Preface

This report contains the 2008 annual technical reports of postdoctoral fellows and senior visitors of the Center for Turbulence Research. A separate report of the proceedings of the 2008 CTR Summer Program was published earlier this year.

The majority of CTR postdoctoral fellows are engaged in research projects supported by NASA's fundamental Aeronautics and U.S. Department of Energy's Advanced Simulation and Computing Program. These relatively large programs have made possible for CTR to maintain a critical mass of researchers which is critical for successful conduct of modern interdisciplinary and multi-physics flow research.

The first group of papers in this volume is in fundamental development of efficient tools for uncertainty quantification of numerical simulation results. This relatively new area of research is at the core of CTR's long term emphasis on predictive science and will continue and expand in the future. The next group of papers is concerned with compressible flows and shock waves. These projects are motivated by recent interest in hypersonic flow and related supersonic propulsion research. Significant effort is being spent on the development of numerical methods for capturing shock waves with minimal detrimental effects on turbulence dynamics. Fundamentals of large eddy simulation and subgrid scale modeling are addressed next, followed by several articles on application of LES to complex multi-physics turbulent flows. After several years of development, CTR's integrated numerical tools are being used to analyze issues of practical importance in industry, such as analysis of surge cycle in high speed compressors and migration of hot streaks from gas-turbine combustors. There is renewed interest in computational aero-acoustics at CTR. The next group of papers describes methods and results from computation of flow generated noise in complex configurations of practical interest. Next, the efforts in the development of advanced numerical methods are presented. Numerical analysis and the associated code development for massively parallel computation continues to be of central importance at CTR, because of the continual need for accurate and stable methods for complex flows with a rich combination of physical phenomena. The final group of papers covers theoretical and computational research in reacting flows including prediction of multi-phase flows, a key component of combustion in practical devices.

We are thankful to Dr. Donghyun You for his skillful editing and compilation of this report. Early in 2009, Dr. You will join the faculty at Carnegie Mellon University; his numerous contributions and active role in CTR over the years will be missed. Thanks are due to Ms. Sara Bedin for her day to day management of CTR. The CTR roster for 2008 is provided in the Appendix. This volume is available on the CTR site on the worldwide web (http://www.stanford.edu/group/ctr/).

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