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REVIEWS

Fluid Mechanics. By H. C. LOWE. Macmillan, 1979. 227 pp. £3.95.

Fluid Mechanics. By J. F. DOUGLAS, J. M. GASIOREK and J. A. SWAFFIELD. Pitman, 1979.

Engineering Fluid Mechanics. By J. A. ROBERSON and C. T. CROWE. 2nd Edn. Houghton Mifflin, 1980. 661 pp.

Mechanics of Fluids. By A. C. WALSHAW and D. A. JOBSON. 3rd Edn. Longman, 1979. 559 pp. £8.50.

Mechanics of Fluids. By B. S. MASSEY. 4th Edn. Van Nostrand Reinhold, 1979. 543 pp.

Fluid Mechanics. By V. L. STREETER and E. B. WYLIE. 7th Edn. McGraw-Hill, 1979. 562 pp. £16.90.

There are now so many books on Fluid Mechanics that, when confronted with yet another, one inevitably asks whether it offers something sufficiently new and important, by way of material or presentation, to justify its existence.

Two of the books under review are new, the other four have all survived the hurdle of at least one previous edition, the last book listed above by Streeter and Wylie has now reached its seventh edition. All of them are aimed at meeting the needs of civil and mechanical engineering students reading for first degrees or diplomas and the books broadly cover the same major subject areas that traditionally figure in fluid mechanics courses for such students. It must be noted that none of them deals with such topics as boundary-layer theory or wing theory in adequate detail to meet the special needs of students of aeronautical engineering.

The book by Lowe differs from the others insofar as it does not aim to be a complete text book, it is primarily a collection of worked examples and problems compiled under appropriate Chapter headings. Each Chapter begins with some relevant theory but in little more than summary form, the reader is assumed to go elsewhere for details of theoretical derivations and basic physics. The book is somewhat more elementary in scope than the others as it is mainly aimed at meeting the needs of students in their first year. The examples are presented with care and much helpful detail, but the summary form of the theory leads to some serious over-simplification and there are misconceptions that mar the book. To take just one example, laminar flow is defined as a flow in which 'all fluid particles move in parallel paths and there is no transverse velocity component'. There is no index or reference, although there is a small bibliography. One could not commend this book to a student working on his own or without expert guidance.

The book by Douglas *et al.* is along conventional lines but with somewhat more material on unsteady flow in pipes and channels than usual. There are plenty of worked examples and problems. It shows a welcome attempt to discuss basic physical phenomena but there are regrettably some strange lapses and errors. A reader is likely to be confused by the treatment of Bernoulli's equation as an energy equation and the development of the full energy equation that follows; separation is intro-

duced in the discussion of potential flow past a corner without making it clear that it is a feature of the flow of a real fluid and before there is any discussion of boundary layers; suction to preserve laminar flow is quoted as an example of a method of suppressing separation; it is implied that the pressure drag of a body disappears at low Reynolds numbers because of the absence of separation although Stokes flow past a sphere is discussed a few pages later. There is a mysterious reference to the extension of a front stagnation point to form a stagnation region ahead of a blunt body. The discussion of the lift on an aerofoil omits any mention of the Kutta–Joukowski condition and viscous effects, and one is left with the impression that inviscid flow theory and experiment are in perfect agreement up to the stall. Discussion of Dimensional Analysis is postponed to the last Chapter, although the text throughout the book inevitably includes many applications.

The book by Roberson and Crowe is a pleasant, easily readable book and the discussion is generally clear and helpful. Each Chapter has a relevant and sometimes interesting photograph to illustrate its subject matter. At the end of each Chapter there is a generous array of problems, to which half the answers are supplied, and there is also a reference list. The book can be criticized on the relatively small coverage of unsteady flows, and the discussion of the lift on a wing is little more than cursory (in contrast to the discussion of drag) and does not include viscous effects.

