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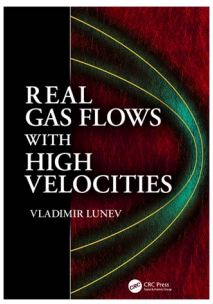
Book Reviews



Real Gas Flows with High Velocities

V. Lunev

CRC Press, Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL, 33487-2742, USA. 2017. Distributed by Taylor & Francis Group, 2 Park Square, Milton Park, Abingdon, OX14 4RN, Oxford, UK. 735pp. £59.99. ISBN 978-1-138-11614-6.

Despite significant interest in high speed flows, there are still not many fundamental books on the physical gas dynamics which are relevant to high temperature flows past space vehicles. The present book represents a significant contribution to this field. It comprises over 750 pages and includes 14 chapters. It is written by a prominent Russian aerospace researcher Professor Vladimir Lunev who has worked in this field for about 50 years. In the analysis of various gas dynamic flows the author focuses on analytical methods although some results of numerical simulation are also presented.

Chapter 1 covers the fundamentals of gas dynamics. The main models of the continuum medium are briefly considered. The chapter contains a good introduction to the physical gas dynamics. Elements of the similarity theory are also outlined there.

Some basic approximate solutions of the inviscid subsonic and supersonic gas dynamics are addressed in Chapter 2. These results are complemented by a rather comprehensive analytical analysis of shock waves that is provided in Chapter 3. In particular it is extended to normal gases. In addition, Chapter 4 is dedicated to the theory of characteristics in application to gas dynamics.

In turn, two-dimensional mixed (subsonic-supersonic) inviscid flows are addressed in Chapter 5. Self-similar solutions are considered in Section 6. Some of these results are not well-known in the literature. They can be valuable for understanding the flow behavior and useful for code validation. Chapter 7 is devoted to hypersonic flows with shock waves. The theory of shock waves is illustrated by numerous experimental and computational results and supported by an analytical analysis that is typical for the entire book.

Chapter 8 is relatively small and devoted to asymptotic analysis in application to hypersonic flows past thin sharp bodies. In turn, hypersonic flows past thin blunted bodies are considered in Chapter 9. Some fundamentals of the physical chemistry are addressed in Chapter 10. They are immediately used in Chapter 11 devoted to nonequilibrium gas flows. This chapter is mostly written on the basis of professional interests of the author and his long-term research expertise. It is not surprising that this chapter is one of the largest in the book. It contains significant quantity of original information.

Some fundaments of viscous flows are provided in Chapter 12. They include the theory of the boundary layer. A significant attention is paid to self-similar solutions. Most approaches described in this chapter are not used nowadays after appearance of powerful computers. Chapter 13 is devoted to multi-component viscous flows. This direction was a hot topic 30 years ago when the re-entry space vehicles such as the Space Shuttle were developed. Nowadays interest in this area is on the rise again. Finally, the elements of radiating gas dynamics are given in Chapter 14.

That some aspects are not reflected in the book in detail is not surprising. For example, a hot topic nowadays, fluid-structure interaction is only described on a few pages. The reader interested in numerical methods for hypersonic flows should look elsewhere. One of the drawbacks of the book is that the author mostly focuses on the results obtained in 1970s and 1980s. There is a lack of references published in English in the last 20 years. On the other hand, the book is full of information based on the sources originally published in Russian and not well known outside.

This book is a comprehensive volume. On its scale it matches the classical book on hypersonic flows by John D Anderson *Hypersonic and High-Temperature Gas Dynamics* (AIAA. 2006– Second editon). These two books make a great contribution to the field of hypersonic gas dynamics and well complement each other. This textbook can be recommended for aerospace engineers, researchers and students.

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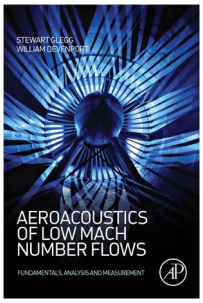

Aeroacoustics of Low Mach Number Flows: Fundamentals, Analysis and Measurement

S. Glegg and W. Devenport

Academic Press, Elsevier, The Boulevard, Langford Lane, OX5 1GB, Kidlington, Oxford, UK. xiii; 537pp. 2017. Illustrated. £97. ISBN 978-0-12-809651-2.

Aeroacoustics is the science of sound generation by air flows or by the interaction of air flows and solid bodies. Common applications in engineering include automotive, railway, wind turbine, gas turbine and HVAC noise. However, it is aviation noise that has primarily motivated a substantial proportion of all the research carried out in aeroacoustics.

The advent of the subject of aeroacoustics is normally attributed to Lighthill's pioneering theory on sound generated aerodynamically published in the 1950s. Since then, along with the growth of civil air transportation, the theoretical foundations of aeroacoustics have been developed. Nowadays highly complex flow noise phenomena can be modelled

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