in BBT (1993–1999).

Equipment for material experiments both in long-term micro-gravity and in a short weightlessness using a drop-tower and in higher gravity fields using centrifuges (1988–1992).

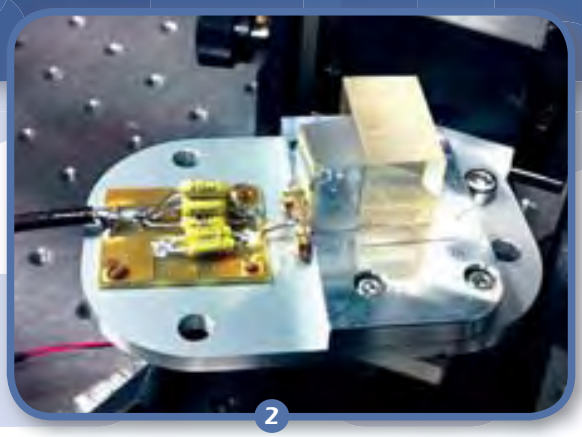
Advanced TITUS: The 3rd generation facility designed for the material experiments in microgravity. (In cooperation with DLR-MUSC, Humboldt Univ., RKK Energia/MIR) (1995–2001).

TITUS MPP (Multi-Purpose Platform with the Advanced Tubular Furnace with Integrated Thermal Analysis Under Space Conditions) – 4th generation facility designed as a tool for the materials sciences experiments on board the International Space Station (ISS). (In co-operation with DLR, Humboldt Univ., RKK Energia and with a financial supports of the Ministry of Education of the Czech Republic and ESA-PRODEX) (1998–2006).

Passive Damping Platform: Damping of vibrations and other disturbing accelerations for a material research in microgravity (KONTAKT 1999–2002).

Thermographic probe with 10 thermocouples was used for determination of the temperature profiles in space furnaces (KONTAKT 1996–1999).

DTA (differential thermal analysis) probe with six chambers was used for both the study of phase transitions in materials and an accurate calibration of absolute temperature scale. The theoretical models of kinetic phase diagrams have been developed (KONTAKT 1996–1999).



Participation in selected programmes and projects:

INTERKOSMOS - MORAVA I (1976-80, Salyut 6-Sojuz), **Morava II** (1986-88, MIR), **Morava III** (1990-97, MIR), **CSK-3** (1989-90) and **CSK-1** (1984-2001): Preparation, realisation and analysis of the international projects in material sciences.

International Users Support Centre for Interkosmos projects in material science which also served for German experiment TES in 1993-4 (laboratory for the ground-based preparation, realisation and scientific evaluation of space experiments) (within CSAV).

RIM-MIR: Experiments of a recalescence of Ag-Ge alloys on board MIR using the CSK-1 furnace (three-lateral cooperation of Germany (DLR), Czechoslovakia and Russia) (1984–1994).

TES and **G-TES/TEST**: Participation in the German (DLR) **TES** (1990–1995) and **G-TES/TEST** (1986–1998) experiments of a recalescence of alloys (realised on board MIR orbital laboratory using CSK-1 furnace).

Drop-tower Bremen: Non-equilibrium solidification experiments performed under conditions of a short-term free fall (in cooperation with ZARM-University in Bremen, Germany) (1990–1994).

MIR'92 (1992-3): Set of material experiments on board MIR using the CSK-1 furnace (ESA, DARA, DLR-MUSC, BBT, RKK Energija).

EuroMIR'94 (1994-5): Set of material experiments on board MIR using the CSK-1C furnace (ESA, DARA, DLR-MUSC, BBT, RKK Energija).

EuroMIR'95 (1995-6): Set of material experiments on board MIR using the TITUS/CSK-4 furnace (ESA, DARA, DLR-MUSC, BBT, RSC Energija, Humboldt Univ., Kayser-Threde).

GermanMIR´97 (1997): German prgramme (DLR) - set of material experiments on board MIR using the BBT furnace CSK-4 (TITUS).

MIR´99 - PERSEUS (1999): Set of material experiments on board MIR using the BBT furnace CSK-4 (TITUS) - RSC ENERGIJA (Russia) and CNES (France).

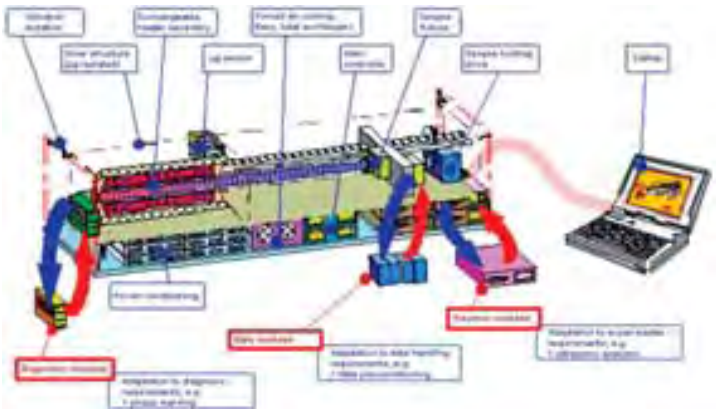
KONTAKT: Several projects - Sets of material space experiments.

PRODEX: Study of non-equilibrium solidification of multi-component alloys, DTA measurements (2000–2004).

EUROSTARS: Innovative acoustooptic systems in the Mid infrared (2008–2011).

ESA Czech Industry Incentive Scheme: New Acoustooptic device based on Calomel for hyperspectral imaging in space applications - NAOMI 2010-2012) and Development of Quality Evaluation Methods for Calomel Optical Elements - DEMON (2011-2014)

1. CSK1-C space furnace with the astronauts Pedro Duque (Spain) and Ulf Merbold (Germany) – ESA Programme EuroMIR´94. (Photo DLR, Germany)
2. New Acoustooptic device based on Calomel for hyperspectral imaging in space applications (in cooperation with Fastlite, France)
3. TITUS space facility on board the MIR space station with the French astronaut Jean-Pierre Haigeneré (Project MIR´99 – PERSEUS) (Photo CNES, France)
4. TITUS and CSK-1C space facilities on board the MIR space station. (Project MIR´99 – PERSEUS). (Photo CNES, France)



TITUS MPP for the ISS

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CZECH SPACE RESEARCH CENTRE

6

Contact

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Design Centre
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Manufacturing Centre
Kojetínská 1163
CZ-767 01, Kroměříž

Profile, History and Mission

CSRC is a privately owned Ltd. company situated in Brno and founded in 1994 to develop space technology and standards in the Czech Republic.

CSRC main domain of activity is the complex realization of space electronics projects based on electronics design, embedded software and cleanroom manufacturing.

CSRC main power consists in the long-lasting practice and high technical level of the designers of electronic systems for space purposes proven by a series of successfully operating instruments in many satellites.

CSRC scientific and research partner is the Faculty of Electrical Engineering and Communication, Brno University of Technology, with its broad technical background proven by long-term collaborations in many international research projects.

CSRC has implemented the ESA ECSS standards related to the electronics design and cleanroom manufacturing activities including the certified system of quality assurance corresponding to ISO 9001:2000 standard.

CSRC, has been audited by ESA and is an attractive business partner for the aerospace industry.

Complex Realization of Space Electronics Projects

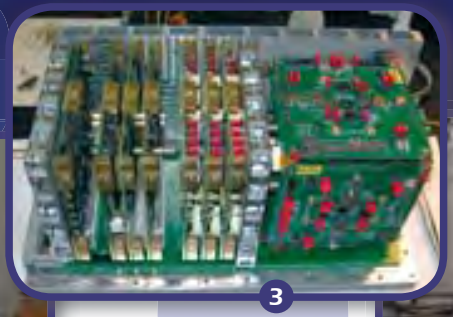
Hardware Design
Standard digital circuits and single-chip microcontrollers, digital circuits with signal processors, FPGA and CPLD design using VHDL, behavioral simulation of the design, test at multi-layer PCB design, electronic circuits for PCI bus including control software development, analog circuit design, behavioral simulation.

