Designing the future of aviation

EREA

Association of
European Research Establishments in Aeronautics

www.erea.org

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EREA, the association of European Research Establishments in Aeronautics, is a non-profit organisation whose members are Europe's most outstanding research centres in the field of aeronautics and air transport. These organisations joined EREA in order to:

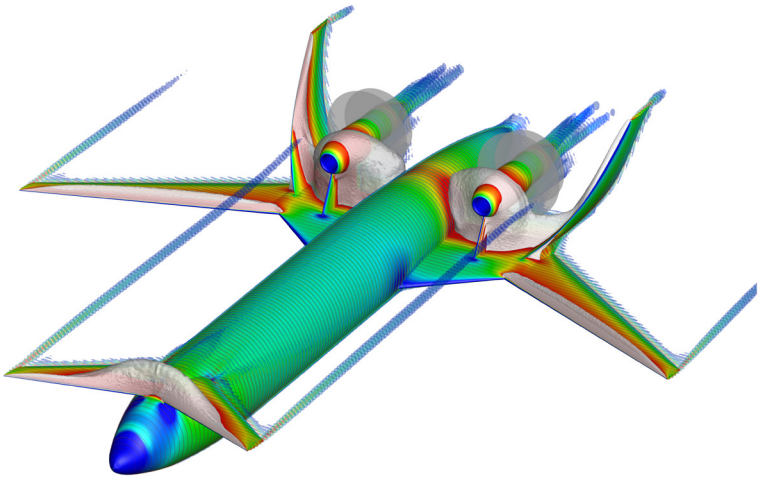
- **PROMOTE AND REPRESENT JOINT INTERESTS**
- **INTENSIFY COOPERATION IN THE FIELD OF CIVIL, MILITARY AND SPACE-RELATED AERONAUTICS RESEARCH**
- **IMPROVE AND INTENSIFY COOPERATION WITH THIRD PARTIES IN THE FIELD OF AVIATION**
- **FACILITATE INTEGRATED MANAGEMENT OF JOINT RESEARCH ACTIVITIES, THUS CONTRIBUTING TO EUROPE'S ROLE AS A GLOBAL PLAYER IN AERONAUTICS**

The European aviation industry has gone through an extensive process of integration. At the same time, the air transport sector has undergone integration into multinational mega-carriers, while regulation is now a European responsibility. Closer European cooperation is also being established in the area of security and defence. All of these developments have created the current environment for the EREA research organisations, which were originally founded to meet national requirements. The change of focus from national to European clients has driven further cooperation among European research establishments. EREA was founded in 1994 to tackle the European challenges that national research establishments began to face.

The EREA Joint Position Paper (September 1993), initiating EREA's creation in 1994, established multiple future lines of activities for the research establishments, in particular:

- To pursue a policy on the coordinated use of and investments in wind tunnels and other facilities, and on joint operation of experimental assets, with the aim of correlating these hitherto nationally-dedicated resources, and rationalising the use of existing and future facilities for the joint benefit of Europe
- To develop joint research programmes and technology acquisition projects relating to the research establishments' own domains, and relating to research activities initiated by third parties such as the European Commission (EC).

EREA believes that European aviation ambitions are achievable only through a joint effort in research and innovation. That is why EREA supports industrial projects scientifically and technically. The organisation also collaborates with European public authorities and industry so as to define and implement a long-term research policy encompassing commercial and technological dimensions. Last but not least, EREA provides objective, neutral and impartial expertise to the EU, national authorities, industry and other bodies.



Members

The origins of the EREA partners date back to the earliest years of aviation and represent a rich history of contributing to innovations in aerospace.

The national research centres that joined forces in EREA are:

- AIT (Austria)
- CEIIA (Portugal)
- CIRA (Italy)
- CSEM (Switzerland)
- DLR (Germany)
- FOI (Sweden)
- ILOT (Poland)
- INCAS (Romania)
- INTA (Spain)
- NLR (Netherlands)
- ONERA (France)
- VZLU (Czech Republic)

AFIT, Poland's research centre originally for military aeronautics, joined EREA as an affiliate member of ILOT, consequently becoming EREA affiliate member.

Strategic Partnership

Although the present members and associates are the most important non-industry research establishments in Europe, EREA continuously strives to build and improve relationships with other establishments in the new European Union member states, and with universities, industrial laboratories and research organisations outside Europe. Our strategic partnerships with VKI of Belgium and with TsAGI of Russia are examples of how EREA is seeking to step-up collaboration in Europe.

Organisation

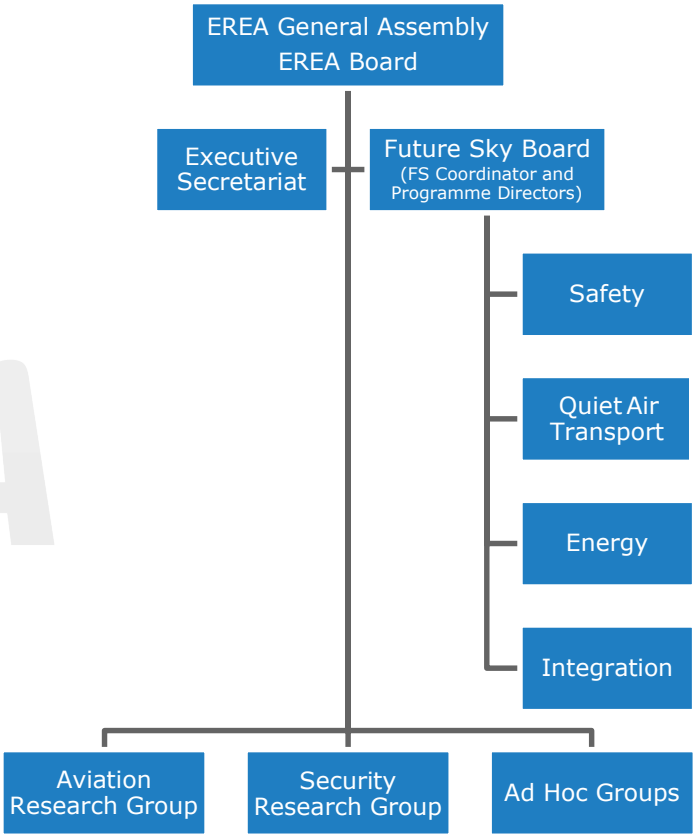
EREA has been an association under Dutch law since 1999. Its internal organisation is made up of the EREA Board, the General Assembly, the Executive Secretariat (ES), the Aviation Research Group (ARG), and the Security Research Group (SRG). Through its Board and dedicated working groups, EREA over the past 20 years has established its member organisations as key players in the European aviation community.

The Executive Secretariat coordinates all EREA activities and aims to enhance the strategic relationships between the EREA members and between the association and the European Commission, European industry and universities.

The Aviation Research Group (ARG) was created back in 1989.

EREA has widened the scope of its joint research to embrace research into security through the Security Research Group (SRG), a dedicated working group established in 2004. Furthermore in order to improve internal and external cooperation EREA set-up its Joint Research Initiative called Future Sky.

Organisation



EREA in numbers

- Almost 6000 researchers working on aviation
- About € 0,5 Bln Annual spent on research in aviation per year
- Over 250 theses per year
- Nearly 8000 Publications per year

EREA Aviation Research Group (ARG)

The EREA-ARG acts as the EREA interface towards the European Commission regarding research and technology programmes and initiatives related to Aviation. Originally the perimeter of ARG was mainly dealing with aeronautics; in due consideration of Flightpath 2050 and SRIA the EREA-ARG area of interest has been extended to embrace Aeronautics as well as the Air Transport System.

EREA-ARG works in close co-operation with other groups within EREA (e.g. EREA-Security Research Group, EREA-Executive Secretariat).

MAJOR TASKS OF ARG

EREA-ARG, within the Aviation perimeter, will contribute to liaison with:

- the European Commission;
- the European industry (ASD/IMG4, IMGs,….), SMEs and universities;
- other research organisations and agencies (EASA, Eurocontrol, …);
- existing networks and working group devoted to European Framework Programmes;
- EC funded large programmes (e.g. Clean Sky, SESAR);
- existing networks devoted to coordinate trans-national and trans-regional research activities (e.g. AirTN, EACP, CARE,….).

EREA Security Research Group (SRG)

The SRG acts as interface towards the European Commission and the European Defence Agency and assists in implementing joint actions for research and technology initiatives related to European civil and military security programmes.

According to the scope of EREA (civil, military and space related aeronautics), the group mainly handles security issues related to the Air Transport System.

MAJOR TASKS OF SRG:

- Inform the EREA-members about relevant (policy) developments within the European Union and of other European initiatives related to Security;
- Act as a point of contact at working level towards the services of the European Commission, the European Defence Agency and European industrial, regulatory, and other groups;
- Promote the common interests and market opportunities of EREA and disseminate relevant information among members
- Assist and co-ordinate initiatives of the Association members towards the European Union and other bodies;
- Work in close co-operation with other groups within EREA (EREA-Aviation Research Group, EREA-Executive Secretariat).

EREA Executive Secretariat (ES)

The EREA Executive Secretariat consists of the permanent points of contact with the EREA members. The ES is responsible for the overall coordination of EREA activities and sets out the internal and external strategy of the association. The Executive Secretariat addresses all political issues relating to the long term vision of EREA and its members. Last but not least, ES promotes the internal and external visibility of EREA by publishing EREA Newsletters, facts and figures, maintaining the EREA website and organising the EREA Annual and Young Researchers events. ES-members prepare and accompany the Board members in EREA Board meetings.

Research activities in Europe

All the member research establishments of EREA play a pivotal role in national research and innovation policy. They contribute to a competitive national aviation industry by offering industry, SMEs and universities technical assistance and high-tech research facilities. Many EREA members also provide technical assistance to their national governments, mostly in the field of air transport and defence.

At European level EREA members fulfil a significant role in European framework programmes for research and innovation, and contribute substantially to programmes such as Clean Sky and SESAR.

EUROPEAN AERONAUTICS RESEARCH INFRASTRUCTURES

The Advisory Council for Aeronautical Research in Europe (ACARE) has stated that a set of world-class and efficient research capabilities is a strategic factor for promoting the development of aeronautics in Europe.

Fundamental and applied research in various scientific disciplines (such as fluid mechanics, materials, structures and systems) and the development of sub-components and components (like engines) and aeronautical end-products (including fixed-wing aircraft and rotorcraft) has always been associated with extensive design, computation, testing, optimisation and validation activities. This complex process calls for the systematic use of various research facilities, such as aerodynamic wind tunnels, combustion and structural test beds, material elaboration apparatus, clusters of small computers (or conversely high-end super-computers), air traffic management and air traffic control simulators, flight simulators, and research aircraft.

