EREA

15 years of European Cooperation in Aeronautics

EREA

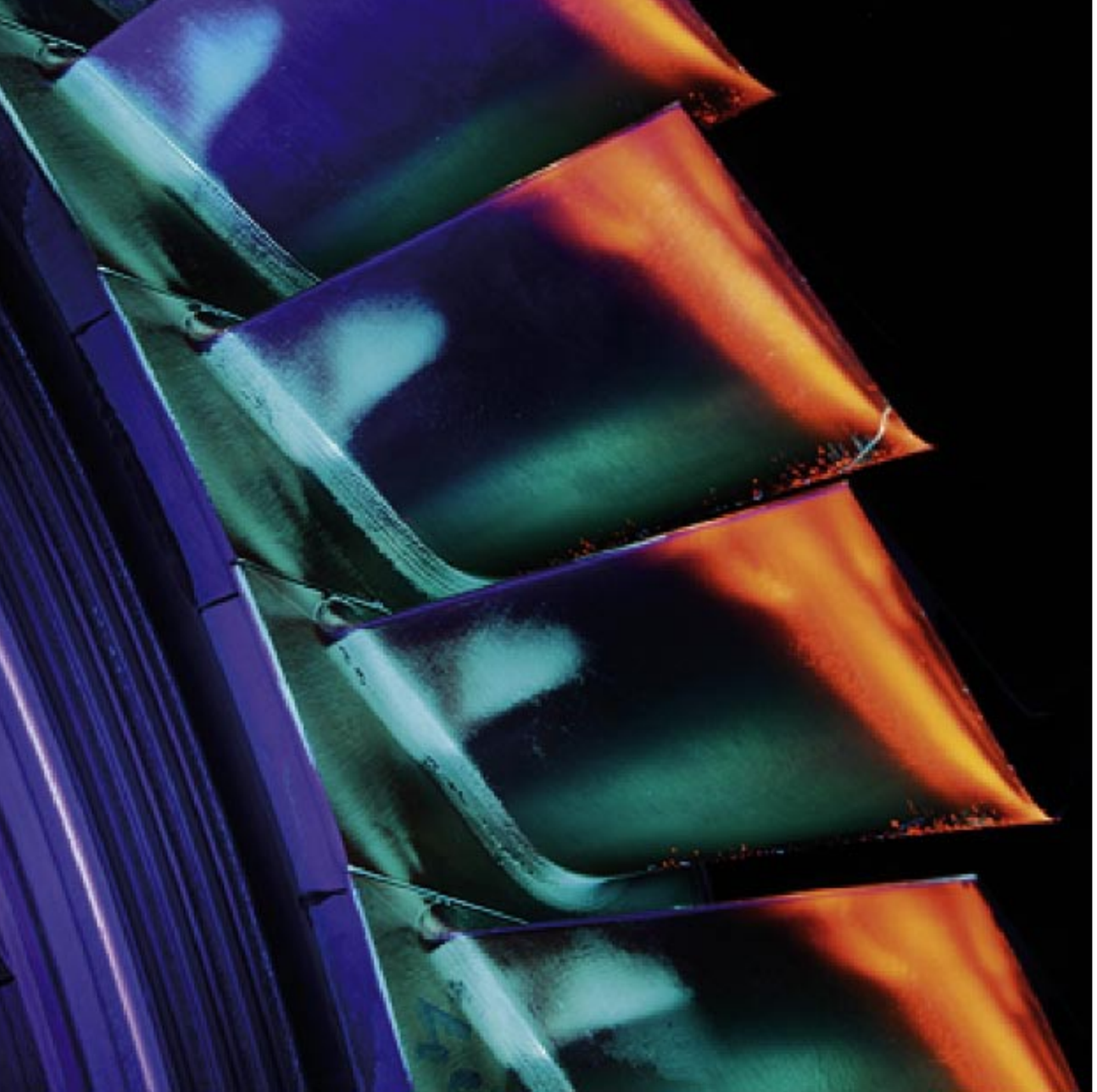
Association of
European
Research
Establishments in
Aeronautics

EREA, the European Research Establishments for Aeronautics (at the beginning called AEREA, then association EREA) was formally constituted in 1994. The aim of EREA is to stimulate and facilitate the networking and pooling of aeronautical research capabilities in Europe and to enhance the visibility of the research establishments in politics, public bodies and industries.

The founding members of EREA were CIRA (Italy), DLR (Germany), FOI (Sweden), INTA (Spain), NLR (The Netherlands), ONERA (France), as well as DRA/DERA (United Kingdom). In the meantime new members joined EREA, the VZLU laboratory from the Czech Republic and ILOT with its affiliate AFIT from Poland. DERA was transformed into DSTL and QinetiQ, and finally the British member left EREA. Associate members are the Austrian institute AIT, the INCAS institute of Romania, the VKI institute in Belgium and the VTT research centre of Finland. Since 1999 EREA is registered as an association under Dutch law. The origins of the EREA partners date back to the very early years of aviation and they represent a rich history of contributing to basic innovations in aerospace.

Although the present members and associates constitute the most important non-industry research establishments in Europe, EREA continuously strives for building and improving relationships with other establishments in the new countries of the European Union, with universities, industrial laboratories and research organisations outside Europe.

The European industry has gone through an extensive process of integration. Furthermore, the air transport sector has experienced a period of integration into multi-national mega carriers, and regulation has become a European responsibility. Also in the area of security and defence, closer European cooperation is being established. All these developments create a new environment for the research organisations in EREA that were originally founded to satisfy national requirements. The change of focus from national to European customers created the stimulus to pool knowledge and facilities. The process has only just begun. In most cases, the integration starts by combining specific capabilities in two partner institutes, to be extended with more participants. This will create a totally new future for aeronautical research and testing in Europe.



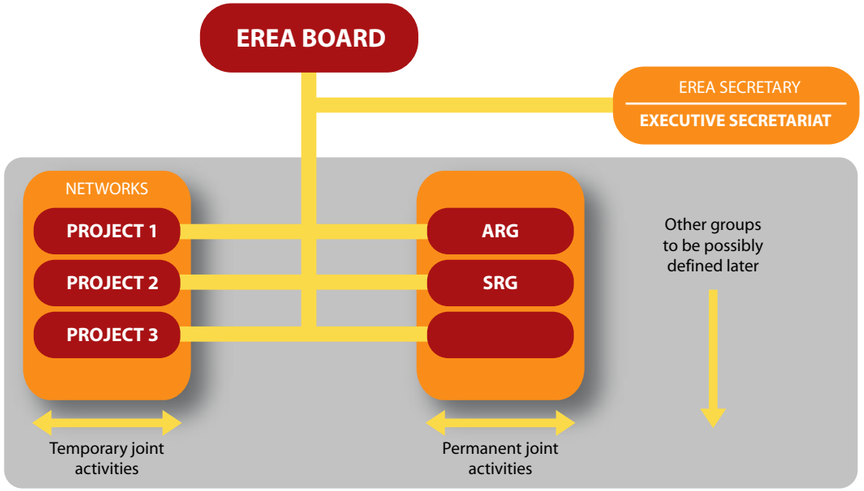
Organisation

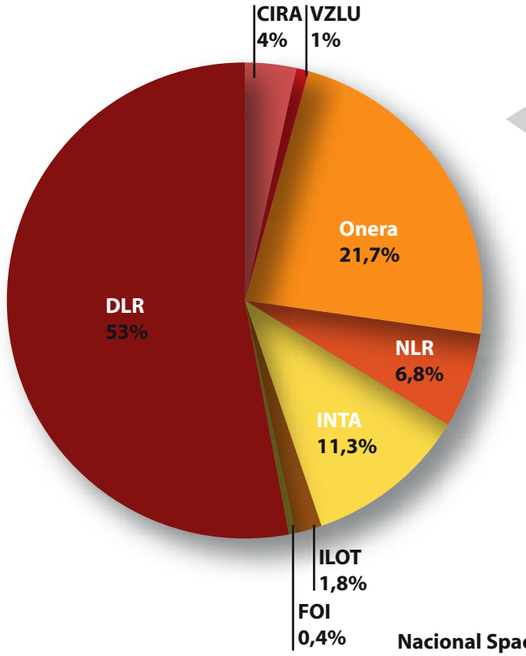
The EREA internal organisation is composed by the EREA Board, the General Assembly, the Executive Secretariat (ES), the Aeronautics Research Group (ARG), and the Security Research Group (SRG, since 2004).

EREA through its Board and dedicated working groups has established in the past 15 years the research establishments as being one of the major players in the European aeronautical stakeholder community. This holds for the strategic orientations within and to the outside of EREA as well as for the technical orientations of the EREA research establishments, be it for the European research programs as well as the internal research and cooperation programs between the EREA members.

Additionally to the Aeronautics Research Group (ARG) created already in 1989 EREA widened the scope of its common research interest to the security research area with a dedicated working group (SRG) established in 2004.

Members of the EREA Board and the working groups have also been and are still very active in the ACARE process. Since the beginning of EREA impressive steps have been realised to perform coordination and cooperation activities among the EREA members and with Industry. Thus a big number of successful projects have been initiated and performed for example in the European framework programs.



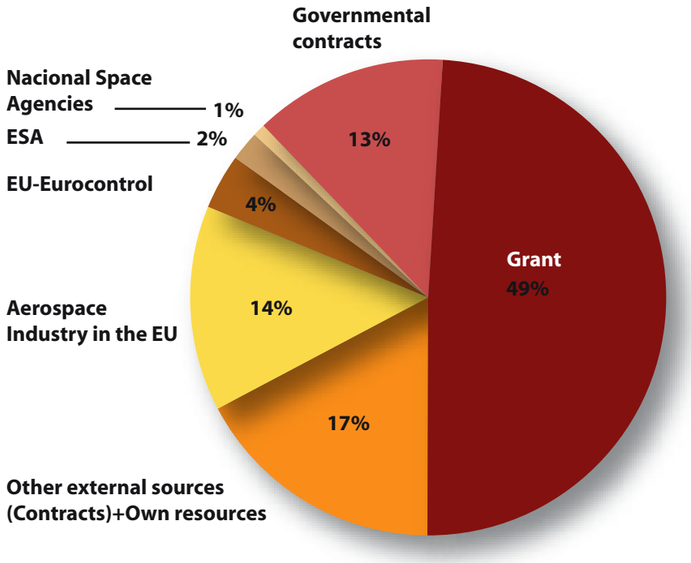


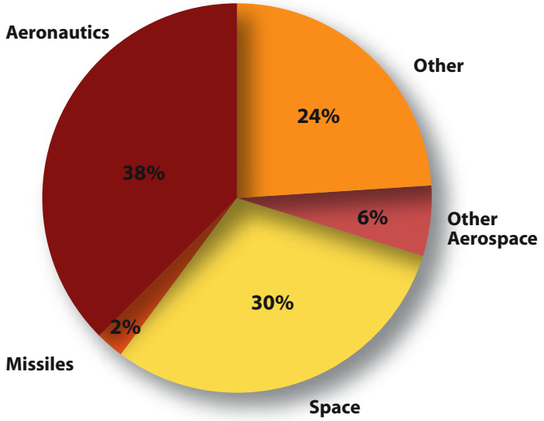
Breakdown of the EREA total revenue by RE