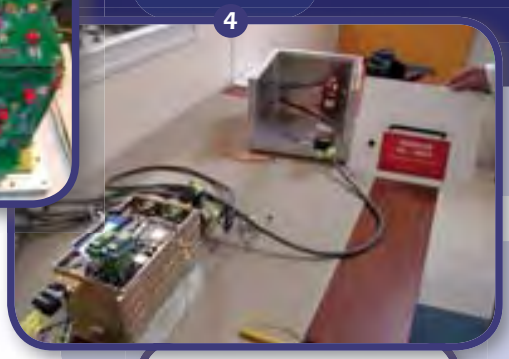
Software Development
Software development is focused on the control and data processing for aerospace, communications or process control including efficient man-machine interface, signal processor and single-chip microcontrollers programming in C language and assembler, development of user specific applications for PC.

Mechanical Design and Manufacturing
Design of the mechanical parts and/or entire systems based on the CAD/CAM systems with electronic data formats exchange. Mechanical manufacturing is outsourced in qualified facilities having certification in the field of aeronautics and space production, applied technologies including CNC machining, alodine, anodisation, electron beam welding, glass feed-through manufacturing, thin layer sputtering, alodine in aerospace quality, laser-beam cutting.

Design Verification
Design output in all space projects is submitted to a complex verification using mechanical and thermal analysis based on finite elements method. Parameters are verified to allow safe operation in the space conditions taking into an account especially the space temperature range in the satellite and the vibrations during the launch phase. Testing procedures for thermal vacuum and mechanical vibrations tests are considered as a standard part of the design verification process.

Project Management
Main design process phases, steps and processes are namely the user requirements analysis, preliminary design, prototyping and design verification, final design, analyses and simulations, components and material procurement, control software with graphical user interface, user and service documentation, test equipment design and manufacture, delivery and integration support, quality assurance.





1 Cleanroom 100.000-Class

2 PROBA 2, DSLP&TPMU Project

3 Satellites SWARM/TEASER, Microaccelerometer

4 Satellite DEMETER, I/V Converter Project

5 Satellite INTEGRAL, PSAC Project

6 Satellite SMART-1, EPDP Project

Cleanroom Manufacturing

Space hi-rel manufacturing activities are performed by ESA certified operators in the 100.000-class cleanroom, producing Flight Model & EM PCBs respecting the ESA ECSS manufacturing procedures. Manufacturing flow covers, for example, incoming inspection, components preparation, thermal pre-soldering processes like de-golding and pre-tinning component lead, soldering of through-hole components, soldering of SMD components, fine pitch soldering, fine mechanical operations like frame & fasteners installation, riveting, treatment, cleaning, nitrogen drying, polymerization, mechanical pre-soldering processes like pre-forming, bending, cutting of component leads, packaging and expedition procedures and other cleanroom activities.

Prominent Space Projects

Satellite INTEGRAL, PSAC Project (launched)
Plastic Scintillator Anti-Coincidence (PSAC) Flight unit for photomultiplier high-voltage control, an experiment for the INTEGRAL (International Gamma Ray Astrophysics Laboratory) satellite for processing of the light emission caused by X ray particles covers development, design, analyses, manufacturing, testing, delivery and support in integration. The PSAC sub-systems are the High voltage power supply, the Low voltage power supply and the Electronic control box with the radiation hardened Actel 1280 FPGA.

Satellite SMART-1, EPDP Project (launched)
First European mission to the Moon covers the design and development of the flight hardware and software for SMART1 satellite, implementation of CAN bus including analyses, manufacturing, testing, delivery and support in integration.

Satellite DEMETER, I/V Converter Project (launched)
Interface system for the Langmuir probe is an intelligent interface between the Langmuir probe and the ground system for scientific data acquisition when converting low-current of pA to µA range to voltage. Interface board operation is controlled by the software application with graphical user interface. The activities cover the development, design, analyses, manufacture, testing, delivery and support in integration.

Satellite PROBA 2, DSLP&TPMU Project (launched)
PROBA 2 represented a complete delivery of the electrical and mechanical design including FPGA design, power supply design and all ESA requested tests, simulations and documentations. Two SLP probes (Segmented Langmuir Probe) are dedicated to the measurement of the plasma surrounding the satellite using TPMU (Thermal Plasma Measurement Unit) process sensors.

Satellites SWARM/TEASER, Microaccelerometer (launch in preparation)
Manufacturing one engineering model and three flight models for three satellites, the SWARM project being supported by ESA.

CSRC in ESA Tenders

ESA Bidder Code: 58019

AO6052 = Preparatory Activities for MTG Participation / Study

AO6647 = Space Application of Timepix-Based Universal Radiation Monitor / Flight HW

AO6647 = SMT Assembly Verification Programme According to ECSS-Q-ST-70-38 / Study

Other Projects Participation

ACES ELT, XMM Satellite - EPIC Experiment, TARANIS Satellite, AGILE, MALST, SMART FUEL, METOP, SATELCOM, NODE 3, GOME 2, CLUSTER II, PCDF-CCD HEAD, MONSTER and others...

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EGGO SPACE S.R.O.

General description

EGGO Space offers a wide range of services and expertise including testing of EEE components, Industrial Screen-printing & Recycling of contaminated substances.

EGGO Test House benefits from a vast experience in testing electrical, mechanical and life properties of electronic components as well as hybrid integrated circuits and their applications.

The main range of Test Laboratory's activities consists of climatic, mechanical and life-time testing of components, parts and materials as well as interpretation and processing of results and defect analyses for electrical engineering and related industries. These tests serve customers from various industries including electrical, automotive and aerospace.

The organization and Test Laboratory procedures comply with the provisions of the European Standard ČSN EN ISO/IEC 17 025. The Test Laboratory was awarded the statute of a certified subcontractor for Electrotechnical Testing Institute, Prague.

One of the main activities of EGGO Test House is to provide support services in development or qualification for space devices or components as defined in fields of activity of the Czech National Space Plan, chapter 5.5. – Devices and Components and Flight Hardware.

EGGO became a member of the Czech Space Alliance at the start of 2011.

EGGO Test House - fields of expertise / capabilities

- Reliability testing
- Failure analysis
- Temperature/humidity stress
- Mechanical stress, solderability
- Non-linearity measurements
- Corrosion test
- Evaluation testing of passive components (Supercapacitors, Tantalum capacitors, Resistors, Relays) as per ESCC standards (ESCC 2263000)
- Designing and manufacturing of electronic devices for special purpose machinery & test measuring equipment

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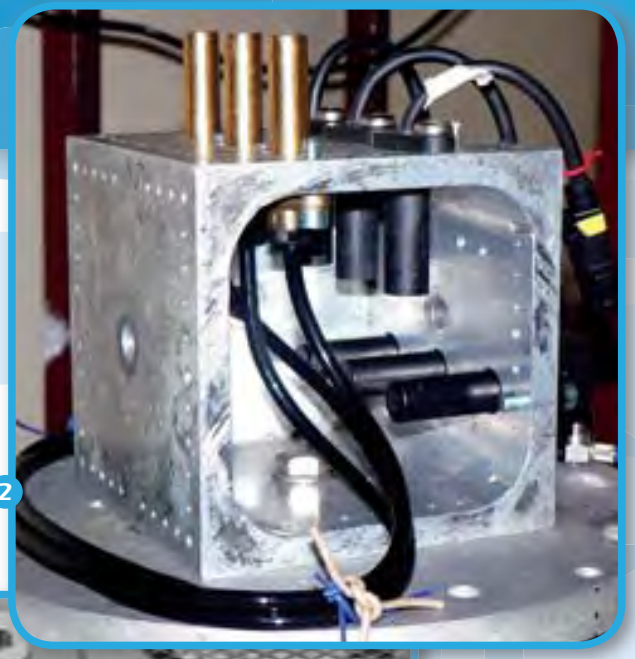


Space projects, products & services

1) Reliability Testing of AVX low ESR Tantalum capacitors types TPS and TPM for AVX / CNES project.
2) Contract no.: 400010504/10/NL/PA – Low ESR Tantalum Capacitor Evaluation and Qualification Contractor: AVX Corporation – Tantalum division;
   Sub-contractor: EGGO Space s.r.o. – responsible for the Evaluation of Tantalum Capacitors phase
3) Contract no.: 4000103977/11/NL/CBi – Development of Test Facility Dedicated to Passives Components (The project was selected under the CZ industry incentive scheme by ESA & CZ government).
   Contractor: EGGO Space s.r.o.