The book by Walshaw and Jolson has an interesting and agreeable style, its presentation is good and great care has been taken to anticipate and surmount difficulties for newcomers to the subject. Concepts of similarity and dimensional analysis come early, as they should, and are later reinforced by a more comprehensive discussion. The Chapters on lubrication theory, turbo-machinery and pumps are more detailed than in most text books. There are many worked examples and problems with answers, and to head each Chapter the authors have unearthed relevant quotations from Leonardo da Vinci! Earlier editions did not contain much classical hydro- and aerodynamic theory for two- and three-dimensional flows, in the present edition a final Chapter has been added in an attempt to rectify this deficiency. It would undoubtedly have been more satisfactory to have introduced this material into the main text where appropriate, but presumably the cost of reprinting precluded this. Thus, transition from laminar to turbulent flow is touched on at a few points in the book including this final Chapter, and the reader may not find it easy to form a coherent picture of this phenomenon. However, in the words of '*Which*', this book seems a good buy.

The first edition of the book by Massey was reviewed in this journal in 1968 (vol. 43 p. 636). That the book has now reached its fourth edition is a clear indication that it meets a need and has a well established reputation. It is a wide-ranging book and has been written with a careful eye to possible difficulties and much is done to help to clarify them. It is however surprising that some of the points of criticism noted in the earlier review have seemingly been ignored or rejected. Thus, it is still not made clear that the instability of laminar flow and the consequent onset of transition to turbulence are associated with the presence of shear; the critical Reynolds number of a sphere is still quoted as 1·0 although a correct statement of scale effects on the flow past a sphere is presented later; separation is still discussed in the context of ideal flow; the Kármán vortex street is still quoted as the cause of flutter of aircraft and the reader is still assured that at speeds at which compressibility effects are

important the Reynolds number is high enough for viscous effects to be insignificant. One also notes an assertion that separation almost always occurs towards the rear of a body however well streamlined. The author feels impelled to instruct his readers how to pronounce the names of some of the scientists to whom reference is made, regrettably he informs them that Mach is pronounced Mark! But to go on quoting such examples of misleading statements is unfair as it obscures the fact that this is a solidly useful book written with obvious sympathy for the student new to the subject.

The book by Streeter and Wylie is the seventh edition of a book that first appeared in 1951 and reviews of the second and third editions appeared in this journal (vol. 6, p. 318; vol. 15, p. 632). Its continuous history over nearly three decades reflects its established value as a text book. It is comprehensive, the presentation and illustrations are good, there are plenty of worked examples and problems, and the answers to half the latter are provided. A feature of this edition is the recognition of the increasing importance of the use of digital computers for solving a variety of problems in fluid mechanics such as pipe net-works and water hammer problems. Formulae are developed in a suitable form for computer solution and some simple programs are provided. However, some of the criticisms in the earlier reviews still apply. The interpretation of the Bernoulli equation as an energy equation does not make clear where and why it differs from the full energy equation. The treatment of boundary layers is very sparse and little more than a summary of elementary concepts; cascade theory is referred to only in the second half of the book devoted to Applications and is also inadequately treated. In the last review, the style of the book is referred to as terse and concentrated with few airs and graces, and this description still applies. However, its comprehensive cover makes it particularly useful as a reference book and it has a good index.

I suppose that I should indicate a first preference amongst these books. My choice for a newcomer to the subject would be the book by Warslaw and Jolson on the general grounds of style, presentation, coverage and reliability. For someone who already has a good text-book on his shelves it is doubtful whether any of these books offers enough that is new and valuable to justify their purchase.

A. D. YOUNG

Contributions to the Development of Gasdynamics. Edited by W. SCHNEIDER and M. PLATZER. Friedr. Vieweg & Sohn, 1980. 429 pp. DM 136.

This volume is issued as a tribute to Professor Oswatitsch on his 70th birthday. A brief biographical sketch and a complete list of his publications are followed by a selection of 24 reprints in English of papers previously published by him in Germany or in reports of limited circulation, and covering the period from 1941 to 1969. The collection represents less than one fifth of Oswatitsch's total publications and can therefore only give a general indication of an impressively productive career. His total impact on the scientific community has of course not only been through his papers but also through his teaching activities and not least as an author of text books which fortunately are available to the English language reader.

The papers are arranged under five broad subject headings rather than chronologically. Within each are well known, and now classic, contributions. Amongst those classified as fundamental and general are the papers on the relation between drag and entropy flow and on boundary-layer separation.

