

PREFACE

The ninth Congress of I.C.A.S., of which this volume is the Proceedings, was held at the Dan Carmel Hotel, Haifa, Israel, from August 25-30, 1974 under the auspices of -

The Israel Society of Aeronautics and Astronautics
Technion, Israel Institute of Technology, Department of
Aeronautical Engineering, and
The Israel Academy of Sciences and Humanities.

The opening session was held on August 26, at the new Haifa Auditorium, and addresses of welcome were delivered by Professor Josef Singer, Chairman of the Israel Organizing Committee; Dr. John Green, President of ICAS; and General Amos Horev, President of Technion. Mr. Josef Almogi, Mayor of Haifa, delivered a short speech of welcome and the Hon. Gad Yaacobi, Minister of Transportation in the Israeli Cabinet, gave an address which dealt with some of the transportation problems which face us to-day. Close to 500 delegates attended this opening session, from fourteen countries. Representatives were present from Australia, Canada, France, the Federal Republic of Germany, the Netherlands, Israel, Italy, Japan, Portugal, Romania, Sweden, the United Kingdom, the United States of America and Yugoslavia. At the conclusion of the opening ceremonies, Dr. Arthur Kantrowitz, Senior Vice-President & Director of the AVCO Corporation and Chairman & Chief Executive Officer of the AVCO Everett Research Laboratory, delivered the Daniel and Florence Guggenheim Memorial Lecture on "High Power Lasers in Space and Aeronautics".

All the papers presented at the Congress are contained in this volume of Proceedings. As in past Congresses, the sessions enabled aeronautical scientists from many countries to exchange information and to discuss research and development problems of major interest. There was, again, that most valued opportunity to look ahead in aeronautics and to have men from different countries give their views of what the future might hold in this dynamic human activity. In addition to the written manuscripts of the 58 talks given at the Congress, the questions and discussions which followed each lecture are included, making the Pro-

ceedings virtually a complete record of the various sessions of the Congress.

ICAS was founded in 1956 to encourage the free interchange of information on all those aeronautical problems in which the scientific aspect is of significant interest, and to promote international cooperation in the study of such problems. These objectives were formulated by the first President of ICAS, the late Theodore von Kármán, and they continued to be fostered and cherished by his successor, our Honorary President Maurice Roy. The organized national associations of all countries dedicated to the advancement of aeronautical science, engineering and technology are eligible to participate in the activities of ICAS, subject to the approval of the Council, which consists of one delegate from each participating country. The American Institute of Aeronautics and Astronautics (AIAA) in New York has provided the Secretariat for ICAS, since its creation, rendering a service of the very highest quality.

Following the eighth Congress in Amsterdam in 1972, the Council's Executive Board (Program Committee) met in Zurich on September 10, 1973, to select the best papers, from those submitted, for presentation at the ninth Congress in Israel. The program for the Congress had no overall theme but included papers from the traditional fields of aerodynamics, aeroelasticity, materials, structures and structural dynamics, propulsion, noise and pollution problems. Papers on these subjects were presented at simultaneous sessions. In addition, the program included four general lectures, delivered at plenary sessions. These dealt with a review of NASA supercritical airfoils, high temperature composite materials, problems of flight turbulence, and electronics technology in civil aviation.

This volume of Proceedings is not a bound collection of preprints. New plates have been prepared so that the papers can be properly numbered, grouped together by subject and indexed.

The Council is greatly indebted to Professor Josef Singer of Technion, the Chairman of the Israel Organizing Committee, and the other members of his Committee for the superb arrangements for this ninth Congress. The excellent facilities of the Dan Carmel Hotel contributed very greatly

to the success and smooth functioning of the Congress. The Council congratulates Technion, Israel Institute of Technology, one of the sponsors of the Congress, on reaching its jubilee year in 1973-74 and is pleased to express its gratitude to Technion and the other sponsors for inviting ICAS to hold its ninth Congress in Israel.

It is my pleasure to extend deep appreciation and thanks to Mr. Robert R. Dexter, Executive Secretary of ICAS, whose untiring efforts and goodwill have always been major factors in the success of our biennial Congresses.

The Council has accepted with pleasure an invitation from the Canadian Aeronautics and Space Institute to hold the tenth Congress in Ottawa, Canada, in late 1976.

John J. Green
President

INTRODUCTION

In the preface the President of ICAS, Dr. John J. Green, has presented the atmosphere of the Congress most vividly. He has also expressed the aims of ICAS and given its history and function in a most succinct form.

We would like to add our gratitude to the many delegates and guests whose active participation as lecturers, discussors and audience contributed to the success of the technical sessions, and whose warm support of the various social activities made them so enjoyable. We hope that the delegates to the 9th ICAS Congress will carry with them pleasant memories of their visit to Israel.

In the Proceedings we have made an effort to group the papers according to subjects and arrange them in what seemed to us a logical sequence. We hope that the reader will find this convenient.

The number of papers necessitated binding the Proceedings in two volumes. However the papers divide naturally into two nearly equal volumes by contents. The first volume is devoted to Fluid Dynamics, Aerodynamics and Gas Dynamics and the second volume to Structures, Materials Dynamics, Propulsion, Design, Noise and Pollution. For convenience the contents, author index and discussor index appear in both volumes.

We would like to thank the authors and discussors for their excellent cooperation and assistance in preparing the Proceedings in its final form. Our warmest thanks and appreciation go to Mrs. Anne Ranze of the American Institute of Aeronautics and Astronautics, and to Mr. Moshe Nimrod and the staff of the Department of Aeronautical Engineering at the Technion for their invaluable help and cooperation.

Robert R. Dexter

Josef Singer

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