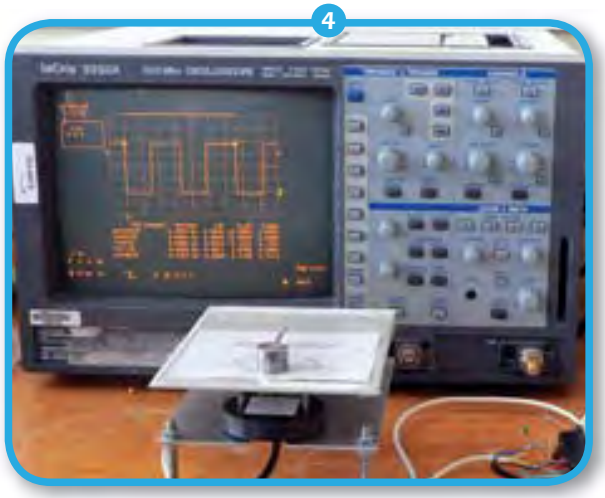
Futher projects:

- Measure maximum rating of components (physical limit)
- Identify limit of current technology and evaluate new technology for high vibration and shock
- Determine derating of components

Certification:

ISO 9001:2009
ISO 14001:2005

1. Electrical measurements
2. Vibration test
3. Change of temperature test
4. Electrical characterization of components
5. Sample preparation for testing



EVOLVING SYSTEMS CONSULTING S.R.O.

AN ESC HOLDING COMPANY

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General information

- ESC is a leader in the field of on-board software in the Czech Republic and it is one of the leading Czech SMEs in the field of innovative R&D projects with a focus on aerospace projects.
- Additionally ESC is experienced in other areas like custom embedded systems for industrial automation, PLC technology, data transmission and microwave high frequency applications.

Products and activities

Flight software for various satellite on-board instruments:

- **Meteosat Third Generation (MTG)**

ESC will participate on payload modeling for Data Collection System & GEO Search and Rescue (DCS & GEOSAR), and on analysis of its behavior. The simulation of payload models will be implemented in MATLAB/Simulink basic blocks.

- **Flight Software for Solar Orbiter's STIX Instrument**

ESC is conducting the engineering support during the project phase B for the Flight software (StartUp SW - Mission critical SW & Application SW) for the STIX (Spectrometer Telescope for Imaging X rays) on-board instrument. The Solar Orbiter is one of the Cosmic Vision M-Class ESA missions. The mission goal is to understand (and even predict) how the Sun creates and controls the Heliosphere. STIX is one of the Solar Orbiter's on-board remote sensing instruments. STIX provides imaging spectroscopy of solar thermal and non-thermal X-ray emissions from approx. 4 to 150 keV, with unprecedented sensitivity and spatial resolution (near perihelion), and good spectral resolution. Launch is scheduled to 2017.

- **Flight Software for ESA's SWARM Micro-Accelerometer MAC04**

ESC has delivered the Flight software (Startup SW & Application SW) and GSE software (Test Equipment SW) for an Micro-Accelerometer Instrument MAC04 for the Earth's Magnetic field and environment Explorer SWARM. ESC has been responsible for the complete software packages in all phases (requirements and architecture design phase, detailed design and implementation phase, delivery and acceptance phase). Prime: Astrium GmbH, Integrator of the Micro-Accelerometer system in the Czech Republic: VZLÚ a.s.

The ESA SWARM mission will provide the best ever survey of the geomagnetic field and its temporal evolution, in order to gain new insights into the Earth System by improving our understanding of the Earth's interior and physical climate. The launch is planned for in 2012.

ESA GSTP projects:

ESA's General Support Technology Programme (GSTP) exists to convert promising engineering concepts into a broad spectrum of mature products. ESC is working on two GSTP projects:

- **AO6488 OBCP-BB: Requirements and I/F definition for future OBCP Building Block**

Spacecraft on-board autonomy is becoming more and more important, in particular for deep space missions with long propagation delays and low telemetry bandwidths. One method by which the Spacecraft is able to maintain this autonomy is through the use of On-Board Control Procedures. This GSTP activity makes an assessment of the ECSS-E-ST-70-01C standard, a review the existing OBCP technologies and determines requirements for its future implementation as a building block prototype. As a part of the activity, a prototype OBCP Building Block implementation is produced.

- **AO6452 OSRAc: On-board Software Reference Architecture consolidation**

Study on the future modular reusable/reference for on-board software architecture with a goal to reuse the On-board software in a systematic manner. This GSTP study is following activities COrDeT and Domeng.

GSE (Ground Support Equipment) software:

ESC has delivered the Ground Support Equipment (GSE Test Equipment Software) Software for the MAC04 instrument.

Data Processing software:

- **Data processing ground segment software for SphinX - a fast Soft X-ray Spectrophotometer for the Russian Satellite CORONAS**

ESC has developed data processing ground segment software for SphinX - a fast Soft X-ray Spectrophotometer for the Russian CORONAS Solar Mission in cooperation with the Astronomical Institute, Academy of Sciences of the Czech Republic. The end customer is the Space Research Center of the Polish Academy of Sciences.

The purpose of the software is to analyze and process incoming data dumps, downloaded from the spacecraft operational center. The inputs for the processing are SphinX spectrometer science (X-ray) data and auxiliary telemetry data - housekeeping/technological data and spacecraft position/orientation data. Processed data will be accessible locally using the interactive visualization tool and remotely using a web server (data catalogue and visualization). Launched on January 30, 2009.

AO6050 IRIS System Design Phase B:

ESC is participating in two independent workpackages of the IRIS programme.

- **ATM Repeater Verification Testbed**

ESC is a member of the team which defines the architecture of a simulator for the telecommunication payload to be carried on the satellite and implements the simulator and its sub-components. This includes simulation of the ATM repeater and the ground to satellite KU-band and aircraft to satellite L-band radio links.

- **TC Results Processor**

Objective of another ESC task is to develop a common data processing and graphical library for the TC Results Processor, to be used to support the test reports generation and further to design and develop the TC GUI module, TC Test manager and TC test processor interface. The development follows the ECSS standardization as applicable for the ground support equipment. The ESC delivery consists of the Software module, the host platform HW and the appropriate documentation.

Non Space:

- ESC is developing 4 UAV production lines (HAES 90, 400, 700 and HAES Scanner). ESC's R&D development in Unmanned Control Systems (ESCUCS) includes S&A Collision Avoidance System; UAS Ground Segment modules compliant with STANAG 4586 w/ C2 integration; long-term aims also include UGV and even UUV.
- CK Detectors - ESC is a member of a consortium for R&D of ionizing radiation detection systems for applications in medical diagnostics, radiotherapy, radiation dosimetry, defectoscopy and other fields.
- UZ Detectors - ESC was selected as a software developer for custom ultrasonic testing software by an important player on the world market of ultrasonic and non-destructive testing.
- Nuclear industry: ESC has delivered software for chilling water in the secondary circuit of a nuclear power plant. The software complies to the safety standards IEC 61508, IEC 62138 and RCC-E. A PLC test-bed was also delivered to support verification and validation of the software.
- EDA (The European Defence Agency) - Czech MOD Authorized and Contracted Expert for EDA UAS working group
- RWE Rhein-Ruhr: ESC has implemented of the system Optimization of Energy Flows for the RWE collection centre in Ruhr Area. RWE Graphic modeling of the network of gauging points of the energy flows and their statistic evaluation; integration of customers and trade partners through the Internet.