Excluding programmes to be administered

Total: 1.132 M€

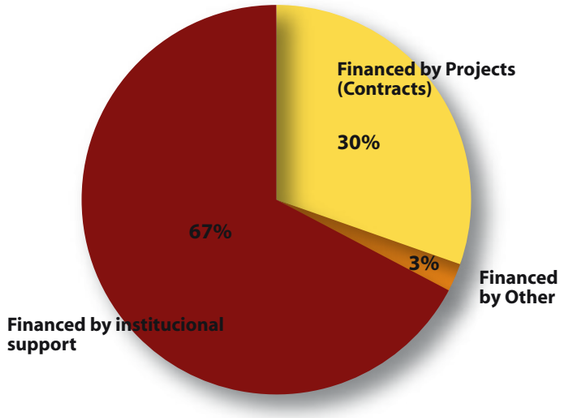
EREA total revenues by clients





EREA expenditures for intramural R&T,D

Total: 1.012 M€

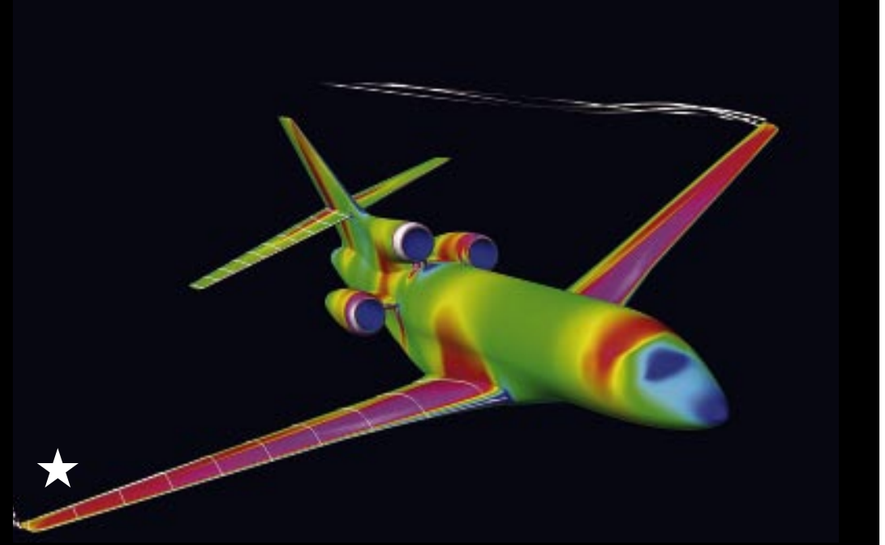


Expenditures for intramural investments 2008

Total: 154 M€

EREA in numbers (2008)

Number of employees	4360
Internal aeronautics research	375 M€
Annual revenues from EU projects	44,8 M€
Number of PhD thesis per year	170
Number of publications Including technical reports	6260
Publications in refereed journals	1080



EREA Facilities

European aeronautics research infrastructures

Within the ACARE, it is acknowledged that a set of world-class and efficient research capabilities is a strategic factor which enables the prosperous development of Aeronautics in Europe.

It is a fact that fundamental and applied research in various scientific disciplines (Fluid mechanics, Materials, Structures, Systems, etc.) as well as the development of sub-components and components (engines, etc.) and of aeronautical end products (fixed-wing aircraft, rotorcraft, etc.) have always been associated with extensive design, computation, testing, optimisation and validation activities.

This complicated process calls for the systematic use of various research facilities, for example aerodynamic wind-tunnels, combustion and structural test beds, material elaboration apparatus, clusters of small computers or, on the contrary, high powered super-computers, air traffic management and air traffic control simulators, flight simulators and research aircraft.

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

Capabilities for experimental and numerical simulations are key enablers for the development of aeronautics

The importance of research infrastructures for the aviation industry and the scientific community involved in aeronautics is a well known fact.

All past and present aeronautical components or products have been tested in aerodynamic wind tunnels. It is likely that the same will be true for future products. This observation is not in contradiction with the trend towards increasing dependency on numerical simulation. Indeed, the fast, detailed and accurate design procedures necessary to meet increasing constraints (in particular those related to environmental and safety issues) call for increasingly powerful testing and evaluation capabilities involving

Typology of European aeronautical facilities

Strategic facilities *individually correspond to investments higher than100 M and have an operating budget of more than €5M/year. They are open to any customer and address the industrial market as well as national and EU programmes on a commercial basis. Such facilities are competitive in a worldwide market. Europe boasts no more than 10 complementary strategic facilities in that category for civil aeronautics.*

Key aeronautics facilities *individually correspond to investments of the order of €10M. They are also subjected to tariffs based on full costs recovery (excluding capital investments) and are used by other players than the operator on the basis of their own funding. Facilities with an obviously unique character are also included in this category. There are about 100 such key facilities spread all over Europe.*

Common facilities *refer to a large number of other medium or small size capabilities covering a wide range of applications in various disciplines. Such facilities are considered as basic tools whose associated costs are in general borne by owners.*

A380 model in a large transonic wind tunnel for accurate lift & drag measurements. In such tests the aerodynamic drag is measured with an accuracy better that 10-4.

multi-disciplinary and multi-physics features. In short, both experimental and numerical simulations will still be complementary. Consequently, in parallel with the effort regarding testing capabilities, effective and affordable access to top level European High Power computing resources should be made available to the aeronautics research community.

Aeronautics infrastructures address both scientific and industrial research in a complementary way

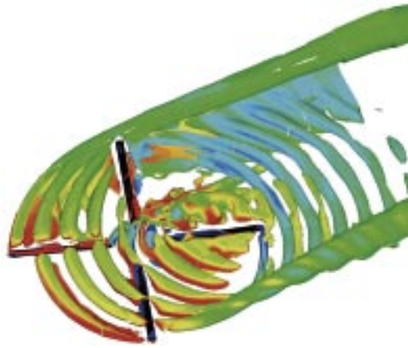
Industrial customers (aircraft manufacturers) use facilities - on a commercial basis - during limited test periods for developing and improving their products. This contributes towards making these facilities available for scientific research to alternate users who also need them for limited periods of time.

This situation benefits the numerous research projects conducted within the framework of various national or EU programmes on both fixed and rotary wing aircraft and also serves the need to improve basic knowledge (e.g. flow stability, transition, wakes, vortices, combustion process...) through tests directly funded by Research Establishments with the underlying objective of increasing fuel efficiency and reducing noise.

The automotive, rail, civil engineering and wind power industries can also benefit from these publicly maintained infrastructures and associated know-how. Conversely, the industrial community benefits from the results of fundamental research which provides improved technologies in several areas.

The need for increasingly accurate experimental databases also calls for the development of highly sophisticated non-intrusive measuring instruments, which stimulates fundamental research in particular domains of physics (coherent optics, etc).

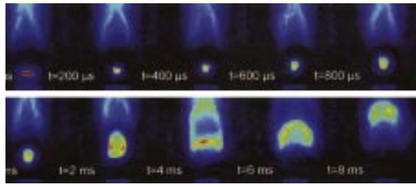
Aeronautics research facilities also contribute to European integration through the exchanges associated with various industrial customers (mostly trans-national companies) or researchers of different nationalities involved in operating them. Additionally, formal pan-European networks have also been established in order to improve overall efficiency, by exchanges of best practices and progressive specialization in areas of application. Examples are AT-one in the field of Air Traffic Management, DNW, ATA or EWA (Network of Excellence created under EU/FP-6) in the field of aerodynamic wind tunnels and measurement techniques. Very encouraging results have been obtained so far and this approach will have to be developed in other domains (flying test beds, airport research, etc.) in the future.



The numerical simulation of complex multi-physic time-dependent phenomena requires extensive computer resources. The aeronautics community needs access to the world's top 10 supercomputers.

Even if it is true that 'traditional' ground based facilities (like aerodynamic wind tunnels, propulsion test beds, etc.) are the most emblematic and well known examples of aeronautics research infrastructures, the sector also needs and exploits a large variety of other capabilities. Examples are Vibration and Fatigue test beds, Crash facilities, Electromagnetic compatibility facilities, Control Tower simulators and, of course, Flying Test Beds.

Similarly, at system level, an all new operational concept of Air Traffic Management will have to be validated using a sophisticated infrastructure covering, amongst other things, automatic / Fast-Time simulation Tools, a Human-in-the-loop simulation Platform and Field experiment Platforms.



Plasma-assisted combustion diagnostics: the detailed analysis of thermal effects requires highly sophisticated measuring apparatus.

Aeronautics facilities represent an asset that has to be preserved

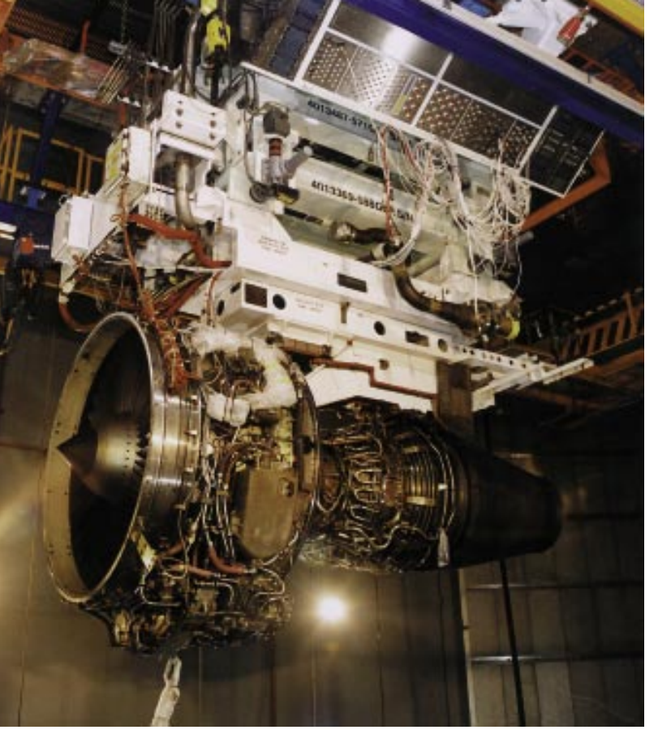
Most of the major aeronautics facilities were funded by national governments in the 50s and 60s to fulfil national needs and it is striking when you realize that a product like the A380, which is likely to be in service for the next 40 years, was extensively tested in 50-year old aerodynamic wind tunnels.

Most large and medium size facilities are operated on an operating costs recovery basis by national aeronautics research establishments and are open to any customer.

University aeronautics departments also operate laboratory facilities more suited to conducting basic research whilst industrial companies own some 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 that is estimated to be worth more than €4 B. Maintaining, renewing / upgrading or replacing these facilities represents an enormous challenge and a financial burden that operators using national funding schemes are increasingly less able to support alone. The result is that less than 1% of the total asset is re-invested each year. Such a situation is unsustainable in the long term.

Europe (through the Union and through intergovernmental tools) will have to be increasingly involved in the process of (re)investments while facility operators will have to make further progress in the rationalization process undertaken several years ago and which already produced tangible results. In this



Turbojet engine test bench

field, as in others, Europe should be in a position to compete on an equal footing with the US where large aeronautics facilities are considered to be national assets and supported as such at federal level.

Operators, in particular of medium-size (key) capabilities, will also have to examine, in relation with national and European public authorities, fair ways and procedures for fostering the optimal use of existing facilities, reducing existing unnecessary duplications and preventing any risk of new duplication involving public funds.

Aeronautics facilities benefit other sectors

'Low-speed' as well as 'high speed' aeronautics research infrastructures (in particular wind tunnels) have been serving the objectives of several sectors other than aeronautics. Surface transport sectors (road and rail) make extensive use of some facilities and benefit from the testing and measuring techniques and associated expertise that have been made available through aeronautics applications. Similarly in the space sector, launch and re-entry configurations have been extensively modelled and tested using tools developed for the aeronautics sector. Civil engineering also benefits from aeronauts infrastructures.

The Environment and Aviation Safety also benefit from aeronautics infrastructures. This is, for example, achieved through regular improvements at component level (e.g. combustor performances) or through the direct study of specific phenomena (e.g. wake vortices). Security is also likely to profit more from the investments made so far by the aeronautics community (e.g. UAVs)

By addressing both scientific and industrial research, by covering a wide range of scientific disciplines and associated expertise, the existing complex network of research infrastructures is a key enabler for the development of europe.

Such a network, at the head of which stand the small group of strategic facilities, represents a tremendous asset and the needs of that particular community, will have to be considered with great attention at both regional, national and european levels in the future.

Flow visualization on an Ariane 5 model

Crash test beds

Model ready for aeroacoustic investigation in a large wind tunnel

The EREA Joint position paper (September 1993), initiating the creation of EREA in 1994, established a number of lines of activities for the Research establishments to be performed in the future comprising mainly:

■ A policy for the coordinated use of and investment in wind tunnel and other facilities as well as for joint operation of experimental assets, the aim of this policy being to correlate these so far nationally devoted resources, and to provide for a most rational utilization of existing, and future facilities for common European needs.

