



1 Fuel consumption is the dominant factor in terms of environmental impact in the use phase of an aircraft.

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2 Data on materials, processes and technologies specific to the aviation sector, in a consistent database and software system.

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## SUSTAINABILITY – A FACTOR OF SUCCESS IN THE AVIATION INDUSTRY

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#### Current Research Topics

The Fraunhofer IBP has established a comprehensive knowledge base in the assessment of sustainability and resource efficiency. In the aviation sector this expertise is of benefit for the assessment of materials and products, since it permits an integrated analysis of the added value networks throughout the life cycle.

#### Aviation today and in the future

According to the latest predictions, transport and passenger volumes will grow by about five percent per annum over the next years. To bring about a long-term reduction in the ecological impact of aviation despite this expected growth, it is necessary to examine and optimize both new developments and existing processes in terms of their ecological footprint. The

modernization of existing aircraft fleets in particular provides an opportunity for the widespread application of more sustainable developments and for reaching a further milestone in the reduction of environmental impact.

#### Lightweight construction

The use phase of an aircraft is the most significant phase in terms of a Life Cycle Assessment. The ecological impact is largely due to the consumption of fuel, but also its production and combustion. These effects can be countered by increased use of lightweight design and of new lightweight and high-tech materials. When and in what places lightweight components make ecological sense can only be ascertained in the course of an overall assessment of an aircraft's production processes and end of life. The ecologically appropriate use of lightweight components is also dependent



on further framework conditions, for example the area of application, aircraft type, fuel consumption and flying hours. For this reason, timely analysis of the available design options and component variants must be carried out in the course of development, in order to fully exploit the potential of the various technologies involved.

### ecoDESIGN for new aircraft concepts

The service life of an aircraft normally amounts to several decades. The assessment of design options accompanying the development process can thus constitute an important step toward systematically and sustainably reducing the ecological impact of aircraft. Suitable designs, materials, processes and technologies can already be quantitatively analyzed and optimized in detail during the design phase by means of an ecoDESIGN approach based on Life Cycle Assessment. To integrate these results into the design process, an intuitive user interface is available to the aviation sector – the ecoDESIGN tool ENDAMI, which enables aircraft developers without comprehensive knowledge of Life Cycle Assessment to calculate and compare the ecological impact of design alternatives.

### Alternative fuels

The sustainable production and long-term supply of fuels pose a challenge to the ecological optimization of aircraft fleets. Detailed knowledge of the entire process chain – from the raw material extraction up to fuel production – is required for the manufacture of suitable alternatives to classic fuels. Current research therefore deals with the ecological assessment of innovative fuels and the technologies required for their production.

### Cost analysis

The implementation of ecologically favorable alternatives also requires due consideration of economic factors. This is the starting point for an integrated assessment, in which both aspects are analyzed and compared. Solutions that are both ecologically and economically viable can be derived under considerations of the specific framework conditions and areas of application of an aircraft (e.g. service life or distances covered).

### The virtual marketplace

A reliable assessment of the ecological impact of aircraft and their components requires access to comprehensive Life Cycle Assessment data for structural and functional components, materials and processes specific to the field of aviation.

The concept of the virtual marketplace provides suppliers and manufacturers with a platform for marketing their products and solutions under consideration of their specific functions, potential uses, and ecological profiles. The virtual marketplace also facilitates the exchange of data: Information relevant to ecoDESIGN is made available to developers, and communication between the protagonists in the aviation sector is streamlined.

### Our competences

- Life Cycle Assessment and sustainability assessment
- Assessment of future-oriented technologies
- Development of methods und databases
- Design for Environment (DfE)
- Consulting in product development

3 *Life Cycle Assessment of aviation products, including jet engine components.*

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4 *Lightweight construction and future-oriented technologies reduce fuel consumption and environmental impact.*

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