Technical know-how

ESC has a team of highly qualified software and hardware engineers, who have made several flight software packages as well as ground segment hardware and software for various satellite instruments and unmanned flying vehicles. The personnel is competent in real-time and embedded systems programming and has already collected over 100 man years in space engineering work.

Besides that ESC employs software architects, database engineers and test & configuration engineers.

ESC's space engineers are familiar with ECSS standards.

Field of specialization

Space qualified on-board software • Software quality • Embedded Software • Real-time Software • Control Systems • Navigation • Software Architecture • Hardware Design • HW/SW Development • EGSE/SCOE • Embedded microcontrollers • Data transmission • Microwave high frequency applications

Software quality

ESC applies the following ECSS standards:

- ECSS-E-ST-40C Space Engineering – Software
- ECSS-E-ST-70C Ground systems and operations
- ECSS-E-70-41A Ground systems and operations — TM/TC packet utilization
- ECSS-M-ST-40C Rev. 1 Space Engineering – Configuration management
- ECSS-M-ST-80C Risk management
- ECSS-Q-ST-20C Quality Assurance
- ECSS-Q-ST-80C SW Product Assurance
- including other specific standards.

"Space" objectives for next years

ESC is positioned to be one of the best players on a field of embedded systems development specialists for

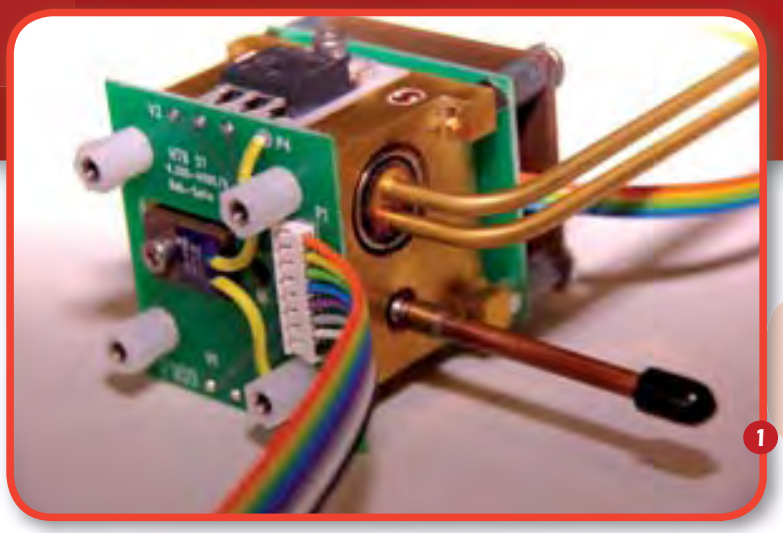
- scientific
- commercial
- military
- satellite on-board systems in Europe.

ESC is very interested in ESA projects in

- Downstream services
- Telecommunications
- Ground segment data processing software
- Earth observation and
- Satellite navigation

ESC is ready to succeed in new ESA ITTs.

1. ESCUCS Control Unit on a design of UAV GCS, © ESC, 2010
2. HAES 400, UAV Aerial Target, produced in HAES CCUAS LABS - The Hacker Model Prod. and Evolving Systems' Competence Center for Unmanned Aerial Systems.
3. MTG - The first MTG-I Imaging Satellite is expected in 2017. Its Flexible Combined Imager (FCI) will offer advanced imaging capabilities — and ensure continuity with the current Meteosat Second Generation satellites. © ESA–P. Carril
4. The Solar Orbiter is one of the Cosmic Vision missions and STIX is its X-ray spectrometer/telescope.
5. The SWARM satellite development phase is in progress with EM2 testing with OBC breadboard in Astrium clean room. ESC delivers flight software for one of the SWARM instruments, the Microaccelerometer MAC-04. From the left: ACC EM2 in the SWARM OBC testbed, SWARM electrical system engineer (EADS), SWARM SW system engineer (EADS), ACC electrical engineer (VZLU), ACC SW engineer (ESC), © EADS + © ESC.



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FRENTECH AEROSPACE S.R.O.

SUPPLIER FOR AEROSPACE

General information

Established: 1994
Total number of employees: 87
Export: 100%

Main activity: Production and delivery of parts and modules for aircraft and space industry (70% of turnover), production of precision mechanics for other lines of business (30% of turnover).

Another activities: Production of mechanism for spacecraft (Solar Array Deployment Mechanism), design and development of subsystems for reactive propulsion systems of satellites, participation in ESA (European Space Agency) and ESO (European Organization for Astronomical Research in the Southern Hemisphere) projects.

Production premises: New production premises (2009), production area 2400 m^2, assembly premises 400 m^2 (clean room 80 m^2 class 100 000 will be available by February 2012), new offices.

Reference: Airbus, Premium Aerotec, Thales Alenia Space, EATON Germany, MT-Aerospace, TESAT SpaceCom, EMERSON, Nord Micro, Thales, EADS Astrium, MBDA, SAGEM, BOSCH, Flextronics, Oxford Instruments, RUAG.

Communication: English, German.

Contact: Pavel Sobotka (managing director)

Description of the company:

Frentech Aerospace s.r.o. is a state-of the-art company, very well equipped with modern and productive CNC machines, quality assembly premises which can be quickly adapted into clean room facility and air-conditioned inspection room with three CMM by Mitutoyo. Frentech Aerospace presents itself as a sophisticated company with installed system for real time production control CPC (by Mazak). In scope of this system we actively use software for Planning, Tool Management System and Machine Monitoring System. For programming we have three installations of Solid Works and Solid Cam (CAD/CAM).

Frentech Aerospace s.r.o. is certified according to ISO9001, AS9100, ISO14001, QSF-A (Airbus).

The company is focused on production and delivery of parts and assembled modules mostly for aircraft and space industry. Beside this line of business also delivers its products for demanding fields such as instrument technology, microelectronics, nanotechnology, radar technique, production of special machines, medicine and vacuum technique.

There are 20 CNC machines available for production of complex parts including five machines with 5 driven axes and also one machine with 9 driven axes. For productive production of the parts we have two HSC five-axes Fehlmann machines equipped with high level of automation with EROWA robot and stock for 140 pallets. These machines can operate in unmanned mode.

Any type of material is machined (Aluminium, Titanium, Stainless steel, Inconel, Monel etc.). The material is purchased from certified resources in Europe and USA. Surface treatments are performed by our subcontractors who are certified according to NADCAP.

In newly built clean room (class 100 000, 10 000 is possible) we will place a test chamber (approx. 1 m^3) for temperature range from -180°C to +150°C including another equipment for space assembly.

Recent development is focused on design, development and construction of subsystem prototypes for reactive

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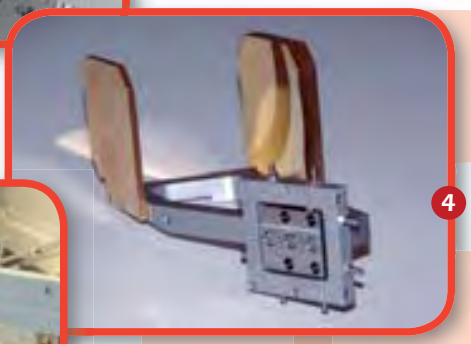

propulsion units for satellites and other subsystems (Solar Panel Deployment Mechnism) for space. In this field the company cooperates with Thales Alenia Space and EADS Astrium. Another very prestigious project is production of special mirrors for ESO (project ALMA in Chile). Based on this experience the company increases its design and development activities where it cooperates with the technical university in Brno.

