Preface

This volume contains the 2016 Annual Research Briefs that summarize the research activities at the Center for Turbulence Research (CTR) in its thirtieth year of operation. A separate volume summarizes the research undertaken during the sixteenth biennial Summer Program held at CTR earlier this year.

The main objective of CTR continues to be the investigation and understanding of fundamental aspects of turbulent flows, and the development of physics-based models and predictive tools for multi-scale engineering analysis. The investigations reported in this volume have been supported by a number of different organizations, including programs sponsored by the Department of Energy's National Nuclear Security Administration (NNSA), Air Force Office of Scientific Research (AFOSR), Office of Naval Research (ONR), and National Aeronautics and Space Administration (NASA).

Twenty-seven reports are contained in this volume that cover a wide range of topics related to multi-physics effects in turbulent flows. The first group of reports is concerned with wall-bounded turbulent flows, with particular emphasis on the characterization of turbulent structures and subgrid-scale modeling in large-eddy simulations including the near-wall region. The second group of reports is focused on multi-scale phenomena in particle-laden turbulent flows, which is a topic that occupies large attention at CTR as part of the Predictive Science Academic Alliance Program (PSAAP-II) at Stanford. The theme of the reports in the third group is two-phase flows, including applications to subgrid-scale modeling of micro-bubbles, along with developments of numerical methods for the efficient treatment of liquid-gas interfaces. Also included in this group are applications of two-phase flows to combustion systems, including spray ignition and transcritical injection of liquid fuels into high-pressure environments. The topic of aero-acoustics occupies the attention of the fourth group of reports, which focus on reduced-order modeling of jet noise and characterizations of new mechanisms of combustion-induced noise. The reports in the fifth group are focused on uncertainty quantification in turbulent flows, which include applications to large-eddy simulations. The last group of reports involves computations and investigations of numerical methods for compressible flows, solid mechanics and biomedicine.

Last year CTR hosted eighteen resident Postdoctoral Fellows, one Senior Research Engineer, three Senior Research Fellows, one Visiting Scholar, and one Visiting Student Researcher. The CTR roster for 2016 is provided in the Appendix. Also listed are the members of the CTR Steering Committee, which has met quarterly to act on fellowship applications.

It is a great pleasure to thank Pamela Nelson Foster and Vi Nguyen for their help on the day to day management of CTR. This volume is available online, including color versions of the figures in the reports, at the CTR website:
`http://ctr.stanford.edu`

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