I was a bit surprised to see the third edition of this book as it seems that the second edition had appeared not a long time ago (in fact, in 2007).

I have been using the second edition of the book extensively in my teaching and come to appreciate first-hand the comprehensive and in-depth coverage of classical and contemporary topics in mechanics of composites that this excellent book offers. The depth of treatment and the emphasis of fundamental principles make the book highly suitable as a textbook for the upper-level undergraduate and graduate engineering students. At the same time, coverage of state-of-the-art issues and findings makes the book a valuable reference source for practicing engineers.

The 653-page book is subdivided into ten chapters, which have been retained from the second edition. Chapter 1 provides an introduction to composites including basic concepts, applications and fabrication methods. Chapters 2-7 cover lamina stress-strain relationships, effective moduli of a continuous fibre-reinforced lamina, strength of a continuous fibre-reinforced lamina, analysis of lamina hygrothermal behaviour, analysis of a discontinuously reinforced lamina and analysis of laminates. Chapters 8-10 focus on analysis of viscoelastic and dynamic behaviour, analysis of fracture and mechanical testing of composites.

A strong feature of the book is the use of a large number of worked-out examples, which are extremely useful in reinforcing the principles presented in the book and expanding on the concepts. In addition to that, each edition of the book is accompanied by an excellent solutions manual – if only they were not so difficult to get (luckily, our library has one).

Compared to the second edition, the Third edition has been expanded to include a number of new topics, as well as new worked-out examples, homework problems, figures, references and an appendix on matrix concepts and operations. Among the new topics, added as new sections in Chapters 1, 6, 8, 9 and 10, are multifunctional materials, particulates, hybrid multiscale reinforcements, nanoenhancement of viscoelastic and dynamics properties, nanoenhancement of fracture toughness and measurement of hygrothermal properties. Extensive references to classical and historical publications as well as current journal articles are included into each chapter and provide additional information on topics discussed.

Overall, this book is essential reading and highly recommended to all engineering students, researchers and practicing engineers working with composite materials. It is a book well worth having on one’s bookshelf, but whether to upgrade to the Third edition if you already have the Second one largely depends on individual circumstances.

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Guidance of Unmanned Aerial Vehicles

R. Yanushevsky

Unmanned aerial vehicles (UAVs) is no doubt becoming a very important part of aerospace industry and also increasingly an attractive research area with many ambitious targets and plans to meet diversified short and long term application demands from both civil and military sectors.

There are a few books dedicated solely on UAVs published recently. Rafeal Yanushevsky’s book Guidance of Unmanned Aerial Vehicles provides a different but realistic angle looking at UAVs – focusing on guidance issues specific for UAVs that are with similar parameters as missiles. Of course, the author is an expert on missile guidance for many years.

There are serious reasons to address guidance issues, as he mentioned in the Preface, “...future UAVs should possess some AI features that reflect a pilot’s reaction in specific situations. But it is improbable to expect, at least in the nearest future, the creation of extremely complex, reliable computational programs to be used with onboard computers that together with related required sensors and other devices would meet payload or other requirements.” I agree with him on this, though there are new developments coming out rapidly. It is logical to deal with common guidance and control issues for UAVs, with methodologies originated from the special type of UAVs – missiles.

This book provides very detailed analytical descriptions of guidance laws for UAVs, starts from basic facts about UAV guidance, navigation control, to guidance laws including implementation and testing, with rigorous mathematical formulation and informative review of recent UAV developments, for example, in the introduction part of Chapter 8.

This book has also mentioned briefly some of the recent developments in UAVs relevant to guidance and navigation, for example, vision based guidance for collision detection with CMOS sensor in Section 8.5. Readers may find similar examples in different chapters.

I think it is a good reference book for those who are involved or are interested in autonomous UAV control systems. The concrete theoretical aspects provided in this book will help reader to further explore optimal solutions towards future and autonomous UAVs. No doubt, more AI features will be implemented to UAVs easily in the future.