During last years the company obtained necessary know-how for production of aircraft and space techniques. All employees such as technicians and operators are very skilled and highly motivated in order to achieve the best possible technical and economical results of the company.

We are also member of the Czech Space Alliance and the Moravian Aerospace Cluster.

In the scope of the ESA tender AO6647, "NEW GENERATION MULTIMEDIA ANTENNA DEPLOYMENT AND POITING MECHANISM" project was chosen Frentech Aerospace s.r.o for the amount of 1 mil EUR. For telecommunication satellites our company delivers more than 9 thousand precision parts per year.

1. Gas analysis sensor
2. Precision element for a telecommunication satellite
3. Precision titanium parts for space application
4. Mirror assembly for ESO (Project ALMA)
5. Assembly

Certificate QSF-A

Certificate AS9100

Certificate ISO14001

Certificate ISO9001

Frentech Aerospace company offices

IGUASSU SOFTWARE SYSTEMS A.S. (ISS)

THE ONLY CZECH COMPANY TO SUCCEED IN 3 ESA INTERNATIONAL BIDS

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Focus of the experience in the European Space Agency (ESA)

GNSS – Experience developed in four EGNOS and SISNeT projects (under PECS), and in two Galileo projects (for GISAR Indra & ALGINT Scisys) during 2005-2008, led us to being given the responsibility by Astrium Gmbh to design and develop the software for the "Interference Monitoring System for GNSS Reference Stations" (ESA call for tender AO6149). This is now operating in ESTEC and three European RIMS stations.

Further two successful bids in the Czech open calls enabled us to deepen our GNSS experience in "Real-Time Performance Monitoring Tool" (AO6052), completed last year, and the "Multi-Constellation Long-Term GNSS Assessment" (AO6647), currently in progress. We are now negotiating with commercial customers their use of the above.

EO technologies – During PECS, ISS worked in ESA/ESRIN on GRID technologies applications, the good results of which were applied in the ACS Italy bid "Image Information Mining in Time Series" (AO5119) – the first contract through ESA international tender for the Czech Republic. We continued our research into low level technologies for data mining, investigation of GPU utilisation for scientific grids computing and also successfully delivered our contribution to the "Open-standard On-line Observation Services (O3S)" (AO6143) system. Currently we are investigating and implementing the use of cloud technologies for EO processing in the "Distributed Raster Processing Framework", won in ESA's AO6647 call for tender.

The first Czech company to succeed in an international tender for Galileo (2005)

ISS is a member of the international consorcium led by INDRA Spain, which has developed the Galileo Search & Rescue system for Galileo Joint Undertaking.

Principal business areas and clients:

Software design, development and consultancy in GNSS and EO processing. ISS skills also include development of real-time systems, embedded systems, and studies.

Principal space clients are

- ESA (ESOC, ESRIN, ESTEC, Toulouse), Eumetsat, GJU/Indra, ACS, CAM GmbH, RACAL (Iridium sub.), SciSys plc UK, Integral France, TriPolus UK, Astrium Germany

and principal non-space technology clients

- HP Germany/US, Agilent Germany, KNAPP Austria, Ingersoll Rand US, SciSys plc, CAM GmbH, HTS UK, ABB Germany, the Argentine Transport Ministry and the Inter-American Development Bank...

Iguassu has extensive and in-depth experience in multi-national teams and consortia, as well as in long-term assignments in Europe and the Americas. It has participated in 4 successful international competitive space bids (one to GJU, three to ESA) and is also bidding with its partners for commercial projects.

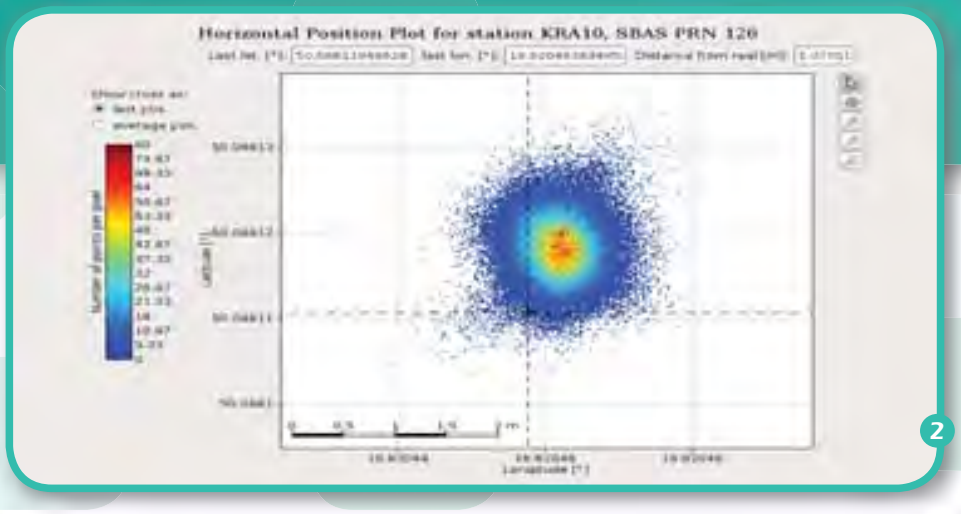
Apart from English, some staff speak also German, Spanish, and limited "Brasileiro". Japanese skills are being developed (see our Japanese website).

Projects successfully concluded in UK, Germany, Spain, France, Italy, Austria, Argentina, Brazil, and the USA.

Space experience

Iguassu Software Systems (ISS) participates in ESA projects since 1994, when it was founded as a Czech subsidiary of SciSys. After the Management Buy Out in 1999, as a Czech SME, ISS continued to subcontract to ESA suppliers, helped by the experience of its Managing Director, who was ESA staff member for 12 years and is in the space business since 1975. The ESA survey of Czech industry in 2002 gave Iguassu top marks, and highlighted its Firm Fixed Price project for Eumetsat, design & development of test tools for MSG CF system validation, as one of two outstanding examples of Czech successes in international space projects.

Direct contracts with ESA started after 2004, when the Czech Republic became an ESA European Co-operating State (PECS). ISS was the only Czech company to win more than one project when PECS started and it was the most successful Czech company during the whole PECS period 2005-2008, winning 6 out of 12 CZ industrial contracts. During that time it was the first Czech company to succeed in an ESA international competitive bid, with ACS Italy as prime.



1 Galileo Constellation Credits: ESA – J. Huart

2 Real-time GNSS performance monitoring tool – graph "Horizontal positions over 24 hours at the Krakow station"

As soon as the Czech Republic joined ESA, ISS was again the only Czech company to win more than one project in the first open call AO6052.

Projects won in ESA tenders (2005 till now)

currently ongoing

- In EO technologies – Distributed Raster Processing Framework, AO6647 (ISS prime)
- In GNSS - Multi-constellation Long-Term GNSS Assessment, AO6647 (ISS prime, university sub.)
- In SatCom - IRIS/Artes 10, satellite communication for civilian air-traffic (subcontracts to Thales Alenia Space Italy and Indra Spain)

2009-2012 successfully concluded since the Czech membership in ESA

- 2012 Interference Monitor System for GNSS Reference Stations, AO6149 (Astrium Gmbh prime)
- 2012 Open-standard On-line Observation Services (O3S), AO6143 (EOX Austria prime)
- 2011 Real-time Performance Monitoring Tool for EGNOS, AO6052 (ISS prime)
- 2011 Parallel Data Mining Components, AO6052 (ISS prime)
- 2010 Design and development of EGNOS education tools, based on experience gained in SISNeT (continuation of a PECS project, partially carried out on-site in ESA Toulouse), PECS (ISS prime)
- Continued operation of an EGNOS monitoring station, linked into the PERFECT international network (continuation of a PECS project, ISS prime)