These facilities, used for different disciplines and specialities, differ greatly in their size and range of application but are often linked to one another through a complex immaterial network that transforms basic scientific knowledge into competitive products while integrating environmental, safety and security requirements. As such, they are an essential asset for Europe, even if the vast majority of these facilities were originally developed to meet national objectives.

CAPABILITIES FOR EXPERIMENTAL AND NUMERICAL SIMULATIONS ARE KEY ENABLERS FOR THE DEVELOPMENT OF AERONAUTICS

It is generally acknowledged that research infrastructures are extremely important to the aviation industry and the scientific community working on aeronautics. All past and present aeronautical components or products have been tested in aerodynamic wind tunnels, and the same is likely to occur with future products. This is not at odds with the trend towards greater dependency on numerical simulations. After all, the fast, detailed and accurate design procedures necessary to meet increasing constraints (especially those related to environmental and safety issues) require increasingly powerful testing and evaluation capabilities with multi-disciplinary and multi-physics features. Experimental and numerical simulations will always be complementary to each other. So in parallel with the effort directed towards testing capabilities, it is necessary to provide the aeronautical research community with effective and affordable access to European high-end computing resources.

AERONAUTICS INFRASTRUCTURES ADDRESS SCIENTIFIC AND INDUSTRIAL RESEARCH IN A COMPLEMENTARY WAY

Industrial customers (i.e. aircraft manufacturers) make commercial use of facilities for developing and enhancing their products during limited test periods. This contributes towards making the facilities available for scientific research to other users who need them for limited periods of time. This situation benefits the numerous research projects conducted under national or EU programmes on both fixed and rotary- wing aircraft, and is conducive to improve basic knowledge (of such matters as flow stability, transition, wakes, vortices and the combustion process) through tests directly funded by research establishments to improve fuel efficiency and reduce noise.

The automotive, railway, civil engineering and wind

power industries also stand to benefit from these publicly maintained infrastructures and the associated know-how, while the industrial community benefits from the results of fundamental research that improves technologies in several fields.

There is a demand for increasingly accurate experimental databases. This necessitates the development of highly sophisticated non-intrusive measuring instruments, which will notably stimulate fundamental research in specific domains of physics (like coherent optics).

Aeronautics research facilities further contribute to European integration through exchanges with industrial customers (mostly transnational companies) and researchers from different countries who are involved in operating them. Formal pan-European networks have been established to improve overall efficiency by exchanging best practices and progressively specialising in fields of application. Examples are AT-One for Air Traffic Management, DNW, and ESWIRP for wind tunnels.

Although 'traditional' ground-based facilities (like aerodynamic wind tunnels and propulsion test beds) are the most emblematic and well-known examples of aeronautics research infrastructures, the sector also needs and must leverage a large variety of other capabilities. Examples include vibration and fatigue test beds, crash facilities, electromagnetic compatibility facilities, control tower simulators, and flying test beds.

Similarly, at the system level it will be necessary to validate an entirely new operational Air Traffic Management concept, using a sophisticated infrastructure that includes automatic/fast-time simulation tools, a human-in-the loop simulation platform, and field experiment platforms.

AERONAUTICS FACILITIES ARE AN ASSET THAT MUST BE PRESERVED

Most of the major aeronautics facilities were funded by national governments in the 1950s and 1960s to meet their national needs. So it is striking when you consider that an aircraft like the A380, which is likely to be in service for the next 40 years, was extensively tested in 50-year old aerodynamic wind tunnels.

A majority of large and medium-sized facilities are run on an operating costs recovery basis by national aeronautics research establishments, and are open to any customer. University aeronautics departments operate laboratory facilities more suited to conducting basic research, while industrial companies own limited research equipment for their exclusive use. Aeronautics facilities are essential for improving basic knowledge and for supporting the competitiveness of the European industry. They represent a tremendous asset with a value estimated at more than €4 billion. Maintaining, renewing/upgrading or replacing these facilities represents enormous challenges and a financial burden that operators using national funding schemes are finding it more and more difficult to support on their own. The upshot is that less than 1% of the total asset is re-invested each year, a situation that is unsustainable in the long term.

Europe (through the EU and intergovernmental tools) will need to be increasingly involved in the process of investing and re-investing, while facility operators will have to make further progress in the rationalization process that began several years ago and has already produced tangible results. In this field, as in others, Europe should be in a position to compete on an equal footing with the US, where large aeronautics facilities are regarded as national assets and are supported as such at the federal level. Operators, in particular of medium-size key capabilities, must examine, in association with national and European public authorities, the fairways and procedures necessary to optimise the use made of existing facilities, while reducing existing unnecessary duplications and preventing any risk of new duplications involving public funds.

AERONAUTICS FACILITIES BENEFIT OTHER SECTORS

'Low-speed' and 'high-speed' aeronautics research infrastructures (in particular wind tunnels) allow several sectors unrelated to aeronautics to pursue their own objectives. Surface transport sectors (road and rail) are intensive users of some facilities, and benefit from the testing and measuring techniques and associated expertise available thanks to aeronautics applications. In the space sector too, launch and re-entry configurations have been extensively modelled and tested using tools developed for the aeronautics sector. Civil engineering is another sector that benefits from aeronautics research infrastructures.

Environment and aviation safety also benefit from aeronautics infrastructures by such means as regular improvements at component level (e.g. combustor performance) or through the study of specific phenomena (like wake vortices). Security stands to gain more from the investments already made by the aeronautics community (e.g. in UAVs). Because it addresses both scientific and industrial research and covers a wide range of scientific disciplines and associated expertise, this complex network of research infrastructures is a key enabler of Europe's on-going development. This network, built on a small group of strategic facilities, represents a tremendous asset and the needs of the research community that runs it will need to be carefully considered at regional, national and European levels in the years ahead.

EREA, the association of European Research Establishments in Aeronautics launched Future Sky: a Joint Research Initiative in which development and integration of aviation technologies are taken to the European level.

What is Future sky?

Future Sky is based on the alignment of national institutional research for aviation by setting up joint research programmes. EREA believes institutional co-operation of European research establishments is the best guarantee to ensure technological development to the benefit of European society and industry, beyond the current SESAR and Clean Sky timescales.

Future Sky's overall goal is "Twenty-four-Seven". This concept describes the full airside mobility, 24 hours a day, 7 days a week, resilient against any impacts e.g. from disruptive events like extreme weather, in line with the goals laid down by Flightpath 2050.

Although Future Sky finds its origins in the alignment of the research programmes of the national research establishments, industry and universities are explicitly invited to join Future Sky.

Collaboration of National Research Establishments

The national research establishments that have gathered in EREA are all committed to contribute to Future Sky. For each joint research programme, the national research establishments will draft of roadmap for the next five to seven years. The research establishments will map out which areas of a certain research theme are covered by their institutional research programmes and where they see opportunities for sharing results and joint planning. The roadmap will also identify certain research gaps that are not yet or insufficiently covered by the national institutional research programmes. These gaps will be tackled in a new European research project in which the research establishments will actively seek to collaborate with universities and industry. The aim of Future Sky is to enhance collaboration between national establishments and to involve the aviation research community as whole to prepare for a competitive European aviation industry in 2050.

How Future Sky Contributes To Flightpath 2050

In order to fulfil Flightpath 2050 goals European aviation research needs to target the complete Air Transport System and to apply a full life cycle engineering approach, covering the full research and innovation chain. The ACARE SRIA envisages putting in place attractive and efficient research instruments, which ensure continuity between research on promising breakthrough concepts, their validation by focused RTD actions and finally their demonstration in an integrated environment.

Furthermore Flightpath 2050 and the ACARE SRIA are proposing to establish multidisciplinary clusters of excellence for research and innovation, to achieve common technology goals (outcome of a common strategy to address societal issues). They ensure that the appropriate organizations are tackling activities at the appropriate level in the innovation chain. For demonstration activities on system level the well-known JTI concept led by industry has been proven to be successful.

Future Sky will combine the power and the capacities of the research establishments in EREA into multidisciplinary clusters of excellence proposed by Flightpath 2050 in order to ensure appropriate mid and long term research on lower level TRLs complementing the industrial led demonstration activities on higher TRLs. As mentioned above Future Sky will address the 24/7 Air Transport System as outlined in Flightpath 2050.

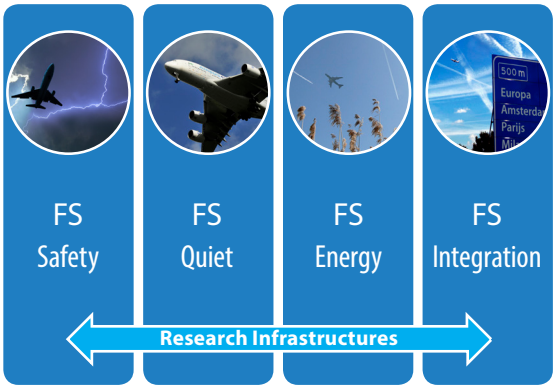
The Joint Research Programmes under Future Sky

The joint research programmes under Future Sky are:

FUTURE SKY SAFETY – EREA takes the responsibility to provide the research and validation needed to guarantee in the short term safety rules, regulations, measures and standards, and in the long term to fulfil the Flightpath 2050 goals concerning safety.

FUTURE SKY QUIET – this programme aims for developing quietly operating air transport vehicles, serviceable from small airfields, that make use of ultra-quiet or hybrid-electrical engines, use flow control for maximum lift on short runways, allow for fast boarding, fuelling, catering, etc.

FUTURE SKY ENERGY – Future Sky Energy will address energy sources, energy systems on board (incl. propulsion) and also on ground with aim to protect the environment and the energy supply.



FUTURE SKY INTEGRATION – the focus here lies on the next generation of vehicles, including new elements such as unmanned aircraft systems and their integration into civil air transport system. It includes technologies related to performance, comfort, safety and impact which are defined by other Future Sky thematic groups. An important part of integration is also appropriate ground transportation system. Intermodal interfaces will be studied, including the design of more efficient and effective air transport interface nodes, both systems and processes.

The Future Sky idea is not limited to four mentioned Joint Research Programmes, but Future Sky is also communication platform of experts who are looking for other important themes which can extend the fundamental Future Sky structure to better achieve all Flightpath 2050 goals.

How to Join Future Sky

Although Future Sky is an initiative of EREA, the joint research initiative is aiming to go well over the boundaries of EREA members: a contribution from all the aviation research stakeholders is needed to achieve the ambitious goals of the programme. Apart from the coordination of national institutional research programmes, each Joint Research Programme will define research projects open to all. Please visit www.futuresky.eu where you will find the latest information on Future Sky, its Joint Research Programmes and contact information.

EREA

Research Establishments

The Polish Air Force Institute of Technology, AFIT (Instytut Techniczny Wojsk Lotniczych), is a scientific research and development organisation (R&D) which is supervised by the Minister of National Defence.

