Book Review

Shock Dynamics

Z. Han and X. Yin, Kluwer Academic Publishers, Dordrecht, The Netherlands, 1993, 320 pp., $137.50

Shock dynamics, which is a relatively simple and easy to use theoretical method by which one can analyze the formation of shock waves and the wave configuration of reflected, diffracted, and refracted shock waves over various geometries, has been gaining more and more interest in recent years. Consequently, this book has appeared right on time. It gives a comprehensive and detailed description of the various aspects of shock dynamics which, as a matter of fact, could be regarded as an extension of Whitham's theory.

The book consists of three major parts. The first two parts present the governing equations of shock dynamics for both quiescent and non-quiescent gases ahead of the propagating shock waves. In each of these cases the two-and three-dimensional governing equations are given and, in addition, both uniform and non-uniform gases ahead of the shock waves are treated. In the third chapter, the authors illustrate the application of the shock dynamics method to three different phenomena, namely: steady and pseudo-steady shock-wave reflections, unsteady shock-wave reflections, and reflections of shock waves at interfaces separating different media. Unfortunately, these illustrations are all two-dimensional with uniform quiescent gases ahead of the propagating shock wave. In addition, part 3 includes material which can be found in other books (e.g., chapter 3 is almost completely covered in the book *Shock Wave Reflection Phenomena*, by G. Ben-Dor). In my opinion it would be much more fruitful to include more examples of the applications of shock dynamics to more complex flow fields.

The book is very easy to follow and understand. Consequently, it could serve as an excellent text book for a graduate course dealing with shock dynamics.

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Recent Research Advances in the Fluid Mechanics of Turbulent Jets and Plumes

P. A. Davies and M. J. Valente Neves, Editors. Kluwer Academic Publishers, Dordrecht, The Netherlands, 1994, 514 pp., $199.00

This book is the volume of proceedings of the NATO Research Workshop on the title subject held at Viana do Castrelo, Portugal in June, 1993. The avowed purpose of the workshop was the presentation of research results obtained in the past ten years. It was intended to extend the exhaustive review articles which appeared at that time. The full text of the 31 papers presented at the workshop appears, but in most cases the presentation is concise because of the limitations of space in the book format. Five of the papers were classed as reviews and occupy about 25 pages while the remainder are each about 15 pages long. At these lengths the reviews are concerned with a narrow subject and the other contributions treat individual research investigations. There does not appear to have been an attempt to cover the all the fundamental areas and applications of jets and plumes. The contributions concentrate on the interests and accomplishments of the authors but these do cover many areas of current interest.

The book is organized around the review papers and this produces a thread linking the papers. The first review, by V. H. Chu, addresses a scheme of analysis of the integral properties based on Lagrangian concepts. It is shown that the entrainment and other constants have unique values for the simple cases studied. Thus one could extend the scheme to complex cases for which experimental data is not available. The second review, by G. H. Jirka, entitled "Shallow Jets" provides full reporting of the experimental work on two-dimensional thin jets. Both mean and turbulent fields have been studied in detail. In the third review, by T. Larsen, the application of integral formulations and the k-ϵ turbulence model to the numerical solution of jet flows of particular interest in Civil Engineering is considered and the equations used in the solution of typical problems are presented. The fourth review, by J. C. R. Hunt, entitled "Atmospheric Jets and Plumes," is a fundamental exposition of the interaction of jets and plumes with cross-flows and stratification. Physical principles and mathematics are used to describe the gross features of these complex flows. The design investigations which have been undertaken for ocean outfalls are reviewed in detail by

P. J. W. Roberts in the fifth item. Laboratory and field investigations are discussed and the means used to meet regulations dealt with.

The shorter papers cover many fields and applications. There are integral schemes for handling bubble plumes as well as atmospheric and oceanographic plumes. Two papers present results obtained using laser induced fluorescence to illuminate the turbulent field. There are also several original experimental and field studies of jets which have not been published elsewhere.

For the most part the material in this book is published more fully in scientific and engineering journals. However, the book does provide an up-to-date look at the status of the understanding of many aspects of jet and plume flows.

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