2005-2008 successfully concluded ESA PECS and Galileo projects

- Image Information Mining in Time Series - ISS contributed its GRID experience to the development of EO information mining in time-series (ACS prime)
- EGNOS SISNeT II including complete design & development of a new generation SISNeT server (ISS prime)
- Galileo Search & Rescue subsystem co-development - subcontract to the Indra consortium, including Thales, Alcatel Space, CNES...
- Galileo ALGINT co-development (subcontract to SciSys)
- Study of SME needs in ESA – encompassing CEE/PECS countries (SME4space/AIPAS prime)
- EGNOS SISNeT development, conceived in co-operation with GMV, including mobile applications
- porting of SAR algorithms to GRID technologies and co-development of "Grid of Demand", conceived in co-operation with INDRA Madrid, on-site in ESA/ESRIN
- setting up of the 1st Central European EGNOS receiving station, monitoring the integrity of EGNOS satellite navigation data, linked in real-time into ESA central database

Previous (1994-2004) space software development (> 45 man years)

- Meteosat TP Main Control Centre CF
- Satellite Control System SCOS 2000 and Ground segment systems and user support for ESA/ESOC
- Envisat payload processing (ESA/ESRIN),
- IRIDIUM terminal test software (Racal, UK)
- MSG, MCF (UK, Eumetsat, and Prague) and Primary Ground Station (Gilching, D)
- telescope auto-tracking system (turnkey system for the Czech Academy of Sciences)

Marketing and consultancy track record

- marketing win WEU Satellite Centre (EU SC) Spain, 2.4 M US$ satellite station for CONAE Argentina, by current Iguassu MD (then Anite Systems Spain MD)
- consultancy in UNEP/Mercure satellite communications project, Iguassu MD for Anite Systems
- bid support of INPE Brazil 9.4 M US$ bid for CBERS system, Iguassu MD for Anite Systems
- Market intelligence & bid support in Brazilian aerospace for Vega and SciSys
- Czech defence market consultancy for Inmarsat (subcontract to TriPolus)
- Latin-American and Czech aerospace marketing consultancy for Shreeveport (UK) , ESA External Services, Integral Systems (F), Ministry of Interior (CZ)

Non revenue earning space activities

- Contributed the industry section of the National Space Plan, compiled by the Ministry of Transport and approved by the Czech government in 2010
- The Managing Director leads the Czech Space Alliance since its foundation in 2006
- formulated and negotiated bi-lateral co-operation agreements with the Japanese aerospace industry association JASPA (signed by the Czech Space Alliance, May 2011) and with the Brazilian space agency AEB (signed by the Minister of Transport, Nov. 2011)

ISS history milestones

1994 established by Science Systems plc – work started on ESA projects

2000 Management-Buy-Out, SciSys CZ subsidiary becomes a Czech SME

2002 highlighted in the 1st ESA's Czech survey for one of two Czech successes in international space projects

2005 won more industry contracts in PECS than any other Czech company

2005 1st Galileo contract as member of INDRA Spain GISAR consortium

2006 founded the industry space association "Czech Space Alliance" with the other space companies BBT and CSRC

2007 1st ESA contract for the Czech Republic through international tender

2009 won more industry contracts than any other Czech company in ESA AO6052 for the Czech Republic

2010 contributed to the industry section of the governmental Czech National Space Plan

2010 concluded for the Czech Republic two bilateral co-operation agreements (Japan & Brazil)

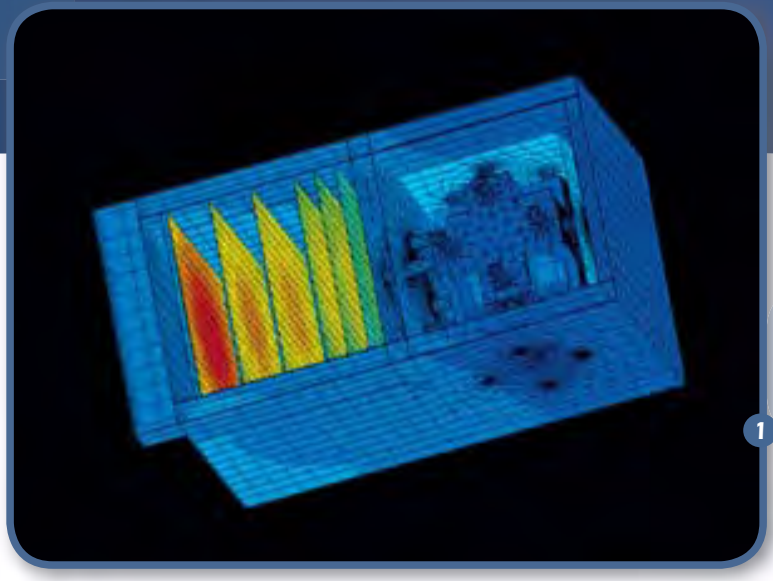
2011 again won the maximum number of Czech industry contracts in ESA call for tenders AO6647

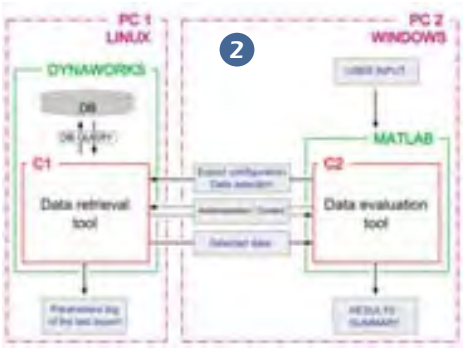
Iguassu Software Systems in a nutshell

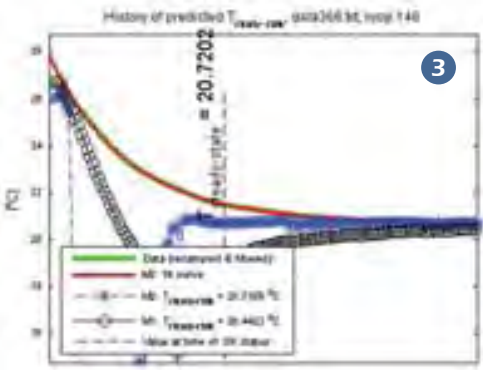
- has well over 100 man years of worldwide space experience
- has staff working with ESA since 1975
- developed successful business partnership with renowned ESA suppliers in Austria, Italy, Germany, Spain and the United Kingdom
- has won more ESA tenders than any other Czech company

⇨ ISS is your ideal Czech software partner for future ESA, or other space, bids

Why don't you try us and see for yourself?







L.K. ENGINEERING, S.R.O.

About

L.K. Engineering (LKE) provides engineering services in all mechanical areas. The core activities are focused on design and analysis using advanced engineering computations. LKE can offer a solution to companies with product R&D activities in each part of the design process such as innovative design proposal, conceptual study and detailed design evaluation.

We use the most advanced computational techniques, technologies and knowledge available to satisfy challenging requirements of today's products. These techniques and our experience help to reduce the cost and time during the development period and contribute to product competitiveness.

LKE provides services to a diverse group of clients and the team of LKE experts has successfully accomplished projects for various areas of industry such as power generation, aerospace, transportation, architecture, etc.

History

L.K. Engineering was established in 2001 after a previous successful experience of its founders in the area of technical calculation for the power generation industry. At first the company was oriented to international OEM in the US market, later the company activities expanded also to Europe and to regional customers.

Capabilities:

- Stress, thermal and fluid dynamic calculations
- Fatigue life and fracture mechanics evaluation
- Design of highly loaded components and optimization
- Numerical computation involving complex physical effects
- Product qualification acc. to specified code
- Expertise, reviews and consultation
- Development of unique computational software
- Technical documentation
- Project management

Space core activities:

- Thermal design and analysis of the spacecraft subsystems
- Structural evaluation of spacecraft components
- Launcher aerodynamics/aeroacoustics

Projects

- Thermal and thermo-elastic analysis of micro-accelerometer unit 2006-2007
- Thermal analysis of European Extremely Large Telescope enclosure 2009-2010
- Temporal Extrapolation Methods in Thermal Testing 2010
- Thermal and structural analysis of ACES/ELT unit 2011
- Computational methodology for evaluation of flutter response on launcher structures
- Structural optimization and thermo-elastic analysis of Lunar Lander spacecraft structure

Contact

L.K. Engineering, s.r.o.