The history of the AFIT reaches back to 1918, when the Scientific & Technological Division was established by the Ministry of Military Affairs. In 1921 the Division was changed into the Military Center of Aeronautical Research, which in 1926 was changed again into the Institute of Technological Research into Aeronautics. This institute existed until 1936, when it was transformed into the Aviation Institute of Technology. In 1953 the Air Force Research Institute was established by the Ministry of National Defence. In 1958 the name was changed into Air Force Institute of Technology, which exists since then.

Mission / Objectives

Its mission is scientific support and research into problems of operating the military products of aeronautical engineering. Owing to the studies in the field of reliability and broadly understood flight safety, the institute has significantly contributed to the development of Polish aviation. Significant achievements, home and abroad, include numerous scientific and research together with experimental and design studies that have been used in the Polish Air Force.

Location

The AFIT headquarters is located in Warsaw.

Programmes / Activities

The institute provides aeronautical engineering research and development and services as follows:

GROUND AND FLIGHT TESTS

- AFIT provides ground and flight tests, including aircraft and helicopters certificate tests, tests of individual pilot's equipment and airborne high-altitude and rescue systems, airborne and ground systems, and designs and develops relevant measuring and recording systems.
- AFIT provides certification tests of aeronautical products for the air force, including air armament, and simulation tests. Additionally it develops and tests aerial rocket targets used for training.

AIRCRAFT WEAPON SYSTEMS

- AFIT upgrades weapon systems, and develops air weapons and aerial targets, and ground-based and flying testing systems for air forces.
- AFIT also tests air weapons after warranty periods to extend service-life, and upgrade the on-board attack avionics systems for aircraft and helicopters.

AIRCRAFT SIMULATION, TRAINING AND MODELLING

- The capabilities of AFIT include formulation of mathematical models of flight dynamics, air weapons, performance of radar and missile-guiding stations, certification tests of flight simulators, and the development of multimedia training systems (e-learning).
- AFIT also provides training systems and flight simulators for control officers, interception navigators, pilots, and air-traffic controllers.

AIRCRAFT SAFETY AND RELIABILITY TESTING

- AFIT provides accident investigation development, computer-aided systems to assist aircraft operational-phase management, and testing of materials used in aeronautical structures.
- AFIT also supplies systems to record parameters of aero-engines, non-destructive testing of structures, service-life tests of structural components, and data decoding systems. In addition, AFIT examines operational damage and failures to aeronautical structures, and helps to extend aircraft service-life and the time between overhauls.

UNMANNED AERIAL VEHICLES (UAVS)

- AFIT provides new UAVs and applications, software, air-reconnaissance-delivered imagery analysis and distribution systems, and UAV operator training.

AIRCRAFT SURVEILLANCE SYSTEMS

- AFIT supplies terrain aircraft surveillance systems, and systems to protect widespread areas.

AVIONICS SYSTEMS

- Ground and airborne equipment; integration of avionics systems into aircraft and helicopters; development of operational-phase assisting diagnostic instruments; integration and maintenance of avionics systems; integrated self- protection systems, helicopter modernization; communication systems integration; avionics systems digitalization; helmet mounted display for flight parameters.

AERONAUTICAL AND AIRFIELD DIAGNOSTICS

- AFIT conducts engine certification tests, and geological and engineering surveys of soils. It also develops diagnostic software, designs diagnostic stations to test structural components and predicts the service lives of structure materials.

AIRCRAFT FUEL AND UTILITY FLUID TESTING

- AFIT supplies quality assessment of engine fuels, lubricating oils, lubricating greases, preservatives, engine coolants, break fluids, industrial (processing) fluids, bio-fuels and bio-components for fuels and oils. It also develops technologies for operating fluids of synthetics, minerals and bio-components.

C4ISR SYSTEMS

Integrity of the network centric systems; depository of the link systems standards; systems for future soldier, F-16 simulator for procedures.

The institute's development strategy intends to increase research potential through participation in projects within the Framework Programmes of the EU, the European Defence Agency as well as other European research programmes.

www.itwl.pl

AIT
AUSTRIA

The AIT Austrian Institute of Technology, Austria's largest non-university research and technology organisation, is among the European research institutes a specialist in the key infrastructure issues of the future.

As an Ingenious Partner to industry and public institutions, AIT is already researching and developing the technologies, methods and tools of tomorrow - paving the way for the innovations of the day after tomorrow. The Republic of Austria (through the Federal Ministry for Transport, Innovation and Technology) has a share of 50.46%, while the Federation of Austrian Industries owns 49.54% of the AIT Austrian Institute of Technology.

Mission / Objectives

The AIT Austrian Institute of Technology takes a leading position in the Austrian innovation system and a key role in Europe as the RTO focusing on the key infrastructure topics of the future. AIT provides research and technological development to realize basic innovations for the next generation of infrastructure related technologies in the fields of Energy, Mobility Systems, Low-Emission Transport, Health & Bioresources, Digital Safety & Security, Vision, Automation & Control and Technology Experience. These technological research areas are supplemented by the competence in the area of Innovation Systems & Policy.

As a national and international network node at the interface of science and industry AIT enables innovation through its scientific-technological expertise, market experience, tight customer relationships and high quality research infrastructure.

Location

The AIT has about 1.300 employees - mostly based at the main facilities Vienna Tech Gate, Vienna TECHbase, Seibersdorf, Wiener Neustadt, Ranshofen and Graz – working on the development of the tools, technologies and solutions for Austrian industries that are of utmost relevance for the future. All these efforts comply with our motto "Tomorrow Today".

Programmes / Activities

The relevant activities concerning the aerospace research include:

DESIGN OF LIGHT WEIGHT STRUCTURES

Environmentally-friendly vehicles are poised to play a major role on the traffic of tomorrow. In order to achieve maximum efficiency, their weight must be kept to a minimum. The AIT is developing new techniques for designing lightweight and safe vehicles comprising aluminium and magnesium components.

MULTI-MATERIAL DESIGN

Sustainable mobility is dependent on innovative solutions for the environmentally-friendly, safe and efficient production of vehicles. The AIT develops special design techniques which takes account of the characteristics of light metal alloys. The methods developed allow safety-critical components and structures for innovative vehicle concepts to be realised as multi-material structures both virtually and as concept demonstrators.

CUSTOMISED MATERIALS DEVELOPMENT

A comprehensive understanding of micro-metallurgical aspects and their relationship with the macroscopic environment is fundamental to the development of new materials and their processing. Material development at AIT is based on alloy development, taking into account the processes involved in manufacturing components as well as the desired component characteristics. This process is complemented by experimental material and component characterization.

ELECTRIC DRIVE TECHNOLOGIES

In recent years, AIT's Business Unit Electric Drive Technologies has positioned itself as a recognised development centre for automotive electric drive concepts, helping both manufacturers and suppliers adapt to the electric era. Regarding the shift towards more electric aircraft, AIT can provide knowhow in energy storage device (esp. battery systems), power electronics as well as electric motors/ generators with high electric efficiency.

ELECTRIC ENERGY SYSTEMS

The Business Unit Electric Energy Systems helps the industry to develop emerging technologies for electricity networks and photovoltaic. The facilities include a high voltage and high power laboratory e.g. for lightning strike tests.

SAFE AND AUTONOMOUS SYSTEMS

AIT's Center for Digital Safety & Security develops real-time capable 3D vision sensors to enable cost-effective and reliable image recordings of surroundings in 3D. The integration of secure "on-board autonomous systems" and cooperative communication systems for networking infrastructures and increasing traffic safety are further main research activity themes, including Visual Airborne Self Localization or Aerial and Runway Obstacle Detection and Tracking.

DYNAMIC TRANSPORTATION SYSTEMS

AIT performs research in traffic systems optimization to enable pedestrians, cyclists, public transport and motorised individual traffic getting from A to B more quickly, more safely and in a more environmentally friendly way. Main research topics in aviation are simulation and prediction of passenger flows, modelling service times at airport processing stations and active counter management, airport ground access mode choice modelling as well as the collection and analysis of passenger motion data.

Since its foundation, CEIIA seeks to contribute to the construction of a new industrial model based in the evolution of Portugal from a logic based on technology importation to a development, integrating and exportation logic involving and building global supply chains.

The basis of this logic is smart specialisation around tradable products and integration of national technologies, whereas engineering capabilities and product development philosophy play a central role as a pull factor for attracting new projects to Portugal with leading international players and emerging markets.

This approach requires an intense engagement with clusters of multi-sectorial nature and multi-technological dimension associated with complex tradable products (e.g. systems, structural modules and even vehicles and aircraft) as the basis of an industrialisation strategy.

Mission / Objectives

With a special focus on internationalisation of Portuguese engineering – associated with product development in large international projects of key players –, CEIIA seeks to induce the increase of national know-how and technology development, and to attract manufacturing to Portugal, as recently achieved with the electric vehicle Buddy of Norway, with the national program of intelligent mobility and with the military transport aircraft KC-390 by EMBRAER.

CEIIA's activities are oriented towards the promotion of competitiveness of Portuguese industry through coordination, management, implementation and dissemination of actions with the following objectives:
Strengthen coordination of players and initiatives;

- Anticipate changes in the strategies of customers, products and technologies;
- Empower the Portuguese industry at a human-level capital and entrust its productive development;
- Develop value chains in Portugal and in neighbour markets;
- Develop strategies for the industry supply of components to traditional and new customers in global markets;
- Specialise the Portuguese industries in the design, development, manufacture and validation of new generations of vehicles,
- Components and engines;
- Attracting Foreign Direct Investment oriented to existing development and manufacturing capabilities;

To achieve these goals, CEIIA develops its activity around three strategic intervention areas:

- Consolidation and specialisation of the activity around manufacturers and suppliers of mobility industries;
- Diversification of CEIIA's activity with the integration in the supply chain of the industry to different markets;
- Development of the national supply chains by increasing the "local content" around the major projects of mobility industries.

Location

Our headquarters is in Matosinhos, near Porto and we also have offices in Maia, Lisbon and São José dos Campos, Brazil.

Programmes / Activities

- Planning and implementation of Aeronautical Programmes - Rotary and Fixed Wing – focused on the development of aerostructures, covering mainly: design and stress analysis, aerodynamics, aero-acoustics, aeroelasticity, man-machine interface, structural testing and certification;
- Development of Engineering, Design and Advanced Manufacturing Programmes with OEM's and Academia;
- Development of Aeronautical supply chain programmes within the Portuguese Mobility Technological Cluster;
- Development of International Aeronautical RDI Programmes in cooperation with Portuguese Universities and International Research Entities.

www.ceiia.com

The Centro Italiano Ricerche Aerospaziali CIRA (Italian Aerospace Research Centre) is a not-for-profit private company under the control of the Ministry of Education, University and Research. The shareholders include ASI (Italian Space Agency), CNR (National Research Council), Industrial Area Development Consortium of Caserta (ASI Caserta), Italian aerospace industries (including Leonardo, Thales Alenia Space Italia, Avio, etc.)

