

Treating the problem of turbulence in industrial practice. Can the future prove better than the past?

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The history of RANS-based turbulence modelling and its industrial deployment are briefly reviewed. Considerable human capital and ingenuity have been invested over the past few decades. However, to date, no practicable model or class of models has emerged which is competent across a broad range of flows featuring diverse states of strain. The reasons for this are examined and it is argued that the RANS treatment of turbulence is inevitably a knowledge based discipline. As such, further investment should be focused on the assembly of such a knowledge base. Industrial practice is at a cusp, enabled by advances in computer architectures, whereby that class of methods for treating turbulence gathered under the banner of Large Eddy Simulation (LES) is poised to enter mainstream engineering practice. There is a growing body of evidence that such methods offer a significant stretch in industrial capability over solely RANS-based modelling. The lessons from history should be heeded in order to inform and steer the unfolding of this next cycle in the development of industrial capability. It is asserted that the reliable deployment of the methodology in the industrial context will prove to be a knowledge-based discipline, as was the case with RANS-based modelling, if not more so. The appropriate knowledge base from which best practice advice can be derived must be grown and matured from the very start of this cycle and not subsequently back-fitted in an attempt to disperse entrenched confusion.