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email: lke@lke.cz

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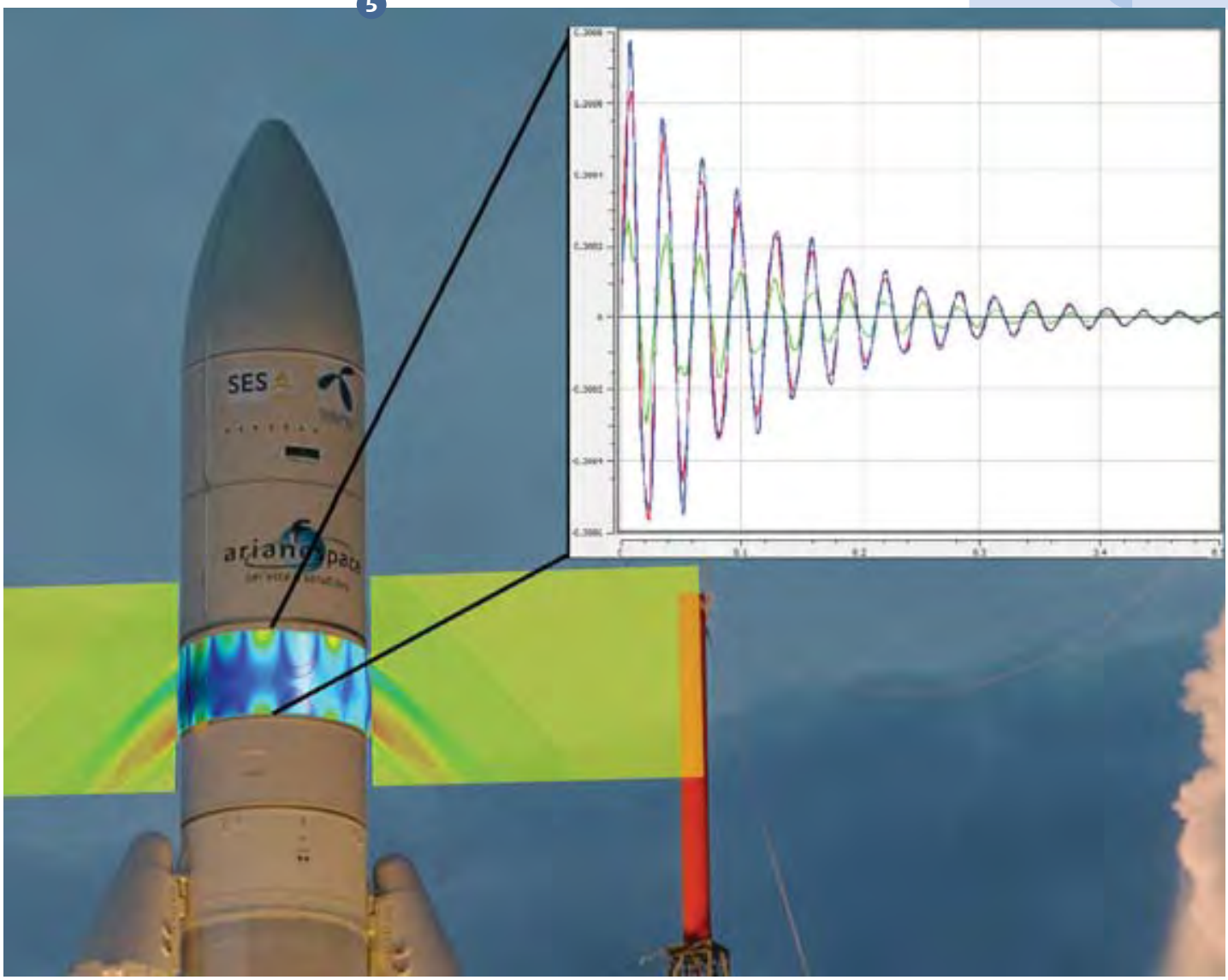
1. Thermal analysis of micro-accelerometer unit
2. Real time temporal extrapolation tool for spacecraft thermal testing
3. Prediction of temperature response during TV/TB test with SW tool
4. Swarm spacecraft with micro-accelerometer unit
5. Flutter response of insulation panel during launcher ascent

5



SIEMENS

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SIEMENS CONVERGENCE CREATORS, S.R.O.

Company profile

Siemens Convergence Creators, s.r.o. is the global partner for communication demands within a broad range of market segments. It stands for innovative products, turnkey solutions, and services in the fields of communication networks, service and customer management, public security, multi-media infotainment, and aerospace technology.

The Space department in the Czech Republic was established in 1998 and has been involved in developing various software solutions for the European Space Agency (ESA), the German Space Agency (DLR), the European navigation system Galileo, as well as for leading satellite operators.

We have a longstanding expertise in executing complex international projects related to satellite communications and ground segment solutions.

Siemens Convergence Creators, s.r.o., formerly ANF DATA spol. s r.o., is an affiliated company of Siemens.

Satellite Communication Solutions

Our team contributes to the customization and on-going evolution and maintenance of the Siemens SIECAMS product family.

SIECAMS: Siemens Carrier Monitoring System

The Siemens SIECAMS family is a highly sophisticated automated RF and content monitoring platform for the continuous monitoring of satellite signals and for ensuring high quality standards in uplink procedures and satellite transmission links.

Carrier Monitoring & Signal Analysis

- Adjacent Satellite Interference measurements
- Transponder Performance measurements
- Hidden Interference detection
- Ka-Band Monitoring

Interference Localization

The interference localization system is seamlessly integrated into SIECAMS. This integrated system provides not only geo-location but also advanced interference detection and classification functionality.

Easy Line Up (ELU)

- The VSAT Commissioning tool is a method and system for supporting earth station antenna alignment for low-cost two-way satellite communication terminals
- The VSAT Monitoring system allows the measurement of RF quality parameters without interruption of operational services.

SIECAMS is installed on many ground stations distributed all over the world and monitors the downlink traffic of 28 satellites.

Contact

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Satellite Communication Solutions
Robert Hamara
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1 SIECAMS control room

2 ESA's deep-space antenna at Cebreros, Spain

3 Maintenance mission of SCOE, ESTEC

4 Space in daily life

5 European Space Operations Centre

6 Mission Control System SCOS-2000

Ground segment solutions

Our team participates in various feasibility studies and in the development, evolution and maintenance of the SCOS-2000 based Mission Control and Check-out systems, monitoring and control subsystems at ground stations, Earth Observation data management and other infrastructure software for ESA, DLR, and other customers.

Satellite Control & Check Out Equipment (SCOE/EGSE):

- Solar Orbiter Power SCOE
- Advanced Integration and Test Services (AITS)
- Galileo Payload Test System (PTS)

SCOS-2000 based Mission Control System solutions:

- SCOS-2000 DLR MCS maintenance and evolution (since 2004)
- Study of SCOS-2000 deployment over WAN for a concept of CMCP (SWAN)
- EGOS DTL/DML based Mission Control System Demonstrator
- SCOS-2000 Advanced Monitoring study
  - CORBA based Data Distribution Prototype
  - SCOS-2000 Command Supervisor
  - EGOS Data Transfer & Data Management Libraries (DTL/DML)

Ground Station Monitoring & Control Systems

- Transient Objects for M&C in GSSC/GMMI (TROs)
- Contribution to development of the Monitoring and Control Module for ESTRACK Ground Stations (MCM4)

Earth Observation Infrastructure

- Decision Support and Real Time EO Data Management (DREAM)
- Open-standard Online Observation Service (O3S)
- Spatial Observation Services & Infrastructure (SOSI-CZ)
- ESA Corporate Knowhow Management Study (COKMAS)

Performance Evaluation & Analysis:

- Operational Data Off-line Analysis, Correlations, and Reporting System (ARES)
- Performance Evaluation and Analysis for the Galileo Satellite Constellation Control Facility (SCCS PEA)

ESA-qualified partner under the "Ground System Software Related Activities" (GFC8) for IT Domains.