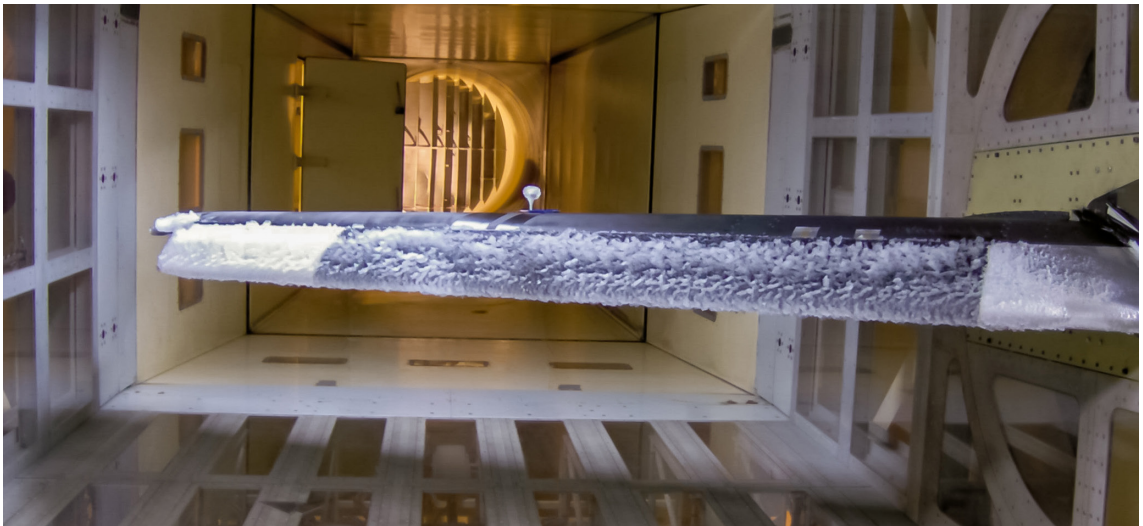
CIRA was founded in 1984, and entrusted by the Italia Government to perform the National Aerospace Programme (PRORA), under the control of MIUR (Ministry of Education, University and Research), in order to support the Italian authorities, aerospace industries and SMEs with facilities, laboratories and competences. CIRA became operational in 1986 and started the design of "world class" test facilities and the training of specialists and researchers in the fields of both aviation and space.

Mission / Objectives

The National Aerospace Program PRORA defines the CIRA mission: to build, operate, maintain and upgrade large scale facilities and laboratories, to develop theoretical and experimental R&TD activities, to produce and exchange information, to educate and train personnel, and to participate in European and international programmes. More specifically, CIRA's are mostly targeted to:

- development, validation and application of physical models and numerical tools;
- definition, management and execution of test campaigns (including test article design, assembly and integration),
- technology development, validation and demonstration,
- systems design and analysis, and technology integration
- technology and system qualification and certification.

These activities are intended to support the Italian authorities, aerospace industries and SMEs, and to promote the networking of competences and capabilities at regional and national level.



Italian Aerospace Research Center

Location

CIRA is located in Capua nearby Naples.

Programmes / Activities

CIRA is entrusted to implement the National Aerospace Program PRORA programme, A three plan, taking into account the National, European and International scenario, is updated every year to define the strategic programming and resources allocation; the planning is approved by MIUR.

In the 2016-2018 planning the following R&TD strategic lines are defined with proper resources:

- RPAS and Autonomous UAS
- Fixed Wing Aircraft
- Rotary Wing and Tilt-Rotor Aircraft
- Access to Space, Satellites and Space Exploration Systems
- Space and Aviation Propulsion
- On Board Systems for aircraft and space vehicles, ATM
- Reliability, Availability, Maintainability, Sustainability - Safety and Security of Air Transport Systems and Critical Infrastructures
- Aerospace Methodologies and Technologies applied to monitor the Environment and Territory

These activities are performed through institutional funding (e.g. PRORA resources) and participating to funded projects at Regional, National and European level. In fact, CIRA is participating to H2020 collaborative research projects and to large programs like Clean Sky 2 and SESAR 2020 jointly with EREA partners and national stakeholders.

Furthermore, Flagship Programs have been proposed in the 2016-2018 PRORA planning; these are going to be launched on three areas: Aviation, Space, Transversal Technologies. R&TD activities and new facilities, laboratories and demonstrators (both on ground and flying) are being defined within the proposed Flagship Programs:

ELECTROPLANE – Innovative aircraft concepts exploiting hybrid-electric propulsion with proper strategy and degree of hybridization.

RPAS – Remotely piloted and autonomous vehicles of different categories (mini/micro, Medium high Altitude Long Endurance, High Altitude Long Endurance, cooperative swarms of UAVs).

ICE – Design, validation, demonstration, qualification and certification of innovative ice protection systems and detecting sensors; enlargement of the testing envelope of the Icing Wind Tunnel to include new FAA regulations (e.g. Super Large Droplets, Ice Crystals).; design, building operation of a new research facility for icing.

LTA – Lighter Than Air stratospheric platform for Earth Observation, Telecommunications, Crises Management, Dual Applications (e.g. border security).

INDUSTRY 4.0 – Production process innovation for Aviation and Space applications; a special focus on Additive Manufacturing design, testing, qualification and certification.

BIO-SPACE – Life Support systems and Bio-regeneration systems design and testing; analysis and characterization of vegetal species for bio-indication in specific environmental conditions and presence of pathogenic substances.

SPACE – Access to Space and Exploration (e.g. Launchers, Space Rider), Earth Observation (mini/micro satellites).

ENTRY/DESCENT & LANDING – Design, validation, demonstration and qualification for planetary re-entry systems including landing.

MARS – Design, building, operation of a unique facility for testing and qualifying technologies and systems for Mars exploration, including bio-regeneration modules for extreme environmental conditions.

www.cira.it

CSEM
SWITZERLAND

CSEM is a private, non-profit research and technology organization and a Swiss innovation accelerator—a catalyst for the transfer of technologies and know-how from fundamental research to industry.

It was created in 1984 when three Neuchâtel institutions active in the field of micro technology — the Centre Electronique Horloger (CEH), the Fondation Suisse pour la Recherche en Microtechnique (FSRM), and the Laboratoire Suisse de Recherches Horlogères (LSRH) — merged, with the support of the Swiss Federal Council, to become CSEM. Besides the confederation and the Canton of Neuchâtel, many well-known Swiss companies supported the new R&D centre from the outset, most becoming shareholders and maintaining links with CSEM as it developed further.

Mission / objectives

CSEM delivers unique advanced technologies to the industrial sector, thereby reinforcing the sector's competitive advantage. Supported by federal and cantonal authorities CSEM bridges the gap between academic findings and industrial requirements. Specifically, CSEM develops, integrates, and matures innovative technologies and transfers them to established industrial partners. Its support to industry ranges from feasibility studies through custom product-development based on advanced technologies, to small-series production. CSEM also facilitates new entrepreneurs' access to its technology platforms, encouraging them in the creation of start-ups.

CSEM customers operate in established markets including medtech, industrial control (including the machine tools industry), watchmaking, aerospace, and space, as well as in emerging markets such as cleantech (including energy production and management) and environmental monitoring. CSEM does not undertake research in one specific direction alone. Rather, its technology platforms can be applied to almost any market.

Locations

CSEM is headquartered in Neuchâtel and has four regional centres in Zurich, Muttenz, Alpnach, and Landquart. Internationally, CSEM has an innovation centre in Brazil.

Programmes / Activities

CSEM's research strategy is built around five strategic programmes:

MICROSYSTEMS TECHNOLOG

Design, integration, and packaging of devices that sense and monitor our environment and aspects of our daily lives, exploring new frontiers at the interface of nanotechnologies, materials science, and biotechnologies and delivering enhanced performance, miniaturization, and new properties.

SYSTEMS ENGINEERING

An application-oriented interdisciplinary programme with a special emphasis on system integration, systems engineering aggregates different components and subsystems designed to collaborate and deliver targeted functionality, taking into consideration resource limitations (in terms of processing and power consumption), reliability, production cost, maintenance, and environmental conditions.

ULTRA-LOW-POWER INTEGRATED SYSTEMS

A strong focus on analogue and mixed IC design as well as wireless communication and vision technologies, the key technologies required to build very-low-power, wirelessly interconnected, embedded smart systems or remote sensing nodes.

SURFACE ENGINEERING

Focuses both on the novel properties of engineered surfaces and interfaces, to deliver breakthrough surface effects, and on their "up compatible" manufacturing processes, to bridge the gap to industrial applications.

PHOTOVOLTAIC & ENERGY MANAGEMENT

Development, covering the full chain from prospective PV cell and module technologies through fully integrated energy systems, where energy efficiency and management is delivered by intelligent hardware and algorithms.

CSEM multi-disciplinary programmes are applied to aerospace and aviation in many different ways.
The most important activities in aerospace are:

- Integrated, autonomous wireless sensor networks powered with energy-harvesting devices to perform health monitoring on aircraft structures.
- Development of flexible, high-performance solar panels to be integrated in aircraft wings.
- Flight testing measurements of pressure distribution and airflow on aircraft wings with pressure sensor strip and pressure sensing paint technologies.
- Anti-icing, anti-fouling and anti-contamination coatings.
- Development of printed and/or coated heating foil for aircraft windshield.
- Development of high-performance MEMS and miniaturized sensors to measure different aircraft parameters (e.g. 6 DoF nano accelerometers, MEMS gyroscopes, linear encoders, and absolute encoders).
- Development of miniaturised LIDAR for UAVs.
- Non-destructive inspection and testing of aeronautics structures using phase contrast X-ray imaging.
- Energy harvesting devices based on photovoltaic cells.
- Characterization of the slat's boundary layer during flight.
- Calculation of wing deformation during flight.

DLR
GERMANY

DLR is the national aeronautics and space research centre of the Federal Republic of Germany.

In addition to its own research, as Germany's space agency, DLR has been given responsibility by the federal government for the planning and implementation of the German space programme. DLR is also the umbrella organisation for the nation's largest project management agency.

The oldest predecessor organisation of DLR was founded 1907 in Göttingen, which was the Aerodynamic Test Establishment (Aerodynamische Versuchs Anstalt, AVA). In 1969 several German aerospace research establishments were integrated into one organisation. Through the fusion with the German Space Agency in 1997, the organisation was finally called German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt, DLR).

