



## 60 years of Romanian Aerospace Research and Innovation

The National Institute for Aerospace Research "Elie Carafoli" is the leading research establishment in aerospace sciences in Romania, with a tradition of more than 60 years in aerospace engineering, flow physics and applied aerodynamics, using state-of-the-art technologies and unique infrastructure of national strategic importance. INCAS has been involved in all major national aeronautical projects for civil and military areas, and is currently acting as a major player in EU policy making for Research and Development under the FlightPath 2050 vision and the future Horizon 2020 program.

**INCAS** has carried out its activity under different names and structures for about 50 years (since 1950) when The Applied Mechanics Institute of the Romanian Academy was established. In 1991 the Aviation Institute was reorganized along with the whole aeronautical industry and a new company has been established, namely National Institute for Aerospace Research "Elie Carafoli" – INCAS which have as object the complex research in the aeronautical and space field.

The name of the institute "Elie Carafoli" was made in recognition of the merits of the famous scientist and Romanian engineer who founded the Aircraft University in Bucharest. He is considered a pioneering contributor to the field of Aerodynamics.

It was here that he built the **first wind tunnel in South-Eastern Europe**, and elaborated some of the theory on which calculations of wing profiles of supersonic aircraft are based.

From 1930 to 1937 Carafoli worked at Industria Aeronautică Română in Braşov. Together with Lucién Virmoux from Blériot Aéronautique, he designed the IAR CV-11, a single-seat, low-wing monoplane fighter aircraft. In 1948, he became a member of the Romanian Academy. In 1949 he became director of the Institute of Applied Mechanics of the Academy. In 1971, he reorganized, along with Henri Coandă, the Department of Aeronautical Engineering of the Polytechnic University of Bucharest, derived from the Department of Mechanical Engineering



## **Mission**

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

- Fundamental Research - aims to increase the level of knowledge in aerospace and aeronautical sciences;
- Applied Research – technological development, refers to development of technology and aerospace materials.

## **Objectives**

Becoming a regional leader and provider of competence and valued resources for advanced research in aerospace sciences, by promoting at an international level of a unique infrastructure of applied research, and through continuous training of an elite body of scientists in the aerospace field.

## **Know-How**

The main research directions of the National Institute for Aerospace Research "Elie Carafoli" are as follows:

- Fundamental and applied research in the field of fluid mechanics and aerodynamics;
- Basic and advanced research in the field of aerospace systems dynamics;
- Conceptual development and integration of aerospace systems;
- Complex simulation in the field of fluid mechanics and complex industrial processes;
- Development of new materials for aerospace applications.
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Also, as an aerospace representative in Romania, INCAS performs the following activities:

- Coordinating national R & D activities in the aerospace field;
- Representing Romania and Romanian organizations at an

- international level in the aerospace organizations;
- Promoting development of research, technology and capacity in the areas of competence;
  - Conducting scientific research and technological development both through its own resources, as well as an integrator of complex projects.

## **Facilities**

INCAS is recognized as a unique research institution that has a very complex experimental platform for research into fluid mechanics and applied aerodynamics. This experimental platform is worldwide competitive and represents the basic element for projects of civil and military aviation industries.

The main components of the INCAS' experimental platform dedicated to aerospace research are as follows:

- Trisonic Wind Tunnel;
- Subsonic Wind Tunnel;
- Airborne Laboratory ATMOSLAB - Hawker Beechcraft King Air C90-GTx aircraft;
- Mechatronic Systems;
- Mechano-Hydro-Pneumatic Laboratory;
- New Materials;
- Tribology, testing and investigations
- Airborne Laboratory BN-2 Britten Norman BN2 A-26;
- Ground Mobile Laboratory;
- Ground Experimental Platform – Strejnic, Prahova;
- Experimental Platform ECOTECH, Mâneci.

## **National and international programs:**

### **National programs**

- Participation in the national research projects type Horizon 2000, PNCD/PNCD-2 and CEEX;

- Participation in the MEF sectorial programs and projects MARD;
  - 84 PNCD / CEEX (57 projects coordinated and 27 as partner);
  - CORINT (8 projects coordinated).
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- Aerospace - national program CD-I space and aeronautics;
  - SECURITY - national program CD-I of research, Techniques and systems for security and defense;
  - AeroTaxi project is distinguished by an approach of a new generation specific thematic of the CS-23 aircraft, for a new regional air transport system.

### **International programs:**

- EU-FP5/FP6/FP7 programs - covering the Aeronautics/Transport thematic area;
  - EU-FP7 programs – covering the Space and Security thematic area;
  - ESA- European Space Agency programs;
  - Bilateral cooperative projects.
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- JTI- Clean Sky (EU-FP7) JU intended for new technologies validated on aircraft developed at the EU level. INCAS participates in SFWA - Smart Fixed Wing Aircraft and GRA-Green Regional Aircraft;
  - CESAR (FP6 IP) Cost Effective Small Aircraft -the only IP project intended for C S-23 aircraft categories developed at EU level;
  - UFAST (STREP-FP6) Fundamental research project to analyze the interaction layer-shock wave limit;
  - AVERT (STREP-FP6): project intended for the development of new technologies of active control for aircraft flow;
  - participation in EGEE/2/3: projects intended to technological development of Grid type at EU level;
  - participation in SEEGrid/2/3 - support actions of development for the Grid infrastructure in the region;
  - EU CA/SSA actions - CEARES projects as well as the participation in CASH and AeroPortal.

### **Memberships / Partnerships:**

- European technological Platforms: ACARE - Advisory Council for Aeronautical Research in Europe;
- EREA - European Research Establishments Association in Aeronautics;
- ARG - Aeronautical Research Group;
- INCAS- International Council for Aeronautical Sciences;
- AIAA-American Institute of Aeronautics;
- Royal Photography Society-Technical Imaging Group;
- IMEKO-International Measurement Confederation;
- EWA-European Wind Tunnels Association;
- STAI-the Supersonic Tunnel Association International.

### **Results of R&D activity:**

#### Products, Technologies, Prototypes

- Concepts and industrial models for civil and military aircraft;
- Unmanned Aircraft Systems for a wide range of applications;
- Consulting services for civil and military aircraft operations;
- City Aerodynamic applications for the city and the environment - expert systems;
- Specialized software for complex numerical simulation, command and control systems;
- Industrial consultancy services for aeronautics industry at EU level;

### **INCAS Aircraft:**

- IAR 99 SOIM;
- IAR 93;
- Supersonic Projects;
- AEROTAXI;
- ECO 100 Light Aircraft;
- IAR-T;
- Hot Air Balloon.



## **Specialization and personnel training**

INCAS also activates in staff training and specialization in aviation and space sciences for non - university higher education, university education and other forms of education.

INCAS performs aircraft personnel training as follows:

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