Preface

This report contains the 2000 annual progress reports of the postdoctoral Fellows and visiting scholars of the Center for Turbulence Research. It summarizes the research efforts undertaken under the core CTR program. CTR publications, including this one, are available on the World Wide Web (http://ctr.stanford.edu). Last year, CTR sponsored sixteen resident Postdoctoral Fellows, nine Research Associates, and two Senior Research Fellows, hosted seven short term visitors, and supported four doctoral students.

In addition to supporting the work reported in this volume, CTR sponsored its eighth summer program, its largest ever, with forty participants. A separate report documenting the findings of this summer program was published earlier this year. Both the Annual Research Briefs and Summer Proceedings are available at CTR's site on the world wide web (http://ctr.stanford.edu). The combustion program has continued to benefit from increased collaborations with NASA-Glenn Research Center through the Ultra Efficient Engine Technology Program and the Department of Energy's ASCI program at Stanford. Through additional planned appointments, we expect turbulent physics and simulation to remain a major focus of CTR in the future. In addition, CTR's new efforts in computational biology and protoplanetary disks will increase moderately. Here our approach has been to appoint fellows interested in applying their experience in turbulence analysis and diverse areas of flow physics to research in these areas.

The reports in this volume are divided into five groups. The first group largely consists of the new areas of interest at CTR. It includes efficient algorithms for molecular dynamics, stability in protoplanetary disks, and experimental and numerical applications of evolutionary optimization algorithms for jet flow control. The next group of reports is in experimental, theoretical, and numerical modeling efforts in turbulent combustion. As more challenging computations are attempted, the need for additional theoretical and experimental studies in combustion has emerged. A pacing item for computation of nonpremixed combustion is the prediction of extinction and re-ignition phenomena, which is being addressed at CTR. The third group of reports are in the development of accurate and efficient numerical methods, which has always been an important part of CTR's work. This is the tool development part of the program which supports our high fidelity numerical simulations in such areas as turbulence in complex geometries, hypersonics, and acoustics. The final two groups of reports are concerned with LES and RANS prediction methods. There has been significant progress in wall modeling for LES of high Reynolds number turbulence and in validation of the $v^2 - f$ model for industrial applications.

At the time of this writing, we became aware of the death of Richard Seebass, current Chairman of the CTR Advisory Committee. Professor Seebass was a renowned aerodynamicist, a great advisor for NASA, and a champion of fundamental engineering research in the United States. He served both as member and chairman of the CTR Advisory Committee. We dedicate this volume to his enormous contributions.

As usual, we are indebted to Debra Spinks, the Center's long-term administrative associate, for the day-today management of CTR and for compilation of this report. This was the last year for Debra at CTR. She has been a tremendous asset to the Center, and her contributions will be missed. We will strive to maintain her high standards in the preparation of these reports.

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