PROJECT

GRAIN 2

GReener Aeronautics International Networking-2

**Funding:** European (7th RTD Framework Programme)

**Duration:** Oct 2013 - May 2016

**Status:** Complete with results

**Total project cost:** €534,350

**EU contribution:** €507,145

Call for proposal: FP7-AAT-2013-RTD-1
CORDIS RCN: 110641

**Background & policy context:**

As mentioned in the Executive Summary of the Strategic Research & Innovation Agenda, aviation has an important role to play in reducing greenhouse gas emissions as well as noise and local air quality issues. The continuous increase of air passenger transport generates an increasing use of hydrocarbon fuel with excessive emission of CO2 and NOX (greenhouse gases, pollutants and noise). It is well known that commercial aircraft operations impact the atmosphere by the emissions of greenhouse gases and greenhouse gas precursors, and also through the formation of contrails and cirrus clouds. In 2011, during the Aerodays in Madrid, the EC launched the future of Aeronautics in the ACARE Flight Path 2050 Vision for the Aircraft report containing the ambitious goals on the environmental impact with 90% reduction in NOx emissions, 75% reduction in CO2 emissions per passenger kilometre, and the reduction of the noise in by 65%, all relative to year 2000.

**Objectives:**

To achieve the ACARE Strategic Research & Innovation Agenda green aeronautics technologies will play a more and more dominant role in mastering the challenge on 'Protecting the environment and the energy supply'. GRAIN2 Supported Action, based on the same collaborative and win-win spirit introduced in former EU-China GRAIN project, will provide inputs and roadmaps for the development of large scale simulation strategies for greener technologies to meet the above future requirements on emissions, fuel consumption and noise. To reach these targets, green technologies efforts will have to be collected and prospected in three major lines: Air vehicle, Air Transport System and Sustainable Energies. Three points to be investigated as future greening technologies:

1) Greening the aircraft and the aero engine
2) Greening the operational environment
3) Reducing the carbon foot print of aviation via sustainable alternative fuels

**Parent Programmes:**
FP7-TRANSPORT - Transport (Including Aeronautics) - Horizontal activities for implementation of the transport programme (TPT)

**Institute type:** Public institution

**Institute name:** The European Commission

**Funding type:** Public (EU)

**Lead Organisation:**

Centre Internacional De Metodes Numerics En L'enginyeria'

**Address:**
C/ GRAN CAPITÀ, S/N; EDIFICIO C-1; CAMPUS NORTE UPC
8034 BARCELONA
Spain
### Organisation Website:
http://www.cimne.com

**EU Contribution:** €45,074

### Partner Organisations:

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<tr>
<th>Organisation</th>
<th>Address</th>
<th>EU Contribution</th>
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<tbody>
<tr>
<td><strong>Institut National De Recherche En Informatique Et Automatique</strong></td>
<td>Domaine de Voluceau- Rocquencourt B.P. 105 LE CHESNAY France</td>
<td>€18,324</td>
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<td><strong>Cfd Software - Entwicklungs- Und Forschungsgesellschaft Mbh</strong></td>
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**Organisation Website:**
http://www.inria.fr/  

EU Contribution: €18,324
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<td>Stichting Centrum Voor De Ontwikkeling Van Transport En Logistiek In Europa</td>
<td>Van Nelleweg 1, 3044 BC Rotterdam, Netherlands</td>
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<td>Chinese Aeronautical Establishment</td>
<td>N°2, Anwai Beiyuan, Chaoyang District, Beijing, 100012, China</td>
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<td>Eurocontrol - European Organisation For The Safety Of Air Navigation</td>
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Organisation Website:  
http://www.cira.it

EU Contribution: €29,024

**Institut Von Karman De Dynamique Des Fluides**

**Address:**  
Chaussee De Waterloo 72  
1640 Rhode Saint Genese  
Belgium

EU Contribution: €39,724

**Numerical Mechanics Application International**

**Address:**  
5 Avenue Franklin Roosevelt  
1050 BRUSSELS  
Belgium

Organisation Website:  
http://www.numeca.com

EU Contribution: €18,324

**Acondicionamiento Tarrasense Associacion**

**Address:**  
Carrer De La Innovacio 2  
8225 Terrassa  
Spain

EU Contribution: €18,324

**University Of Glasgow**

**Address:**  
University Avenue  
Glasgow  
G12 8QQ  
United Kingdom

Organisation Website:  
http://www.gla.ac.uk

EU Contribution: €0

**Cranfield Aerospace Limited**

**Address:**  
Cranfield University Campus Hangar 2  
Cranfield  
MK43 0AL  
United Kingdom

Organisation Website:  
http://www.cranfield.ac.uk

EU Contribution: €18,324

**Universidad Politécnica De Madrid**
Key Results:

EU-China efforts for cleaner, greener aeronautics technology

The European Commission has set ambitious emissions, fuel consumption and noise targets for aviation by 2050. An EU initiative explored the role of green technologies in meeting these objectives.

In 2011, the Advisory Council for Aeronautics Research in Europe (ACARE) set challenging goals for aviation to meet by 2050 relative to the capabilities of typical new aircraft in 2000. These include developing technologies and procedures to reduce aircraft carbon dioxide emissions per passenger kilometre by 75%, noise by 65% and nitrogen oxides by 90%. To reach these targets, green technology efforts need to focus along three major lines: air vehicle, air transport system and sustainable energies.

With this in mind, the EU-funded [http://www.cimne.com/grain2](http://www.cimne.com/grain2) (GRAIN 2) (Greener aeronautics international networking-2) project addressed several key technology streams involving future greening technologies.

Project partners identified and focused on four key greener technologies (KGTs) as the most promising ones for more environment-friendly aviation. These are propulsion-related technologies, airframe flight physics, eco-friendly materials and structures, and communications navigation and surveillance.

The GRAIN 2 team identified areas of mutual research, technology and development (RTD) interest. It found emerging RTD research topics within the KGTs and delivered a document on the state of the art for each KGT.

GRAIN 2 nurtured collaboration between Chinese and European partners in the KGTs and prepared specific RTD activities for joint Seventh Framework Programme (FP7) and Horizon 2020 proposals. The joint networking actions were supported by a series of open dissemination events. These included KGT groups, open forums, workshops, and a short course involving physical modelling, simulation, optimisation and control experts from China and Europe in the various KGT areas.

A web-based platform was also developed to store and disseminate collected data relevant to computational methods and experimental tests for multidisciplinary applications in aeronautics.

GRAIN 2 provided Chinese and European researchers with a valuable opportunity to collaborate now and in the future towards the development of greener aeronautics technologies.

Documents:

- Final Report Summary - GRAIN 2 (GReener Aeronautics International Networking-2)

STRIA Roadmaps: Low-emission alternative energy for transport

Transport mode: Air transport

Transport sectors: Passenger transport, Freight transport

Transport policies: Environmental/Emissions aspects, Decarbonisation

Geo-spatial type: Other