Mission / Objectives

The primary objective of DLR's aerospace research activity is to fulfil governmental and societal needs and to enhance Germany's and Europe's aerospace industries competitiveness. DLR performs fundamental and applied aerospace research and development by:

- Further development of civilian transport systems from the perspectives of efficiency/economy, safety and environmental compatibility
- Technological contributions towards assuring the capability profile of the German armed forces

The DLR aeronautics programme is in line with the major strategic challenges:

- Orientation with the European strategic research and innovation agenda for civil aviation
- Research into the complete air transport system and all its major components
- Carrying out specific defence-related research work, making greatest possible use of synergies with civilian themes
- Strategic co-operation with the most important German and European partners from research and industry

Location

DLR has 38 institutes and facilities at 20 locations in Germany: Cologne (headquarters), Augsburg, Berlin, Bonn, Braunschweig, Bremen, Bremerhaven, Dresden, Goettingen, Hamburg, Jena, Juelich, Lampoldshausen, Neustrelitz, Oberpfaffenhofen, Oldenburg, Stade, Stuttgart, Trauen and Weilheim, as well as offices in Brussels, Paris, Washington D.C. and Tokyo.

Programmes / Activities

Besides Aeronautics, DLR performs research programmes in Space, Transport, Energy and Security. The aeronautics program is described below as being the most relevant with respect to EREA activities.

The DLR Aeronautics research is focused on:

- Raising the Economic Efficiency of the Air Transport System
- Raising the Economic Efficiency in Development and Operations
- Reducing Aircraft Noise and Harmful Emissions
- Raising appeal of Passenger Aircraft
- Raising Safety Levels

The activities are organised in four research topics:

FIXED-WING AIRCRAFT RESEARCH

The research topic Fixed-Wing Aircraft concerns research in methods and tools for development, design, validation and evaluation in the field of transport aircraft. It consists of the following sub-topics:

- Flight Physics
- Structures and Materials
- Systems and Cabin
- Concepts and Integration
- Simulation and Validation
- Military Technologies
- Laser Research and Technology

Under the DLR/ONERA partnership agreement on transport aircraft research so-called Common Research Projects have been established to partly harmonize the research programs of both establishments.

ROTORCRAFT RESEARCH

The Rotorcraft research is based on the DLR/ONERA partnership agreement established in 1998. Following the needs and requirements of official and industrial customers in Germany and France, the activities are currently concentrated in five Research Fields, including all DLR, ONERA and joint DLR/ONERA rotorcraft related tasks and projects:

- The Virtual Aerodynamic Rotorcraft
- The Quiet and Comfortable Rotorcraft
- The Smart Rotorcraft
- The Robust Rotorcraft
- The Innovative Rotorcraft

ENGINE RESEARCH

This research topic covers all DLR activities with respect to environmentally friendly and efficient engines with high specific performance for civil and military aircraft. In particular:

- Compressor Technology
- Combustion Chamber Technology
- Turbine Technology
- Virtual Engine and Validation Methods

ATM AND OPERATION

The future development of air traffic will be highly affected by the optimization of the overall traffic flow in particular close to airports and in terminal areas. Related DLR activities are concentrated in the following sub-topics:

- Efficient Flight Guidance
- Human Factors and Safety in Aviation
- Climate, Weather and Environment
- Communication, Navigation and Surveillance
- Air Transport Concepts and Operation

FOI
SWEDEN

The Swedish Defence Research Agency FOI is one of Europe's leading research institutes in the areas of defence and security.

In 2001, two of Sweden's pioneering scientific organisations, the Aeronautical Research Institute, FFA, and the Defence Research Establishment, FOA, were successfully merged to create FOI, the country's premier innovative force in defence and security research. With its 870 employees, FOI excels not only in multidisciplinary and advanced technologies, but reflects the dynamism of the knowledge society and corporate responsibility that are hallmarks of Swedish inventiveness. FOI is organised so that the comprehensive needs of whole country defence are served by a focused suite of expertise. Led by its Board and a Director General, FOI has an Administrative and Technical Support Division, as well as four Research Divisions, each with its specific perspective on defence and security research: Defence Analysis; Defence & Security, Systems and Technology; CBRN Defence and Security; and C4ISR.

Mission / Objectives

FOI's core activities span a full spectrum of issues related to the defence and security sectors. As an assignment-based authority under the Ministry of Defence, FOI has deep experience in providing sustainable solutions, not only to support and collaborate with the Armed Forces and the Swedish Defence Material Administration, its main customers, but to carry out assignments from civil authorities and industry. Success in this complex mission requires diversity and depth, which FOI addresses by selecting from its portfolio of key competencies and integrative approaches. FOI achieves this by relying on its most valuable asset, its experts and scientists. Whether through such diverse fields of application as security policy studies and analyses of defence and security issues, underwater systems, explosives, systems for crisis leadership and management, protection against and management of hazardous substances, IT security and the opportunities provided by new sensors, FOI is a dedicated and reliable partner in contributing to an innovative, safe and secure society.

Location

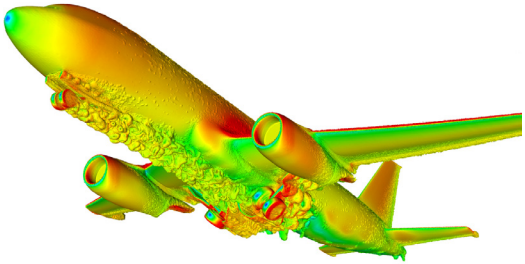
FOI's headquarters, where it also maintains its greatest concentration of aeronautics-related research, are in Kista, Stockholm. It also has major facilities in Grindsjön, just south of Stockholm, and in Linköping and Umeå.

Programmes / Activities

Aeronautics-related research can be found in most of FOI's Research Divisions, but with focus in two Departments; The Aeronautics and Autonomous Systems and the Systems Technology Department. Advanced training of Gripen pilots is another FOI core area with the operation of the Swedish Air Force Combat Simulation Centre (FLSC). The Aeronautics and Autonomous Systems department upholds basic disciplines such as aerodynamics, structures and signatures. Research is based on numerical simulations with decades of experience in advanced methodology. The System Technology department maintains and develop the simulation models used in FLSC, but also provides research on new methods and models for system-of-system effectiveness.

FOI maintains and builds aeronautical competence within the following groups:

AERODYNAMICS – Conceptual design and performance assessment of manned and unmanned vehicles including weapon and missiles provides aero data for simulation models. A range of numerical in-house tools, from basic panel methods to state-of-the-art CFD software including meshing are maintained to the highest standard. Incorporating unique capability for flow control, aero-elasticity, store separation, propulsion integration and countermeasure aerodynamics.



STRUCTURES AND MATERIALS – Large-scale structural design and analysis of aircraft to predict static strength, fatigue life and damage tolerance of real aircraft structures made from both metallic and composite materials. A variety of commercial and in-house numerical tools. Crack growth and failure analysis with experience of accident investigations of aircraft and industrial applications.

SIGNATURES – Multidisciplinary RCS and IR signature predictions for detection and (NCTI) identification using in-house and commercial software for full scale analysis including specular and diffuse reflections, cavities and RAM/RAS material characterization and with background modelling.

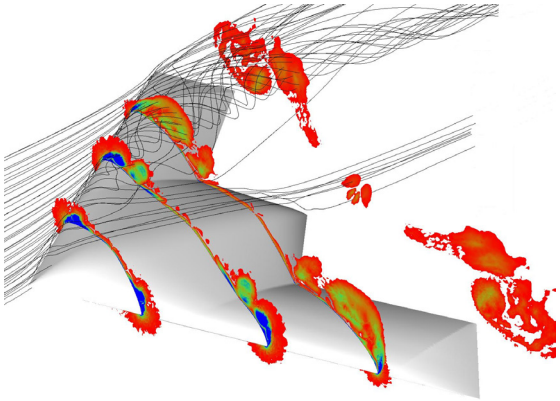
FLIGHT DYNAMICS – Stability, control and non-linear concepts from fighter jets, including pilot input, down to fine calibre munitions. With unconventional actuation using MEMS, plasma, micro-jets or morphing. Mission planning and combat performance metrics.

ENVIRONMENTAL IMPACT – Emission estimation of both commercial and military air transport including ATM using statistical or database methods. Provide knowledge of regulations both on national and international levels.

COMBAT ANALYSIS AND ASSESSMENT – Evaluation of weapon systems at combat and tactical level for land, naval and air/space domain using computer based simulation framework. Aggregation of multiple levels system-of-systems for scenario evaluation and materiel acquisition purposes.

GUIDED WEAPONS – Uphold expertise in guidance, navigation and control of autonomous and unmanned systems. Means of delivery for weapons, damage tolerance and vulnerability of warheads and propulsion techniques with models of varying fidelity.

SIMULATION TOOL DEVELOPMENT – Modelling, software architecture and development of real time simulation systems for FLSC as well as planning and mission tools for pilots. Tactical behaviour modelling of CGF for training and evaluation.



SPACE FOR DEFENCE & SECURITY – Provides and builds knowledge within orbital mechanics, satellite technology with insight into the military possibilities and practical use for space technology, global growth and trends in the space sector including global security, political and policy developments. Responsibilities of arms control issues in space.

SENSORS AND EW SYSTEMS – Evaluate, demonstrate and develop new or increased sensor capability in the fields of radar, IR and optics with advanced image and signal processing including data fusion and counter measure.

The Institute of Aviation, ILOT, is the Polish research and development establishment subordinate of the Ministry of Economic Development. The institute is an independent legal body; it owns its assets and has full legal capacity and power to act.

The Institute of Aviation is one of the oldest research establishments in Europe, officially founded in 1926. For over 90 years of its activity, the scientists and engineers employed in the Institute of Aviation have contributed remarkably to the development of Polish economy and defence. Before the Second World War, all Polish aircraft were constructed or tested in the Institute of Aviation. Since the end of the 1990s, ILOT has developed into a major centre of new technologies. It offers services to clients and strategic partners of the biggest aviation consortia.

The Institute of Aviation employs 2200 engineers, scientists and researchers, among who are 10 professors and 60 PhDs. It owns 30 laboratories located in 5 different research centres.

The main fields of the Institute's activity are space technologies, aero and missile engines, materials technology, aerodynamics, composite technologies, design and testing of aircraft constructions, near-field noise and energy conversion.

ILOT as an independent entity is able to flexibly adjust to the requirements of the international research market. More than 75% of the research executed by ILOT is performed for partners from the USA, Canada, Spain, UK, Germany, Italy and France.

The Institute comprises of 6 research centres:

- Center of New Technologies
- Materials and Structures Research Center
- Center of Space Technologies
- Center for Composite Technologies
- Transportation and Energy Conversion Center
- Engineering Design Center (EDC)
-

Since 2000, the Institute of Aviation has been a strategic partner of General Electric. Engineering Design Center (EDC) was established on the basis of agreement between General Electric and ILOT. Engineers from both companies work on engineering projects for science and industry.