■ The development of joint research programmes and technology acquisition projects relating both to the Research Establishments own domain of activities and to research actions initiated by third parties such as the EC.

This booklet gives an overview on the activities since then initiated and performed in, and through the frame of EREA, the association of European Research Establishments in Aeronautics. It gives in a 1st step an overview on the cooperation efforts between the EREA members and in a second step presents each of the EREA members individually.

Rotorcraft Cooperation of DLR and Onera

Despite many promising efforts and advancements in the past years main parts of the aerospace research in Europe are still organized in national units and stay behind the merging industrial movement. It is common understanding that international co-ordination, co-operation and finally integration will contribute to better solve the existing technical and economical problems, and to strengthen the position of the world-wide aerospace community.

'Agreement on a DLR-ONERA Partnership in Rotorcraft Research', signed on 2 December 1998 in Paris. Mr. M. Scheller, ONERA and Mr. W. Kröll, DLR.

Under the auspices of EREA the German Aerospace Center (DLR) and the French Aerospace Lab (Onera) decided for a close partnership in rotorcraft research, and consequently an "Agreement on a DLR-ONERA Partnership in Rotorcraft Research" was signed on 2 December 1998 by the ONERA President and the DLR Chairman of the Board of Directors.

Already in 1992 the "Onera/DLR Mutual Commitment on Co-ordinated Aeronautical Research" had been signed together with the Technical Annex No. 1 on Rotorcraft Research. Since that time an increasing number of cooperative tasks started. This positive development was strongly supported by (1) the official French-German co-ordination in helicopter research and technology as formulated in the Common Declaration (1995) by the Ministries of both countries, (2) the establishment of the French/German company Eurocopter (1992), and (3) the governmental decisions for the development of the joint military helicopters.

The decision for a close partnership in rotorcraft related research was driven by the following general objectives:

■ To advance and promote the intended and progressive integration of European research in the field of aeronautics. This bi-lateral agreement on a specific subject was considered to be a first step to further integrate the DLR and Onera activities in other technical areas, and being open for other European research establishments.

■ Considering the European environment of aeronautical research it is the common interest of both, Onera and DLR, to act as a single body and to speak with one voice in front of the public and private partners and customers.

■ With respect to the common research activities it is the main objective to obtain the best efficiency at minimum cost by avoiding duplications but still allowing for a certain scientific competition, and by capitalizing on emerging synergy effects.

In pursuing these objectives the following principles have been strictly observed:

■ It is full intention of both partners to create a win-win situation with no one-sided and unfair shortcoming for one of the partners.

■ In general, the partnership is established on a 50% by 50% venture, applied to the input (resources) as well as to the output (reports, patents, publications).

■ The financial principles are established on a full cost basis of personnel, facilities and equipment for both, partners and customers.

■ The costs for the use of the facilities and equipment of each partner are based on a no-money-exchange policy and have to be incorporated in the common research programme.

■ All rotorcraft related activities within Onera and DLR are planned in a common research programme, even if only one partner is contributing to a specific subject.

S1MA tiltrotor test

For realizing this project of the Onera/DLR partnership the following approach was decided on:

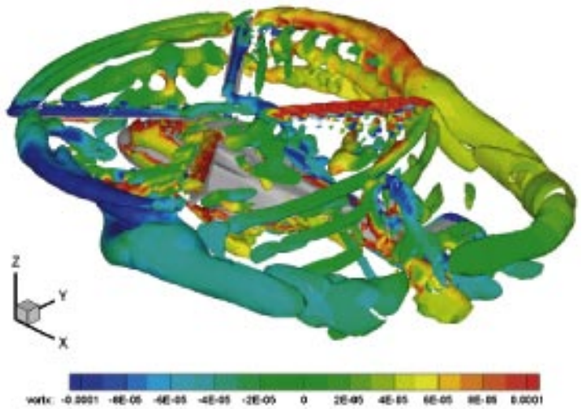
■ Installation of a DLR/Onera management organization with two common groups on different levels, the Steering Committee at the level of the General Directors of Onera and of the Executive Board of DLR, and the Permanent Common Management Team (PCMT). The main tasks of the PCMT are to prepare the common research programmes and the business plan and to co-ordinate, integrate and market all rotorcraft related research activities of both establishments.

■ The new organization works programme/project-oriented with the main objective to manage vehicle-oriented multidisciplinary projects and tasks.

■ The execution of the research work remains in the DLR Institutes and the Onera Departments involving the appropriate experts/scientists in the corresponding disciplines.

For the first time in 1999 the PCMT elaborated a DLR-Onera Mid-term Rotorcraft Research Programme (1999 - 2003) and subsequently a 2000 Rotorcraft Research Programme. Each year these programmes are being updated with respect to the full integration of all rotorcraft related research at DLR and Onera.

All rotorcraft related information and data available or being produced in this framework by DLR and Onera are considered to be open for use within DLR and ONERA, with the exception of information and data marked by the generating organization or by one external partner or customer as "limited distribution". New rotorcraft related reports and documents are being produced in English language.



elsA NH90 flow simulation

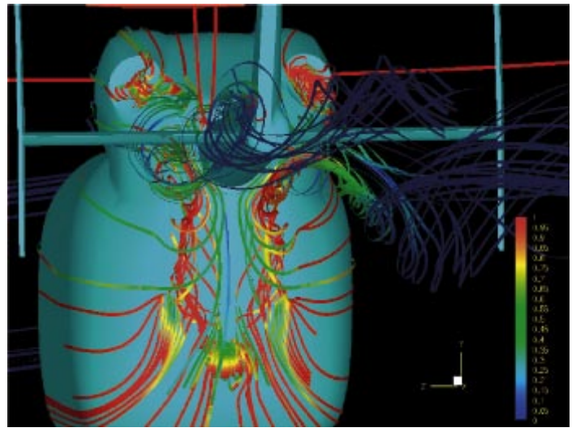
The vehicle oriented multidisciplinary projects and tasks are defined in the so-called Research Concepts (now Research Fields) and are handled by research teams formed out of experts/scientists from the appropriate institutes and departments. The research teams are composed preferably as joint teams including Onera and DLR team members, but also Onera teams or DLR teams are possible, depending on the specific research tasks. The joint teams are managed by one project head, either from Onera or DLR, with a deputy head from the other organization. Actually the common yearly research programme represents a joint budget of more than 20 Million Euros and consists of six Research Fields: (1) The Virtual Aerodynamic Rotorcraft, (2) The Quiet and Comfortable Rotorcraft, (3) The Smart Rotorcraft, (4) The Robust Rotorcraft, (5) The Innovative Rotorcraft, and (6) The Specialized Military Rotorcraft.

This yearly programme is based on a mid-term plan with the main objectives:

- Develop and validate tools for designing efficient, safe and cost-effective helicopters
- Increase the operational flight envelope of civil and military helicopters
- Decrease external and internal noise, and vibrations
- Develop and evaluate advanced technologies and new concepts for future rotorcraft

- Provide assistance to French and German governmental agencies
- Support the French-German rotorcraft company Eurocopter and other French and German companies concerned with rotorcraft.

In their role as national aerospace research organizations both, DLR in Germany and Onera in France, are in charge to support their national industries for keeping and improving competitiveness on the world wide market. In order to better fulfil the needs of the French-German rotorcraft industry Eurocopter, the DLR/Onera mid-term rotorcraft research programme, in a large part, is directly connected to the Eurocopter R & T strategic plan. On this basis Onera, DLR, Eurocopter, and Eurocopter Deutschland, in 2001, signed the Research & Technology General Partnership Agreement, creating a durable partnership. The ongoing co-ordination process will guarantee that the research activities planned and conducted at Onera and DLR will complement the industrial R & T programs and will support as much as possible the common French-German rotorcraft industry.

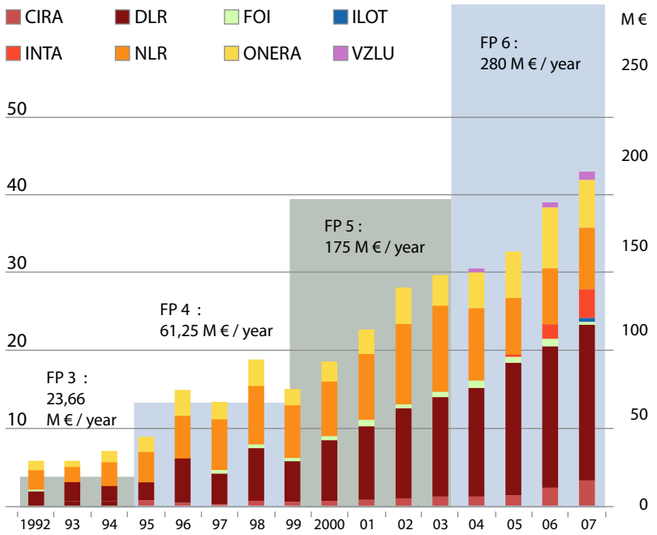


FLOWer EC-145 flow simulation

Beside this partnership DLR and Onera cooperate with many other partners from national and international research institutions, academia and industry in bi- or multi-lateral agreements. It is mentioned explicitly in the partnership agreement that existing cooperations and partnerships of both organizations are respected, considered and supported. In addition new co-operative agreements with other partners, preferably involving both, DLR and Onera, are strongly promoted, in particular within the EREA association.

Ten years after the signature of the "Agreement on a DLR-ONERA Partnership in Rotorcraft Research", the expected outcome with respect to the position of rotorcraft research within DLR and Onera could be fully achieved. A broad spectrum of outstanding analytical and experimental results demonstrates the competence of both organisations and the significance of the partnership. This was only possible by the combined know-how and the personal resources and power of the partners. It is expected that this exemplary co-operation will continue to prosper and serves as a nucleus for further integration of aerospace research in Europe.

EREA participation in the European Framework Programmes



The Research establishments of EREA have since the beginning contributed to the framework programmes of the European Union. The figure shows that the participation of EREA research establishments in the aeronautical part of the EU framework programs has been continuously increasing over the years. In the current 7th Framework Program Aeronautics and Air Transport is being performed through the traditional Collaborative Research instruments, the Clean Sky Joint Technology Initiative and the SESAR (Single European Sky ATM Research) Joint Undertaking.

EREA Research establishments are increasing their activity in the Area of Pioneering the Air Transport System of the Future. EREA Research Establishments involvement in the level-2 project activities confirms the importance of Research Establishments activity in the integration and validation of new technologies in cooperation with European industry.

EREA members are actively involved in the Clean Sky Joint Technology Initiative, as Associate Members in all Integrated Technology Demonstrators, except the one for Engines. EREA members are playing a leading role in the Clean Sky Technology Evaluator. EREA considers very important to be involved in the SESAR research activities and to keep focus on long-term research for Air Traffic Management in order to prevent seeding a future technology gap.

AT One

In December 2004, DLR and NLR have decided to establish an air traffic management research alliance by the beginning of 2005 named AT-One. AT-One is the ATM strategic research alliance between DLR's Institute of Flight Guidance and NLR's Air Transport Division.

Goal of the alliance is to join forces in the fields of ATM. Harmonisation of research programs, facilities and investments enhances the competitiveness of both organisations and contributes to the expansion of the leading position in European ATM Research.

With a total workforce of 260 employees (scientists, technicians, engineers), AT-One's establishments in Amsterdam, Braunschweig, Brussels and Flevoland serve government bodies, industry, Eurocontrol, and the European Commission. Moreover, this research workforce is embedded to mother institutes employing a further 1400 aviation experts, who can be called upon for support. The annual turnover of AT-One amounts to around EUR 35 million.

AT-One is founded as a European Economic Interest Grouping (EEIG) with a 50% share of each NLR and DLR. The organisation is headed by two directors, one of NLR and one of DLR. The activities are organised in eight so-called Areas of Expertise.
These are:

- Arrival, Ground and Departure traffic Management
- Airspace and En-Route Traffic Management
- Integrated Airport processes
- Validation
- Air-Ground Integration
- Air Transport Safety & Security
- Environment and Policy support
- Human Factors & Training

AT-One studies issues ranging from air traffic control, safety and the environment, to airports and the human factor in aviation. The inception of the Single European Sky Initiative has prompted increased cooperation in the management of airspace. A major implementation project called SESAR is currently underway. As this work can best be accomplished by a pan-European organisation the AT-One alliance was a logical and timely step for DLR and NLR, and a further move towards European integration in aerospace research.

