

PREFACE

This volume is a compilation of papers presented at a conference on hypersonics held at the Massachusetts Institute of Technology in August 1961 and sponsored jointly by the Air Force Office of Scientific Research and the American Rocket Society. Individual chapters of the volume constituted separate sessions at the conference, and the introduction to each chapter has been written by the chairman of that session.

It was not the aim of the conference, nor is it the aim of this volume, to cover every aspect of hypersonic flow research. Instead the objective is to select special items of current interest and to treat these in some detail. The topics that are covered are low Reynolds number effects, chemical kinetics effects, inviscid flow calculations, and a survey of current experimental techniques, as they relate to the problems of acquiring an understanding of hypersonic flow. Many topics of importance, such as boundary layers on ablating surfaces, electrical properties of inviscid flows, and electronic heat transfer in viscous flows, could not be covered. Others, such as the structure and composition of hypersonic wakes with attendant complex chemical kinetic effects, are treated only briefly. A complete coverage of all aspects of the field would not be feasible in a volume of this type.

The emphasis of the book is on research problems; however, the motivation is clearly to further an understanding of the problems of flight in the atmosphere at hypersonic speeds. Evidence of this is in the current interest in low Reynolds number flows whereas, at the lower supersonic Mach numbers, no similar general and intense emphasis developed. This interest has apparently been stimulated by the current engineering design problems of vehicles re-entering the atmosphere from space. Hence, the practical engineer, in this era in which the distinction between basic and applied research and advanced development is becoming steadily more obscure, should find much of interest. The first three chapters contain theoretical papers, all having a direct bearing on the problem of calculating flow fields at hypersonic speeds, while the final two chapters on experimental techniques are of particular immediate practical interest in view of the difficulty of flight testing.

It is thus intended that the volume, in reflecting the current state of the art, will be of use to engineers involved in advanced design problems as well as to the pure researcher. For the reader who would like a general orientation to the subject matter of the papers in this volume, a summary of the meeting and a review of the lively, tape-recorded discussion that accompanied the presentation of the papers are presented in the article by A. D. Wood and A. Pallone with which this volume begins.

The conference was organized by first selecting areas of current interest in hypersonic flow research and then finding session chairmen of recognized capability within these areas. Each session chairman was involved from the outset in the organization of his particular session, deciding how the session should be set up and participating in the selection of papers to be presented. The editor, who was also conference general chairman, would like to express his gratitude to each of the session chairmen for the time and effort spent in making his session of special significance.

The editor is also indebted to many members of the staff of the American Rocket Society for help in preparation of this volume, and to all the members of the Hypersonics Committee, which initiated the recent conference on hypersonic research problems. Recognition is also due the Avco Corporation for its generous support in preparing the manuscripts for publication. Having the typing done by one group has made it possible to produce the book to a uniform format, which it is hoped will be pleasing to the reader.

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