Dr Shigang Yue
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Safety and Reliability in Cooperating Unmanned Aerial Systems

C. A. Rabbath and N. Lechevin

The title of this book is a little misleading. The book is concerned with two specific problems relating to unmanned aerial systems (UASs). The first is a problem in control theory when UASs are flying in formation with each platform tracking the next one up in a chain (or more generally a directed acyclic graph) culminating in an overall mission leader. The second is a problem in decision theory in which formations proceed along edges of a graph where they are exposed to threats; the object is to arrive at a destination
with minimum attrition. The authors elaborate these problems by assuming that individual platforms are subject to faults – actuator faults in the first case, communication faults in the second. Other vehicles in the formation need to have ways of recognising that a fault has occurred and to change their behaviour accordingly. Thus a system for health monitoring and adaptation for the formation as a whole is needed.

The treatment of the two original problems is highly mathematical. The inclusion of system faults makes the mathematics more complicated still. The treatment of the second of the problems has been extended to a consideration of distributed decision-making and computational workload. The conclusions are illustrated by descriptions of simulation experiments.

A book of such a nature as this can scarcely be expected to be an easy read. However, the manner in which the mathematics are expressed has made the arguments unnecessarily hard to follow. It does not help that lack of clarity causes occasional mathematical statements to be technically incorrect. They may not affect the fundamental argument; nevertheless the reader will need to satisfy himself of the validity of the theorems presented.

Reading the book certainly stimulates thought about wider aspects of the problems addressed by the authors. For example, the work of James Moffat has taught us to distinguish between the deliberate and rapid styles of human decision making – the material is available on www.dodccrp.org. Should UASs not also be programmed to recognise certain standard situations and employ specific responses? When choosing routes that avoid threats, should there not also be an abort option when the risk appears too high?

It is no criticism of the book under review that it does not explore these aspects; what it describes are a couple of building-blocks towards an overall control system. The book makes one appreciate what a massive task the design of such an overall system must be.

**Practical Reliability Engineering – Fifth edition**

**P. D. T. O’Connor and A. Kleyner**


This latest edition of the definitive book on this subject, first published over 30 years ago, has been brought up to date and enhanced by the Author, who has contributed greatly to the development of reliability practice, both in military aircraft and industrial environments. This new edition, in collaboration with Dr Andre Kleyner, incorporates the advances since the 4th Edition (2002), including methodology, analytical software development and the impact of the Internet and ubiquitous software tools such as Excel, particularly on data capture.

This comprehensive volume takes the student or engineer from the basic mathematical reliability theory, through to its application to design, (both mechanical and electronic), stress analysis, testing, manufacture (and quality analysis) and on through to operational and repair requirements.

It illustrates the need for the integration of all of these disciplines to achieve the maximum optimum reliability of systems ranging from the complex (nuclear submarines, flight control systems, etc.), to an individual item or problem.

Given the increasing repair costs for sophisticated equipment, the authors emphasise the need for high level corporate strategy to introduce and maintain the input of reliability engineers from the project stage onwards.

The relationship of LCC (Life Cycle Costs) to achieve reliability, taking account of prevention, appraisal and failure costs – and others such as repair and spares costs – is addressed and illustrated by the use of a Poisson model on spares provisioning.
The widespread use of Weibull probability analysis to process and interpret life data is covered in depth, with many practical examples of its application. Other techniques such as Monte Carlo simulation and reliability prediction are brought up to date.

There are many wide and varied practical applications given in each chapter, ranging from, for example, the failure prediction of an aircraft’s tyre on landing; how to determine the breaking strength of different wires of similar length by comparative analysis; predicting the failure modes of a shipborne radar system and how to establish the life testing times for electrical insulators, and many, many more. Each chapter concludes with some practical application questions, which will give the student the opportunity to make use of the preceding text, and, for further reference, a bibliography relevant to each chapter is also appended.

Overall, this is an excellent reference to a complex subject, and should give not only the student, who is contemplating a career as a reliability engineer, a thorough grounding in its techniques and applications, but also will update those practising engineers, such as project, design, stress and test, manufacturing and quality assurance engineers, and enable them to be more aware of how integrated reliability engineering is now an essential component of their respective disciplines.

From a personal point of view, I would have liked to have seen a more detailed description of ILS (Integrated Logistic Support), as this is an area where a great proportion of life cycle costs can originate and be managed. Perhaps a later edition will expand on this.

The underlying message, as always, is that ‘all failures are preventable’.

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