ATA / EWA / ESWIRP

The vital importance of efficient wind tunnel facilities and measuring technologies for aeronautical research and development resulted in several European co-operations in this field.

The Aero Testing Alliance (ATA) is a major step towards European integration of aerospace research facilities. This alliance (started in 2006) aims to provide the framework for joint operation and management of Onera and DNW (founded by DLR and NLR) commercial wind tunnel facilities, under the umbrella of a European Economic Interest Grouping (EEIG), registered in the Netherlands.

The ultimate goal of ATA is the integrated operation of major European wind tunnel facilities, intensively used by leading aerospace companies worldwide. As a first step, DNW and Onera will perform joint activities not only concerning technical cooperation, but also on marketing, and joint acquisition of contracts for their wind tunnel services. Furthermore, joint investments will enhance ATA's capabilities to provide the aerospace industry with the very best testing services available.

The European Wind tunnel Association (EWA) is a Network of Excellence funded by the European Commission under its 6th Framework Programme. The project was started in 2004 and will be completed in 2009. It consists of 14 member organisations from 8 European countries, including 7 EREA members.

The aim behind EWA is to integrate and strengthen European Aeronautical Research by building lasting relationships and inter-dependencies between the major European wind tunnel operators and developers of advanced measuring technologies.

The European Strategic Wind tunnels Improved Research Potential (ESWIRP) is funded by the European Commission under the Capacities Research Infrastructures Programme of the 7th Framework Programme. The project starts in 2009 and ends in 2013. It aims at enhancing the complementary research potential and service capabilities of three strategic wind tunnels in Europe both in terms of productivity and quality by new long-term investments. The concerned wind tunnels are Onera S1MA Modane, DNW-LLF and ETW.

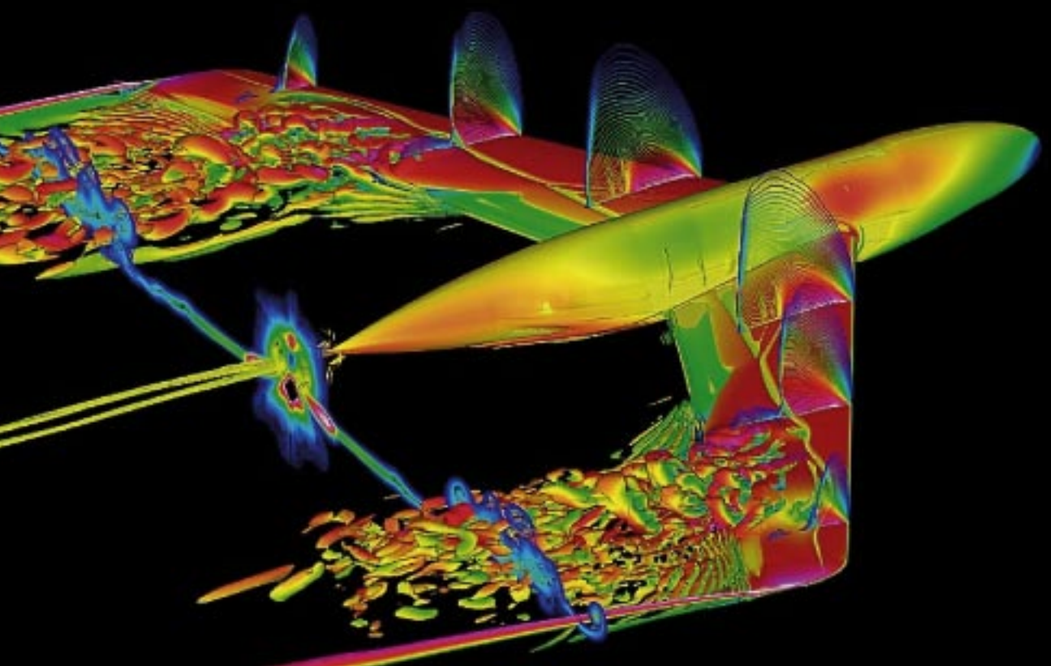
ACARE and external visibility

EREA has been very active in shaping the ACARE process. EREA members are participating in Advisory Groups to the Framework programmes (External Advisory Group Aeronautics, Prof. von Tein, Prof. Abbink, 1998-2002, Advisory Group Aeronautics Chairman Prof Szodruch 2002-2006, Advisory Group Transport Prof. Abbink 2007), which influenced the creation of the ACARE Vision process. Prof. Kröll as EREA chairman was member of the Group of Personalities defining the Famous Vision 2020 document and became first chairman of ACARE, which was proposed in Vision 2020, to define the Strategic Research Agenda. EREA is contributing continuously to the work of ACARE defining, reviewing and implementing the European Research Strategy not only with three representatives on plenary level but also with representatives in all ACARE working groups. Currently ACARE, which served as pilot for now more than 30 European Technology Platforms, is co-chaired by representatives from Industry (Francois Quentin) and EREA (Prof. Szodruch). EREA will continue to significantly contribute to the implementation of the ACARE and vision 2020 goals on aviation and the associated Strategic research agendas and their further development.

"European Charter for Researchers", signature event. Mr. D. Maugar EREA Chairman EU, Research Commissioner J. Potocnik and Prof. F. Abbink EREA Vice-Chairman.

EREA also performs and performed a number of public relations activities for example through dedicated stands and workshops at the "le Bourget" and "ILA" air shows and organising the EREA / Pratt & Whitney price and the EREA award for young researchers and for innovative research projects.

EREA is also very keen in promoting the career development and the mobility of researchers within Europe. In the presence of EU research Commissioner J. POTOCNIK, the 12 members and associate members of the EREA signed in September 2008 a statement of support to the European Charter and Code of Conduct for Researchers.



EREA Researchs Establishments

The **Centro Italiano Ricerche Aerospaziali CIRA (Italian Aerospace Research Center)** 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), the major Italian aerospace industries, the Regione Campania and the National Research Council CNR.

CIRA was founded in 1984, when the Ministry of Research initiated the National Aerospace Programme (PRORA) in order to support the Italian aerospace industries, authorities and universities with proper facilities, skills, competences and capabilities. The company became operative in 1986.

At that time the primary objectives were the design of "world class" test facilities and the education and training of the team of researchers. Later on, in the two thousands, CIRA's commitment was widened and had to include the new task to build up system integration competences and expertise.

Mission / Objectives

As defined by PRORA, CIRA's mission is 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. In particular CIRA's activities in aeronautics are mostly targeted to:

- development, validation and application of theoretical and numerical tools,
- design, management and execution of test campaigns (including test article design, assembly and integration),
- technology development & integration (including technology demonstration, through prototype design, realization and testing),
- systems design, analysis and integration (looking at both, near term as well as futuristic configurations - e.g.: supersonic and hypersonic planes),
- certification. These activities are performed applying competences in the main aeronautical scientific and technical disciplines with the objectives to support the Italian industries, authorities and universities, to contribute to the definition of programmes and projects, and to promote the aggregation and networking of competences at regional and national level.

Programmes / Activities

CIRA's programmes comply with the PRORA, with the technology development guidelines approved by the ministry, and with specific industrial requests (cooperation agreements and contracts). Hereafter some details about CIRA's most relevant aeronautical programmes are given.

PRORA UAV is targeted to the development of flying laboratories for the demonstration and validation of advanced enabling technologies for high altitude and long endurance flight.

PRORA USV (Unmanned Space Vehicles): Based on the assumption that in the long term space access and re-entry will be guaranteed by aviation-like vehicles, the overall program approach consists in the execution of flight missions of increasing complexity, to test identified enabling technologies.

JTI "Clean Sky": The development of "Green" technologies for aeronautics is one of the strategic guidelines, thus CIRA is partner of the "Clean Sky" - JU within the EC FP7.
As an associate member in the ITD Green Regional Aircraft CIRA's main activities address the development of new technologies for Low Weight and Low Noise Configurations, New Aircraft Configurations, and Mission and Trajectory Management.
In the ITD Green Rotorcraft CIRA contributes to Innovative Rotor Blades and Reduced Drag of Airframe, and to Environment-Friendly Flight Paths.
In the Technology Evaluator CIRA performs activities for Requirements & Architecture and Models Development and Validation.

EXTICE: CIRA is driving the larger Icing Wind Tunnel and icing related studies and technologies are of strategic importance; for this CIRA is leading the EXTICE project, funded within EC FP7, aimed to improve the knowledge about the condition of ice formation and accretion due to the presence of Supercooled Large Droplets.

COMFORT: In cooperation with Alenia Aeronautica and Boeing, the project is targeted to the development of technologies for composite fuselage optimization including noise reduction treatments (passive, active and hybrid).

www.cira.it

DLR is a non-profit organisation and Germany's national research center for aeronautics and space and acts as the German space agency. Its research and development work include aeronautics, space, transportation and energy.

The oldest predecessor organisation of DLR was founded 1907 in Göttingen which was the Aerodynamische Versuchs Anstalt (AVA). In 1969 several German research establishments were integrated into one organisation. Through the fusion of the German space agency in 1997, the organisation was finally called 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 research 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.

Programmes / Activities

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

The DLR aeronautics research is covering the following research domains:

- Optimisation of the performance and environmental compatibility of the entire aircraft system
- Expanding the range of helicopters to all weather conditions
- Efficient and environmentally-friendly aircraft engines
- Safe, environmentally-friendly and efficient air traffic (flight control, flight operations)

The activities are organised in four research topics:

Aircraft Research (LAR)
The programme topic Aircraft Research (LAR) is orientated to address three general, medium-term objectives of fixed wing aircraft research, i.e.:

- Continuous improvement of existing aircraft
- Design of new aircraft or aircraft families
- Conception of new aircraft configurations

Under the DLR / Onera partnership agreement so-called Common Research Projects have been established covering core areas, i.e. Flight Physics; Structures and Materials; Systems and Cabin; Concepts and Integration; Simulation and Validation; Specialized Military Technologies and Laser Research and Technology.
Conception of new aircraft configurations
Under the DLR / Onera partnership agreement so-called Common Research Projects have been established covering core areas, i.e. Flight Physics; Structures and Materials; Systems and Cabin; Concepts and Integration; Simulation and Validation; Specialized Military Technologies and Laser Research and Technology.

Rotorcraft Research (LRR)
Following the needs and requirements of official and industrial customers in Germany and France the activities are concentrated in six Research Fields (RF), including all DLR, ONERA and joint DLR / ONERA rotorcraft related tasks and projects as agreed upon in the DLR / ONERA partnership agreement, i.e. the "Virtual"-, "Quiet"-, "Smart"-, "Robust"-, "Innovative"- and the "Specialised Military Rotorcraft".

Engine Research (LER)
This research topic covers all DLR activities with respect to environmentally compatible and efficient engines with high specific performance for civil and military aircraft. In particular Compressor Technology, Combustion Chamber Technology, Turbine Technology and Virtual Engine / Validation Methods are addressed.

ATM and Operation (LAO)
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 sub-programmes, i.e. Efficient Flight Guidance and Operation; Human Factor and Safety in Aviation; Climate, Weather and Environment; Communication, Navigation and Monitoring and Innovative Air Traffic Management.

• Washington, D.C.

www.dlr.de

The Swedish Defence Research Agency FOI is an independent agency, funded primarily through contracts, reporting to the Swedish Department of Defence.

FOI was founded in 2001 by merging two agencies, the Aeronautical Research Institute FFA, and the Defence Research Establishment FOA. These agencies were originally founded in 1940 and 1945, respectively. At that time, the primary functions of the agencies were to perform research and studies in order to build up competence and experience in selected topics deemed important for national defence purposes. Such tasks are still being performed together with contract work for Swedish and foreign customers.

