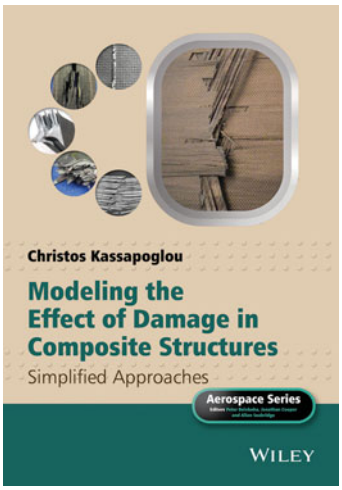

Modeling the Effect of Damage in Composite Structures: Simplified Approaches

C. Kassapoglou

John Wiley and Sons, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK. 2015. 238pp. Illustrated. £74.95. ISBN 978-1-119-01321-1.

The aerospace industry is arguably one of the biggest users of composite materials due to their high stiffness-to-weight and strength-to-weight ratios. Safe and weight-efficient design of airframe structures requires that engineers have good understanding of various kinds of damage that can occur in composite materials over their lifetime and how the presence of damage affects the performance of composite structures.

Complexity of damage in composites makes it very difficult to model it accurately. Over the years, methods that can capture damage evolution and damage interaction have been developed, but they are computationally very intensive and time consuming.

This 230-page book addresses the needs of preliminary design of composite structures when analytical models and simplified approaches can help estimate the effect of damage and account for its presence quickly and efficiently. Holes, cracks, delaminations, impact damage, and fatigue damage are all examined and discussed, each within a dedicated chapter. The introductory chapter gives an overview of damage in composites and points out some important differences between metals and composites with regard to notch sensitivity. The final chapter provides a very useful summary and set of design guidelines, which can serve as a quick reference source for practicing design and structural engineers. Each chapter is generously illustrated with figures, tables, and diagrams, some of which are printed in colour in the insert and contains a small set exercises at the end.

As this book has grown from a graduate course taught by the author at Delft University of Technology, strong emphasis is placed on comparative analysis of different analytical models, discussion of simplifying assumptions made within each model and assessment of each model's capabilities and limitations. This will help the readers – engineers who will be designing the next generation of airframe structures – to develop not only better understanding of underlying damage mechanisms, but also critical thinking and open-mindedness needed for

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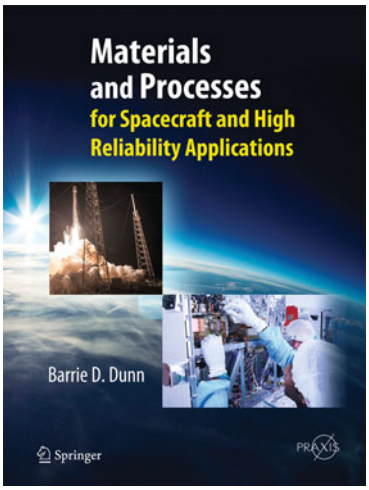
evaluation of any new simplified approaches that may emerge in the future.

Many topics discussed in this book remain the subject of ongoing research, and better models and methodologies will undoubtedly follow.

Professor Maria Kashtalyan
University of Aberdeen



Materials and Processes for Spacecraft and High Reliability Applications

B. D. Dunn

Springer. 2016. 667pp. Illustrated. £126.50. ISBN 978-3-319-23361-1.

This very substantial reference book is an expanded and updated version of the author's previous text *Metallurgical Assessment of Spacecraft Parts, Materials and Processes* (John Wiley & Sons Limited, 1997). As such, it is no longer confined to metallurgy but now covers organic and ceramic materials, together with the processes for applying them within spacecraft equipment and structures. The stated aims of the book are to provide a balance between general background and in-depth technical information, to a target audience spanning engineers, scientists, and technicians: those who need to select suitable materials and processes for a given (usually but not necessarily space-based) application.

As with any good piece of engineering, following the introduction, the book starts by addressing requirements. This includes the general issues and constraints coming from the space environment, but also covers particular requirements for different applications and the issues that may arise through the whole space project lifecycle. This chapter also identifies some novel materials that have potential to meet challenging requirements; those discussed include carbon nanotubes, shape memory polymers and even, fascinatingly, material found in the teeth of limpets.

The focus then moves on to quality, reliability and safety, which forms a major part of the book. Chapter 3 addresses the programmatic aspects of managing materials selection, procurement, and processing. This includes topical issues such as 'greener spacecraft' and increasing restrictions on the use of hazardous materials; chromate primers being one well-known example. The reliability theme is continued in the very extensive Chapter 4, where a range of sources of failure including hydrogen embrittlement, corrosion and stress-corrosion are discussed. Approaches for failure prevention are explored across different applications and

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