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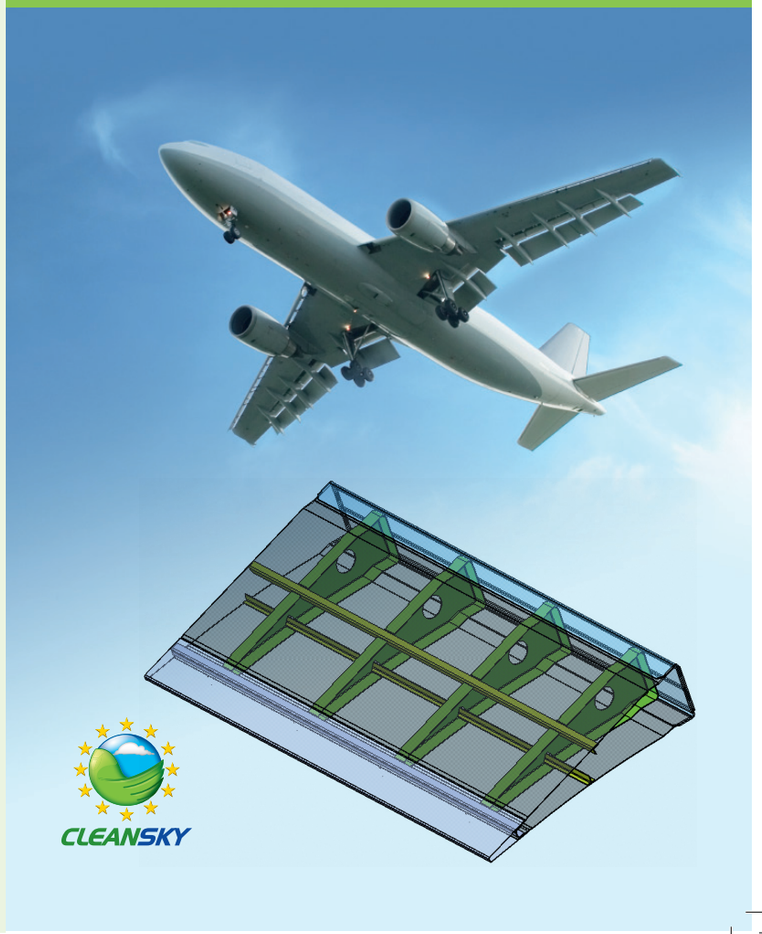
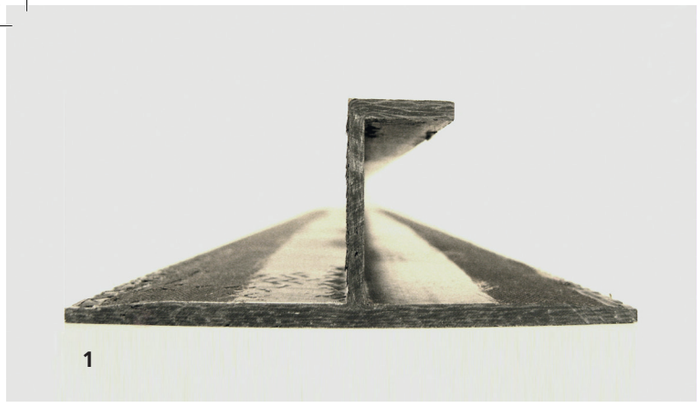
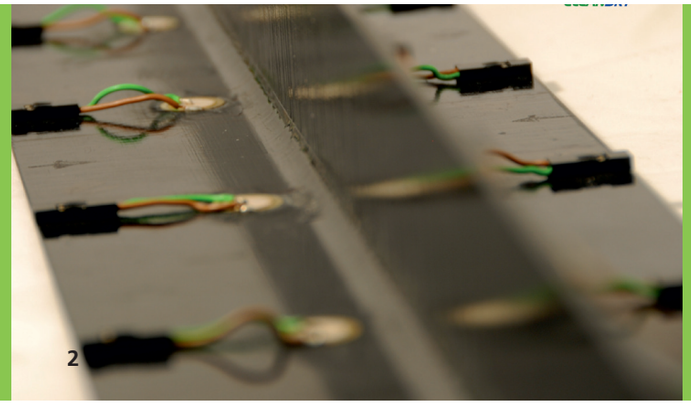
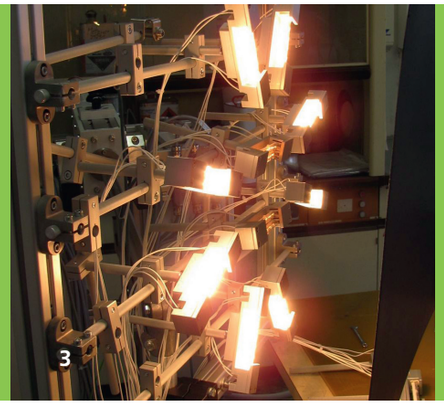