Mission / Objectives

FOI contributes to defining objectives, programmes and projects relative to defence and security, providing technical support and services to other governmental organisations and industrial and technological enterprises as well. FOI is required to

- perform research, develop methodologies, technologies, and evaluations for the Armed Forces and supporting disarmament and international security;
- work to transfer results from defence related research to other sectors;
- perform defence related analyses based on available international information and other sources;
- take measures to enhance cooperation between defence and civil research, as well as between national and international research;
- provide technical support and services to public bodies and industry within its remit;
- support, within legal statutes, export of Swedish defence materiel.

Programmes / Activities

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

- Swedish National Aeronautics Programme: Cooperation with Saab on CFD code development and hybrid structures.
- Swedish Military Programme: Cooperation with Saab and Volvo Aero on CFD, structures and materials, national code development on low signature (radar and IR-modelling), communication systems, sensor technology, weapons integration, and conceptual design.
- GARTEUR Aerodynamics: AG45, Application of CFD to predict high 'g' wing loads; AG46, Highly integrated subsonic air intakes; AG47, Coupling CFD to flight mechanics modelling; AG48, Lateral jet interactions at supersonic speeds.
- 6th and 7th Framework Programme:
FOI contributes to about 20 projects of the European Commission.

The activities of FOI in aeronautics include:

- Conceptual design and studies
Conceptual design of both fighter and civil aircraft; new propulsion concepts; UAV concepts; mission planning

- UAV studies
Stability and control issues of tailless concepts; innovative control effectors; directional stability; TVC concepts; mission planning; autonomous flight control

- Computational fluid dynamics
Development and application of numerical tools; design and shape optimization; flow control; applications to missiles, store release, spacecraft; fluid-structure integration and aeroelasticity

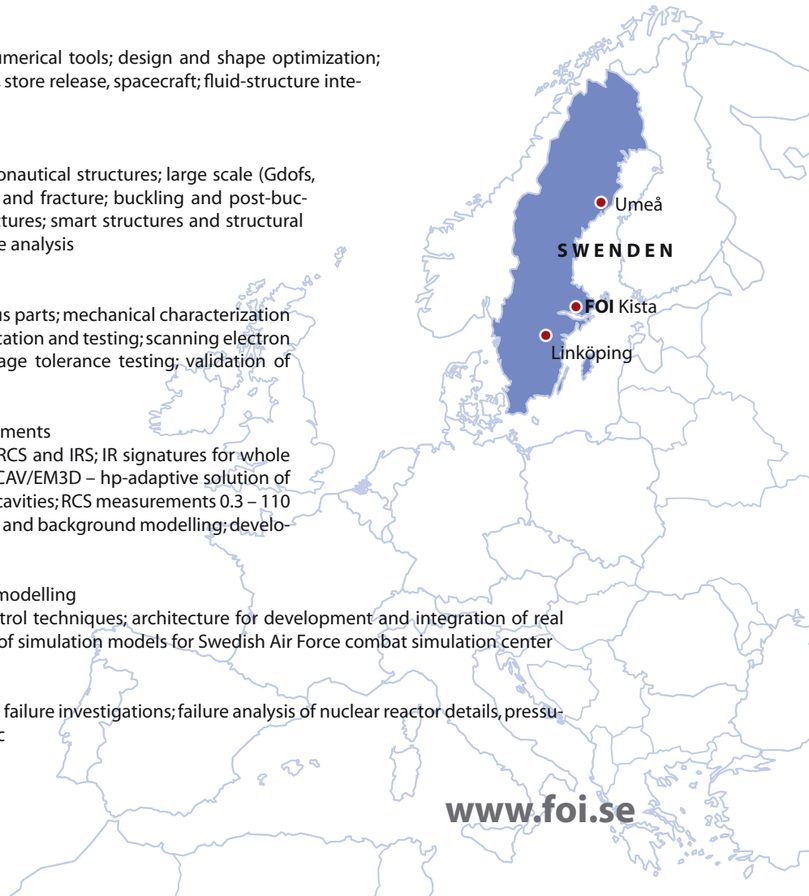
- Computational mechanics
Design and analysis of different aeronautical structures; large scale (Gdofs, TFlops) 3D p-adaptive FEM; fatigue and fracture; buckling and post-buckling; composite materials and structures; smart structures and structural health monitoring; damage tolerance analysis

- Structural testing
Structural and fatigue tests on various parts; mechanical characterization of various materials; composite fabrication and testing; scanning electron microscopy and fractography; damage tolerance testing; validation of computer modelling

- Signature modelling and measurements
Development of national codes for RCS and IRS; IR signatures for whole body, cavities and surroundings; EMCAV/EM3D – hp-adaptive solution of 3D electromagnetic scattering from cavities; RCS measurements 0.3 – 110 Ghz; IR measurement systems; target and background modelling; development of RAM/RAS

- Flight Mechanics, simulation and modelling
Stability and control; non-linear control techniques; architecture for development and integration of real time simulation models; integration of simulation models for Swedish Air Force combat simulation center

- Failure analysis
Failures in orbital rockets and aircraft failure investigations; failure analysis of nuclear reactor details, pressurised gas tanks, welded structures etc



www.foi.se

The Institute of Aviation, **ILOT**, is the Polish research and development establishment subordinate of the Ministry of Economy through the Supervised and Subordinated Units Department. The institute is an independent legal body; it owns its assets and has full legal capacity and power to act.

The history of the Institute of Aviation dates back to the renewing of Poland's independence after the First World War. The institute was founded in 1926. Up to 1939 the institute under its previous name, Institute of Aviation Technical Research, performed the authorisation and certification testing of all military aircraft produced and operated in Poland. Later it was named General Institute of Aviation and was active as a research and design centre for flying objects such as rockets, flying targets, helicopters, airplanes, and aircraft equipment. From 1998 the ILOT has developed into a major centre of new technologies. It offers services to clients and strategic partners of the biggest aviation consortiums.

Mission / Objectives

The mission of the Institute of Aviation is to provide research services of highest quality in aviation, aeronautics and related domains to companies worldwide.
The strategy 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, and
• increasing its competitiveness in the global research market.

The Institute of Aviation continues and expands research into all aspects of the aviation sector. It promotes and implements research results and conducts education activities through co-operation with organisations and institutions worldwide. ILOT invests in the development of scientific research workforce and research infrastructure and aims at enhancing human and organisational potential.

Programmes / Activities

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

In addition ILOT receives funds by the Ministry of Science and Higher Education as research grants assigned in competition. These funds are concerned with statutory research, scientific promotion of the employees, investments and supporting realization of industry commissions.
For the 2nd call in aeronautics of the 7th Framework Programme ILOT offered its participation and contributions in several projects:

- MESSAGE – Methodology for Sustainability of Airport Growth in Eastern European Countries,
- EPATS2 - European Personal Air Transportation System- Coordinating,
- COOPAIR - Guidelines for Cooperation between EU and LA in Aeronautics,
- WAW-Env-Mon - Warsaw Airport Environmental Monitoring,
- EMORPH - Electroactive Morphing for Aeronautics Configuration ,
- AVANCER - Application & Validation of New Flow Control Technologies to Empennage and Rear Fuselage,
- SAFELAND - Smart Technologies for Safe Landing Scenarios in Rotorcraft Activities

In order to perform these projects the activities of ILOT concerning aerospace in its New Technologies Centre and the Materials and Structures Research Centre include theoretical work, design & analysis and laboratory research in the fields of:

- aerodynamics (CFD and experimental analysis)
- avionics and systems integration
- design and strength analysis of metallic and composite structures (airplanes, helicopters, non-standard constructions and others)
- rocket propulsion
- landing gears and energy absorption systems
- aircraft propulsion including piston, turbo-shaft, & jet engines
- composite technologies
- vibration and flutter analysis
- environmental research
- testing of mechanical properties of materials, structures and structural components

www.ilot.edu.pl

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 independent organisation 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.

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 science, providing technical support, assessment and services to official bodies and agencies, and to industrial or technological enterprises as well.

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.

Programmes / Activities

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

■ Power Optimised Aircraft, POA: Development of new aircraft equipment with reduced consumption in non-propulsive power.

■ 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 observation UAV
- ALO: Light observation airplane
- MILANO: Long reach observation UAV with 20 hour flight time and 1000 km range
- DIANA: High speed drone
- PLATINO: Vertical take-off UAV

Apart from these developments, the institute continues to develop new generation unmanned aircraft, mini UAV and micro UAV.

■ TANGO: Structural tests of compound materials on real size aircraft fuselage; damage tolerance tests agreed with Airbus-Germany.

■ RAMPE: Study of alternatives to chromium and cadmium protective coatings to be applied in the aeronautical industry.

■ METEOR: Development of a new generation air to air long range missile. Reliability growth tests; EMC tests; inert qualification trials; structural trials; missile ejection trials.

■ PAESA: Spectrometric and systematic analysis of oils for early detection of failures in lubricating mechanical systems.

■ A400M: Structural and fatigue tests on the military transport aircraft A400M

In order to perform these projects the activities of INTA concerning aerospace include:

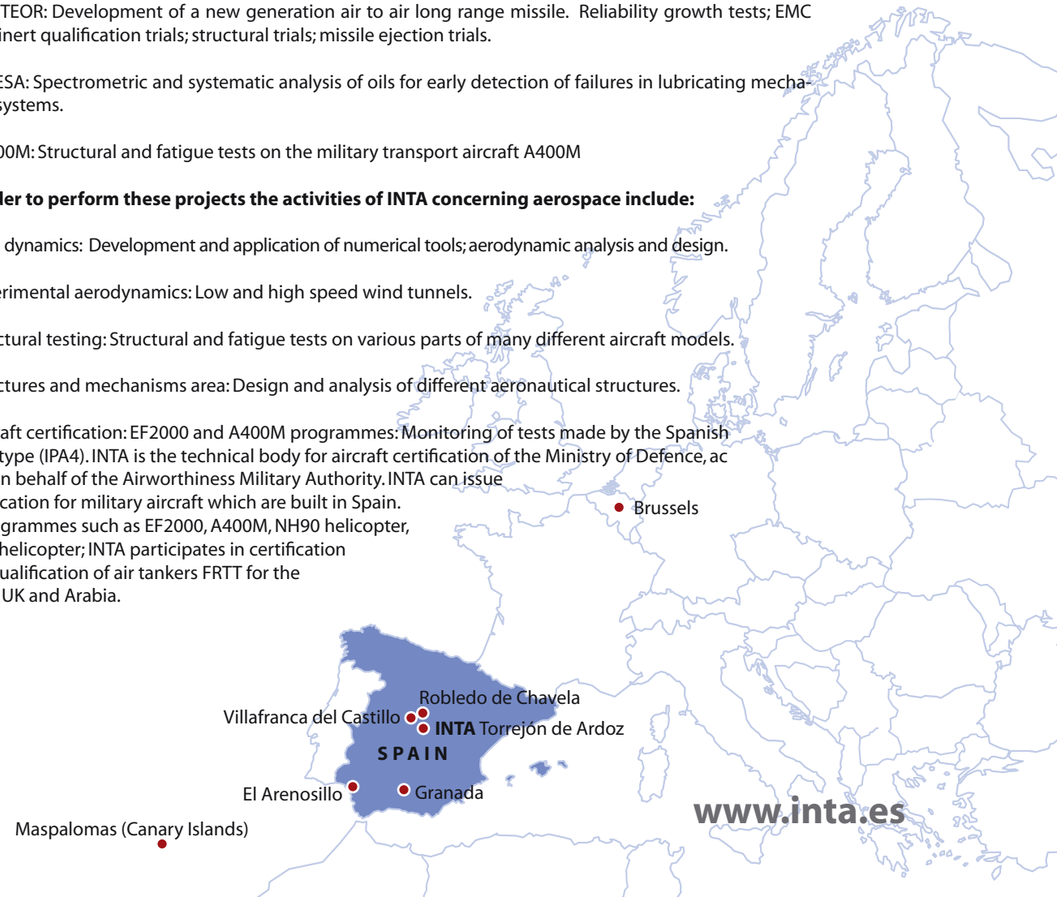
• Fluid dynamics: Development and application of numerical tools; aerodynamic analysis and design.

