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Advances in Hybrid RANS-LES Modelling

Papers Contributed to the 2007 Symposium
on Hybrid RANS-LES Methods, Corfu,
Greece, 17–18 June 2007

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Preface

Turbulence modelling has long been, and will remain, one of the most important topics in turbulence research, challenging scientists and engineers in the academic world and in the industrial society. Over the past decade, Detached Eddy Simulation (DES) and other hybrid RANS-LES methods have received increasing attention from the turbulence-research community, as well as from industrial CFD engineers. Indeed, as an engineering modelling approach, hybrid RANS-LES methods have acquired a remarkable profile in modelling turbulent flows of industrial interest in relation to, for example, transportation, energy production and the environment.

The advantage exploited with hybrid RANS-LES modelling approaches, being potentially more computationally efficient than LES and more accurate than (unsteady) RANS, has motivated numerous research and development activities. These activities, together with industrial applications, have been further facilitated over the recent years by the rapid development of modern computing resources. As a European initiative, the EU project DESider (Detached Eddy Simulation for Industrial Aerodynamics, 2004-2007), has been one of the earliest and most systematic international R&D effort with its focus on development, improvement and applications of a variety of existing and new hybrid RANS-LES modelling approaches, as well as on related numerical issues. In association with the DESider project, two subsequent international symposia on hybrid RANS-LES methods have been arranged in Stockholm (Sweden, 2005) and in Corfu (Greece, 2007), respectively.

The present book is a result of the Second Symposium on Hybrid RANS-LES Methods, held in Corfu, Greece, 17-18 June 2007. The symposium has covered a number of relevant topics in the field, including *Unsteady RANS and LES*, *Improved DES Methods*, *Hybrid RANS-LES Methods*, *Embedded LES*, *DES-related Numerical Issues*, *Performance of the New SAS Model*, as well as *Industrial Applications of DES*. 32 papers have been selected to address these topics, which represent a leading part of current studies and achievements on the fundamentals of hybrid RANS-LES methods in general, as well as on their applications to industrial flow problems. Along with 29 papers selected from the symposium presentations (all being reviewed and further revised after the symposium), three invited keynote papers (by B. Geurts, U. Piomelli and P. Sagaut, respectively) plus an invited overview paper by P. Spalart are also presented in this book. The mailing addresses of all authors are listed at the end of the book to allow readers-to-authors communications when needed.

The editors are confident that the present book represents a viable part of the state-of-the-art in the development and application of DES and other hybrid RANS-LES modelling approaches. The contributors include a number of well-known leading academic researchers and industrial experts in the field. It is our wish to offer this book as a useful reference for researchers, university graduate students and industrial engineers in their work on advanced turbulence modelling approaches, as well as on numerical analysis of unsteady industrial flow problems.

The success of the symposium rests primarily with the participants, who have further facilitated the publication of the present book. In particular, the editors are very grateful to P. Spalart for taking the burden of reviewing all the full papers by reading through hundreds of pages and writing comprehensive comments on each paper. We are also grateful to L. Davidson, B. Geurts and D. Laurence for supporting us in that respect.

Furthermore, we would like to express our thankfulness to M. Braza, co-chairwoman of the symposium, who has ardently supported the preparation and arrangement of the symposium, the interaction with the IUTAM symposium, including a joint round-table discussion on “The future of CFD”.

Thanks are also due to all the partners of the DESider project consortium for their valuable support.

Finally, we wish to express our sincere gratefulness to the European Commission for supporting and monitoring the DESider project, in particular to A. Podsadowski being the EC scientific officer for the DESider project and to the financial support of the symposium by ANSYS, Eurocopter, the KATnet-II EU project and last but not least the Numeca company.

October 2007

Shia-Hui Peng
Werner Haase

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