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SYNPO

AKCIOVÁ SPOLEČNOST

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Company profile

SYNPO research institute is a Joint Stock Company with more than 60 years tradition in R&D of polymeric materials. Four research teams are specialized in synthesis of polyesters, polyurethanes, epoxies and acrylates and in the formulation of paints, composites and adhesives. One of our major research areas is the development of nanostructured and hybrid polymers and polymers based on recyclable and renewable materials. Analysis, evaluation and testing are carried out in accredited laboratories. SYNPO provides also transfer of production technologies of developed polymer products from laboratory to production scale. Synpo opened a new Centre of Nano Polymers and Polymers from Renewable Resources in 2009. SYNPO is currently fully in conformance with standard ISO 9001:2008. The SYNPO system has been approved by Lloyd's Register Quality Assurance. SYNPO closely collaborates with Czech industry and companies in the European Union, USA, and Japan, SYNPO provides a technology transfer and commercial introduction of many new products.

R&D areas

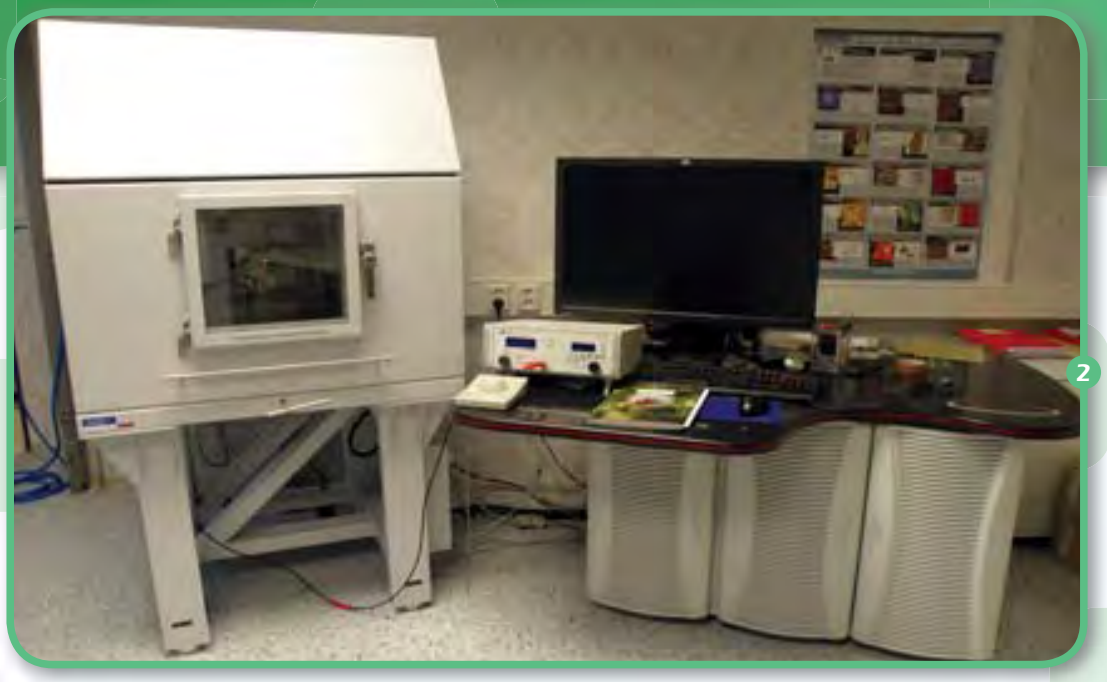
- Epoxy resins
- Nanostructured polymers
- Alkyds, polyesters and polyurethanes
- Emulsion and solution polymers and acrylic dispersions
- Polymers based on renewable raw materials
- Product testing and certification in accredited testing laboratories
- Supporting advanced analytical services in polymer and physical sciences
- Small-scale manufacturing of specialty resins, curing agents and adhesives in a pilot plant

Applications

- Binders
- Composites (construction, electronic, automotive, aviation and space)
- Laminating resins
- Casting and sealing compounds
- Adhesives, sealants and putties
- Paints and coatings
- Foams (construction, electronic, automotive, aviation and space industry)

Selected projects for customers

- Cryogenic thermal insulation foams (fuel tanks of space vehicles)
- Antiradar coatings
- High temperature resistance coatings (over 300 °C)
- High refractive index polymeric systems



- Coatings with high abrasion resistance and resistance against aggressive liquids
- Rubbers with low gas/liquids permeability (military applications)

Space projects, products & services

- Liners material study
- Epoxy Core Development

Technology areas of SYNPO interest related to the aerospace industry

- Liquid propulsion
  - o Composite propellant tanks
- Thermal
  - o Thermal Protection System
  - o Cryogenic materials
- Materials and Manufacturing Process for:
  - o Composite materials
  - o Elastomers
  - o Paints & coatings
  - o Joining (adhesives) of parts/structures made of different materials

1. Nanomill for Lab and Pilot Scale Production of Nanoparticles Dispersions
2. Atomic Force Microscopy
3. Basket Mill – Dispergasion Unit (300 L)

5M S.R.O.

General description

The 5M s.r.o. company operates in the area of the development and manufacture of composite and sandwich materials. We specialise in demanding applications and special products. Our customers are companies from ground vehicle transportation and aircraft industry but also electronic parts or certificated sport equipment producers. We have our own R&D which we invest about 8% of the annual turnover in. We have been awarded as the Company of the Year of 2010 in the Czech Republic.

Fields of expertise

Production and development of structural composite parts, pultruded profiles, structural epoxy adhesives, sandwiches, epoxy resins, aluminium honeycombs, foil adhesives, preimpregnated fabrics (prepregs, semipregs), precise sandwich surfaces for optics, etc. Our materials fulfill ECSS standards (e.g. outgassing).

ESA Projects:

Programme: PECS
Name: 5M composite technology evaluation
Prime contractor: Thales Alenia Space
Duration: 2012-2013

Further space projects, products, services

- Composite Materials with Low Volatile Content and Radiation Resistance for Astrophysics and Space Applications (Ministry of Industry and Trade of the Czech Republic)
- Large-sized Composite Structures for Active and Adaptive Optics (Technology Agency of the Czech Republic)
- High Precision Sandwich Panels for Optics (commercially based)
- Materials for Structures of Small Satellites (commercially based)

Contact

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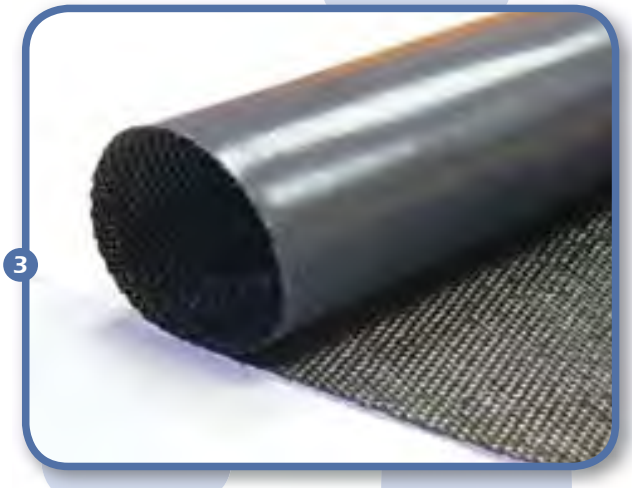

1 Radiotelescope mirror made by 5M precise sandwich panels

2 Composite radome covers

3 Carbon prepregs acc. to ECSS standards (e.g. outgassing)

4 5M production capacities (5000 m²)

CREDIT: ESA External coronagraph in space

Ministry of Transport of the Czech Republic

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