• 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: EF2000 and A400M programmes: Monitoring of tests made by the Spanish prototype (IPA4). INTA is the technical body for aircraft certification of the Ministry of Defence, acting on behalf of the Airworthiness Military Authority. INTA can issue certification for military aircraft which are built in Spain. In programmes such as EF2000, A400M, NH90 helicopter, Tiger helicopter; INTA participates in certification and qualification of air tankers FRTT for the RAAF, UK and Arabia.



www.inta.es

The foundation National Aerospace Laboratory NLR (Nationaal Lucht- en Ruimtevaartlaboratorium) is an independent non-profit organisation and the central institute for aerospace research in the Netherlands.

In 2009 NLR celebrated its 90th anniversary. From 1919 to 1940 the National Aviation Research Institute (Rijksstudiedienst voor de Luchtvaart, RSL) was based on the navy compound in Amsterdam. The institute included research departments for aircraft, aerodynamics, structures and materials, and engines, and already it had a wind tunnel. Ninety years of history confirm that NLR has had its sights set on the future since the early years of aviation.

Mission / Objectives

The NLR carries out applied research to support the aviation and space sectors in the Netherlands. Work under research contracts amounts to 75 percent of NLR's activities, the remaining 25 percent funded by the Netherlands' government for basic research programmes and development of equipment.
To support the Netherlands' government policy, NLR assists the Netherlands' Ministry of Defense at operational level and with the procurement of new ordnance. Also, NLR uses its research results to enhance the innovative capacity of private businesses. In this way, NLR contributes to more responsive authorities and competitive industries.
NLR is focussed on the realization of a specific set of goals:

- improve the safety of air transport
- reduce the environmental impact of air transport
- improve the capacity of airspace and Netherlands airports
- improve the competitiveness of the Netherlands aerospace industry
- improve the effectiveness and efficiency of the Netherlands military aviation
- support the Netherlands government policy with regard to the participation

NLR increases the research capacity of its staff and the operating budget of its research and test facilities through specific cooperation: In particular through the Framework Programmes of the European Commission, with (inter)national research institutes and universities.

Programmes / Activities

NLR's competences in aerospace are clustered in main knowledge areas:
Integral and system knowledge (multidisciplinary)

■ Safety and Security: Safety aspects of air traffic management procedures, aircraft operations, accidents and incidents.

■ Air Traffic Management and Airports: Development of new concepts for air traffic management; contributions to the European SESAR programme.

■ Environment & Policy Support: Aircraft noise, emissions and immissions, third party risk, standardization and enforcement.

■ Military Operations Research: Integration of knowledge about systems with operational deployment and characteristics of threat systems.

■ Space: Development of the European space infrastructure and its application.

Discipline knowledge (enabling technologies)

■ Human Factors & Flight Simulation: Concepts for instruction, training and deployment, and interaction with systems used by human operators.

■ Avionics Systems: Avionics system engineering, mission and operating systems, interoperability and interconnectivity between aircraft (and ground) systems, and manufacturing and qualification of avionics hardware and test systems.

■ Flight Test: Measurement techniques and methods for application at flight tests; evaluations and demonstrations of new concepts and systems.

■ Structural Integrity & Innovative Design Methods: Consequences of aircraft use on maintenance, repair and overhaul processes and on safety; integration of design tools, data management, project management, knowledge management, chains of problem solvers, and work flow management for the benefit of integral design.

■ Platform Technology & Flight Physics: Development and deployment of knowledge and experience on flying platforms as a whole: aircraft, helicopters and subsystems.

■ Composites & Structures Technology: Development of aerospace vehicles structures using new composite materials and metals; methods for cheaper manufacturing and design.

■ Test and Evaluation of Structures: Test and evaluation of materials, structures, manufacturing techniques and protection layers (coatings, paint).

The enabling main knowledge areas are directly used in research projects but they also provide inputs to the integral, multidisciplinary main knowledge areas.

www.nlr.nl

ONERA

THE FRENCH AEROSPACE LAB

Onera 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 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, 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 and tilt rotors,
- Propulsion,
- Orbital systems,
- Space transport,
- Missiles, defence and security systems,
- Aerospace systems.

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

Programmes / Activities

Onera's fields of activity are focussed on

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

Experts were 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. In the current FP7, Onera is one of the major associated member of the Clean Sky Joint Technology Initiative (JTI) through its participation in three Integrated Technology Demonstrators (ITD): SFWA (Smart Fixed Wing Aircraft), GRA (Green Regional Aircraft), GRC (Green RotorCraft) and in the Technology Evaluator.

Among particularly innovative programmes are:

Helicopters: Over 30 years of intense research on rotors, European rotorcraft now sets the best standard for noise and vibrations. Onera scientists provided industry with powerful design tools to drive the competitive advantage.

Dassault Aviation's Falcon 7X: During the design phase, Onera helped to enhance the aerodynamics and to reduce drag for lower fuel consumption.

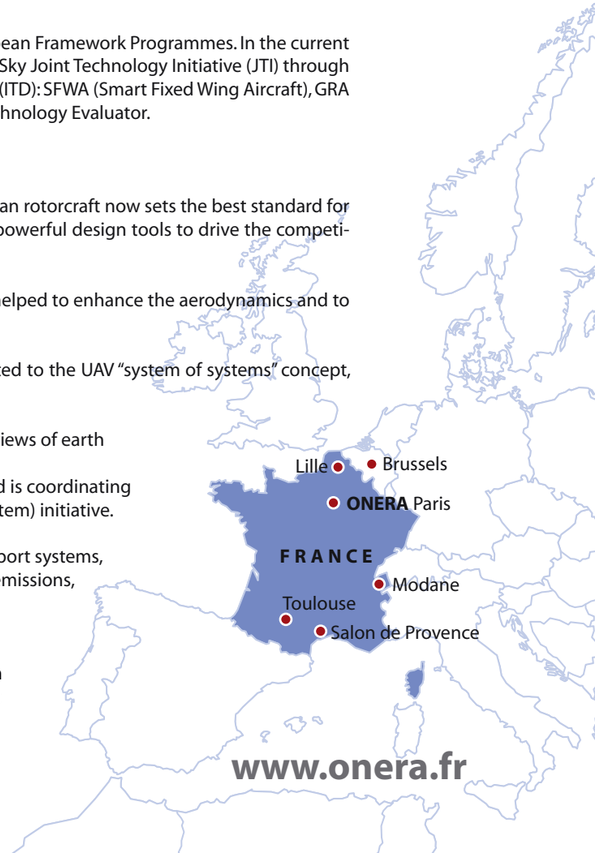
Unmanned Combat Air Vehicles (UCAV): Onera is fully committed to the UAV "system of systems" concept, driving basic research to develop enabling technologies.

SETHI: Airborne data acquisition and sensor test bed for aerial views of earth

IFATS: Onera is coming up with automated system concepts and is coordinating partners through the IFATS (Innovative Future Air Transport System) initiative.

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

Onera is also leading a consortium of 19 industrial and research partners to conduct a European strategic feasibility and impact study (SWAFEA) on alternative fuels for aviation.



www.onera.fr

The Czech Aeronautical Research and Test Institute VZLU (Vyzkumny a Zkusební Letecky Ustav) is a research organisation in the form of the joint stock company. It is the national center for research, development and testing in aeronautics and space with the Government of Czech Republic as the major shareholder.

The history of VZLU dates back to 1922, when it was founded by the former Ministry of Defence. In the pre-war years the institute was focussed mainly on aerodynamics and strength-of-structure calculations. After the war the institute came under the civil administration and took over design work from many aviation factories. VZLU gave rise to a number of successful aircraft, sport planes and helicopters. From the mid sixties, the institute participated in the development of new airplanes, small commuter and sport planes. VZLU also played an important role in initiating license production of Soviet planes. After 1989 VZLU got started working on new aeronautical and other programmes particularly the development of a new jet trainer. As for the civil sector, VZLU took part in the development and trials of a regional transport plane and a single engine turboprop.

Mission / Objectives

VZLU's mission is to conduct independent industrial (applied) research and development, partnership research and development, technology transfer and specific supplying services. The target customer is not only aircraft industry but other expanding industries as well, including particularly transport engineering, power engineering, civil engineering and space.

The major multidisciplinary fields of VZLU include: aerodynamics, structure strength and durability, material and corrosion engineering, composite materials and technologies, and accredited testing. In the field of product development, VZLU is focused on prop blades, industrial fans, cooperation on aircraft engines and satellite equipment. VZLU collaborates closely with similar organisations throughout Europe to support its continuous development.

Programmes / Activities

VZLU is active in following fields of competence:

- Aerodynamics
- Strength of structure
- Accredited environmental testing (mechanical, climatic, etc.)
- Aircraft engines
- Propellers and industrial fans
- Composites
- Micro-accelerometers for space applications
- Design of wind tunnels and accessories

VZLU also receives institutional funding from Research Plans from Czech Government. Actually VZLU is engaged in four Research Plans focussed on the following domains:

- External aerodynamics
- High-speed aerodynamics in engineering
- Research of strength of low-weight structures
- Composite materials in the primary structure

Since 2000 VZLU is active in a project of the Aerospace Research Centre (ARC), funded by the Ministry of Education, Youth and Sports, aimed to establish "Centres of Excellence" in aerospace research domains and to provide for the effective transfer of findings to other bodies.

VZLU provides research and developmental work mainly for national industry, usually through the targeted support of ministries, predominantly by the Ministry of Industry and Trade. The institute is involved in the following projects:

- Development completion of small multipurpose aircraft EV - 55 Outback
- Applying of hi-tech composite materials in fuselage primary structure of commercial aeroplane in the category CS 23 / FAR 23
- Composite repairs of airframes
- Integration of the ice accretion influence on flight characteristics and performance in all stages of development of small transport aircraft including certification process according to CS 23 and FAR 23
- A device for the conversion of heat energy into mechanical energy based on turbine machine.
- Unsteady flow of an axial-flow turbine stage Investigation

Participation in international projects is an essential part of RTD activities in the institute. VZLU takes part in many projects of 6th and 7th Framework Programme funded by the European Commission.

www.vzlu.cz

The Austrian Institute of Technology – AIT is a limited company according to Austrian legislation. Shareholder is the Republic of Austria (Federal Ministry for Transport, Innovation and Technology) with more than 50%. The other shares are in possession of the Federation of Austrian Industries. The division of Advanced Materials and Aerospace Technologies - AMAT is strategically positioned in the aviation and space travel sector.

The Austrian Research Centers – ARC were founded in 1956 and became Austria's largest non-university research institute. In 2009 ARC was restructured and transformed into the Austrian Institute of Technology – AIT.

Mission / Objectives

AIT understands its role as innovation partner of industry and of public organisations. It acts as a service provider in the field of application-oriented research and technology development combining a broad interdisciplinary catalogue of skills with specialized know-how.

The division of Advanced Materials and Aerospace Technologies - AMAT has a strong focus on the aeronautics and space sector working with partners from industry to develop new processes, products and system solutions for materials and process engineering. Interdisciplinary collaboration between experts from the different fields of technology is the strength of our research. Customers come from various sectors of industry, including aeronautic and space, the automotive supply industry, steel and metals, polymers and composites, machinery and equipment.

Programmes / Activities

The programmes most closely related to aeronautical development are:

■ Space Material Test House for the European Space Agency ESA / ESTEC:
In the field of material testing and development ARC operates over a period of 20 years a "space materials test house" under an ESTEC frame contract within the TRP Programme. In frame of this test house contract various projects cover areas like fretting behaviour, tribological characterisations, and solder technology or stress corrosion of metallic materials.

■ AMTT Aerospace Materials Technology Test House:
Co-operation with the European industry and academia in the field of aeronautics and space. From 1998 to 2004 this program was financed as a European Major Infrastructure in the framework of the "Improving the Human Research Potential and Socio-Economic Knowledge Base" program by the European Commission.