Papers on similarity and equivalence cover the fundamental contributions on transonic, supersonic, and hypersonic flows resulting from his work at the Royal Aircraft Establishment in England and at the Kungliga Tekniska Högskolan in Sweden. Under the somewhat open heading 'Methods for solving problems of gas-dynamics' we find more papers on transonic and supersonic flow and examples of the more recent important work on wave propagation problems.

The papers on the applications of gasdynamics are concerned with thrust and drag in supersonic flow with heat addition, intermediate ballistics, and cascades, as well as the famous work on shock diffusers. The final section includes samples of the early work on condensation, in particular the paper on condensation in supersonic nozzles, and also papers on sound propagation in clouds and on the evaporation of clouds.

This well presented collection of papers will be enjoyed by workers in a wide range of fields and should find a place in both teaching and research libraries.

N. H. JOHANNESEN

SHORTER NOTICES

Numerical Simulation of Fluid Motion. Edited by J. NOYE. North Holland, 1978. 580 pp. $67.

This book is the proceedings of the 1976 International Conference on Numerical Simulation of Fluid Dynamic Systems held at Monash University, Melbourne, Australia. The proceedings divide into two parts, seven longer papers on numerical methods and fifteen shorter papers on applications. The collection is very parochial as only the article by G. Fix on Hybrid finite element methods is by an internationally known practitioner, the remaining works coming entirely from Australian, New Zealand and New Guinea authors. The applications section has a large contribution of six papers on tidal and surge modelling. The remaining articles are scattered over a variety of topics including closed cavity, acoustic and supersonic boundary-layer problems.

Sixth International Conference on Numerical Methods in Fluid Dynamics. Edited by H. CABANNES, M. HOLT and V. BUSANOV. Springer, 1978. 620 pp. $30.

This conference was held in Tbilisi, USSR in 1978 and begins with three invited lectures on Hydrodynamic stability problems with time-dependent boundary conditions (K. G. Roesner), on Numerical simulation in fluid dynamics (A. A. Samarskii) and on Some finite element methods in fluid flow (R. Temam). Although this was a truly international conference with contributions on many topics from all over the world, readers may find the many articles by Russian authors (and the appended bibliographies) an invaluable guide to the state of numerical fluid dynamics research and its literature there.

Notes on Numerical Fluid Mechanics. Volume 2. Edited by H. HIRSCHEL. F. Vieweg & Sohn, 1979. 315 pp. DM 98.

These are the proceedings of the Third GAMM Conference on Numerical Methods in Fluid Mechanics held in Cologne, 10–12 October 1979. This is an apparently random collection of 32 theoretical and applied numerical papers. Although more work appears on aerodynamic topics than any other, no underlying pattern or theme can be discerned in the choice of contributions by the organizers.

Computational Fluid Dynamics, Volumes I and II. Edited by W. KOLLMANN. Hemisphere, 1980. 612 pp.

This is a collection of thirteen papers in two volumes. The first volume contains nine long survey articles which made up the 1978 Von Kármán Institute of Fluid Dynamics lecture series on Computational Fluid Dynamics. Although the balance of the book reflects strongly the aerodynamic interests of the Institute with two articles on panel methods and one on transonic flows, several are of wider interest, among them: J. F. Thompson's paper on body-fitted grids for finite difference equations; U. Schuman's article on fast elliptic solvers for irregular domains including a FORTRAN code; and a discussion of the multigrid method for nonlinear elliptic equations by A. Roberts. Such articles can serve as excellent introductions to these topics for further research. The second volume contains a further four articles, two of which (Hollanders & Viviand; Krause) describe very different methods of solving the Navier–Stokes equations, for compressible and incompressible flow respectively. As with the first volume, the emphasis is on the description of numerical techniques rather than on the presentation of solutions to practical problems.

Estuarine and Wetland Processes. Edited by P. HAMILTON and K. B. MACDONALD. Plenum, 1980. 653 pp. $69.50.

This volume contains twenty-five papers presented at a workshop on 'Estuarine and Wetland Processes and Water Quality Modelling' held in New Orleans, June 1979. The papers range over a wide field of disciplines from fluid mechanics to ecology. Among the fluid mechanics papers there are reviews of turbulence, box models, numerical hydrodynamics, sediment transport, nutrient chemistry, movement of copepods, fishery resources; plus case studies for many sites along the coastlines of the U.S.A.