Mission / Objectives

The mission of the Institute of Aviation is creating innovative technologies in aerospace and providing services in the international research market. The strategy of ILOT is based on the active participation in diverse European and world priority themes. ILOT is determined to achieve the strategic objectives of:

- becoming one of the leading aeronautical research centres in the world,
- increasing its competitiveness in the global research market.

The Institute of Aviation expands its research onto all aspects of the aviation sector. It promotes and implements research results and conducts education activities through cooperation with organisations and institutions worldwide.

Location

ILOT is located in Warsaw, Poland.

Programmes / Activities

ILOT receives funds from the Ministry and several national research funding institutions in forms of grants which are assigned in competition. These funds cover its statutory research, development of technology demonstrators, scientific promotion of the employees, investments, development of research infrastructure and works commissioned by the industry.

The Institute of Aviation also actively participates in numerous European and overseas projects and programmes. ILOT has taken part in the projects within the EU framework programmes – 5th, 6th, 7th FP, Horizon 2020, Clean Sky, SESAR and EUREKA as well as projects for ESA, EDA and the US agencies.

The Institute has been carrying out commercial works for the aviation industry leaders such as: General Electric, Boeing, and Airbus.

The research done by the Institute of Aviation covers, among others, the following areas:

- security research in General Aviation
- research and design of rocket motors
- hydrogen peroxide processing
- combustion engine testing
- aircraft noise measurement
- non-destructive tests
- strength dynamic tests
- complex stress fatigue and static tests and assessments
- aerodynamic tests
- construction of prototypes and demonstrators
- composites research and testing
- new generation vehicle
- energy efficiency of transport
- conversion of renewable energy
- conversion and accumulation of energy in aircrafts and buildings

The Institute of Aviation is a member of the domestic and international research organizations. The researchers of the Institute of Aviation are active members in ACARE, AERONET – Aviation Valley Project, AIAA, CEAS, EASN, IAA, ICAS and many others.

The Institute of Aviation organizes international conferences, symposia and is a moderator in the global research incentives.

ILOT is a partner of numerous universities, research institutes, research centres and industrial labs in Europe, the United States, Asia and Africa.

INCAS
ROMANIA

INCAS - National Institute for Aerospace Research "Elie Carafoli" is the leading research establishment in aerospace sciences in Romania, with more than 60 years tradition in aerospace engineering, flow physics and applied aerodynamics, using state-of-the-art technologies and unique infrastructure of national strategic importance.

Since 1950, when the Applied Mechanics Institute of the Romanian Academy was established, aerospace research was carried out under different names and structures. Finally, after reorganisation in aerospace research and aeronautical industry, a new organisation was created, INCAS, as the only research institute in Romania specialized in aerospace activities.

The National Institute for Aerospace Research "ELIE CARAFOLI" - INCAS of Romania is active under this name since 1991, according to the certificate of registration at the Chamber of Commerce and Industry of Bucharest.

Mission / Objectives

INCAS is a comprehensive research establishment, fulfilling a national and international role in providing world class capabilities across the whole spectrum of basic and applied research in aerospace sciences, industrial support and specialized expertise. INCAS performs this mission in an integrated environment with industry and academia, and supported by higher education training in areas reflective of the Institute's mission. It aims to achieve this in an innovative, responsive, caring and flexible working environment with state-of-the-art facilities and the most advanced technology available.

It is committed to providing access to state-of-the-art technologies for the worldwide aerospace industrial community, universities and academia, and to achieving quality and excellence in all aspects of its work.

This commitment extends to the provision of basic and applied research, development and consultancy services for industry and society, with due regard to the technological, commercial, social and cultural needs of the community it serves.

INCAS has been involved in all major national aeronautical projects for civil and military areas, and currently is acting as a major player in EU policy for R&D development under Flightpath 2050 vision and future Horizon 2020 programme.

Location

Headquarter of National Institute for Aerospace Research - INCAS - is located in Bucharest, Romania.

INCAS Experimental Base for Atmospheric Research is located in Strejnic, Prohova County and a new Space related facility is under development in Maneciu, Prahova County.

Programme / Activities

INCAS' EXPERTISE IN AERONAUTICS INCLUDES:

- Main design authority and system integrator
- Aerodynamic design
- Experimental wind tunnel validation
- Global performance analysis
- Structural design and analysis
- New materials and technologies in aeronautics.

INCAS KEY RESEARCH FACILITIES:

- Subsonic Wind tunnel
- Tri-sonic wind tunnel
- ATMOSLAB – Airborne laboratory based on Hawker Beechcraft King Air C90-GTx aircraft
- Experimental Base for atmospheric research
- AERO-VR - Virtual Reality Laboratory for Aerospace Systems Design

INCAS performs efficient research and development activities with industrial applicability in different aircraft, helicopter and rocket development programmes. In upgrade programmes INCAS provides the testing equipment and conducts the performance testing.

Participation of INCAS in European projects started in FP5 with relative limited involvement continuing to increase its international visibility in FP6 by involvement in several projects: CESAR, UFAST, AVERT and then in FP7 with projects like: ESPOSA, HAIC, AFLoNext, ATLLAS-2, BEAWARE, CAPPADOCIA.

INCAS is participating in Clean Sky, SFWA – Smart Fixed Wing Aircraft as an associate member in a consortium formed out of two research centres in Romania, INCAS and STRAERO and two industrial partners, Romaero and Avioane Craiova. The participation in the JTI is highly supported by Romanian authorities and is considered as a major step towards integrating R&D and industrial capabilities at EU level in aeronautics. INCAS is continuing its participation in Clean Sky 2 with RoRcraft project in a consortium with Romaero.

In Horizon 2020, INCAS is participating with projects such as: Future Sky Safety, SMILE, PERSEUS.

INCAS is also an important player in the space sector, mostly sustained by its involvement in several ESA projects related to launchers or Vertical Take-Off Vertical Landing Vehicles such as: Phase 0/A Micro launcher Feasibility and Demonstrator for Technologies Validations (DTV). Deorbitation Design to Demise – Aero-thermo-dynamic aspects (D4D - ATD) is a project where in-house codes will be developed for research related to the demise of a typical launch vehicle upper stage.

Demise Orbitation Capsule (DOC) and Space Rider are two projects related to a re-entry black-box and a re-entry vehicle. When it comes to deep-space missions, INCAS is in charge with the design of several attitude control thrusters' brackets in the Euclid project. All these projects are coordinated under the LASVEC project that has been awarded to INCAS by the Romanian Space Agency.

INTA
SPAIN

The Instituto Nacional de Técnica Aeroespacial or National Institute of Aerospace Technology in Spain, INTA, is a public research establishment specialized in research and aerospace technological development. It is an organization attached to the Spanish Ministry of Defence through the State Secretariat for Defence. INTA is an independent legal body with own assets and financing, managing independence and full legal capacity and power to act.

INTA was founded in 1942. At that time, the primary functions of the institute were for technical support to aeronautical services and authorities, and technical assistance to the aeronautical Industry. Such tasks are still being performed, in addition to many others mainly related to our projection into other countries, especially within Europe.

The integration into INTA, in 2014, of "La Marañosa" Institute of Technology, El Pardo Model Basin and "General Marvá" Laboratory of the Army Engineers represents the beginning of a new institutional era where four different but complementary trajectories and experiences have come together to end up constituting a technology organism, attached to the Ministry of Defence, that positions Spain at the forefront of knowledge in aeronautics, space, ground and naval technologies for civil and military use.

Mission / Objectives

INTA's most relevant goal is to obtain, preserve and increase the level of technology to be applied in the aerospace sector.

INTA contributes to defining objectives, programmes and projects related to aeronautics and space, ground and naval science, providing technical support, assessment and services to official bodies and agencies, and also to industrial or technological companies.

INTA performs co-operation and research tasks for the Spanish Ministry of Defence, and research and development for the aeronautical industry within and outside Spain.

Location

The INTA main campus is located close to Torrejon de Ardoz, about 20 km from Madrid. Other facilities are spread throughout the rest of the country, namely, San Martín de la Vega, El Pardo (Madrid), Robledo de Chavela, Villafranca del Castillo, El Arenosillo (Huelva), Granada and Maspalomas (Canary Islands).

Programmes / Activities

The current programmes most closely related to aeronautical research and development are:

- UAVs: For many years INTA has carried out an extensive research programme in order to develop the technologies required for the design and construction of a range of unmanned aircraft:
- SIVA: Medium tactical UAV for surveillance and reconnaissance missions.
- ALO: Small tactical UAV for surveillance and reconnaissance missions.
- MILANO: Medium Altitude Long Endurance UAV.
- DIANA: High speed target drone.
- RPAs research and development infrastructures: INTA has two technological centres, located in Rozas (Lugo) and Mazagón (Huelva), unique in Europe, to support the development of flight tests, integration and certification of different types of aircrafts, including remoted piloted aircraft systems (RPAs).
- Fluid dynamics: Development and application of numerical tools; aerodynamic analysis and design.
- Turbojet engine testing: Upgrading and optimization of turbojet engine testing facility.
- Experimental aerodynamics: Low and high speed wind tunnels.
- Structural testing: Structural and fatigue tests on various parts of many different aircraft models.
- Structures and mechanisms area: Design and analysis of different aeronautical structures.
- Aircraft certification: INTA is the technical body for aircraft certification of the Ministry of Defence, acting on behalf of the Airworthiness Military Authority. INTA issues certification for military aircraft which are built in Spain. In programmes such as EF2000, A400M, NH90 helicopter, Tiger helicopter; INTA also participates in certification and qualification of air tankers FRTT for the RAAF, UK and Arabia.

NLR
NETHERLANDS

NLR-Netherlands Aerospace Centre, founded in 1919, is an independent aerospace knowledge enterprise. Our mission is to make air transport and space utilisation safer, more sustainable, more efficient and effective.

Mission / Objectives

The innovative solutions and practical advice aim at reinforcing industrial competitiveness and contribute to solving societal challenges. NLR's multidisciplinary approach focuses on developing new and cost effective technologies for aviation and space, embracing everything from design support to production technology and MRO (Maintenance, Repair and Overhaul). With its unique expertise and state of the art facilities, NLR bridges the gap between research and application.

NLR covers the entire spectrum of Research, Development, Testing & Evaluation, including all the essential phases in research, from validation, verification and qualification to evaluation. NLR's work contributes to the innovative and competitive strength of government and industry, in the Netherlands and Europe.

NLR in Europe

As one of Europe's leading research establishments, NLR is a major player in European research programmes. NLR is intensively involved in European Framework Programmes and in programmes such as SESAR and Clean Sky. The applied knowledge that NLR contributes to these programmes reinforces innovative strength and the attainment of the sustainability targets of European governments and industry.

