Book Review

Walshaw, A. C. and Jobson, D. A., *Mechanics of Fluids*, Longman, Third Edition 1979, pp. 599, £8.50 net, UK only.

The first edition of this textbook appeared in 1962 when books on fluid mechanics for engineers published in this country were still relatively few in number. In fact the references in that edition were almost all to standard American texts. The third edition which is the subject of this review differs from the first in that SI units are used throughout, and two further chapters have been added, one on viscous films of varying thickness, and the other a closing chapter on the elements of hydro- and aerodynamics. The main body of the descriptive text appears to have been retained, with minor amendments, in its original form. Unfortunately fashions change quickly and the development of the theory may not be completely to the liking of today's instructor. The original preface stated that the aim of the book was to present 'a straightforward and modern approach' to the subject of fluid mechanics. This reviewer is intrigued to note that in the current preface 'a straightforward applicable approach' is being presented.

For example, although the term 'control volume' appears in the derivation of the momentum and Bernoulli (sic) equations in the sense of what could be more appropriately called a 'moving fluid system', the idea of a stationary control volume or surface, by no means a new concept, receives scant attention, even though in the opinion of many it provides a rational and necessary transition from the mechanics of particles and rigid bodies to that of fluids.

The naming of equations after historically significant personalities inevitably persists. Perhaps one should not complain overmuch if a name serves to identify adequately a particular equation or principle. Unfortunately one is never certain with Bernoulli. Is his equation a relation between pressures, velocities, and elevations at points on a streamline or is it an energy equation applicable (albeit with reservations) to flow through end sections of a defined region or apparatus?

With Archimedes it is a slightly different matter. The principle associated with his name is the starting point for the discussion of buoyancy, the first topic in the book. Buoyancy forces arise naturally in the development of fluid statics and it hardly seems necessary any longer to invoke the authority of Archimedes.

Symbols for physical quantities generally conform to current (or British Standard) usage. Some teachers are not greatly concerned whether this is so or not. However, there is a good case for encouraging students to adopt notations that are widely accepted or standardized. It is rather surprising therefore that in this edition the symbol η is used for the coefficient of dynamic viscosity, and replaces the symbol μ used in the first edition. Are we all badly out of step?

For flow in a pipeline the graphical representation of the variation of the so-called hydrostatic head $(p/\rho g + z)$ is still referred to as the 'hydraulic gradient'; this leads to the unfortunate usage 'slope of a hydraulic gradient'.

For what is described as an introductory textbook the coverage is wide and included in its 600 pages are chapters on lubrication, open channel flow, hydraulic power transmission, compressible fluid flow, and fluid machinery. There is also the final chapter on hydro- and aerodynamics. The reputation of the authors is such that the student can be assured he is in safe hands, even though on occasions the method of arriving at essential results would not satisfy everybody; the introduction to compressible fluid motion is a case in point. Incidentally, one reads at the foot of page 367 that 'for a gas, for which $e = c_v T$ and $p/\rho = RT$, $h = c_p T$'; would that nature were always so accommodating!

In spite of the wide coverage one could wish on occasions that the treatment had been amplified in certain respects. Thus the notion of specific speed is introduced for turbomachinery, with the usual remarks about units. No mention is made of the non-dimensional shape number. The authors also subscribe to the view that specific speed is not really a speed at all; the matter is open to argument. On the other hand, in contrast to the avowedly introductory nature of the main body of the book, the final chapter on hydro- and aerodynamics is quite different in tone and character and is rather out of place after the more leisurely progress through the preceding chapters.

A particularly valuable feature of the book is the large number of examples (about 140) solved in the body of the text, in addition to the useful collection of exercises at the end of each chapter. In the solutions to the examples the manipulation of units has received special attention.

The first edition contained a limited number of suggestions for further reading. In this edition such references do not appear. One would like to think that carefully chosen references would encourage students to venture further afield, or at least recognize the contents of the textbook as being a contribution to a wider field of study.

In summary, whilst this reviewer did not feel that this was an exciting textbook, nevertheless it was worth issuing as a third edition. It contains all the basic material likely to be required for engineering courses up to first degree level and can be confidently recommended as a text for the purpose. The readership is stated to encompass that in HNC and degree courses; it would probably be necessary to prescribe supplementary reading in the latter case.

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