

CESAR - a challenge for general aviation in Europe

In 2006 forty organizations from 14 European countries joined their forces to bring new technologies and know-how to make development and operation of general aviation airplanes more effective.

The integrated project entitled as **CESAR (Cost Effective Small AiRcraft)** supports competitiveness of European manufacturers of small-size commercial aircraft and their supply chains. Technologies addressed by CESAR are scheduled mainly for smaller regional airplanes of commuter type for 5 to 19 passengers, falling under EASA CS-23 (or FAR 23) regulation category.

The project budget is 34 million Euro, of which 18 mil. EUR is the contribution of the European Commission under the 6th Framework Programme. The remaining part of the budget is funded by private sources. The project is coordinated by VZLÚ, the major aeronautical research and testing centre in the Czech Republic.

The project consortium

AERNOVA, ARC, CENAERO, CIRA, DLR, EADS-CRC, EUROCOPTER, EVEKTOR, FOI, HAI, HEXAGON, INCAS, IOA, IVCHENKO, JIHLAVAN, JIHOSTROJ, LIEBHERR, LMS-UniPATRAS, MERL, MESIT, NLR, ONERA, PBS, PIAGGIO AERO, PZL, RWTH Aachen, SICOMP, SOCATÀ, SPEEL, SRM, TECHNOFAN, TUM, TURBOMECA, ULG, UNIS, UOM, VUT Brno, VZLU



CESAR is focused on development processes, design tools and selected technologies enabling a significant reduction of the time-to-market and lowering the overall developmental and operation costs. The project consists of five technology areas sufficiently covering the complexity of the aircraft design process, namely aerodynamic and structural design, propulsion integration, aircraft system optimization and design integration aspects.

General CESAR objectives

- Time to market reduction by 2 years
- Development cost reduction by 20%
- Reduction of manufacturing and assembly costs by 16%
- Propulsion unit efficiency and affordability
- External noise reduction by 3 dB (A)
- Optimization of selected aircraft systems

In particular CESAR project aims at enhancing aerodynamic and structural design tools and structural evaluation methods. Technical work comprises development, validation and integration of design tools and methodologies to provide suitable environment for virtual aircraft simulation. Another important part of the project is technological development for aircraft subparts and systems. The CESAR aspires to provide technologies and knowledge for advanced wing, competitive and environmentally acceptable propulsion unit and new technologies for selected aircraft systems to reduce aircraft operating costs and improve safety.

The activities also include the integration of the latest technologies already applied to large commercial aircraft and their modified economical use within the category of small commercial general aviation aircraft, e.g. advanced aerodynamic design based on CFD, cost effective electro-hydraulic and electro-mechanic actuation, complex power-plant control system, competitive technologies for air

systems, structural health monitoring and on condition maintenance systems.

Achievements brought by CESAR:

Aerodynamic Design	<ul style="list-style-type: none"> • Proved high fidelity aerodynamic tools customized for small aircraft development • Adaptation and improvement of specific tools to be used for aerodynamic analysis • Providing methods, tools, data and experiences, which allow accelerating the aerodynamic design • Demonstration of the improvement of design process results by means of CFD methods in combination with optimization strategies • Design with a higher degree of safety with respect to flow separation and icing • Catalogue of advanced airfoils • Wing design optimization • Reliable tool for analysis of wing contamination • Development of more consistent chain of tools and database for flight dynamics analyses • Proven flight dynamics testing procedures customized for general aviation
Structural Design	<ul style="list-style-type: none"> • Affordable tool for estimation of operational and fatigue load • Assessment of alternative design and manufacture technologies (welding, riveting, composite technologies) • Reliable and relatively fast methods and tools for strength evaluation for CS-23 aircraft • Development of an effective tool able to analyze composite structures • Real-time structural health monitoring system resistant to harsh conditions • Development of improved methods for reliable and fast prediction of aeroelastic stability • Optimization of analytical and experimental approaches and methods to reduce time and costs of ground vibration tests and flutter certification process

Propulsion Integration	<ul style="list-style-type: none"> • Design tools and technologies necessary for development of modern turboprop engine • Low weight centrifugal compressor and increased efficiency of thermodynamical circle • High reliability and efficient transmission • Low cost "FADEC" with self-diagnostics, incl. propeller control for smaller engines • Low-noise propeller design
Optimized Systems	<ul style="list-style-type: none"> • Efficient and low weight electro-hydraulic actuation (EHA) • Advanced concept for electro-mechanical actuation (EMA) • Competitive integrated environmental control system and cabin pressure system • Integrated diagnostics and on-condition maintenance system
Design Processes	<ul style="list-style-type: none"> • Integrated computer environment for the design of small aircraft • Optimized processes and knowledge management for design and development of small commercial aircraft



The CESAR project will be accomplished in 2010 and definitely the project will not stay alone in the next period. In January 2008 the European Commission adopted a special agenda recognizing general and business aviation as an important industrial sector with a large source of employment, expertise, technology and revenues. The European Commission now proposes to integrate general and business aviation into the EU air transport policy.



More information about CESAR project on www.cesar-project.eu



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Organisation	Country
Výzkumný a zkušební letecký ústav, a.s.	Czech Republic
Aero Vodochody a.s.	Czech Republic
Austrian Research Centers GmbH	Austria

Organisation	Country
Centre de Recherche en Aéronautique, ASBL	Belgium
Centro Italiano Ricerche Aerospaziali ScpA	Italy
Deutsches Zentrum für Luft- und Raumfahrt e.V.	Germany
EADS Corporate Research Centre	Germany
EUROCOPTER S.A.S.	France
EVEKTOR, spol. s r. o.	Czech Republic
Swedish Defence Research Agency	Sweden
AERENNOVA Engineering Solutions, S.A.	Spain
HELLENIC AEROSPACE INDUSTRY S.A.	Greece
HEXAGON Systems, s.r.o.	Czech Republic
National Institute for Aerospace Research "Elie Carafoli"	Romania
Instytut Lotnictwa - Institute of Aviation	Poland
IVCHENKO PROGRESS SE	Ukraine
Jihlavan a.s.	Czech Republic
JIHOSTROJ a.s.	Czech Republic
Liebherr Aerospace Toulouse SAS	France
Materials Engineering Research Laboratory Ltd	UK
MESIT přístroje spol. s r.o.	Czech Republic
Stichting Nationaal Lucht- en Ruimtevaartlaboratorium	Netherlands
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES	France
První brněnská strojírna Velká Bíteš, a.s.	Czech Republic
PIAGGIO AERO INDUSTRIES S.p.A.	Italy
Polskie Zakłady Lotnicze Sp. z o.o.	Poland
SICOMP AB	Sweden
EADS SOCATA	France
SPEEL PRAHA, Ltd.	Czech Republic
Svenska Rotor Maskiner AB	Sweden
Technofan SA	France
TURBOMECA	France
UNIS, spol. s r.o.	Czech Republic
The University of Manchester	U. K.
Brno University of Technology	Czech Republic
RWTH Aachen University	Germany
Université de Liège	Belgium
Technische Universität München, Institute of Energy Systems	Germany

Organisation	Country
Univesity of Patras	Greece