BOOK REVIEWS

The Thermodynamics and Gas Dynamics of Internal Combustion Engines: Volume 1

R. S. Benson

This is the first of two volumes planned by the late Professor Rowland S. Benson of UMIST but he died in 1978 having completed only the draft of this volume. It has been edited and steered into print by J. H. Horlock and D. E. Winterbone, who have made only very minor changes from the original draft.

Volume 1 covers the gas dynamics of internal combustion engines (volume 2 will cover the thermodynamics, including combustion and heat transfer, with chapters contributed by various authors). In fact Volume 1 is concerned solely with one method of predicting the gas dynamics of internal combustion engines, solving the equations by the method of characteristics. Thus the text is an extremely detailed (572 pages) and thorough presentation of how the method may be applied to engine inlet and exhaust pipe gas flows and includes treatment of pipe boundary conditions common on engines (valves, pipe junctions, turbocharger compressors and turbines, carburettors, etc., but strangely omits charge air coolers). In practice the book is a memorial to one man's dedication to this subject over a lifetime.

Graphical solutions for homentropic flow form about one third of the book, numerical solutions for homentropic and non-homentropic flows being the remainder. Although graphical solutions do help convey the significance of the pressure waves and their interaction with the fluid, nobody today would contemplate anything but a numerical solution; hence the large amount of space devoted to graphical methods seems unnecessary. This space might better have been devoted to illustrating how the wave action calculations can be used to design optimum intake and exhaust systems (eg a tuned exhaust or intake system, or a 'Cser-type' resonant intake).

The sections on basic principles and numerical methods for pipe flows and their boundary conditions, are excellent. Complex phenomena are explained in simple terms and the thoroughness of the treatment cannot be over emphasised. It is also commendably free of errors. The subject matter however, is extremely specialised and as such the book will only be of interest to a very limited group of people, namely those in engine manufacturing companies or research establishments already using the Benson (UMIST) engine gas dynamic simulation computer program, or those considering doing so. People interested in gas dynamic calculations for other types of equipment (eg compressors, pipe lines, etc.) may find some of it useful but £55 is expensive, even for such a specialised book.

Criticisms are few, but there really is no excuse for liberally mixing SI and Imperial units, even on the same page in places.

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Three-Dimensional Turbulent Shear Flows

Eds. S. Carmi, A. Hamed, J. Herring and F. Peterson

This volume contains the sixteen papers presented in the mini-symposium on the title topic held at the AIAA/ASME joint Fluids, Plasma, Thermophysics and Heat Transfer Conference in St. Louis in June 1982. It follows ASME's practice in recent years of issuing such papers bound together, rather than as individual pre-prints. This arrangement that allows the Society to cover costs while offering the collection at a price within the sights of even the hardest pressed university department.

Several highly successful collections have resulted from this approach, for example, the volume on laser Doppler velocimetry from the 1982 ASME Winter Annual meeting. The present collection, however, cannot be numbered among them. Perhaps inevitably, given the subject, the range of topics is so diverse that most readers will not be directly interested in more than a few of the papers. The grouping of the contributions under the conventional headings 'internal flows', 'boundary layers', and 'external flows', while possibly helpful in organizing the conference, does nothing to help the unity of the collection. There are in fact two papers on spatially two-dimensional, unsteady boundary layers which appear in separate sessions. Likewise, there are two papers on developing three-dimensional flow in a corner and two on flow in curved ducts which cry out to be paired together; in each case however they are slotted into different 'sessions'. Only in the three-part paper by Pierce, McAllister and Tennant is there a unified theme developed.

Lest these remarks seem too critical, let me add that the general quality of the papers is good with the majority being of journal quality standard. It is pertinent to note that current ASME policy does not regard volumes such as this one as 'archival material' and so the authors are at liberty to offer their papers for publication in one of the ASME 'Transactions' journals. Indeed, it is likely that several of those in the present collection will appear in one or other of those journals over the next twelve months.

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