

EUROPEAN RESEARCH PROGRAM ON HYPERSONIC AERODYNAMICS

EUROHYP Review 1993

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SUMMARY

This report reviews the recently completed and current work programs on various aspects of hypersonic aerodynamic research conducted in European research organizations. Four main fields are covered: configuration aerodynamics, propulsion aerodynamics, rarefied flows and associated non-equilibrium effects, and real gas effects. In each field, a brief description or comment appears on each job, together with references to published papers, a job index and an address for each contributor.

ACKNOWLEDGEMENT

This review was compiled with the support of the European Space Agency (ESA) Contract 10360/93/F/FL.

INTRODUCTION

The goal of this Eurohyp review is to provide a survey and a summary of the recent and ongoing hypersonic research activities in Europe and to promote so information exchanges between research groups. As it is based upon volunteered replies solicited with an admittedly incomplete mailing list, some groups may have been missed while it is clear that we did not receive information from several contacted groups. Nevertheless, the Editors believe that a reasonably complete picture of the hypersonic European research is presented in this review. A list of research items, together with names of contact persons and a list of addresses are given to facilitate communications between researchers.

While there has been a slight decrease in the hypersonic activity, compared to the previous review, this review is somewhat bigger. This is due to the extension of Eurohyp to the previously Eastern block. As "Eastern" contributors were new ones, they have been allowed to present not only their activity over the last two years but also past activities in order to give a more consistent information. It is sure that only a few groups have been reached and it is hoped that the next reviews will welcome a larger number of contributions from this side.

Another, apparently minor change, compared with the previous reviews, is the new editor for field one. Changes in the editor board are usually not very important news to be given in the introduction. Len Squire, who was active among others in the field of hypersonics since the end of the fifties, has been involved in the Eurohyp review from the very beginning. He was at the AGARD meeting on hypersonic flows in London in May 1968 and attended an informal meeting at the Royal Society to discuss European cooperation in hypersonics. This led to Eurohyp. He then attended a meeting of Eurohyp correspondants in Cologne in October 1969 where the Eurohyp review was established and edited the lifting body and wing section ever since, except for 1971. After the 1969 and 1971 issues, his name appears on the editor list of the 1976, 1979, 1983, 1986, 1989 and 1991 issues. We would like to take the opportunity of this new issue to thank Len for his major contribution to the review.

The importance of hypersonic activity over Europe can be seen from the various meetings held in Europe since the last review. Among these, we can remind the two successive AGARD meetings held in April/May 1992 at Le Fauga and Torino, the IUTAM and ISSW meetings in Marseille, Euromech meetings in Aachen and Göttingen as well as the publication of the results of the Antibes workshops or the construction of the European Hypersonic Database.

A large variety of hypersonic projects is under study all over Europe.

The Hermes program is now turned into the Manned Space Transportation Program (MSTP) which plans to quickly develop a capsule. This is a new challenge, not so ambitious as a space shuttle, but still requiring a very good knowledge of hypersonics.

ESA is still conducting research activities such as the Huyghens program in which a probe will enter Titan's atmosphere or the Mars mission Intermarsnet. Entries on other planets atmospheres are also planned. Moon return is also foreseen.

Long term programs focus on airbreathing propulsion, on the German side with the Sänger program, on the French side with the PREPHA program or at ESA level with the FESTIP program. Scramjet propulsion is also investigated in Russia.

Hypersonic education is still active. Germany has university programs on hypersonics and a "Space Course" was organized in Munich last fall. We have also received information about hypersonic courses

delivered in Russia, unfortunately without any information concerning the addressed audience.

This quick and incomplete survey of European hypersonic activities shows that this is still an evolving field, with new challenges and research topics. This is why it is important to keep informed of its evolution and of the evolution of hypersonic research activities. We would like finally to apologize for the unwanted delay in the diffusion of the collected information and hope the readers will find this review a useful document.

The General Editor wishes to acknowledge the European Space Agency (ESA) for its financial support without which the review could not be edited and distributed, the Editors for the important and volunteer work they have done and Mrs C. Pujol for her support in the preparation of the final version and the mailing.