CLEANSKY







1 Frame produced in out-of-autoclave process (Source: ETH Zurich).
2 Damage detection in fibre-reinforced plastics (Source: University of Twente).
3 Green repair solutions (Source: EADS France).

eco DESIGN® AIRFRAME

In eco DESIGN® Airframe life cycle assessment (LCA) tools and a database tailored for the aeronautic industry will be developed. The tools address every aspect of the A/C lifecycle except fuel consumption. More than one hundred technologies will be investigated for application potential and reduced environmental impact and evaluated with the LCA tools.

The results from the selection, processing and recycling of environmentally sound materials will be combined to generate an eco DESIGN® Guideline, which will enable the implementation of a green product life cycle for the aeroplanes of the future.

MATERIALS

In the development of green aircraft new materials will be developed for:

- Recyclability
- Fatigue resistance
- Weight reduction
- Corrosion resistance
- Resource efficiency

For example, new surface treatment technologies and Cr^{6+} and Cd-free protection systems are under development. The aim is to eliminate or at least reduce hazardous substances according to REACH specifications.

MANUFACTURING

Lower resource consumption, waste and emission reduction and the increasing recyclability of components are the main objec-tives in developing new manufacturing technologies and improving existing ones. For example "out-of-autoclave" (OOA) prepreg and liquid composite moulding (LCM) technologies are suitable processes for the production of aerospace components. Their combination in a one-shot co-curing process expands the concept of integrated structures. Hybrid processes enable the advantages of both techniques to be exploited in different components of a structure. Moreover, the higher integration reduces the manufacturing cycle time and the overall energy consumption of the manufacturing process.

LONG LIFE STRUCTURE

Based on the development of sound diagnostic and prognostic methods, structure lifetime will be increased. Testing methods will be improved to ensure a time- and cost-efficient derivation of accurate and comprehensive data bases, to support the long life objective. Green repair solutions will be developed to guarantee a safe long-term use of the aircraft structure. These fast and low-energy heating and curing techniques use near-infrared and induction detection technologies to locate carbon-fibre reinforced polymer (CFRP) part defects.

END OF LIFE

Eco-assessments will be performed during all development steps through to the end of life phase, and a comparison will be made between the current and new technologies.

The main focus is on:

- Improving material identification methods
- Optimizing recycling and testing methods for carbon-fibre-reinforced polymers
- Screening of recycling technologies
- Screening of recycling routes and improvement of high-performance metal alloys

Two examples:

1. Carbon-fibre composite recycling is one field of development, using solvents or other physical means to remove the resin and recover valuable recycled fibres. The application of these fibres in products will be developed, along with appropriate testing methods.
2. Single fibre fragmentation is used to perform single fibre tensile tests. Fibres are separated after their treatment and embedded in a defined dog-bone shape to measure the interfacial shear strength of the contact surface.