■ AAR Austrian Aeronautics Research:

ARC is engaged as the co-ordinator and scientific partner of the Austrian Aerospace competence network for composites and lightweight materials (volume of 20 M€ for period 2000 – 2009). The network formed with the mayor Austrian aeronautic industries was the first national initiative to combine and develop the technological capacity and potential of the Austrian aeronautic supply industry. Polymer composite developments within this network cover resin transfer moulding techniques, composite structures for cryogenic applications and development of structural health monitoring techniques for composites.

The relevant activities concerning the aerospace research include:

■ Aerospace and Advanced Composites:

- Structural Health Monitoring / Non-destructive Testing
  - Defect and structural modelling
  - Advanced sensor design and methodology
  - Residual lifetime models
- Composite Development:
  - Polymer Composites & Processes
  - Ceramic Composites & Coatings
  - Tribological Applications & Coatings
  - Nano-Particle Reinforcements
  - Process modelling

■ Space Propulsion and Advanced Concepts:

- Electric Micropropulsion (FEEP, µPPT)
- Plasma simulations
- Green Propellant Chemical Microthrusters
- Innovative Hydrogen Storage for Telecom Satellites
- Gravitational Anomalies in Superconductors

■ Alloy Development and Powder Technology:

- Steels & high temperature materials, coatings
- Light metal alloys and metal matrix components
- Powder technology (Metals, hard metals, ceramics and MMCs)
- Feasibility studies and small series production
- Hot pressing and sinter-hipping
- Powder injection moulding (PIM)
- Severe plastic deformation (SPD)
- Inorganic Nano-particles and Coatings

www.arcs.ac.at

The National Institute of 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.

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 the aeronautical and space fields.

Mission / Objectives

The mission of INCAS is to offer dedicated R&D services to aerospace community. INCAS covers the whole cycle from the basic-oriented research, via applied research and finally technological development and implementation of the obtained production results.

■ The basic research accomplished by INCAS aims to increase the knowledge level in the aerospace and aeronautical fields, referring to general aerodynamics, flight and systems dynamics, aerospace structures, aeroelasticity, strength of materials applicable in aeronautics, and aerospace propelling systems.

■ Applied research and technological development which represents the specificity of the institute refers to the achievement of aerospace technologies and materials; electronic mechanical-hydraulic and pneumatic equipment, experimental models in the aeronautical and aerospace fields, testing benches and installations, platforms and pilot stations, laboratory apparatus, devices and tools for the aeronautical industry.

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.

The institute elaborates computing programs and computing methodologies for the completed testing benches and installations.

An important field of the research and development activity of the institute refers to aeronautical and space plants restructuring, retrofit and up-grading.

For an easier industrial implementation of the institute's research, in order to obtain the expected parameters in a shorter time and more efficiently, the institute is carrying out associated activities to be offered to the end-users. Such activities are:

- technical assistance ;
- consulting;
- scientific and technical support;
- testing performed on special facilities;
- issuing of quality certificates.

In addition, the institute carries out studies referring to strategies, prognosis, reliability, evaluation, aircraft assessment and airborne instruments.
INCAS performs aircraft personnel training consisting in:

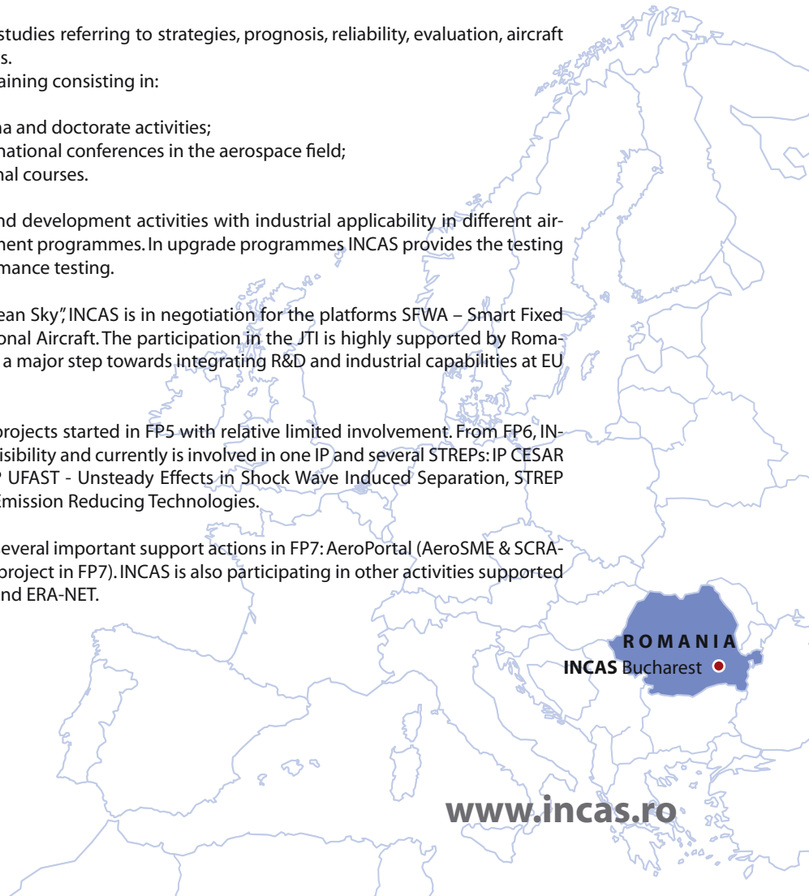
- organisation and survey of diploma and doctorate activities;
- organisation of national and international conferences in the aerospace field;
- organisation of airspace educational courses.

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.

With respect to the European JTI "Clean Sky", INCAS is in negotiation for the platforms SFWA – Smart Fixed Wing Aircraft and GRA – Green Regional Aircraft. 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.

Participation of INCAS in European projects started in FP5 with relative limited involvement. From FP6, INCAS has increased his international visibility and currently is involved in one IP and several STREPs: IP CESAR - Cost Effective Small Aircraft, STREP UFAST - Unsteady Effects in Shock Wave Induced Separation, STREP AVERT – Aerodynamic Validation of Emission Reducing Technologies.

In addition INCAS is contributing to several important support actions in FP7: AeroPortal (AeroSME & SCRATCH projects) and CEARES (SSA - CA project in FP7). INCAS is also participating in other activities supported by EU instruments: SCRATCH, AirTN and ERA-NET.



www.incas.ro

VON KARMAN INSTITUTE
FOR FLUID DYNAMICS

The von Karman Institute for Fluid Dynamics, VKI, is an International Not 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 center 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 number 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. In October 2006 the 50th anniversary of the foundation of the VKI was celebrated.

Mission / Objectives

VKI's 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;
- 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.

Programme / Activities

Main programmes and activities cover the following fields:

- Aerodynamics of flight vehicles, from low-speed to hypersonics
- Aeroacoustics (aeronautical and automotive applications, fans)
- Aerothermodynamics of hypersonic vehicles for planetary entry and high-speed transportation
- Solid rocket propulsion (internal flows and pressure instabilities)
- High-speed reacting flows, fluid physics and physical modelling
- Computational fluid dynamics algorithms and numerical schemes
- Space weather
- Electrochemically reacting flows (fuel cells, electrolysis, electroplating
- Aerothermodynamics of high pressure turbines,
- Aerodynamics of jet engine boosters
- Low pressure compressors and turbines,
- Turbines cooling
- Micro gas turbines,
- Design and optimization techniques for turbomachinery components
- Time resolved instrumentation for pressure, velocity, temperature and heat flux
- Wind engineering (urban microclimates, pollutant dispersal, structural aspects)
- Industrial processes, including heat transfer and multiphase flows
- Mitigation of industrial hazards
- Biological flows
- Mechanics of turbulence

www.vki.ac.be

The Technical Research Center of Finland, VTT (Valtion Teknillisestä Tutkimuslaitoksesta) is a part of the Finnish innovation system under the domain of the Ministry of Employment and Economy. VTT is a not-for-profit research organisation and has ISO9001:2000 certificate.

Since its establishment over 60 years ago (1942), VTT has become an important center of technological expertise and developer of new technologies. After the war VTT was the only concentrated research centre capable of serving reconstruction and the war reparations industry. In the 1960s VTT grew to become Finland's biggest research institute. In 1978 state funding and commercial research were separated and later VTT was reorganised to ensure the achievement of the goals set out in VTT's strategy and to safeguard both the current and future technological expertise, internationalisation and competitiveness of the research center.

Mission / Objectives

VTT is the biggest multi-technological applied research organisation in Northern Europe. As a globally networked contract research organisation, VTT provides high-end technology solutions and innovation services.
From its wide knowledge base, VTT can combine different technologies, create new innovations and a substantial range of world class technologies and applied research services thus improving its clients' competitiveness and competence.
Through its international scientific and technology network, VTT can produce information, upgrade technology knowledge, and create business intelligence and value added to its stakeholders.

VTT produces research services that enhance the international competitives of companies, society and other customers at the most important stages of their innovation process, and thereby creates the prerequisites for growth, employment and wellbeing.

VTT promotes the realisation of innovative solutions and new businesses by foreseeing already in the strategic research stage the future needs of its customers. VTT creatively combines its multidisciplinary expertise with the know-how of its partners. VTT also exploits global networking and the basic research results of universities in its services.

Programme / Activities

Spearhead programmes:

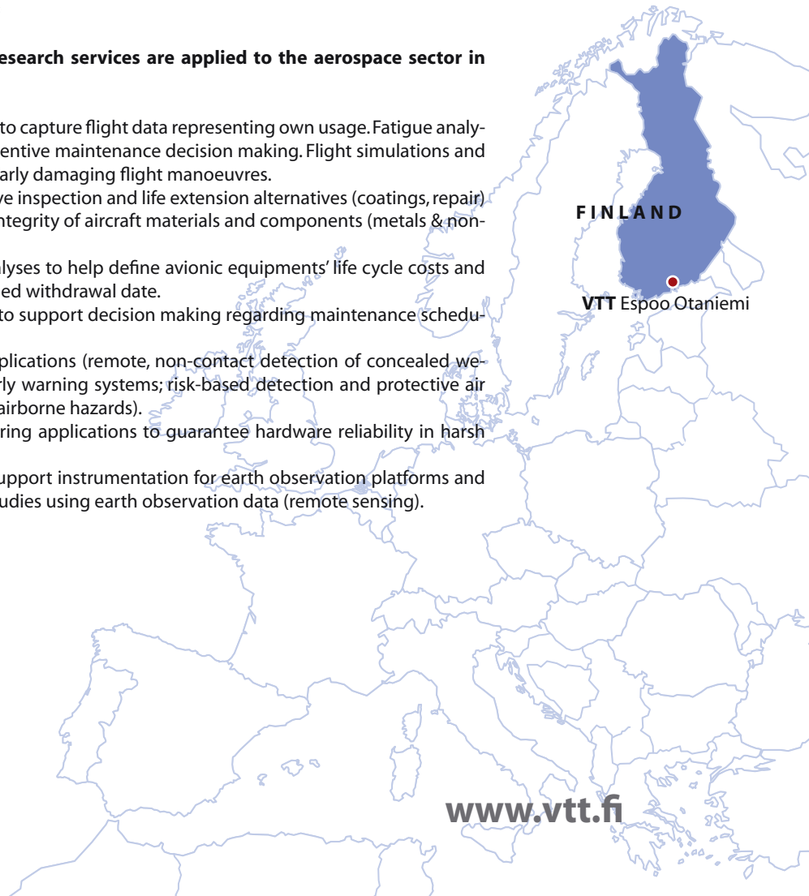
- Industrial biomaterials – Renewing of forest cluster and bioeconomy based wellbeing.
- eEngineering – Digital product process as a success factor for technology industries.
- Digital world and ubiquitous computing – Open smart spaces.
- Printed intelligence – Facilitating the economic production of new smart products.

