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Book Reviews

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Fundamentals of Modern Unsteady Aerodynamics

Ülgen Gülçat, Springer–Verlag, Berlin, 2010, xii +341 pp.

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This book can be broadly divided into three parts. In the first part (chapters 2–5), the author provides a review of classical aerodynamics theory, i.e., a review of the fluid dynamics equations, incompressible flows about airfoils and wings, and compressible subsonic and supersonic flows. In the second part (chapters 6–8), transonic and hypersonic flows, static and dynamic stall, vortex lift caused by leading-edge flow separation, wing-rock phenomena, and flapping of both rigid and flexible airfoils are considered. The third and shortest part (chapter 9) offers an extremely brief outlook on the future of aerodynamics mainly on unmanned air vehicles and high-altitude, high-speed aerospace vehicles. Chapter 1 is a brief summary of the contents of chapters 2–9. In addition, there are 10 appendices that cover topics ranging from curvilinear coordinates to leading-edge suction.

According to the author, this book is intended for graduate students in aerospace engineering as well as for professional engineers who want to know of recent advances in unsteady aerodynamics. Although the author has tried to follow a very pedagogical style of presentation, has made some efforts to achieve a balance between classical and modern topics in aerodynamics and between analytical tools and numerical simulations, and has provided examples and solutions to some problems in chapters 2–8 (and all chapters except the ninth contain some problems and questions of different levels of difficulty), the large variety of topics considered assumes a class of knowledgeable and motivated graduate students.

What perhaps sets this book apart from other texts available in the literature is that it covers a large variety of topics on classical and modern aerodynamics in a single volume, and some of these topics are not seen in other textbooks at the same level, e.g., numerical simulations of flows around airfoils, flapping motion, etc. As a consequence, the presentation of some topics is necessarily brief, and the extent of coverage is not uniform; for example, transonic flows are treated in 20 pages and no reference is made to the books by Cole and Cook [1] and Moulden [2]. In addition, the book contains many typographical and grammatical errors; some equations, e.g., Eqs. (7.92) and (7.95), are incorrect; many references at the end of each chapter lack volume and/or page numbers; improper usage of English is made in many places; etc.

Although this book provides a review of a large set of flows in aerodynamics, I would not recommend it for use as a textbook in graduate courses on aerodynamics unless it is employed in conjunction with the classical ones by Katz and Plotkin on low-speed aerodynamics; Anderson, Ferri, Liepmann and Roshko, and Shapiro on compressible subsonic and supersonic flows; Anderson and Hayes and Probstein on hypersonic flows; Moulden and Cole and Cook on transonic flows, etc.; the classical NACA technical reports; technical memorandum and technical notes on aerodynamics that are now available through the World Wide Web; and selected papers on computational fluid dynamics.

References

[1] Cole, J. D., and Cook, P. L., *Transonic Aerodynamics*. North–Holland, New York, 1986.
[2] Moulden, T. H., *Fundamentals of Transonic Flow*, Krieger, New York, 1990.

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