

Preface

The global interest in the development of pulse detonation engines (PDE) for propulsion has led to numerous studies on detonations, particularly pertaining to its control and confinement. This is evident from the formation of collaborative teams by universities and industry both in the U.S. and in Europe and sponsored research worldwide. Dedicated technical meetings and special minisymposia and sessions on PDE in combustion-related conferences are becoming very popular.

The U.S. Office of Naval Research (ONR) and the Russian Foundation for Basic Research (RFBR) are among the principal sponsors of fundamental research on detonations. The International Colloquia on Advances in Experimentation and Computation of Detonations, held in 1998 in St. Petersburg, jointly sponsored by these organizations in association with ONR International Field Office — Europe (ONRIFO), and European Research Office of the U.S. Army, and on Control of Detonation Processes, held in 2000 in Moscow, jointly sponsored by these organizations in association with ONRIFO, European Research Office of the U.S. Army, and the Scientific Council on Combustion and Explosion of the Presidium of the Russian Academy of Sciences (SCCE), have further strengthened the awareness of this forefront area of technology, and provided a forum for dialogue among experts. These also offered the research community the opportunity to revisit the wheel that has been invented and not to reinvent it, but rather to improve upon it and to apply it for more cost-effective practical purposes.

Although devices utilizing pulse detonations have a wide variety of applications, the current focus is towards the development of detonation-based propulsion engines. The near-constant volume operational cycle of PDE provides a higher thermodynamic efficiency as compared to the conventional Brayton cycle used in gas turbines. The advantages of PDE for propulsion are simplicity and easy scaling, subsonic to supersonic operation with a single engine, and reduced fuel consumption. However, control of single and successive detonations is required to realize these advantages. The colloquia, mentioned above, addressed this subject.

The subject of confinement effects on detonation is not yet fully explored. Since confinement plays a very significant role in the development of practical PDEs, an International Colloquium on Advances in Confined Detonations has been organized. This Colloquium is spon-

sored by the ONR*, ONRIFO*, RFBR, and SCCE. The international scientific community responded with 55 papers from 9 countries.

Since providing a full publication of the edited papers and making it available during the Colloquium is a formidable task during the short time ahead, we have endeavored to publish condensed versions in the form of extended abstracts of the papers that will be presented at the Colloquium. The book gives a quick overview of the state-of-the-art in detonations. Limited references are added but further information can be obtained from the authors, and an author index is provided at the end of the book. Since proper confinement of detonation processes is the next appropriate step in transitioning this technology to applications, this volume is prepared as a reference for practicing engineers and research scientists working in the field of combustion and propulsion.

The Colloquium and this volume are the outcome of the hard work of several persons, and we appreciate their contributions. In particular, we acknowledge the assistance given at various stages by Ms. Olga Frolova. We thank the staff of Torus Press Ltd. for their excellent service in producing the volume. Special thanks are due to Academician A. G. Merzhanov, Academician V. A. Kabanov, and Prof. A. A. Berlin for their valuable contribution to the organization of the Colloquium. We appreciate the time and effort the authors made in preparing their papers and participation in the Colloquium, and the sponsoring agencies for their financial support, without which this endeavor would not be possible. We do hope that this volume will serve as a useful addition to the literature on detonations and their application to PDE.

After we started to work on this book, we have learned that Prof. Vladislav V. Mitrofanov of the Institute of Hydrodynamics, Novosibirsk, passed away. He was a distinguished scientist whose outstanding contribution to the detonation physics is world renowned. One of his last, may be the final, publications addressing the evaluation of PDE performance is included in this book. We dedicate this book to his fond memory, with our sincere appreciation for his work and the legacy he left behind.

July 2002

Gabriel Roy
Sergei Frolov
Robert Santoro
Sergei Tsyganov

*The content of the information does not necessarily reflect the position or the policy of the U.S. Government and no official endorsement should be inferred.