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Flight Vehicle Aerodynamics (MIT Press)



Synopsis

This book offers a general overview of the physics, concepts, theories, and models underlying the discipline of aerodynamics. A particular focus is the technique of velocity field representation and modeling via source and vorticity fields and via their sheet, filament, or point-singularity idealizations. These models provide an intuitive feel for aerodynamic flow-field behavior and are the basis of aerodynamic force analysis, drag decomposition, flow interference estimation, and other important applications. The models are applied to both low speed and high speed flows. Viscous flows are also covered, with a focus on understanding boundary layer behavior and its influence on aerodynamic flows. The book covers some topics in depth while offering introductions and summaries of others. Computational methods are indispensable for the practicing aerodynamicist, and the book covers several computational methods in detail, with a focus on vortex lattice and panel methods. The goal is to improve understanding of the physical models that underlie such methods. The book also covers the aerodynamic models that describe the forces and moments on maneuvering aircraft, and provides a good introduction to the concepts and methods used in flight dynamics. It also offers an introduction to unsteady flows and to the subject of wind tunnel measurements. The book is based on the MIT graduate-level course "Flight Vehicle Aerodynamics" and has been developed for use not only in conventional classrooms but also in a massive open online course (or MOOC) offered on the pioneering MOOC platform edX. It will also serve as a valuable reference for professionals in the field. The text assumes that the reader is well versed in basic physics and vector calculus, has had some exposure to basic fluid dynamics and aerodynamics, and is somewhat familiar with aerodynamics and aeronautics terminology.

Book Information

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Customer Reviews

Mark Drela is Terry J. Kohler Professor of Fluid Dynamics in the Department of Aeronautics and Astronautics at MIT.

I'm a student in MIT's MOOC in Flight Vehicle Aerodynamics. The book is a good tool to succeed in this course. Mark Drela is a genius and a very good teacher. This book worth the money and the time spent on it.

Ever since writing the XFOIL program for MIT project Daedalus, Mark Drela has rightly gained the reputation as one of the cornerstones of aerodynamics for aircraft design. "Flight Vehicle Aerodynamics" captures his latest efforts to move from 2D vortex panel method to 3D vortex lattice method in the AVL code. By considering aircraft performance during various manoeuvres this approach is absolutely relevant to aircraft optimisation - even in a world where freeware CFD codes such as Open Foam make serious aerodynamic investigation available to projects on a limited budget. It should be considered an advanced text on the subject, well suited to those with a reasonable mathematical grasp. It is concise, well planned, and full of coloured diagrams to explain the ideas clearly. If you are serious about understanding aircraft aerodynamics then this is the book for you. It does not go into the depth required to write your own code, but AVL is available on the MIT website. If your needs go beyond this then I would read this book and "Low Speed Aerodynamics" by Joseph Katz & Allen Plotkin. All in all this book sits very well with "Theory of Wing Sections" by Abbott & Doenhoff, "Fundamentals of Aerodynamics" by John D. Anderson Jr, and "Aerodynamics" by Houghton & Carpenter. So whether you are a keen glider pilot preparing for a master degree in aeronautics, or you just have a craving to understand things at a deeper level, then I can highly recommend this book. Actually both descriptions fit me...

Outstanding book that thoroughly covers the basics and more. Well worth the investment and should be on every aerodynamicist's bookshelf. Excellent reference. Well done.

Excellent set of reorganized class notes & lectures. It's very strong on the basics. Good fundamental starting point for all.

This is a terrific book, concise and containing a wealth of material.

Excellent textbook.

I find this book understandable, with very nice figures and the topics are very well explained. It is an excellent book.

Good book

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