The CLEANLE project within HOMOFABER framework

Presentation for students involvement during spring semester 2011
The Interdisciplinary Aerodynamics Group (IAG)

- Cost group within EPFL-STI
  - Administarted by Prof. D. Psaltis
  - Led by Dr. P. Leyland
- Nowadays 10 permanent members
  - 1 group leader
  - 1 Post-doc
  - 4 PhD Students
  - 1 Engineer
  - 3 External collaborators
- BSc/MSc Students
IAG field of competences

• General aerodynamics analysis
  – Vehicles
  – Propulsion systems
• Flight dynamics
  – Flight models
  – Trajectory analyses
• Computational codes developments and use
• Noise emissions
  – Computational aeroacoustics
• Pollutants and particles emissions analyses and assessment
  – Production mechanisms
  – Dispersion and diffusion mechanisms
  – Certification
• Physics modelling for aerothermodynamics
  – Chemistry and reaction phenomena
  – Combustion
  – Heat transfer
  – Radiation
  – Ablation
• Multidisciplinary coupling
  – Multi-physics couplings (aero-elasticity, aero-acoustics, plasma-aerodynamics)
  – Multidisciplinary multi-objectives optimisation
• Systems engineering
  – Complex systems assessments and evaluation methodologies
  – Risk assessment
  – Concepts of operations
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Project overview

Objective

Explore the possible solutions for cleaning devices capable of clearing out the leading edges of business jets or airliners
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Project partners

- CleanSky FP7 CE funded
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Project partners

- Mandated by IFAM, Bremen (D)
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Project partners

• In collaboration with PAS (A)
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The whole CLEANLE project duration is 18 months
The HOMOFABER project will take place from 5th to 7th months
Further MSc semester projects available
HOMOFABER contribution

- Task 1.1: Documentation about existing concepts
  - Exhaustive documentation gathering and selection of potentially extrapolable existing concepts
  - Reverse engineering
  - Re-design

- Task 1.2: Investigation for alternate and innovative concepts
  - Identification and definition of innovative designs
  - Trade-offs
  - Design

Re-design HOMOFABER group

3 to 5 students

Innovative designs HOMOFABER group

3 to 8 students
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HOMOFABER contribution

- Documentation gathering
  - Industrial actors identification
  - Cleaning mechanisms identification
  - Cinematic mechanisms identification
- Documentation summary
- Trade-off study
  - Methodology definition
  - Extrapolation potential evaluation
  - Solutions selection

• Reverse engineering
  - Selected solutions measuring
  - Drawing of selected solutions
  - Dimensioning models
• Re-design
  - Modifications identification
  - Re-dimensioning
  - Final solution design

Re-design HOMOFABER group
HOMOFABER contribution

- Cleaning physical principles
- Implementation constraints
  - Bizjet and Airliner wings layouts
  - Implementation difficulties evaluation
- Propositions for innovative solutions (8)
  - Principle schemes
  - Dimensioning models

• Trade-off study
  - Methodology definition
  - Solutions evaluation
  - Solutions selection (3)

• Design
  - Dimensioning
  - Drawing of selected solutions
  - Final designs assessment

Innovative designs HOMOFABER group
General skills/interests required

- General mechanical design
- Aircraft systems
- Cleaning technologies
- Industrial level of requirements
- Team work
Specific skills/interests required

Re-design HOMOFABER group

- Mechanical systems design
  - Statics
  - Dynamics
- Reverse engineering
  - Metrology
- Computer environment
  - CAD/CAO (CATIA V5)
  - Matlab

Innovative designs HOMOFABER group

- Mechanical systems design
  - Statics
  - Dynamics
- Innovation spirit
- Computer environment
  - CAD/CAO (CATIA V5)
  - Matlab
Concurrent work implementation

Re-design HOMOFABER group

Documentation gathering  
Documentation summary  
Trade-off study  
Reverse engineering  
Re-design

Concurrent tasks

Common need of cleaning mechanisms identification  
Common need of design requirements  
Common need of trade-off methodology  
Overall final design assessment

Cleaning physical principles  
Implementation constraints  
Propositions for innovative solutions  
Trade-off study  
Design

Innovative design HOMOFABER group
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Any Questions?

More details on http://iag.epfl.ch
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