Major innovation programmes:

- Eco-efficient Intelligent Built Environment
- Energy Efficiency and New Fuels for Transport
- Fuel Cells
- Functional Surfaces
- Technologies for Health
- Finnish Global Factory
- High-performance Microsystems
- Information and Network Security

VTT's multi-disciplinary applied research services are applied to the aerospace sector in many ways:

- Individual aircraft fatigue tracking to capture flight data representing own usage. Fatigue analyses using these data to support preventive maintenance decision making. Flight simulations and visualisation to help identify particularly damaging flight manoeuvres.
- Destructive testing, non-destructive inspection and life extension alternatives (coatings, repair) to assess and extend the structural integrity of aircraft materials and components (metals & non-metals).
- Life cycle cost and availability analyses to help define avionic equipments' life cycle costs and availability within the aircraft's planned withdrawal date.
- Risk-informed fleet management to support decision making regarding maintenance scheduling, fleet availability and safety.
- Airport security improvement applications (remote, non-contact detection of concealed weapons and explosives; biohazard early warning systems; risk-based detection and protective air filtration system for airports against airborne hazards).
- Environmental reliability engineering applications to guarantee hardware reliability in harsh environments (shock, vibration).
- Spectrum of ICT applications to support instrumentation for earth observation platforms and space science missions. Dedicated studies using earth observation data (remote sensing).



www.vtt.fi

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.

Programme / 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.

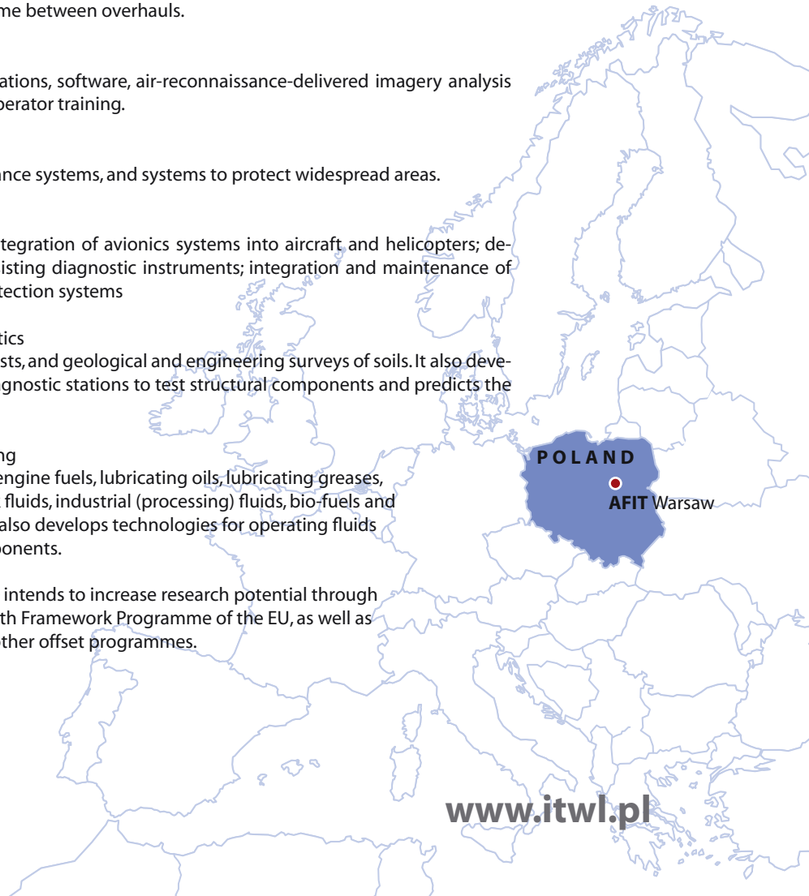
■ Aircraft Surveillance Systems
AFIT supplies terrain aircraft surveillance systems, and systems to protect widespread areas.

■ 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

■ 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.

The institute's development strategy intends to increase research potential through participation in projects within the 7th Framework Programme of the EU, as well as the European Defence Agency and other offset programmes.



www.itwl.pl

Conclusion / Outlook

As EREA was created 15 years ago the challenging vision consisted of

- The formation of a common institutional identity
- The creation of common centers of competence
- The common operation of large testing facilities such as wind tunnels.

Even though boundary conditions since 1994 have changed EREA progressed towards its goal of strengthening the interdependencies between its members by establishing common programmes and activities. In the last 15 years EREA has shown itself to be active and has gradually proved to be relevant and representative on the European scene, EREA has succeeded in establishing good internal consultation, EREA now has a very good idea of how to speak with one voice and defend the interests of its members in many areas concerning the European Union's research activities as well as within ACARE.

Important contributions for the harmonisation of research activities through common technical networks and projects in the frame of EREA and the European Framework Programmes have been achieved. EREA led a large number of upstream collaborative research projects and gave substantial contributions to downstream validation projects. EREA actively took part in the definition of the 7th FP and was also one of the major contributors in the elaboration of the ACARE Strategic Research Agendas. EREA contributed to implement the European Research Area in the domain of aeronautics by coordinating Networks of Excellence, and in addition the European co-operation was intensified through EREA by establishing essential bi- and multilateral programmes.

Therefore it is quite easy to think to the anniversary as an important milestone already reached, and an occasion for celebrations; but the important point is not to forget that an anniversary, beyond any celebratory event, is the right time to consolidate the results obtained and thinking towards the improvement needed for a better future; this is exactly the aim of EREA after 15 years of "operations": take the opportunity to celebrate an important anniversary, looking at the future of the association having in mind the experience and the lessons learned in the first fifteen year.

Next to an increased technical co-operation the necessity appears within EREA to coordinate the overall development and policy of aeronautical research in domains of global relevance like safety and environment. EREA will also significantly continue to contribute to the implementation of the ACARE Vision 2020 goals and the associated Strategic Research Agendas. The EREA establishments will also be important stakeholders towards the implementation of the Single European Sky, and they will continue to be important partners within big European programmes like the JTI Clean Sky and SESAR.

As such, EREA is going to fulfil the role of the European aeronautical "Center of Excellence".

EREA Delegates

Full Members

	CIRA	DLR	FOI	INTA	NLR	ONERA	ILOT	VZLU
	Via Maiorise 81043 Capua Italy Tel : + 39 0823623111 **www.cira.it**	Linder Höhe 51170 Köln Germany Tel : + 49 22036010 **www.dlr.de**	SE-17290 Stockholm Sweden Tel : + 46 855503000 **www.foi.se**	Carretera de Ajalvir, km.4 28850 Torrejón de Ardoz Madrid - Spain Tel : + 34 915201852 **www.inta.es**	P.O. Box 90502 1006 BM Amsterdam The Netherlands Tel : + 31 205113113 **www.nlr.nl**	B.P. 72 92322 Chatillon cedex France Tel : + 33 146734040 **www.onera.fr**	Institute of Aviation Aleja Krakowska 110/114 Warsaw - Poland Tel : + 48 228460011 **www.ilot.edu.pl**	Beranovych 130 19905 Praha Letnany Czech Republic Tel : + 42 0225115100 **www.vzlu.cz**
Board	Dr. **L. VERDE** General Director Tel : + 39 0823623332 E-mail : l.verde@cira.it	Prof. Dr. **J. SZODRUCH** Member Exec. Board, Aero. Tel : + 49 22036013678 E-mail : joachim.szodruch@dlr.de	Dr. **A. BLOM** Research Director Defence & Security, Systems & Technology Tel : + 46 855503160 E-mail: anders.blom@foi.se	Mrs. **C. RODRIGUEZ AGUSTIN** Deputy DG of Corporate Rel. Tel :+34 915202140/1774 E-mail: cra@inta.es	Ir. **F.J ABBINK** General Director Tel : + 31 205113256 E-mail : abbink@nlr.nl, mvveen@nlr.nl Helene Groenewald 3259	Mr. **D. MAUGARS** President Tel : + 33 146734000 E-mail : franc@onera.fr	Dr. **W. WISNIOWSKI** General Director Tel : + 48 228460993 E-mail : waw@ilot.edu.pl	Ing.. **J. KASPAR** General Director Tel : + 42 0225115101 E-mail : kaspar@vzlu.cz
Executive Secretariat ES	Mr. **M. L. FARIOLI** SCDA – Support to the Board for Strategic Planning Tel: + 39 0823.62.31.10 E-mail: m.farioli@cira.it	Mr. **A. JUNIOR** HGF/European Integration Tel : + 49 22036013029 E-mail : alf.junior@dlr.de Dr. **U. MÖLLER** Head Brussels office Tel : + 32 25000842 E-mail : uwe.moeller@dlr.de Mobile Corp: + 49.173.2910855	Dr. **A. BLOM** Research Director Defence & Security, Systems & Technology Tel : + 46 855503160 E-mail: anders.blom@foi.se	Mrs. **M. MARCH** Subdirec. Gral. de Relaciones Institucionales y Política Comercial. INTA Tel: +34 915201558 E-mail: marcham@inta.es	Mr. **M. BROUWER** Head Strategy and Policy Tel : + 31 205113057 E-mail : mbrouwer@nlr.nl, groenewd@nlr.nl Mobile Corp: + 31.62334 4279	Dr. **D. NOUAILHAS** Director Tel : + 33 146734656 E-mail : dominique.nouailhas@onera.fr Mobile Corp: + 33 6082674.52	Prof. **M. JEZ** Tel : + 48 228460801 E-mail : hedgehog@ilot.edu.pl marian.jez@wp.pl Mobile: + 48 504204042	Ing. **K. PAIGER** Head, Commerce & Marketing Tel : +42 0225115332 E-mail : paiger@vzlu.cz
Aeronautical Research Group ARG	Mr. **M. AMATO** Head CFD Laboratory Tel : + 39 0823623310 E-mail: m.amato@cira.it Mobile Corp: + 39 3480187324	Mr. **V. KRAJENSKI** Programme Directorate Aeronautic Tel : + 49 22036013699 E-mail : volker.krajenski@dlr.de	Dr. **A. HANIFI** Research Director Dept.Computational Physics Tel : + 46 855503197 E-mail : ardeshir.hanifi@foi.se	Mr. **P. GARCIA-SAMITIER** Assistant Dir. of Institutional Relations & Commercial Policy Tel : + 34 915201450 E-mail : garciasp@inta.es	Dr.ir. **H. ROEFS** Manager knowledge and Technology Tel : + 31 205113774 E-mail : roefs@nlr.nl Mobile Corp. +31.610558286	Mrs. **C. MICHAUT** Civil Aviation and European Affairs Tel : + 33 146734942 E-mail : christiane.michaut@onera.fr	Ph.D.Eng. **Z. WOLEJSZA** Dir.Center of New Technologies Tel +48 228463822 E-mail: zbigniew.wolejsza@ilot.edu.pl	Dipl. Ing. **P. MAKOVSKA** Manager for RTD Project Administration Tel : +42 0225115367 E-mail : makovska@vzlu.cz
Security Research Group SRG	Mr. **P. SCHIANO** Head of ICT Services & Laoratories Tel : + 39 0823623140 E-mail: p.schiano@cira.it	Dr. **U. MÖLLER** Head Brussels office Tel : + 32 25000842 E-mail : uwe.moeller@dlr.de Mobile Corp: + 49 1732910855		Mrs. **M. MARCH** Subdirec. Gral. de Relaciones Institucionales y Política Comercial. INTA Tel: +34 91 520 15 58 E-mail: marcham@inta.es	Dr.ir. **H. ROEFS** Manager knowledge and Technology Tel : + 31 205113774 E-mail : roefs@nlr.nl Mobile Corp. +31.610558286	Mrs. **S. PASCAL** European Defense & Security business development Tel : +33 146733742 E-mail : sylviane.pascal@onera.fr		Mr. **R. ULMAN** RTD Project Manager Tel : +42 0225115470 E-mail : ulman@vzlu.cz
Brussels Delegates		Dr. **U. MÖLLER** Rue du Trône 98 1050 Brussels Belgium Tel : + 32 25000842 E-mail :uwe.moeller@dlr.de		Mrs. **M. MARCH** Rue du Trône 62 1050 Brussels Belgium Tel : + 32 22892692 E-mail : marcham@inta.es		Mr. **J. PRIEUR** c/o CLORA Av. des Arts, 6-8 1050 Brussels Belgium Tel : + 32 25068841 E-mail : prieur@clora.eu		

Chairman

Vice Chairman

Head

notes

EREA

notes

EREA


DLR
FOI
NLR
VTT
ONERA
I.N.C.A.S.
INTA
CIRA
AIT