Aerostructures and Innovative concepts

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INFO DAYS – FP7 2 Call
Rzeszów, 11-12 March 2008
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INSTITUTE OF AVIATION - ACTIVITY
IN EUROPEAN FRAMEWORK PROGRAMS

- HIRETT
- HELIX
- UAVNET
- TAURUS
- X2NOISE
- HISAC
- UFAST
- CESAR
- ADLAND
- DRESS
- SOFIA
- SUPERSKYSENSE
- EPATS
- X3NOISE
- IMPERJA
- FLITE 2

AERONET
INFO DAYS – FP7 2 Call
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INNOVATIVE CONCEPTS IN FPs

- **HELIX** 5 FP
- **ADLAND** 6 FP
NEW INNOVATIVE CONCEPT OF HIGH LIFT SYSTEM FOR TRANSPORT AIRCRAFT (BASED ON A320) WAS INVENTED BY OUR SPECIALISTS AND WAS REALISED UNDER THE EU PROJECT „HELIX” (STREP)
INNOVATIVE CONCEPTS IN FPs

INNOVATIVE AERODYNAMIC HIGH LIFT CONCEPTS

SESF high - lift system was developed by IoA, cooperation with Airbus UK and QINETIQ

/ SESF - SEGMENTED EXTENSION SLOTTED FLAP /

Removal of the flap track fairings in SESF concept reduces the cruise drag coefficient by 1.3% in comparison to the HELIX baseline aircraft

AIRBUS A320
INNOVATIVE CONCEPTS IN FP7s

INNOVATIVE AERODYNAMIC HIGH LIFT CONCEPTS
INNOVATIVE CONCEPTS IN FPs

INNOVATIVE AERODYNAMIC HIGH LIFT CONCEPTS

Benefits for HELIX aircraft (Airbus A320) with SESF innovative high lift system

- **511 kg weight saving (i.e. 35%)** in the comparison to HELIX Baseline high lift system
- **Reduction of the cruise drag by about 1.3%** due to complete elimination of the flap track fairings
- Results of the Airbus UK numerical calculation (FLITE 3D code) show:
  - **Increase of the CLmax by 5% at take-off**
Benefits for HELIX aircraft (Airbus A320) with SESF innovative high lift system

- Trade analysis performed by Airbus UK and IAI based on 3D numerical results (FLITE 3D code) shows:
  - At take-off: take-off distance decreases by 4.4%  
  - At landing: decrease of approach speed by 2% and nearly the same landing distance  
  - Fuel burn reduces by 4.7% on defined mission.

- The SESF concept has been down selected (as the best one among 21 concepts developed within HELIX project) to the experimental 3D validation in large scale wind tunnels at low and high Re number (Airbus UK and QuinetiQ).

INNOVATIVE CONCEPTS IN FPs

INNOVATIVE LANDING GEARS
WITH ADAPTIVE SHOCK ABSORBERS

NEW IDEA OF CONTROL LOADS GENERATED BY LANDING GEAR
DURING LANDING PROCESS OF AIRCRAFT
WAS INVENTED BY OUR SPECIALISTS AND WAS REALISED UNDER
THE EU PROJECT „ADLAND” (STREP)
NEW IDEA OF CONTROL LOADS GENERATED BY LANDING GEAR DURING LANDING PROCESS OF AIRCRAFT WAS INVENTED BY OUR SPECIALISTS AND WAS REALISED UNDER THE EU PROJECT „ADLAND” (STREP)
EIGHT PARTNERS WERE INVOLVED IN THE PROJECT:

FROM POLAND:
- INSTITUTE OF AVIATION - WARSAW
- INSTITUTE OF FUNDAMENTAL TECHNOLOGICAL RESEARCH, WARSAW (COORDINATOR)
- PZL MIELEC (NOW SIKORSKY)

FROM GERMANY:
- EADS MÜNCHEN
- FRAUNHOFER INSTITUTE – WÜRZBURG

FROM ENGLAND:
- THE UNIVERSITY OF SHEFFIELD

FROM FRANCE:
- MESSIER-DOWTY – PARIS-VELIZY
- CEDRAT TECHNOLOGIES - GRENOBLE
INSTITUTE OF AVAITION

INNOVATIVE CONCEPTS IN FPs

ADLAND

3D CAD models of new Landing Gear & Adaptive Shock Absorber

Adaptive Shock Absorber & New Landing Gear during drop tests in Institute of Aviation in Warsaw Right - results (with and without control).

