
Preface

The Congress, of which these volumes are the Proceedings, was held at The Royal Garden Hotel, London, and was greatly honoured by the presence, for the whole of the opening day, of H.R.H. The Prince Philip, Duke of Edinburgh, Honorary President of The Royal Aeronautical Society. His Royal Highness officially opened the Congress on 12th September and welcomed the 520 delegates who had registered from 26 countries — from Belgium, Brazil, Canada, China, Czechoslovakia, Denmark, France, West Germany, Hungary, Israel, Italy, Japan, Kuwait, The Netherlands, Norway, Poland, Portugal, Rumania, Spain, Sweden, Switzerland, Syria, the United Kingdom, the United States of America, the Union of Soviet Socialist Republics and Yugoslavia.

These volumes contain all of the papers presented at the joint Congress held in London, September 12–16, which combined the Royal Aeronautical Society's Centenary Congress and the 5th Congress of the International Council of the Aeronautical Sciences. The occasion was a singularly happy one because it enabled aeronautical scientists from many countries to join together in celebrating the hundredth birthday of the oldest aeronautical society in the World. At the same time it permitted the aeronautical representatives of the nations to exchange information and to discuss research and development problems of common interest. The most important aspect of such a meeting perhaps lies in the opportunity to look forward in aeronautics and to hear what men of different countries see for the future in a human activity dedicated to a dynamic progress. These objectives were formulated by the first honorary President of ICAS, the late Dr. Theodore von Kármán, and they have been cherished and fostered by his successor M. Maurice Roy, President de l'Academie des Sciences, Paris.

ICAS was founded in 1956 to encourage a free interchange of information on all phases of mechanical flight. The organised national associations of all countries dedicated to the advancement of aeronautical sciences, engineering and technology are eligible to participate in the activities of ICAS, subject to the approval of the Council, which consists of at least one delegate from

each participating country. The American Institute of Aeronautics and Astronautics (AIAA) in New York has served as the permanent Secretariat for ICAS since its organisation and has rendered a service of the highest quality to this international activity.

Following the fourth meeting of ICAS in Paris, the Council appointed a Programme Committee which met in Paris on 27th August 1964, in London on 3rd May 1965, and again in Zurich on 22nd September 1965. At these meetings and through the medium of correspondence between the Chairman and Members of the Committee and between the Chairman and Honorary President, an overall programme best described as 'The Horizons of Aeronautical Science' was chosen with three individual themes — Air Transport in the 1970's; Man-Machine Relationships; and The Aerospace Aeroplane. Since the Council of ICAS had accepted the invitation from the Royal Aeronautical Society to hold the 5th Congress jointly with the Centenary Congress of the Society, the programme was formulated in close collaboration between the officers of the R.Ae.S. and the ICAS Programme Committee. The Society sponsored a number of addresses of a general or survey nature of which the Centenary address by H.R.H. The Prince Philip, Duke of Edinburgh, which dealt with 'Influences on the Development of Aviation' was a highlight of the Congress. The Daniel and Florence Guggenheim Memorial lecture is traditionally given by a speaker from the host country. Mr. M. B. Morgan, Controller of Guided Weapons and Electronics, Ministry of Aviation, consented to give this lecture at the invitation of the Council and spoke on 'Some Aspects of Aircraft Evolution'. Mr. Morgan examined the massive, still rapidly evolving, aeronautical scene from the point of view of both the short- and long-term possibilities engendered by current research work, stressing the continuing need for very high standards of skill and judgment in balancing performance of aircraft against cost.

With the exception of the papers sponsored by the R.Ae.S., the lectures delivered at the Congress were given at the invitation of the Programme Committee. Considering the programme as a whole the Congress maintained that good balance between general and survey papers and those written more for the specialists in the aeronautical sciences which has characterised previous ICAS Congresses. In the publication of all these papers in these volumes they have been grouped as logically and consistently as possible under generally accepted subject matter headings and not under the original special topic areas of the Congress programme. This has been done for easy reference by the reader and because the papers were particularly amenable to this method of treatment.

In addition to the written manuscripts of the talks given at the Congress, questions and discussion which followed each presentation are included. Unfortunately this is not a complete record of the discussion, as only written comments submitted before the end of the Congress were considered. Thus

the printed comments are not in every case representative of the original verbal exchange. It is believed, however, that the discussions reported are useful and will be of interest to many readers.

On the occasion of this joint Congress the Royal Aeronautical Society acted as host. The Council is indebted to Mr. A. D. Baxter, President, Dr. A. M. Ballantyne, Secretary, and the staff of the Royal Aeronautical Society for the excellent facilities and superlative arrangements at the Royal Garden Hotel, Kensington, without which the Congress would not have been the success it proved to be.

The Proceedings of the Congress document the fifty papers presented. The Editorial Committee has striven for early publication in the belief that rapid dissemination of the content of the papers is essential and in keeping with the tempo of the scientific world today.

The Editorial Committee wishes to express its gratitude to the Authors for delivering their manuscripts and returning the proofs so promptly. We are also indebted to the staff of the Royal Aeronautical Society and the publishers, Macmillan and Company Ltd., for the excellent work done in the production of the Proceedings. The Authors, Council and Committees have devoted their best efforts to making the proceedings welcome and valuable books for those engaged in aeronautical engineering and research.

At the meeting in London the Council accepted with pleasure the invitation from the Wissenschaftliche Gesellschaft für Luft- und Raumfahrt (WGLR) to hold its 6th Congress in the Cologne area during the month of September 1968. No changes were made in the Officers of the Council who are as follows: Professor Maurice Roy, Honorary Chairman; Sir Arnold Hall, Chairman: Executive Committee; Dr. John J. Green, Chairman: Programme Committee; Robert R. Dexter, Executive Secretary.

JOHN J. GREEN

Chairman: Programme Committee, ICAS

Avant-Propos

Ce fut un exceptionnel et très heureux évènement que la conjonction, du 11 au 16 Septembre 1966 a LONDRES et sur l'aimable invitation de la Royal Aeronautical Society, de la célébration de son premier Centenaire et de la tenue du V^e Congrès ICAS. Plus encore qu'un symbole des liens d'amitié unissant dans ICAS tant d'associations nationales occupées de sciences aéronautiques, cette conjonction a été l'occasion d'une confrontation entre les résultats obtenus au cours d'un long et glorieux passé et les perspectives de nouveaux et importants progrès, les uns et les autres dans le domaine des Sciences Aéronautiques, qui deviennent maintenant en un sens élargi Sciences Aérospatiales.

Le présent volume contient à la fois les Conférences Générales données à l'occasion et en l'honneur du Centenaire de la Royal Aeronautical Society, à son initiative et sous son égide, et les conférences ou communications présentées au V^e Congrès ICAS, y compris la traditionnelle Conférence dédiée à la mémoire de Daniel et Florence Guggenheim.

Que l'on me permette d'avouer que je me sens très honoré par l'agréable devoir d'exprimer, en-tête de ce Volume et à son propos, de chaleureux remerciements au Comité d'Édition et au Secrétaire Exécutif de ICAS, au Secrétaire Général de la Royal Aeronautical Society et à tous ceux qui ont si bien contribué à la préparation, au contenu et à la publication de ce nouveau volume de la série des Congrès ICAS.

MAURICE ROY
President d'Honneur, ICAS