CESAR
Cost-Effective Small AiRcraft
integrated project
3rd call of FP6 EU
 CESAR Consortium

Total budget Euro 33,7 mil. EUR
EC contribution 18,1 mil. EUR
39 participants, 14 countries

7 a/c designers / manufacturers
Aero Vodochody, Piaggio Aero, Socata
EADS, Evektor, PZL, Eurocopter, INCAS;

12 a/c systems manufacturers
Liebherr LTS, Aernnova (former Gamesa),
HAI, Jihostroj, Technofan, Jihlavan, Mesit,
Hexagon, Merl, SRM, Speel, Unis

3 engine manufacturers
Turbomeca, Ivchenko, PBS

11 research establishments
EADS-CRC, DLR, NLR, ONERA, VZLU,
FOI, CIRA, ARC, IoA, Sicomp, CENAERO

6 universities
Universities of Manchester, Aachen, Brno,
Liege, Munich & Patras

of these 8 SMEs
CESAR objectives

*Increasing European competitiveness in the field of small commercial aircraft from 5 to 15 passengers*

- 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 (to reduce fuel consumption by 5 to 15%, noise emissions by 3 to 6 dB(A), engine weight by 7-9%)
- Optimization of selected aircraft systems (health and usage monitoring system (HUMS), electro-hydraulic and electromechanical actuation technologies (EHA, EMA), air systems)
Project Structure

**WP 0 - Management and Training**

- WP 1 Aerodynamic Design
- WP 2 Structural Design
- WP 3 Propulsion Integration
- WP 4 Optimized Systems

**WP 5 Development Concept Integration and Validation**

Integration and assessment of project's results on two baseline a/c configurations

**NEW DEVELOPMENT CONCEPT FOR SMALL A/C**
modified economical use of technologies applied on large commercial aircraft

**PROJECT DELIVERABLES**

1. NEW DEVELOPMENT CONCEPT FOR SMALL A/C
2. NEW SOLUTIONS FOR SELECTED AIRCRAFT SYSTEMS
AERODYNAMIC DESIGN

High fidelity design tools
• 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 experience which allow accelerating the aerodynamic design

Advanced wing
• 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

Flight Dynamics
• Development of more consistent chain of tools and database for flight dynamics analyses
• Proven flight dynamics testing procedures customized for general aviation
STRUCTURAL DESIGN

Operational loads
• Affordable tool for estimation of operational and fatigue load

New design approaches to advanced airframe structure
• Assessment of alternative design and manufacture technologies (welding, riveting, composite technologies)

New strength evaluation methods of advanced airframe structures
• Reliable and relatively fast methods and tools for strength evaluation for CS-23 aircraft
• Develop. of an effective tool able to analyze composite structures

Smart structural health monitoring
• Real-time structural health monitoring system resistant to harsh conditions

Flutter prevention for small aircraft
• 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**

**Advanced structure of small gas turbine engine**
- Design tools and technologies for development of modern turboprop engine, incl. adv. design config. of the virtual engine
- Low weight centrifugal compressor and increased efficiency of thermodynamic cycle
- Cooled Small Turbine
- High reliability and efficient transmission

**Complex power-plant control system**
- Low cost “FADEC” with self-diagnostics, incl. propeller control for smaller engines
- Development of new storage and communication module for analytical technology with data downloads

**Environmentally friendly propeller propulsion**
- Low-noise propeller design
OPTIMIZED SYSTEMS

Cost effective actuation
- Efficient and low weight electro-hydraulic actuation (EHA)
- Advanced concept for electro-mechanical actuation (EMA)

Competitive technologies for air systems
- Competitive integrated environmental control system and cabin pressure system

Integrated diagnostics and on-condition maintenance system
- Reduction of delays and cancellations of flights due to unscheduled maintenance and repairs
DESIGN CONCEPT INTEGRATION AND VALIDATION

New design and development concept
• Integrated computer environment for the design of small aircraft
• Optimized processes and knowledge management for design and development of small aircraft

Evaluation platforms

AC1 is a twin engine turboprop un-pressurized aircraft

AC2 is a twin engine Very Light Jet pressurized aircraft.

Figure 1 - IDS concept for small a/c
CESAR Outcomes:

✓ Technical achievements (knowledge, software, methodologies, technical solutions and technologies etc.)

✓ Development of international cooperation in the GA sector with intensive participation of larger manufacturers, SMEs, research establishments and universities

✓ Side effects on national level

✓ Promotion of General Aviation in Europe and towards European Commission

✓ Demonstration of organizational and managerial competences of GA stakeholders to prepare and run large RTD projects

✓ Recommendations and definition of research topics to be addressed by the next RTD projects
THANK YOU FOR YOUR ATTENTION

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