Airplane Skytruck (PZL-Mielec Poland)

AERONET

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ENVIRONMENTALLY FRIENDLY HIGH SPEED AIRCRAFT

IoA Task:
AERODYNAMIC PROJECT OF MIXER EJECTOR CONCEPT FOR REDUCTION OF ENGINE NOISE
( Close colaboration with RR )

WP 3.2  Nozzle noise Reduction Technologies
WP 3.2.1  Mixer-ejector aerodynamic and acoustic design
WP 3.2.4  Tests results analysis
INNOVATIVE CONCEPTS IN FPs

ENVIRONMENTALLY FRIENDLY HIGH SPEED AIRCRAFT

HISAC

Take Off – Configuration

Cruise – Configuration
INNOVATIVE CONCEPTS IN FPs

- EPATS 6 FP
- CESAR 6 FP
- HISAC 6 FP
EPATS
European Personal Air Transport System

Thanks to GNSS GALILEO and advanced technologies EPATS will allow aircraft to fly precision approaches to more than two thousands of small and unused airports that don’t have ILS system and permit traveling through Europe from point to point, to more people, in near all weather conditions, at lower cost, and in time much shorter than currently.

Airborne GNSS system and easy of use throught MFD &PFD graphics will assist pilots in all flight phase in all weather condition.
To identify and assess mission’s requirements for possible new classes of aeroplanes based on advanced technologies, which will satisfy the society needs for flexible, fast, easy to use, efficient, low cost, near all weather, safe and environmentally friendly air travel.

To identify the step changes in European industry development of engines and avionics for small aircraft, and in technologies that need to be researched urgently in order to ensure a competitive position of the European aircraft industry, which is composed of many small and medium sized companies in this market segment.
CESAR
Cost-Effective Small Aircaft

IoA:

- NEW LS AND HS AIRFOILS AND WINGS WITH AND WITHOUT HIGH LIFT SYSTEM
- NEW ADVANCED PROPELLER
- ANALYSIS OF FLIGHT LOADS
- FLUTTER
- COMPOSITE STRUCTURES
- REGISTRATOR OF FATIGUE LOADS
INNOVATIVE CONCEPTS IN FPs

CESAR
Cost-Effective Small Aircaft

Institute of Aviation airfoils
Designed for light aircrafts

Experimental results
IoA low speed wind tunnel φ1.5m
Reφ= 1.14*10^6
INSTITUTE OF AVAITION

INNOVATIVE CONCEPTS - FUTURE

DEMONSTRATOR TECHNOLOGII

Idea zasadniczej poprawy parametrów aerodynamicznych statków powietrznych, poprzez zastosowanie innowacyjnej metody zmiany ich wyważenia bez szkody dla stateczności.
NEW INNOVATIVE CONCEPTS
FOR HELICOPTERS

- NEW ROTOR WITH NEW AIRFOILS FOR HELICOPTER „SOKÓŁ 2”
- MORPHING STRUCTURES OF ROTOR BLADES
- APPLICATION OF INTELLIGENT COMPOSITES IN HELICOPTER STRUCTURES
NEW INNOVATIVE CONCEPTS FOR HELICOPTERS

3D MODELS OF ROTOR BLADES FOR WT TEST

CFD ANALYSIS

Hover

Flight V=235 km/h

Induced Velocity - Symmetric Plane
NEW INNOVATIVE CONCEPTS FOR HELICOPTERS

Electrically Controlled Rotor
CONCLUSION

POLISH SCIENTISTS AND ENGINEERS ARE ABLE TO GENERATE NEW INTERESTING, INNOVATIVE CONCEPTS. THEREFORE OUR INTELLECTUAL POTENTIAL CAN BE USEFUL FOR EUROPEAN UNION.
Thank you for your attention

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