Location

NLR has approximately 650 employees working at offices in Amsterdam and in Marknesse, in Flevoland province. The company posts annual turnover of approximately 75 million euro.

Programmes / Activities

Dedicated to innovation in aerospace

NLR's aerospace competences are clustered in the market segments of Civil Aviation, Industry, Defence and Space.

CIVIL AVIATION

Civil Aviation addresses the challenge to help the stakeholders of aviation to innovate their systems and operations. NLR helps increasing capacity of European airports and airspace, developing new concepts for Air Traffic Management, improving safety of aircraft operations and reducing operational costs and environmental impact. NLR helps government and industry to address challenges that involve emissions, training, human factors, community engagement and aviation noise issues in general. In the SESAR programme, together with DLR in AT-One, NLR is a key player in fulfilling the European ATM master plan, aimed at modernizing the European ATM system.

INDUSTRY

NLR assists the aviation and defence industry in the fields of aerodynamics, aeroacoustics, aeroelasticity, structural design, production automation, avionics design and man-machine interfaces and MRO. NLR is engaged in all phases of aircraft and aircraft component development and use, spanning the full spectrum of RDT&E (Research, Development, Test & Evaluation). This includes all key research stages, from validation, verification and qualification to evaluation. NLR provides assistance in major topics such as additive manufacturing, composites, structural health monitoring and avionics. NLR is involved in the development of large defence programmes as well, such as F-35 and NH90. The knowledge and experience gained in national and international programmes can be applied to the defence programmes of the European defence industry.

DEFENCE

For the defence segment, NLR addresses the technical and operational support for the safe and effective deployment of air defence platforms, technical support for the acquisition of new weapon and threat systems and the safe operations of army in international peacekeeping missions. It also supports the lifecycle management of aerospace related weapon systems, and the definition and implementation of military aviation standards.

SPACE

The space segment concentrates on the development of the European space infrastructure and its usage. It supports satellite, launcher or payload system engineering, thermal control, and testing and verification. NLR-space also works on the technical infrastructure for applications for earth observation, navigation, and communication. A good example is the complex thermal control system that NLR developed for a scientific instrument installed on International Space Station (ISS) to search for antimatter and dark matter.

ONERA
FRANCE

ONERA, the French aerospace lab, is a public establishment (EPIC) reporting to the French Ministry of Defence. ONERA has an independent legal personality, its own assets, financing and managing independence, and full legal capacity and power to act.

The "Centre Aéronautique de Meudon" was born in 1794 and the first aerostats were designed, manufactured and flown from there (1877). In 1935, the Grande Soufflerie de Meudon (S1Ch) was built as the largest wind tunnel in the world. The Office National d'Etudes et de Recherches Aéronautiques (ONERA) was founded in 1946 and later renamed in "Office National d'Etudes et de Recherches Aérospatiales". ONERA is a true pioneer in aeronautics and space studies and their applications.

Mission / Objectives

ONERA is acting as the bridge between basic research and technology applications, creating innovative solutions that enhance industry's competitiveness and meet the major challenges facing the society: environmental protection, safety, security, sovereignty.

The key missions are:

- Direct and conduct aerospace research, as described in particular in the Defence and Security White Book and the Civil Aeronautics Research Council (CORAC) requirements,
- Build and operate test facilities and the associated processing systems,
- Transfer results to companies in France and Europe,
- Provide top quality services and expert analysis for industry and government agencies,
- Train new researchers and engineers, and
- Develop pan-European aerospace research.

The core activity is "application-oriented" research for the French government and the aerospace industry and the scope of business encompasses:

- Civil and military aircraft,
- Helicopters rotorcraft,
- Propulsion,
- Orbital systems,
- Space transport,
- Missiles, defence & security systems,
- Aerospace systems.

ONERA services span Technology Readiness Levels (TRL) 2 to 6, where the transition from research to industry is most demanding.

Location

ONERA is having its principal place of business at Chemin de la Hunière - BP 80100 - 91123 Palaiseau Cedex – France. Other locations are in France (Châtillon, Le Fauga-Mauzac, Lille, Meudon, Modane-Avrieux, Salon-de-Provence, Toulouse), and an office in Brussels (CLORA).

Programmes / Activities

ONERA's fields of activity are focussed on

- Industry competitiveness
- Environment and society
- Defence and security
- Enhancing knowledge

Experts are involved in many major aerospace programmes like Airbus jetliners, Dassault aircraft, European launch vehicles, Graves space surveillance system (operated by the French Air Force) and Nostradamus over-the-horizon radar, Scramjets, Innovative very-high temperature alloys for turbine blades and disks, Very Large Telescope (VLT) in Chile, High-resolution infrared measurement instruments.

ONERA has been for many years a major participant in the European Framework Programmes. ONERA is one of the major Core Partners or Partners of Clean Sky 2 Joint Technology Initiative (JTI) through its participation up to now in three Integrated Technology Demonstrators (Airframe, Engines and Systems ITDs) and two Innovative Aircraft Demonstrator Platforms (Large Passenger Aircraft and Regional Aircraft IADPs).

Among innovative programmes, platforms & projects are:

ROTORCRAFT: Over 30 years of intense research on rotors, European rotorcraft now sets the best standard for noise and vibrations. ONERA scientists provided industry with innovative airfoils and blade shapes thanks to its powerful design tools to drive the competitive advantage as recently illustrated by the low noise Blue Edge™ Blade technology now used on the H160 helicopter from Airbus Helicopters.

FUTURE COMBAT AIR SYSTEM (FCAS): ONERA benefits from its experience in pan-European demonstrator nEUROn. ONERA is directly involved in FCAS program both as breakthrough technology provider to industry (stealth, engine materials, flight dynamics and decision making) and governmental expert reporting to the French Ministry of Defence. To contribute to the definition of future combat aviation, ONERA can also rely on the **BLADE (Battle Lab for Aerospace and Defence Experimentation)** simulation tool, which assesses defence systems in an environment representative of operational situation.

SETHI: the new-generation airborne imaging system with radar and optronic sensors for aerial views of earth, preparation of satellite missions and security applications.

IESTA: Infrastructure for evaluating future concepts for air transport systems, combining all aeronautical skills of ONERA (platform, noise, emissions, engines….) and its know-how in terms of system evaluation and simulation architecture.

LABSIM (LABORATOIRE DE SIMULATION): is designed to support human-system interaction in helicopter operations research studies in order to reveal innovative interaction concepts, prototype & evaluate them in piloted simulation.

PHYWAKE, PHYSAFE, PHYLIGHT, PHYSICE: research programmes funded by DGAC (Directorate General for Civil Aviation) to deal with the complexity of the phenomena related to the environment of aircraft: **PHYWAKE** on wake vortices, **PHYSAFE** on crashes, **PHYLIGHT** on lighting, **PHYSICE** & **PHYSICES2** on the modelling of physical phenomena related to icing.

NOVA: Foreshadowing the evolution of a medium-haul aircraft in 2025, the four configurations of the Carnot NOVA Project **(Next ONERA Versatile Aircraft)** incorporated many innovations, such as a wide fuselage, downward winglets or engines ingesting fuselage boundary layers. Within this project ONERA aims to remove technical obstacles for the installation of engines with high dilution rates, which are economical but bulky.

AMPERE: project dedicated to increase maturity of Distributed Electric Propulsion for small business aircraft: Based on its expertise in all disciplines of aviation design, ONERA performed exploratory studies to investigate potential new technologies and concepts around electric propulsion integration for aircraft.

www.onera.fr

The Central AeroHydrodynamic Institute named after Professor N.E.Zhukovsky (TsAGI) was founded on December 1, 1918. TsAGI is Russia's National State Research Center in aeronautics.

Today, TsAGI has more than 4.400 employees. Its wide range of test facilities includes more than 60 wind tunnels to simulate flight conditions at speeds ranging from 10 m/s up to Mach 20.

Mission / Objectives

TsAGI's mission is to secure Russia's leadership in aeronautics, to guarantee national security and the competitiveness of the Russian aviation industry. To accomplish this mission TsAGI is involved in strategic planning and the development of Russian R&D programmes in aeronautics.

Location

TsAGI is located in the city of Zhukovsky 40 km southeast from Moscow.

Programmes / Activities

TsAGI's activities are focused on but not limited to aeronautics and include:

AERODYNAMICS

All aircraft developed in Russia undergo tests in TsAGI wind tunnels. In addition to conventional aircraft configurations the Institute also conducts research into new aircraft concepts. TsAGI's new innovative projects include cryogenic fuel aircraft, laminar flow control, forward swept wing, deep integration of power plant and airframe, «blended» and «flying» wing concepts, etc.

FLIGHT DYNAMICS & CONTROL SYSTEMS

Flight dynamics and control systems have always been a priority for TsAGI. The Institute has introduced advanced flight simulators and control system simulators for solving tasks involving dynamics of manoeuvrable and passenger aircraft. Simulators developed by TsAGI played a major role in creating control systems for Russian military and civil aircraft with a strong focus on flight safety.

STRUCTURES

TsAGI provides the scientific acumen in developing and improving regulatory documents regulating the safe operation of aircraft with respect to static, dynamic and thermal strength, life and reliability, loads, aeroelasticity and shimmy. The Institute conducts fundamental and applied research in these areas.

HYDRODYNAMICS

Hydrodynamics is a scientific field which has been studied at TsAGI since its foundation. TsAGI's primary hydrodynamics research task is to make recommendations for safe aircraft water landing. Also, an object's underwater high velocity motion with strong cavitation is an important part of TsAGI's research. The hydro test facilities include a water channel, high speed water test bench, a water shock hydro acoustic tank, etc.

AEROACOUSTICS

TsAGI researchers work to ensure the compliance of Russian aircraft with ICAO noise standards and to enhance the efficiency of cabin and cockpit sound proofing and sound absorption. Aeroacoustics covers theoretical and experimental investigations on aircraft noise generation and propagation, and the development of noise reducing methods.

AEROSPACE RESEARCH

TsAGI specialists comprehensively resolve problems of thermodynamics, dynamics and control, strength and acoustics, and rocket-spacecraft power plants. The research covers all phases of flight: ascent, re-entry of detachable sections, orbital manoeuvres and interplanetary flights, re-entry, automatic landing, etc.

INDUSTRIAL AERODYNAMICS

TsAGI has modern methods and software to design wind power plants and to test full scale models in wind tunnels, and has experience in conducting aerodynamic and strength tests of propeller and vertical-axis turbines. TsAGI also studies wind loads on high buildings and bridges. In its wind tunnels the Institute performs tests to find optimal shapes for trains. The Institute is a recognized expert in the design of industrial fans and compressors, as well as ventilation systems.

