Interaction of Shock Waves

R. S. Srivastava, Kluwer Academic Publishers, Dordrecht, The Netherlands, 1994, 332 pp., $120.00

Shock wave diffraction, refraction, and reflection are representative of the "interaction of shock waves". The study of these phenomena is one of the most important branches of modern fluid dynamics. This research subject is of great practical importance in connection with supersonic flying vehicles as well as blast effects. Consequently, the appearance of this book is particularly welcomed. It covers theoretical approaches to the subject which have been found fruitful, and goes into comprehensive detail about them.

The monograph consists of several parts. Following the introduction (Chapter 1) and the brief description of shock wave reflection (Chapter 2), the major part (Chapters 3 to 6) presents Lighthill's linearization theory and its extension to the diffraction of normal shock waves (Chapters 3 and 5) and oblique shock waves (Chapters 4 and 6) by convex corners and yawed wedges, respectively. The normal shock wave, as an incident shock wave, propagates in an undisturbed gas, while the oblique shock wave, obtained as a reflected shock wave, propagates in a moving gas.

Chapter 7 deals with shock interaction with a moving aerofoil, known as shock-on-shock interaction. Chapter 8 presents a perturbation method for the study of the diffraction of a shock wave by a flat surface. In the last chapter (Chapter 8), Whitham's approximate theory is briefly described.

Under the limitation of linearized theory, the author cannot deal with problems relating shock wave interactions with more complicated structures. Meanwhile, most references cited in this book were published decades ago. It would be much more fruitful to include an updated look at recent developments in this field. To the best of my knowledge, the understanding of shock interaction phenomenon has improved a great deal in the past decade.

This book would be useful as a reference book for graduate students majoring in applied mathematics, fluid dynamics and aeronautics.

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Errata

Van Driest Transformation and Compressible Wall-Bounded Flows

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BECAUSE of errors in the production process, the following equations appeared incorrectly.

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Equation (8) should read:

$$\frac{dU^+}{dy^+} = \frac{2\mu_w/\mu}{\left[\sqrt{1+4(\mu_w/\mu)^2(\rho/\rho_w)l^{+2}}+1\right]}$$

Also, the last sentence of the paragraph after Eq. (8) should read:

Similarly, by combining molecular and turbulent heat fluxes, the dimensionless temperature equation can be written in terms of $\mu_t/\mu_w = (\rho/\rho_w)l^{+2}\,dU^+/dy^+$ as ....

AIAA regrets these errors.