

Preface

The contents of this book are based on my lectures “Commercial Aircraft Composite Technology” (*Verbundwerkstoffe im Flugzeugbau*) given to master’s students at the Faculty of Mechanical Engineering, Technical University of Kaiserslautern, Germany, who wish to broaden their specific knowledge about composite material properties and manufacturing-optimised light weight design. The topic is very extensive and comprehensive textbooks only exist for certain areas. I have tried to focus on the central theme of societies’ overall aircraft requirements to specific material requirements and to highlight the most important advantages and challenges of carbon fibre-reinforced plastics (CFRP) compared to conventional materials. During the product development process, it is fundamental to decide on “the right material at the right place” early on. It is, therefore, basic to understand the main activities and milestones of the development and certification process and the systematic defining of clear requirements. The process of material qualification—verifying material requirements—is explained in detail. All state-of-the-art manufacturing technologies are described, including future perspectives. Especially for composites it is key to understand the interaction of the design scheme, manufacturing technology and resulting material properties. Here I have tried to highlight some key aspects of advanced CFRP design for primary load carrying airframe structures along with selected examples. I have also included a short chapter on testing as part of the certification process—and repair.

As more and more high-performance composites such as CFRP are also used in other sectors—especially automotive, manufacturing systems engineering, wind power, architecture, sports and leisure and medical engineering—the textbook can also be useful for students and engineers engaged in these areas.

The book closes with an outlook on some of the latest developments for future aircraft that we presently pursue at the Institut für Verbundwerkstoffe (IVW). This last chapter was supported by my assistant researchers Tim Krooß (PPS—PES blends, enabling a material performance close to PEEK at lower cost), Benedikt Hannemann (carbon metal fibre hybrid materials, enabling electrical conductivity

and improved failure behaviour) and Moritz Hübler (morphing structures by shape memory alloy integration into fibre-reinforced polymer structures).

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