MEASUREMENTS AND METROLOGY

The Institute has developed its own unique tools and measurement systems. TsAGI has built various types of multi-component strain gauge balances. These balances make it possible to measure with high accuracy aerodynamic loads in a wide range of flow speeds (up to Mach 20), under high temperatures and for short test durations. TsAGI is also a pioneer in non-contact optical measurement methods.

MODELS AND EQUIPMENT MANUFACTURING

An important activity at TsAGI is the design and manufacturing of aerodynamic models (including those made of composite materials), strain gauge balances and non-standard equipment.

The dimensions of models produced by TsAGI range from a few centimetres up to 12 meters. TsAGI has a full range of equipment needed for the manufacturing of models. In addition, research is carried out on improving model design techniques and production technologies.

MULTIDISCIPLINARY STUDIES

TsAGI has considerable experience in the concept design of both civil and military aircraft and in the development of software for automated multidisciplinary design and its application to define configurations and basic parameters. TsAGI also conducts system studies for future development of civil and military aviation.

INTERNATIONAL COOPERATION

TsAGI is cooperating with more than 50 leading aerospace companies, research institutions and universities from Europe, Americas and Asia, as well as with dozens of organizations from CIS-countries. An important part of TsAGI's international cooperation is the participation in the EU Framework Programmes.

www.tsagi.com

The Von Karman Institute for Fluid Dynamics, VKI, is an International no-for-profit Association (INPA) incorporated under Belgian Law as an independent legal person.

The VKI was founded under the name of TCEA (Training Center for Experimental Aerodynamics) in 1956, under the auspices of the Advisory Group for Aeronautical Research and Development (AGARD) of NATO by the action of Professor Theodore von Karman, in his position as chairman of AGARD. He proposed the establishment of an institution devoted to training and research in aerodynamics which would be open to young engineers and scientists of the NATO nations. It was strongly felt that this form of international undertaking would fulfil the important objective of fostering fruitful exchanges and understanding between the participating nations in a well-defined technical field, and the Belgian Government agreed to host the projected new centre in its Aeronautical Laboratory in Rhode-Saint-Genèse, bearing in mind the existing facilities. Negotiations between the governments of the USA and of Belgium resulted in a formal agreement between the two governments, reached in Belgium in September 1956 and signed officially in Paris on December 15, 1956. Later the support of the Institute was shared, with different contributions, between a larger numbers of NATO countries Theodore von Karman acted as the Institute's Chairman until his death in 1963. It was then that the name of the organisation was changed in memory of its founder.

Mission / Objectives

VKIs mission, as defined by its statutes, is:

- to promote the training of scientists and engineers from the NATO countries in the field of fluid dynamics; The Research Master in Fluid Dynamics (master after master level) received the NVAO accreditation. NVAO ensures the quality of educational programmes following the Bologna agreement for higher education in Europe.
- to contribute to the dissemination of knowledge in the field of fluid dynamics;
- to undertake, to instigate and promote studies and research in the field of theoretical, numerical and experimental fluid dynamics.

Scientists and engineers coming from other non-NATO countries, in accordance with the policy of NATO, can be authorized by the Board of Directors to participate in the activities of the Institute.

The missions of the institute are fulfilled by:

- Running training programmes for scientists and engineers at undergraduate, post-graduate, after-master, doctoral and post-doctoral levels.
- Organising and hosting continuing education programmes like Lecture Series, organising and participating to international conferences
- Performing research in various fluid-dynamic fields in the context of training programmes, following the principle of "training in research by active research" (the main programme being the doctoral one), as well as performing research for industrial partners, research agencies or other organizations, often involving industrial consortia, and conducted under specific research contracts or grants.

Location

The VKI is a non-profit international research and educational establishment, located in Rhode-Saint-Genèse, at about 15 km South of Central Brussels, Belgium

Programmes / Activities

Recent programmes and activities in aeronautics cover the following fields:

FLIGHT AND SPACE PROPULSION: Fluid hammering in satellite propellant lines, Flash evaporation in liquid propulsion, Pressure oscillations in solid boosters, Deformation of thermal protections, Cryogenic science

FLIGHT AND GROUND TESTING FOR AEROSPACE: CATE in-flight experiments, strategic ground testing approach for high-speed re-entry, Optical spectroscopy, original tomography methods, characterisation of noise level, Static and dynamic stability study of the ARV re-entry vehicle

Small satellites: Cubesats to perform atmospheric research as well as in-orbit technology demonstrations.

AEROACOUSTICS: Simulation methodologies for airframe noise modelling, theoretical and experimental investigations of ventilation noise in ducted systems), modelling and control of the noise emitted by the aircraft Environmental Control Systems, application of porous materials to reduce the interaction noise in Contra-Rotating Open Rotor (CROR) propulsion systems.

INSTRUMENTATION DEVELOPMENT: Airborne Research using PIV, Icing detection by non-intrusive optical technique, design and manufacturing of cooled probes for measurements at engine temperature, qualification of the flow in a new steady state model-turbine rig, development of tip timing methods.

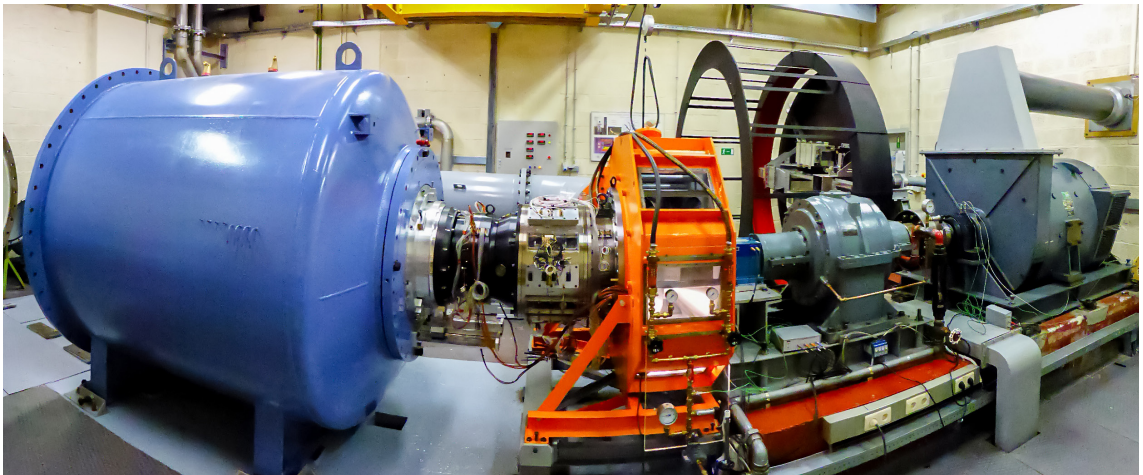
PHYSICAL AND NUMERICAL MODELLING: COOLFluiD-2 (CF2) platform, wall boundary condition model with variable catalytic efficiency and radiative equilibrium, MHD solver for Space Weather applications, new Finite Volume solver for the full Maxwell equations, innovative Monte Carlo-based algorithm for radiation transport, RANS and LES models into the Residual Distribution solver, rarefied gas dynamics, satellite application, Hyperwall prototype

DESIGN AND OPTIMIZATION: Optimization on axial fans, radial and axial compressors, axial and radial turbines and automotive fans, development of a Total Integrated Design and Optimization Software for Turbomachinery

Low Pressure compressors and turbines: roughness, transition, separation and boundary layer control, influence of Reynolds number, free stream turbulence, blade loading, periodic inlet wakes, technological effects, aerodynamics and stability of low pressure compressors (boosters)

INTERNAL FLOWS IN TURBOMACHINES: optimization of the return bend in an internal cooling channel. , rotating facility for the investigation of centrifugal, buoyancy and Coriolis effects on internal cooling flows, internal and external cooling of high pressure turbine components.

INDUSTRIAL PROCESS FOR NANOPARTICLES: dedicated laboratory for the research on surface passivation of metallic nanoparticles, non-intrusive diagnostic tools.



VZLU
CZECH REPUBLIC

VZLU - Aerospace Research and Test Establishment is a national centre for research, development and testing in the field of aeronautics and space.

The history of VZLU (Aerospace Research and Test Establishment) dates back to 1922, a year when the Institute for Air Navigation Studies under the auspices of Ministry of Defence was founded. More than 80 Czechoslovak aircraft types have passed through the VZLU's gates since then. VZLU ensures a wide range of research, development and testing work necessary for designing new aircraft including certification tests.

Mission / Objectives

The main mission of VZLU is to generate new knowledge, transfer it into industrial use and provide its partners with maximum support in the development of new products. As a multi-discipline research organisation, VZLU exploits synergic effects and also contributes to the devolvement of automotive, rail, defence, security and power industry and civil engineering.

The major multi-disciplinary fields that VZLU specialises in are: aerodynamics, structure strength and durability, material and corrosion engineering, composite materials and technologies and accredited testing. VZLU cooperates closely with similar organisations throughout Europe to ensure feed-back essential to its continuous development.

VZLU creates, organizes and concentrates new knowledge in disciplines that are necessary for the development of aviation equipment and disseminates it in various ways within research and university communities. Special emphasis is placed mainly on applying this knowledge on new or innovative products and services. Thus, VZLU´s primary mission is to be a reliable provider of R&D services for different industrial branches.

Location

VZLU is a scientific technical base located in Prague – Letňany.

Programmes / Activities

RESEARCH - DEVELOPMENT – INNOVATION - TESTING

VZLU is performing internal research and provides RTD and testing services for national and foreign industrial partners in following domains:

AERODYNAMICS

- Research and development in the field of applied external and internal aerodynamics
- Development of specialized CFD software for external and internal aerodynamics
- Development of simulation tools pertinent to the area of aero-elasticity
- CFD calculations and flow simulation, optimization, flight mechanics
- Measurements in wind tunnels
- Simulation and measurement of wind resistance of building structures
- Simulation and measurement of harmful gas propagation in the atmosphere

PRODUCT ORIENTED RTD ACTIVITIES

- Research and development in the area of turbine engines (operation, combustion chambers, compressors, turbines, gearboxes etc.)
- Research and development of propellers and industrial fans
- Research and development of advanced composite structures
- Calculations and testing of the products for use in space (instruments, equipment, small satellites)
- Mechanical and climatic resistance testing
- Electrical systems testing
- Reliability analysis

STRUCTURAL STRENGTH AND DURABILITY

- Research and development in the field of structural durability
- Development of new procedures and software applications for strength analysis
- Development of new methodologies for strength and modal analysis
- Analysis, calculations and experimental verification of strength characteristics of structures
- Static, dynamic and fatigue tests of structures
- Modal analysis, aero-elasticity and ground vibration testing (GVT)
- Experimental stress analysis
- Non-destructive testing (NDT)

MATERIALS AND TECHNOLOGIES

- Research and development in the field of materials
- Research and development in the field of corrosion resistance and surface protection
- Research and development of technologies for production of composite structures
- Material analysis and material characteristics testing

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