

REVIEW

Handbook of Turbulence. Volume 1. Fundamentals and Applications.

Edited by W. FROST and T. H. MOULDEN. Plenum, 1977. 498 pp. \$49.50.

This thick book on the mechanics of turbulence is an addition to the number published during the last few years, and is of a different type from all the others. Its title does not indicate correctly its contents, since it is not a reference book but a workshop proceedings containing a number of survey lectures by different lecturers devoted to selected topics in the mechanics of turbulence. The lectures form the chapters of the book and vary considerably in style and size. (The smallest chapter contains about 3 pages of text and 4 pages of photographs without any equations or references, while several others are about 50 pages long and contain in some cases almost 200 numbered equations and many tens of references.) The chapters of the book are only loosely connected with each other: there are practically no references to other chapters of the book, the notation is not the same in all chapters and there is even some repetition of the material in different chapters. The subtitle of the book does not seem to very useful, since it is natural to think that 'Fundamentals and Application' embraces the whole subject. It is indicated on the book jacket that Volume 2 will have the subtitle 'Modelling and Measurement', but this seems strange too since a considerable portion of Volume 1 is devoted to turbulence modelling and measuring techniques.

The chapters of the book are as follows (in some cases a short explanation of the chapter contents is added in parenthesis): Chapter 1, 'The complexity of turbulent fluid motion' by T. H. Moulden, W. Frost & A. H. Garner (a few quite general remarks supplemented by unnecessary axiomatic derivation of the equations of fluid dynamics); Chapter 2, 'An introduction to turbulence phenomena' by T. H. Moulden; Chapter 3, 'Statistical concepts of turbulence' by W. Frost and J. Bitte; Chapter 4, 'Spectral theory of turbulence' by W. Frost; Chapter 5, 'Turbulence: diffusion, statistics, spectral dynamics' by H. Tennekes; Chapter 6, 'Transition' by R. Betchov; Chapter 7, 'Turbulence processes and simple closure schemes' by R. H. Deissler (this is a review of a number of the author's papers devoted to moment-discard approximations and some related simple closure methods); Chapter 8, 'Kinetic energy methods' by P. T. Harsha (a review of a number of semi-empirical model equations); Chapter 9, 'Use of invariant modelling' by W. S. Lewellen (a detailed description of a particular reasonable second-order closure); Chapter 10, 'Numerical simulation of turbulent flows' by S. A. Orszag; Chapter 11, 'Laboratory instrumentation in turbulence measurements' by V. A. Sandborn; Chapter 12, 'Techniques for measuring atmospheric turbulence' by J. R. Connell; Chapter 13, 'Optical and acoustical techniques' by W. S. Cliff (only Doppler techniques are considered); Chapter 14, 'Monte Carlo turbulence simulation' by G. H. Fichtl, M. Perlmutter & W. Frost (a long-winded discussion of a rather special mathematical problem of simulation of time series with given statistical properties); Chapter 15, 'Wind, turbulence, and buildings' by R. C. Elstner (the shortest chapter).

Not all the chapters are good in my opinion. Moreover even those which are interesting are in some cases clearly intended for different readers. For example, the

well-written and comparatively short chapters 5 and 6 both do not use fluid dynamics equations; they contain discussions of some physical features of turbulent processes which are illuminating, but are likely to be useful only for people with substantial preliminary acquaintance with mechanics of turbulence. (Incidentally, the very important Kolmogorov theory of locally isotropic turbulence is described in the book only in chapter 5 in a quite unusual presentation.) On the other hand, chapters 8 and 9 contain a systematic introduction to the modern semi-empirical theories of turbulence which is quite suitable for beginners. One of the best in my opinion is chapter 10 on numerical simulation; this chapter is good for beginners but I think it will be interesting to the specialists also. To sum it up I want to repeat that there are some valuable chapters in the book, and many quite different readers will find here something interesting for them. However it is not clear to me what readers book is intended for, and I doubt that there are any readers who will enjoy the the whole book.

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