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The Role of Coherent Structures in Modelling Turbulence and Mixing

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PREFACE

In the past years there has been a growing recognition of the existence of large-scale structures in many turbulent flows. Qualitatively this has led to a new insight into the nature of turbulence and to a new way of doing experiments in the field. In the area of flow computation and modelling, however, the new ideas have not produced a corresponding number of important results, and the whole field has become clearly driven by experimental physicists and engineers.

This is probably inevitable after a major experimental breakthrough, and so it was time to bring together experimentalists and theoretists to discuss which had been the main achievements of the last years and to try to find out which will be the development in the future. This Conference was hosted by the IBM Scientific Center at the Universidad Autonoma of Madrid to provide a forum in which this discussion could take place. As such, the emphasis was on the interpretation of known results. Nevertheless, much new material is covered in these Proceedings.

One session concentrates on theoretical and computational problems. The next two are devoted to experimental evidence. One of them (Session II) tries to emphasize experimental methods, while the other one deals more with the presentation of results. The remaining session is devoted to the discussion of those applications, especially noise production in jets and turbulent combustion and mixing, in which turbulent flows play a dominant role as the underlying phenomenon and in which it is currently possible to see a connection with the concept of coherent structures. The session chairmen were asked to review the state of the art in the different fields. Their lectures are included at the beginning of each session.

The IBM Scientific Center and the School of Aeronautics of the Universidad Politecnica of Madrid have been working for some years in the field of experimental turbulence and the application of computer image processing and pattern recognition methods to the processing of the data. It was therefore an honor for us to organize the Conference.

This was only possible through the generous support from IBM SAE and the European Research Office of the United States Army (USARSG). We wish to express our thanks to them.

Professor H.W. Liepmann from the California Institute of Technology acted as external advisor on the scientific programme. Without him this Conference could not have taken place.

I will also like to express my gratitude and appreciation to all the lecturers, chairmen and members of the Scientific Committee; they bore much of the burden of organizing and preparing the Conference. The help of everybody in the local Organizing Committee was invaluable. As in most cases, most of the remaining work was carried out by the secretarial staff of the Scientific Center. To them my sincere thanks.

Madrid, June 1980

Javier Jimenez

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