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Book Review

Flow Around Circular Cylinders—Volume 1: Fundamentals, by M. M. Zdravkovich, Oxford Science Publications, 1997.

REVIEWED BY P. W. BEARMAN[1]

It can be argued that much of what we already know about fluid dynamics, and a great deal of what we still need to understand and predict, is present in the variety of phenomena generated by the flow around a circular cylinder. This simple body shape has challenged generations of experimentalists and latterly has proved to be an exacting test case for computationalists. Dr Zdravkovich has spent a lifetime studying flow around circular cylinders. His book is the most authoritative review of the subject to appear since the well known, but now outdated, study by Morkovin in 1964, entitled "Flow Around a Circular Cylinder; A Kaleidoscope of Challenging Fluid Phenomena."

The book is well organised, clearly presented and contains a wealth of information drawn from more than an estimated 1200 references. Volume 1 concentrates on fundamental aspects of flow around a circular cylinder and Volume 2, which is in preparation, will describe applications. In roughly the first third of the book the author presents in detail the various flow regimes experienced by the circular cylinder from low Reynolds number steady attached flow to very high Reynolds number postcritical flow. A lot of original material is reproduced, including a number of excellent flow visualisation photographs. The middle part is concerned with analytical and numerical solutions of flow around a circular cylinder, based on the Navier Stokes equations or on simplified models. The final third of the book is a compendium of influencing factors on circular cylinder flow: free stream turbulence, shear, compressibility, heat transfer, sound, cavitation and the effect of a non-Newtonian fluid.

This book is a major contribution to fluid dynamics and is thoroughly recommended to anybody interested in the flow around a circular cylinder. While there are a significant number of typographical errors this will not inhibit the reader's understanding or enjoyment. However, it is possible that there will be sections where the reader disagrees with the author's interpretation of flow phenomena or with the emphasis placed on certain aspects. For example, there could have been more on the application of hydrodynamic stability theory and the concepts of convective and absolute instability in cylinder flow. A fuller coverage of the control of circular cylinder flow might have been included. In the section on modelling I would have welcomed a more critical review of methods and perhaps some need not even have been presented. The application of CFD to circular cylinder flow is progressing rapidly and the book is not fully up to date in this area. However, one must acknowledge the enormous effort, spread over many years, that has gone into the preparation of this book. Recently the circular cylinder has found itself once more at the forefront of fluid dynamics research and in fast developing areas it is unreasonable to expect to have a book that is up to date in every detail.

This book will become the standard reference for the flow around a circular cylinder. I have already used it several times myself to check on the availability of data on certain aspects of circular cylinder flow. Without its help it might have taken me a lifetime to find them.

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KEYWORDS: Flow-Induced Vibration, Flow Visualization, Bluff Body, Circular Cylinder, Scruton Number, Finite Spanlength, Aspect Ratio, Stream-Wise Vibration, Cross-Flow Vibration, One and Two Degrees of Freedom. JOURNAL NAME: Journal of Flow Control, Measurement & Visualization, Vol.7 No.3, July 15, 2019.Â In addition, the effects of the aspect ratio of a cantilevered cylinder on the flow-induced vibration characteristics were clarified and compared with the results of a two-dimensional cylinder. When a cantilevered circular cylinder with a finite length vibrates with one degree of freedom in the stream-wise di-rection, it is found that acylinder with a small aspect ratio has a single excitation region, whereas a cylinder with a large aspect ratio has two excitation regions. Zdravkovich M (1997) Flow around circular cylinders: Volume I: Fundamentals. Oxford University Press, New York. doi: 10.1115/1:2819655. Download references.Â Achenbach E (1968) Distribution of local pressure and skin friction around a circular cylinder in cross-flow up to Re = 5â‹…106. 5 â‹… 10 6. . J Fluid Mech 34(04):625. doi: 10.1017/s0022112068002120. Flow Around Circular Cylinders book. Read reviews from worldâ€™s largest community for readers. This book is a unique compilation of experimental data, the...Â Start by marking â€œFlow Around Circular Cylinders: A Comprehensive Guide Through Flow Phenomena, Experiments, Applications, Mathematical Models, and Computer Simulations Volume 1â€ as Want to Read: Want to Read savingâ€¦ Want to Read.