The Future Use of Composites in Transport

**Funding:** European (5th RTD Framework Programme)

**Duration:** Dec 2001 - Jun 2004

**Status:** Complete with results

**Background & policy context:**

Composite materials, such as fibre reinforced plastics and sandwich panels, have considerable potential for increased use in the next generation of transport structures. They are lightweight, durable, and readily moulded to shape.

However, there are also additional complexities associated with the use of composites, particularly in terms of design and manufacture. These complexities, together with issues of cost, are currently limiting their adoption by the transport sectors.

**Objectives:**

The aim of the COMPOSIT thematic network was to bring together researchers, designers, manufacturers and end-users of composite materials across the aerospace, automotive and rail industries. The intention was to encourage knowledge transfer and promote best practice in the use of composites within the transport system.

By identifying and ultimately addressing the composite material research needs of the transport sectors it is anticipated that the legacy of COMPOSIT will be:

- (i) new and improved concepts for composite material transport applications leading to an increased usage of composites and better vehicle solutions,
- (ii) improved competitiveness for the composites industry by reducing development costs and time-to-market for new transportation products, and
- (iii) the creation of an infrastructure for sustainable inter-industry co-operation.

**Methodology:**

Throughout 2002 and 2003, workshops were held on ten of the most critical issues associated with the use of composite materials in the aerospace, automotive and rail industries. These ten issues were repair, design and structural simulation, crashworthiness, manufacturing, light weighting, joining, recycling, modelling, fire safety, and new material concepts.

Each workshop provided a forum for comparison, collaboration and cross-fertilisation between the different sectors. As an output from each workshop, priorities for future research activity to meet the needs of the transport sectors were identified.

**Parent Programmes:**
The COMPOSIT consortium was headed by four partners, each representing one of the industrial sectors with a vested interest in the project: NewRail for the rail industry, EADS Deutschland for the aerospace industry, Centro Ricerche Fiat for the automotive industry, and SICOMP for the composites industry. Six additional members provided further specialist technical input: D’Appolonia, IKV, INEGI and the Universities of Leuven, Newcastle and Zaragoza.

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Key Results:
Although there are clear differences between the aerospace, automotive and rail industries, particularly in terms of their cost structures, production volumes, vehicle design lives, approaches to safety, and other specific factors, the COMPOSIT thematic network found that the three industries could sensibly and usefully collaborate in the following areas:

- **Design, simulation and modelling** – for improved product performance, reduced time to market, lower development costs and reduced development risk. In particular, failure and damage modelling, integrated design / processing tools, and the development of quicker simulation techniques should be priority areas.

- **Manufacturing technologies** – for improved affordability and improved quality. Focus areas should include advanced textile preforms, low cost sandwich structures, process automation, and non-autoclave processing.

- **Recycling** – common research and development priorities should include end-use applications for recycled composites, recycling logistics (collecting, dismantling, sorting, etc.), recycling technologies, and the development of more easily-recyclable materials (e.g. 'monomaterial' composites).


- **New material concepts** – in particular, nanomaterials, three-dimensionally tailored textile preforms, bio-based composites, and low cost sandwich structures are all considered to have potential for future use in the transport sectors.

- **Fire safety** – specifically new materials with improved fire performance, and low cost, meaningful fire test protocols. Of the areas identified above, design, simulation and modelling and manufacturing technologies are considered to be the most critical. In terms of the drivers for the increased future use of composite materials in the transport sectors, the most important is cost reduction. This includes both component costs (including material costs, manufacturing costs and development costs) and operating costs (including energy consumption). This further emphasises the necessity for more affordable composite design and manufacturing technologies.

Policy implications
Economic aspects
Key Findings

- Manufacturing technologies – for improved affordability and improved quality. Focus areas should include advanced textile preforms, low cost sandwich structures, process automation, and non-autoclave processing.

Policy Implications
For the longer term, the expected achievements of COMPOSIT can be summarised as follows:

- improved competitiveness for the composites industry by reducing development costs and time-to-market for new transportation products

Efficiency

Key Findings


Policy Implications
For the longer term, the expected achievements of COMPOSIT can be summarised as follows:

- recommendations for future research priorities and actions, and the identification of appropriate centres of excellence; and
- the creation of a infrastructure for sustainable inter-industry co-operation.

Environmental aspects

Key Findings

- recycling – common research and development priorities should include end-use applications for recycled composites, recycling logistics (collecting, dismantling, sorting, etc.), recycling technologies, and the development of more easily-recyclable materials (e.g. 'monomaterial' composites).

Policy Implications

Documents:

The Future Use of Composites in Transport - Part I: The Composite Material Research Requirements of the Aerospace Industry (Final report)

STRIA Roadmaps:
Vehicle design and manufacturing
Transport mode: Multimodal transport
Transport sectors: Passenger transport, Freight transport
Transport policies: Safety/Security, Environmental/Emissions aspects, Societal/Economic issues
Geo-spatial type: Other